OPTIMIZING THE CONTRADICTION BETWEEN ENHANCED ENERGY SECURITY, ENVIRONMENTAL PROTECTION AND MINIMIZING THE COSTS

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ABSTRACT

The paper intends to make an analysis regarding the solutions on costs optimization with increasing energy security, with environmental protection and in the same time, bringing satisfaction to electricity consumers by providing electricity in the requested parameters of quality and efficiency.
Energy security is a complex concept, which means ensuring the continuity of supply under acceptable technical, economic, political, social and environmental conditions.
Regarding the environmental protection, investments in technology are required in order to reduce pollutant emissions. In the same time, the lowest costs for CO2 allowances will be obtained.

INTRODUCTION

In a future where energy options play a crucial and sustainable role in the economy of world countries and where energy consumers must have a better understanding of the electricity use, the energy picture has to be shaped through decisions made by both decision-makers and individuals.
Network operators and suppliers have an obligation to deliver to their consumers electricity always in safe conditions.

Energy security and environment protection

The energy security is a complex concept, which represents ensuring the continuity of power supply under acceptable terms from technical, economical, political, social and environmental point of view. It can be defined in terms of: physical availability of the energy resources, accessibility of energy from the price point of view, security of energy demand. There is no infinite security, but a strategy should be designed in order to meet this requirement, providing the risks are acceptable and the costs not very high. To the concept of energy security we should also add the **sustainability** of the energy sector, with a view to maintain the sector's development. **Security and sustainability** mean money and investments that should return to those who pay. There is an increasing trend of the energy resources, and the access is more and more difficult. This will be felt both by the industrial sector, and the population. Also, we should not forget that everything should be based on **sustainable development**, in order not to spend today the resources of the future generations.

Environment protection – The energy is the main contributor to the environmental pollution problems. As far as environment protection is concerned, investments are needed in technologies to reduce polluting gas emissions. The Romanian technological structure is very obsolete, this is why it pollutes. We use Russian systems, from the '60s-'70s. The investments necessary to be done amount to seven billion Euros. An investment in the energy sector takes 5 to 15 years, so Romania has a chance if it takes a decision today. The deadline set by the European Union for solving this problem – reengineering – is the year 2012.

Promoting the concept of intelligent network

The permanent obligation of the network operators is to supply electricity to the consumers under **safety conditions**.

For this, the concept of **intelligent network should be promoted**, the most important technological revolution of all times, **Fig.1**.
Thus, the following are necessary:

- the development of digital technology at the protection control systems, meant to improve reliability, safety and efficiency of power distribution and transmission networks
- capacity to develop, store, send/receive digital information regarding the use, costs, tariff, time of use, type of use, storage, or other relevant information on electricity and the equipment, network or procedures used by operators
- ensuring the coexistence of centralized and distributed generation (distributed resources with possibility of real time interconnection)
- mature, integrated wholesale and detail market, offering to the consumers the possibility to participate in the market (informed, involved and active customers)
- cost optimization, improved tariff systems
- increasing quality in the distribution service, and reducing expenses with customer care centers
- power quality becomes a priority
- promoting efficient technologies, with low carbon emissions
- highly improved data acquisition
- online problem detecting and solving

Fig.1 – The concept of intelligent network (*Source: IEEE*)

Implementing the smart metering concept

The power measurement with smart meters leads to:

a. Significant reductions of costs for manual readings;
b. Consumption reduction and increase of electricity use, as well as achieving the proposed efficiency targets;
c. Cost reduction for the consumers, and customer awareness regarding the energy price and the operation of energy markets;
d. Reduction of consumption at peak hours;
e. Detailed knowledge of load curve and improved consumption forecasts (reducing the expenses with imbalances).

Correct costs setting

The main problem is to set limits to the costs that the economy can afford, in order to increase the energy security, under conditions of economic efficiency.
For this, it is necessary to:

- Supervise the investment programs, determining the cost very accurately;
- Promote the distributed generation (generating electricity from renewables, generating electricity and thermal energy in high efficiency cogeneration; for this, state aid schemes can be implemented);
- Encourage introduction of instruments for flattening the load curve; the measures for flattening the peak load can include the use of electrical vehicles, DSM type energy saving measures, as well as storage batteries.

The energy regulatory authority plays the role of ensuring the necessary regulations and to monitor the operation of energy market. For a good and efficient operation of the energy market, the following are necessary:

- To set the justified cost level for energy generation, transmission and distribution.
- To substantiate the operators cost effectiveness of the regulated base of assets pertaining to the generation, transmission and distribution activities.

The regulated base of the assets, expressed in Lei, is calculated with the formula:

$$BAR_t = BAR_{t-1} + (IA_t - EA_t)/2 - AM_t - PDI_t + NFRR_t$$

where:

BAR_t represents the regulated base of assets for year *t*;
IA_t /EA_t – inputs/outputs of assets during year *t*;
AM_t – annual depreciation of the assets
PDI_t – provisions for the depreciation of intangible assets during year *t*;
$NFRR_t$ – value of the working capital set at the beginning of year *t*

The cost effectiveness of the regulated base of assets, *RC*, is set with the following formula:

$$RC = RRR \cdot BAR$$

where *RRR* represents the regulated rate of return.

So the Regulatory Energy Authority has task to monitor the implementation rigorous investment programs in intelligent network at all utilities, recognizing their justified costs in the tariffs approved.
The relationship between evolution of investment in intelligent network and ROI (return on investment) is presented in **Fig.2**.

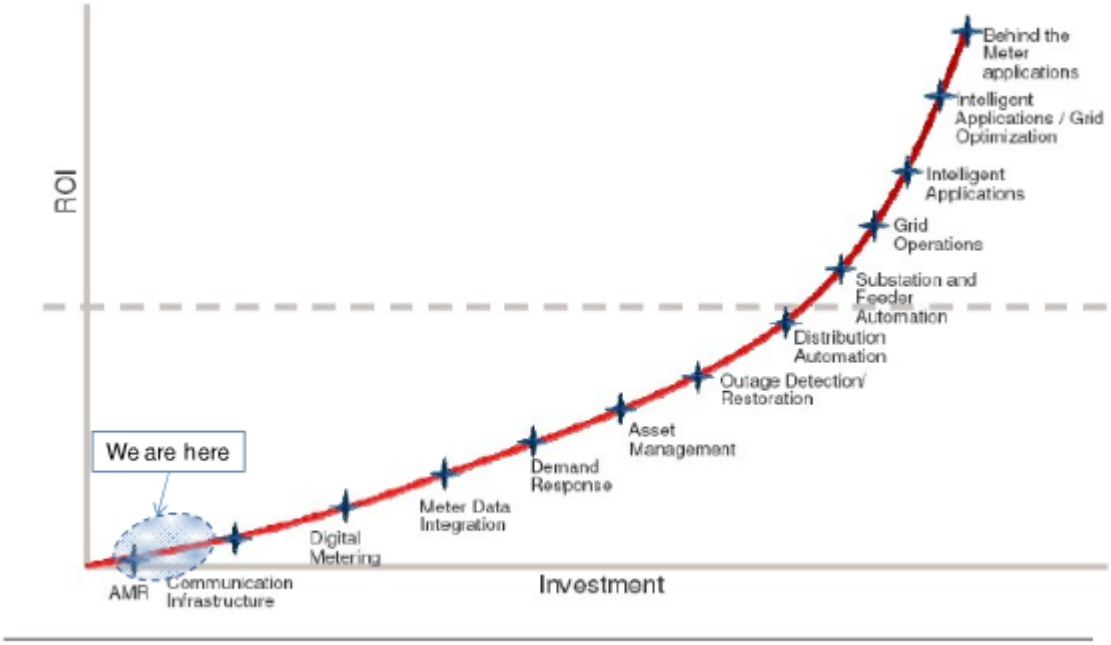
Costs minimization

One of the main ways through which one can act on the minimization of costs for the increase of energy security is the correct dimensioning of risks related to the continuity of energy supply for the consumers. The risk management comprises:

- knowledgement and evaluation of risk factors: political, economical environment, legal area, environment area, institutional framework, regarding the cash flow, the processing of information on energy supply for the consumers
- risk reduction methods: assuming, avoiding, diversifying, transmitting, verifying the business partners, correctly making the business contracts, drawing up the business plan, correctly selecting the company's staff, keeping confidentiality

The factors that need to be taken into consideration when dimensioning the risks taken to ensure the continuity supply for the consumers are:

- energy market structure
- costs and availability of financing
- signals of investments in power plants
- network costs
- supply costs
- interaction with neighbouring markets
- interconnection capacities
- low liquidity on energy markets
- incertitude of future prices related to the costs of greenhouse effect gas emissions.



Source: Independent Electricity system Operator (IESO), 2008, GP Bullhound

Fig. 2 - Investment vs. ROI

Receiving from the end consumer the affordability of the electricity price

All costs are embedded in the price of the electricity at the end consumer. For a good functioning of the electricity market it is necessary to obtain signals regarding the price of electricity, by means of permanent consulting the consumer representatives.
For this, the following is needed:

- identify the efficient transfer channels for and/or from the consumer
- the impact of applying the support scheme for promotion of RES-E, high efficiency cogeneration and the rights for trading CO_2 emissions on the electricity prices at end-users
- satisfy the concept of public service of electricity supply
- protecting more efficiently the consumers against the abuses of market participants

- quantities the consequences of giving up regulated tariffs at end users and planning to eliminate them in stages
- appreciate the evolution trend, during the period 2010-2020, of prices at end users, while eliminating in several stages the regulated tariffs
- evaluate the affordability degree of electricity prices for end users
- process of more exact identification of consumers affected by this measure
- information about the weight of expenditure for electricity bills in the total revenue, broken down on consumer categories:
    - domestic/non-domestic;
    - urban/rural;
    - vulnerables (customs with social tariff)/ the rest of domestic consumers

The main objective - safe, sustainable and competitive power networks

Everything has to be based on sustainable development. We do not must consume resources of the future generations in the present .
We need to strengthen power networks and their adaptation to use renewable energy sources.
All efforts must be directed towards a cleaner and cheaper energy to have energy security.
The objectives that must be considered for security, sustainability and competitiveness are:

- taking over European energy targets to increase energy efficiency by 20%, achieving 20% share of renewables in total energy consumption and reduce emissions of greenhouse gases by 20%, until 2020;
- security in energy supply should be an obligation of all involved participants;
- primary energy resources should be kept in state ownership; their operation must be efficiently the exploitation must e in market terms;
- for the increase energy security it is necessary the modernization of transmission and distribution networks, development of interconnections and diversification of import sources of energy raw materials;
- developing multi-annual investment plan to purchase CO2 capture and storage technologies, for the storage of radioactive waste, management and recovery for other waste in order to protect the environment;
- reducing energy intensity of the Romanian economy, through incentive measures for reorientation towards economic activities with low consumption and high added value.

CONCLUSIONS

The solutions proposed by the authors are sustainable if supported by an adequate institutional, legal and regulatory framework, by medium and long-term energy-environment strategies, together with energy policies and programs at country level, and instruments specific to the free economy. We should not forget that the cost of lack of energy is much higher than the cost of energy.

REFERENCES

[1] A. Leca, 2010, "*Enhancing energy security of Romania by unlocking the potential of energy saving "*, Central and Southeastern Europe Energy Forum, Bucharest, 13 – 14 May.

[2] V. Musatescu, 2007, "*Climate changes. Energy. Environmental Protection "* Conference, Bucharest, published by EurActiv.ro on 21 March.

[3] V. Alicuş, L. Caracaşian, 2010, "*Intelligent network concept - case studies*", CD Rom, FOREN-Neptun, Romania Conference, 13-17 June.

[4] ANRE Order no. 57/2008, "*The methodology for establishing the prices and the quantities for the electricity sold by the generators on regulated contracts and the prices for thermal energy delivered from power plants with cogeneration groups*", published in the Official Journal of Romania, Part I, no. 472 on June 26, 2008.