PROACTIVE MANAGEMENT IN THE POWER INDUSTRY: TOOL SUPPORT

L. D. GITELMAN, T. B. GAVRILOVA, L. M. GITELMAN & M. V. KOZHEVNIKOV
Department of Energy and Industrial Management Systems,
Ural Federal University, Russia.

ABSTRACT

Increasingly dynamic, non-linear and all too often chaotic changes in the global environment and tougher competition, including at the geopolitical level, call for radical transformations in strategic management of the power industry. The article provides the results of a study into proactive actions of energy company management, which are becoming increasingly important. The article offers a framework of concepts relating to proactive management and sums up ideas of a number of authors on diagnostics of weak signals as possible harbingers of threats to sustainable power industry development. The authors have determined a general approach to mechanisms of threat identification and developed methodological principles of shaping a corporate management model capable of reacting to new challenges. The article provides a thorough study of some components of the model and an assessment of factors that ensure successful implementation of the authors' conceptual solutions in energy companies.

Keywords: advanced warning, challenges, proactive management, the power industry, threats, weak signals.

1 INTRODUCTION

Global challenges and threats of accelerating changes in the environment, environmental uncertainty and aggressiveness, a growing number of new tasks which cannot be solved based on experience, call for management's proactive actions in the power industry and are shaping a new model of management of energy companies' development. This model brings in the spotlight the issue of developing a corporate system of early diagnostics of threats and opportunities.

The concept of proactive management [1–3] is a methodological framework for solving this problem; moreover, it ensures sustainable development and increases business' strategic flexibility. At the same time, theoretical aspects of proactive management, including the framework of concepts, basic models and tools, are still under development.

2 FRAMEWORK OF CONCEPTS FOR PROACTIVE MANAGEMENT IN THE POWER INDUSTRY

Proactive management in the power industry is a set of technical, organizational, resource and economic measures implemented at all levels of management and aimed at advanced prevention of the negative impact of internal and external factors (including environmental turbulence and resources restrictions), which threaten stability, integrity, economic efficiency of the industry, energy companies' competitiveness and power supply reliability.

We suggest defining the main terms and correlations between concepts in the proactive management theory.

Trend (synonym: tendency) is a direction actively developing for a certain period of time which can significantly affect relevant fields of work.

Challenges are new conditions and factors of environment that require adequate managerial decisions at all levels of management. They can either offer new sources of development and growth for the industry's efficiency or transform into relevant threats.

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Challenges tend to arise from time to time as a result of rather powerful financial and economic, scientific and technical factors as well as factors relating to resources, energy and even nature and climate ("shifts"). For example, an increase in the share of renewable energy sources in the structure of generating capacities in a number of countries; creation of renewable energy storage systems; development of small-scale (distributed) power generation; smart grid systems; nuclear power units of small and medium capacity with intrinsically safe reactors.

The growing number of challenges and their critical role in the development of the electric power industry have resulted in a relevant intellectual reaction: the role of proactive management as a response to these challenges has grown.

Threats are a possibility of an event with consequences that are unfavourable for a particular energy company; it is a probabilistic characteristic.

Correlations between challenges and threats are outlined in Fig. 1.

A threat alert is information about the nature (kind) of the threat and its source obtained with the help of continuous monitoring of some sectors of the external micro-environment.

Threat identification is an important element of the proactive management process which includes expert (probabilistic) assessments:

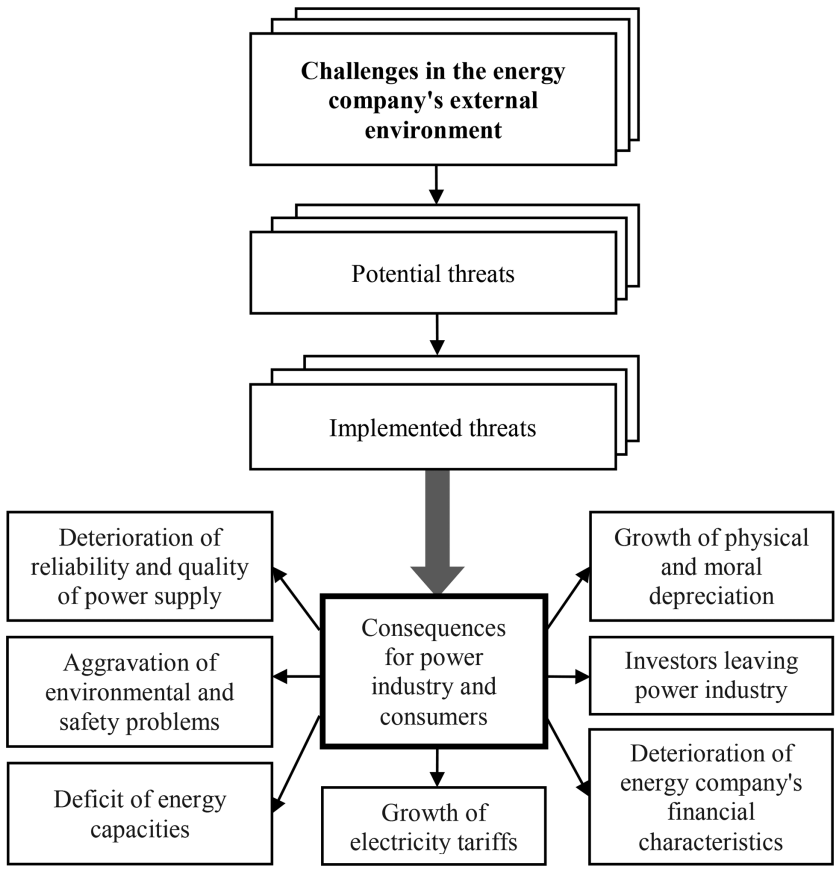

Figure 1: Correlations between "challenges - threats - consequences" for the power industry.

- The likelihood of the threat implementation (as the probability of a relevant event taking place).
- The maximum surge in parameters of the sector of the external micro-environment.
- The time frame of the surge in parameters (which determine the event duration and its impact on the existing trend).

  An event (in this context) is a sharp ("out-of-trend") change ("a surge") of parameters mediating energy company's ties with subjects of the external micro-environment, which can cause deterioration of key financial and economic characteristics of this particular energy company.
- *Key Performance Indicators (KPI)* are indicators that characterize the efficiency of the energy company's activities in the financial sphere and fields relating to customers, business processes, human resources and innovations.

Limit (or threshold) of key indicators criticality is the maximum level of deterioration of specific indicators set for a particular energy company, below which there begins a zone of event unacceptability from the point of investment appeal and competitiveness, that calls for urgent organizational-technical or economic decisions to eliminate the threat.

Depending on the completeness of information obtained as a result of observations, signals are divided into two categories: strong and weak. Problems revealed by strong signals are so obvious and specific that one can assess their significance and take relevant measures in order to eliminate threats or seize opportunities.

Weak signals are early and vague signs of emerging important events which are difficult to grasp and assess in the course of monitoring. They give a feeling about an emerging problem (threat, opportunity) but cannot be used to confidently forecast where and when they will emerge and what exactly they will be like.

In the course of time weak signals can turn into strong ones and, if the level of instability does not exceed the company's ability to timely react to changes, managers can postpone making the decision until they get a strong signal. If the instability of the environment is high, managers who choose to wait for a strong signal may end up being late to solve the problem or being incapable of making the decision under the conditions of time pressure and lack of resources. That is why, if the level of instability is high, it is essential to begin working on a decision once one gets weak signals.

Adequate management based on weak signals requires a well-adjusted monitoring system sensitive to warning signals and readiness of energy company managers and personnel for changes and making risky decisions.

3 WEAK SIGNALS AS OBJECT OF ANALYSIS OF ENERGY COMPANIES' POSSIBLE PROBLEMS

I. Ansoff [4–8] introduced the idea of weak signals and their use for early identification of threats and opportunities in strategic management. P. Schoemaker and G. Day [9–16] developed the concept and detailed a general scheme of weak signal monitoring, their interpretation and integration in the management process. Schoemaker P. and Day G. summarized their outlook in the article [10] published in the *Harvard Business Review* in November 2005 and then presented it as a more extended version in the book [11]. The book substantiates the need to broaden organizational outlook and proposes a structured approach to management which makes it possible to track weak signals coming from the periphery (areas outside the strategic focus).

In the articles written after the book was published the authors elaborate the idea of peripheral vision. The article "Seeing Sooner: How to Scan for Weak Signals from the Periphery" [12] focuses on conditions for successful tracking of weak signals and details areas and relevant methods of scanning. The article "How to Make Sense of Weak Signals" [13] looks at individual and organizational prejudices that impede timely and correct assessment of weak signals and reaction to them. It also offers solutions to this problem and rules which allow for arranging the process of scanning and processing of weak signals in the best possible way.

The last article published on the issue, "Integrating Organizational Networks, Weak Signals, Strategic Radars and Scenario Planning" [16] expands the area under study further. It links weak signal processing to scenario planning and proposed a scanning process from a variety of sources. It looks at various kinds of external networks and assesses their importance for broadening organizations' outlook and developing periphery vision. In the article the authors suggest a tool of strategic management called "Strategic Radar". The tool is based on developed external networks and scenario planning technologies and consists of three major functional subsystems: 1) the monitoring of external signals; 2) the assessment of strategic actions in the changing external environment; 3) the scanning for additional weak signals. The interrelation between the subsystems makes it possible to form and maintain strategic flexibility.

In the 1990s the issue of weak signals was developed in the context of studies of complex adaptive systems (CAS). This direction is most extensively covered in the works of B.S. Coffman [17] who proposed a process model for weak signals.

Yet another direction of in the study of weak signals is being actively developed by futurologists in the context of studies of the future, and sociologists for the purposes of organizational training. This direction is based on the publications by Ansoff as well as the works of G.T.T. Molitor [18–20] who studied "emerging issues". When studying changes, Molitor paid special attention to the phase preceding changes and, consequently, weak signals detected at the beginning of this phase. He pointed out that the changes that seem sudden are in fact an expected result of lengthy processes and by scanning emerging problems one can timely reveal upcoming drastic changes.

At present this direction is being actively developed by various groups of researchers. An article by Jari Kaivo-Oja [21] suggests a model that combines knowledge management technologies and weak signal analysis that can be used when developing new future studies and foresight methodologies. In the article [22] the authors look at weak signals in the context of the foresight theory and practice and show how weak signals analysis in addition to trends monitoring enables an organization to effectively develop and implement its strategy. The article [23] looks at conceptual frameworks and applications, problems and methods of weak signal analysis in early threat detection systems. The article [24] studies the influence of interactions existing in the external environment, stereotypes and the context in which signal interpretation is carried out on weak signals. The article [25] deals with analysis of distributed, heterogeneous, open and continuous data which can be used for early detection of problems. In the paper [26] the authors suggest a tool for weak signal filtration in the strategic process the application of which contributes to pro-active decision-making. The article [27] looks at the use of improvisation in strategic studies. By combining improvisation with planning and implementation an organization gets paradoxical forms of "real time foresight" which enables it to timely detect and use emerging opportunities.

Additionally, one can cite a number of articles published by E. Hiltunen [28–32]. The article [28] offers a thorough study of the Wild Card concept (seemingly unlikely but suddenly occurring events with rather serious consequences). The article shows that in many cases

closer examination reveals that the events classified as Wild Cards are in fact links in the chain of gradual changes and weak signals enable one to see the signs of Wild Cards hidden in these changes. The article [29] discusses the use of weak signals in futures studies: it offers the term "Future Signs" and a conceptual model based on it. The article [30] provides a thorough study and assessment of various data sources and offers the most suitable data sources for weak signal scanning. The article [31] proposes a new method (the Futures Window) for visualization of weak signals and choosing a direction for futures thinking and innovation in organizations. The Futures Window could be used as a central component in Creative Foresight Spaces (CFS) to enhance innovation in organizations.

Hiltunen used these and a number of other studies for her PhD thesis called "Weak signals in organizational futures learning" [32] in which Hiltunen places primary emphasis on an approach that combines views developed in studies on organizational training with weak signals concept. The issue of weak signals, their significance and processing methods are covered in the works by other Finnish researchers: Tuomo Kuosa [33] and Kimmo Laakso [34]. Mika Korhonen (2014) in his work entitled "Tacit knowledge and weak signals in organizational learning" [35] and Pia Adibe (2015) in "Competence foresight" [36] also developed the concept of weak signals.

Yet another direction of research in weak signal scanning and interpreting, which is relevant for energy management, is linked to risk reduction and prevention of accidents and catastrophes [34, 37].

The issues of inadvertent changes in the environment and system stability to such changes are closely connected with weak signals. Despite some differences as to the terms (wild cards), researchers study similar processes and phenomena. For example, the authors in the article [38] suggest an analytical approach to management of surprising and potentially damaging events which is based on up-to-date conceptual and empirical studies. For that purpose the authors use the wild card management system. Wild cards refer to sudden and unique incidents that can become turning points in the evolution of a certain trend or system. As the first of the two components of the proposed wild card management system, the authors use a weak signal methodology to get warning about possible surprising events in the course of environment scanning. The second component is nurturing improvisation capabilities for activities amid an ongoing crisis.

Among publications relating to weak signal scanning and interpretation the work of Korean researchers [39] also claims attention. The researchers introduce the NEST (New & Emerging Signals of Trends) model which provides for systematic collection and assessment of weak signals of emerging technologies by scanning expert network worldwide.

4 CORPORATE SYSTEM OF ADVANCED THREAT WARNING AND DETECTION OF NEW OPPORTUNITIES

In Fig. 2 proactive management in energy companies is presented in the form of a process consisting of a number of consequent experts and analytical operations.

To illustrate the application of the proactive management method we suggest looking at a grid (distribution) company.

Sector: energy monopolies' regulation.

Monitoring: regulator's pricing policy.

Threat alert: expected restriction of electricity transmission prices.

Threat identification: likelihood of the regulator making the decision, %; relative reduction of price (in comparison with the current regulation method), %; time before the introduction of the price cap, months or years; duration of restriction (assessment), years.

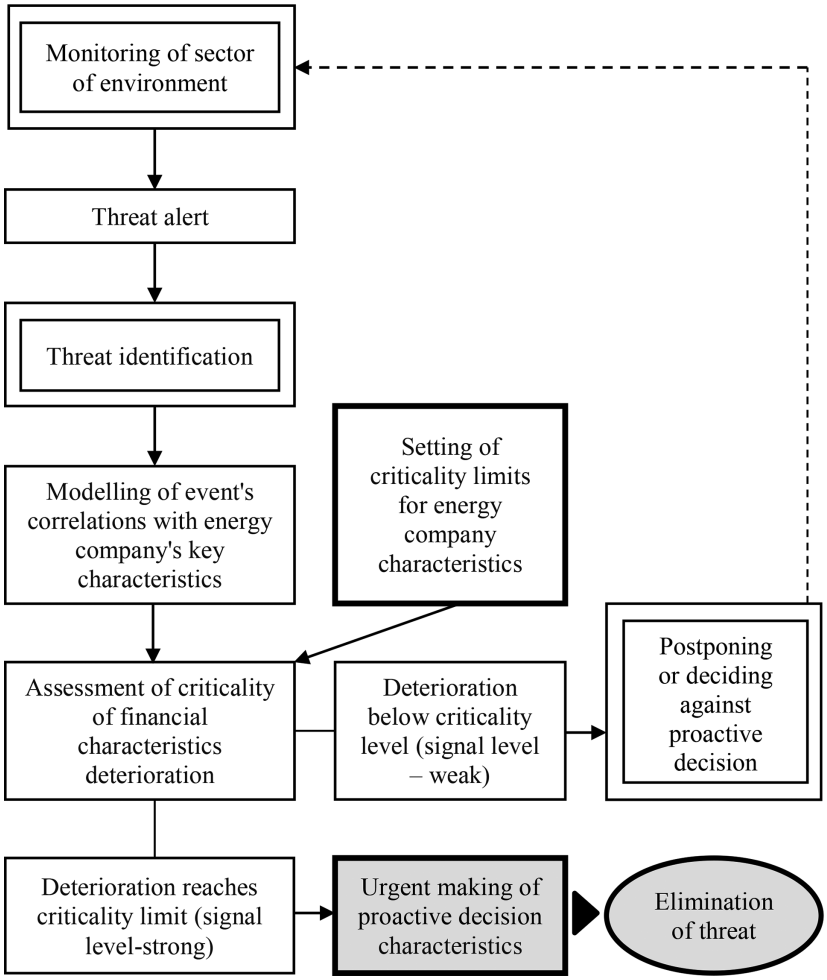

Figure 2: Structure of proactive management in energy companies.

Assessment of consequences and their criticality for the energy company: proactive solutions are required.

Proactive solutions (variants): organizational and technical measures aimed at reducing fixed costs; organizational and technical measures aimed at reducing technical and commercial losses in the grid; adjustment of customers' load in order to increase transmission capability in the existing grid; interaction with customers as regards reactive power compensation; creation of small-scale power generating units (a comprehensive feasibility study is necessary).

Using the outlined plan an energy company has an opportunity to timely and adequately react to emerging threats. However, monitoring usually applies to the area of the energy company's strategic focus and weak signals emerging in the periphery may be missed. New technologies emerging far beyond the visual range of the company's clients may have a decisive influence on their business. Consequently, their demand for electricity may drastically

drop or grow. For example, a mass switch over from incandescent lamps to LED lamps will result in a significant decrease in demand for electricity used for lighting. Such changes occur everywhere but only some of them are spotted by monitoring.

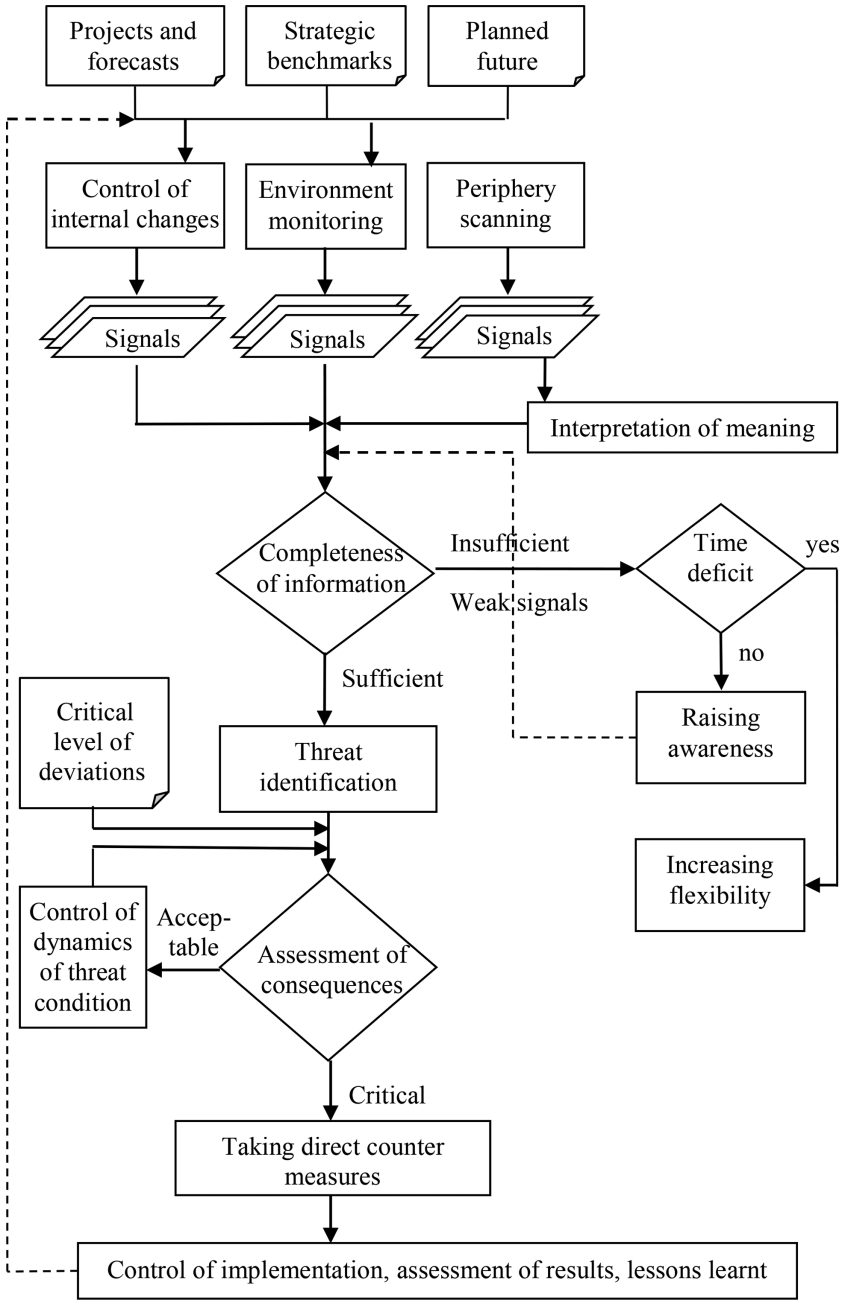

Figure 3: Proactive management model with weak signals taken into account in energy company.

It is even more dangerous not to take into account weak signals which are the harbingers of catastrophes or serious accidents. As a rule, such signals are most perceptible in the places of potential emergencies. But as people manage to prevent most of the accidents at a local level the information about a potential threat does not reach the upper level. However, when the situation gets out of hand the consequences can be disastrous. It is impossible to develop an exhaustive instruction for processing such signals, but advanced training, gaining experience, practicing interaction during drills and simulated events, active information exchange inside the energy company enables managers to reduce risks and teach employees to detect dangerous signals and act efficiently in order to prevent accidents.

Proactive management model with weak signals is presented in Fig. 3.

The testing of this model with energy companies' staff showed that the blocks Periphery Scanning and Interpreting the Meaning of Obtained Weak Signals turned out to be the most difficult ones. Moreover, 76 percent of specialists and managers participating in the project considered the demand for periphery scanning to be low and thought that the identification of threats detected by specialists and managers in their fields of work would be enough.

Yet another hindrance in the way of weak signals is limited exchange of information between the energy company's departments. Moreover, neither specialists nor managers feel the need to intensify internal information exchange and to create a single information space. Only 12 percent of managers and 9 percent of specialists support the enhancement of information exchange. At the same time, both managers and specialists are in favor of closer interaction in the functional hierarchy.

Finally, the most serious problem in the processing of weak signals is the problem of interpretation of the information contained in the signal or the second filter in Ansoff's classification [6]. Researchers have repeatedly pointed at the conservatism of mental models and difficulties connected with attempts to change them, which is essential for understanding the importance of weak signals for companies [13, 21, 26, 38]. As for the power sector, the specific character of the industry determined by heavy regulation of processes and reliability being a priority add to psychological difficulties.

Under the circumstances, it is reasonable to form a cross-functional team in an energy company to focus on futures planning and scanning for weak signals from the periphery. This group should be headed by a top manager and its members should be broad-minded and sensitive to novelties and have good communication skills. Their tasks should include intense communication with employees of different departments, active scanning of the periphery, detection of weak signals and assessment of their possible impact, arranging a broad exchange of information and monitoring of potential threats and opportunities.

5 CONCLUSION

The conducted research shows that the development of the theory and methodology of proactive management in the power industry, which is characterized by longer response time, high capital intensity and risks of catastrophic man-made and environmental consequences, is extremely important.

For advanced prevention of threats in big energy companies, it is necessary to introduce a new system that can foresee scientific, technical and organizational innovations with certain probabilistic characteristics and promptly adjust energy companies' strategies. This problem can be solved only through specialized research focused on forecasting the technological development of the power industry, forming a vision of the future and new competences. It is

obvious that it will require a stronger partnership of the power industry with leading universities and research centers.

The authors propose the following issues for further studies: principles of planning the future of the power industry and management systems based on weak signals; methodology of foresight in the power industry; methodology of study of complex energy systems and risk assessment amid uncertainty; management of the corporate environment generating new knowledge and innovations.

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