

Risk Identification and Assessment of Emerging Platform —Based Energy Internet Businesses

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ABSTRACT

Energy Internet has lived up to the future development needs of the energy industry, and set higher requirements for the reliable and safe operation of various energy systems. Therefore, it is crucial to carry out a comprehensive assessment of the risks it brings about from a theoretical perspective. In this paper, the risk assessment matrix method is used to assess the risks of emerging platform-based Energy Internet businesses. The results of the research show that the management and security risks of platform-based Energy Internet business are prominent during the incubation period; security risks and market risks increase in the growth period; and platform-based businesses face fair regulatory risks in the mature stage. Accordingly, we propose appropriate risk prevention and control strategies.

Keywords: Energy Internet, Platform-based business, Risk assessment matrix method, Risk identification, Risk prevention and control.

1. INTRODUCTION

The internet has not only profoundly changed the way people live and work but has also continuously transformed and disrupted a number of traditional industries. Consequently, the formation of the Energy Internet by integrating the electricity-centric energy network with the internet is an inevitable trend. With the advancement in Energy Internet development, risk identification and risk assessment have become a necessary method of analysis and evaluation, which need to be prioritized at various stages of business development. Existing studies on Energy Internet, both in China and overseas, mostly focus on the macroscopic aspects, such as overall framework [1], basic concepts [2], key technology [3, 4], and business model [5]. Specific studies on Energy Internet risk assessment are still relatively rare, and the topic is still new and unexplored, however, research methodologies in these studies involve risk assessment of smart grid and other relevant industries [6, 7].

In the case of Energy Internet companies, platform-based businesses comprise an important business development orientation for emerging Energy Internet businesses, and are an important means to attract external market players, social capital, and high-quality

resources to participate in value creation and achieve industrial upgrade. Risk identification and assessment are conducive to smooth business development and operations. In this paper, we first propose the risk identification and assessment framework for emerging Energy Internet businesses, and secondly identify the risks and propose risk assessment concepts and methods by conducting risk assessment of platform-based Energy Internet businesses. Finally, we propose countermeasures and suggestions for risk prevention and control of emerging Energy Internet businesses.

2. EMERGING ENERGY INTERNET BUSINESS RISK IDENTIFICATION AND ASSESSMENT FRAMEWORK

The risk identification and assessment framework (Figure 1) consists of three parts: risk identification, risk assessment, and risk prevention and control.

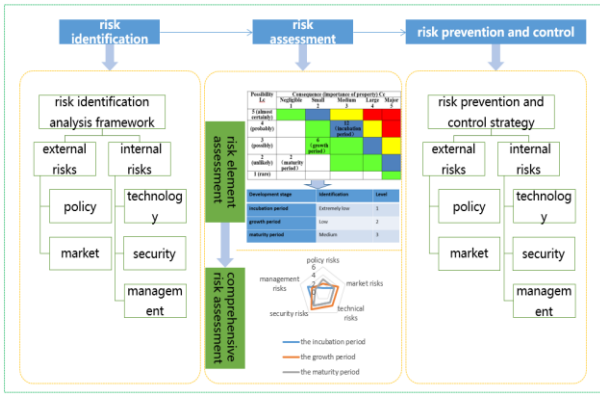


Figure 1 Risk identification and assessment framework.

The risk identification analysis framework for emerging Energy Internet businesses is established from the two perspectives of the external environment and internal environment of the enterprise, their risk points are organized and analyzed, and external risks such as policies and markets, as well as internal risks such as technology, security, and management are clarified.

The risk assessment matrix method is applied to assess the risk elements, and then the assessment results of each element are integrated to conduct a comprehensive risk assessment to get the distribution of various risk elements in different periods of the business.

Subsequently, relevant countermeasures and suggestions are proposed for each risk element, and risk prevention is carried out based on the foregoing analysis.

3. EMERGING ENERGY INTERNET BUSINESS RISK IDENTIFICATION

Based on the risk identification and analysis framework, the risk factors faced by emerging Energy Internet businesses are organized and analyzed as follows:

Policy risk: The policy risk for emerging Energy Internet businesses is reflected in the regulatory risk. Most emerging Energy Internet businesses are competitive industries and face policy risks when incorporated into the main business. Relevant entities need greater operational autonomy, to respond to market demands more swiftly. Platform-based businesses feature strong professionalism, strong user stickiness, and high quality and safety requirements. Therefore, while taking the lead in business development exploration and targeted advancement, large enterprises need to ensure fairness and openness of the platform, and face the policy risk of fair supervision in their development process.

Market risk: The market risk faced by emerging Energy Internet businesses is reflected in three aspects:

financial market risk, market competition risk, and market cooperation risk. Development of emerging Energy Internet businesses generates social capital and provides external services, which inevitably leads to demand for financing, and dependence on the financial market, which cause financial market risks. Market competition risk refers to the risks arising from market competition among Energy Internet businesses. The market competition mechanism can lead to major changes in the operation mode and organizational system of the Energy Internet, and exert multiple impacts on its safe and reliable operation. At the same time, for platform-based businesses, the core resources for business development are data platforms and shared ecosystem, which requires key partners to extend from being simple energy producers and service providers to upstream and downstream enterprises in the industry chain and toward becoming internet companies. Nevertheless, uncertainties in technology, credit, quality, and operations have increased market cooperation risks.

Technological risk: The technological risk is one of the major risks faced by emerging Energy Internet businesses, which is primarily concentrated in three aspects: the research and development of core technologies, the domination of technical standards, and the protection of intellectual property rights [8]. Among them, the R&D of core technologies in power distribution, communications, software, and other fields is the major technical risk faced by emerging Energy Internet businesses. Whether it is possible to build standards for emerging Energy Internet business technology system is critical to the construction and development of the Energy Internet ecosystem.

Security risk: The security risk faced by emerging Energy Internet businesses is presented in two aspects: data management risks and information security risks. In developing emerging Energy Internet businesses, and platform-based businesses in particular, data and businesses are highly integrated and developed, and data-driven business innovation has become a new trend. Data quality and security directly determine the level of business development. Enterprises face risks such as the difficulty of conducting business based on cross-industry data due to data barriers, lack of data, poor data quality, low accuracy of data analysis results, and user information leakage caused by data and information security issues.

Management risk: The management risk faced by emerging Energy Internet businesses is reflected in three aspects: organizational management risk, human resource management risk, and financial management risk. Organizational management risks are manifested as mutual pushbacks incurred by inadequate authorization in the organizational structure, which result in vague responsibilities and waste of costs, and complex

business processes due to poor coordination and communication within the organization, which affect the project process. Human resource management risks are manifested as a lack of market-oriented talents for emerging businesses, low work efficiency caused by unclear division of labor and vague responsibilities, low production enthusiasm, and brain drain. Financial management risks are manifested as follows: due to the large initial investment and the long recovery period of many projects, insufficient working capital results in an inability to complete the project development capital turnover, which affects the normal operation of the enterprise.

4. RISK ASSESSMENT OF EMERGING ENERGY INTERNET BUSINESS

4.1. Risk Assessment Ideas

The risk assessment process consists of two steps, namely risk element assessment and comprehensive risk assessment. Risk element assessment is conducted in different development stages of the business (incubation period, growth period, and maturity period; 2 years considered for each stage). It can be described from both quantitative and qualitative perspectives, includes risk possibility, impact on the enterprise (economic loss, social image), enterprise's tolerance to such risks, and development stage of the Energy Internet, and can determine the risk level and score (the higher the score, the higher the risk). According to circumstances, the possibility of the existence of the risk and the severity of its consequences are graded, and the risk assessment matrix is obtained, which lays the foundation for the subsequent comprehensive risk assessment.

In summary, we integrate the risk element assessment process and conduct a comprehensive risk assessment, that is, on the basis of evaluating various risk elements, we integrate the assessment results of each risk element, get the risk distribution of the business incubation period, growth period, and maturity period, judge the key risks in various development

Table 1. Level of consequence (degree of impact) and its qualitative description

Level	Identification	Detailed Description
1	Negligible	No harm, low property loss
2	Small	Under immediate control, moderate property damage
3	Medium	Controlled, high property damage
4	Larger	Major injury, loss of production capacity, large property loss
5	Major	High risk, interruption of continuous operation capability, huge property loss

Table 2. Possibility of occurrence of a risk event and its qualitative description

Level	Identification	Detailed Description
1	Rare	Occurs only under exceptional circumstances
2	Unlikely	May occur at a certain time
3	Possible	Possibly occurs at a certain time

periods, and prepare for the prevention and control of risks in advance.

4.2. Risk Assessment Methods

The risk element assessment adopts a multi-dimensional risk assessment matrix method. The steps are described as follows:

Step 1: for the specific business direction of the emerging Energy Internet business, the consequence (degree of impact) of its risk events are divided into 5 levels according to the degree of harm. The greater the degree of harm, the higher is the risk level. The level of consequence (degree of impact) and its qualitative description are shown in Table 1.

Step 2: classify the possibility of risk events, the greater the possibility, the higher the level. The possibility of a risk event is divided into 5 levels. The possibility of occurrence of a risk event and its qualitative description are shown in Table 2.

Step 3: determine the risk level R_c in the form of a risk analysis matrix according to the following equation:

$$R_c = C_c * P_c \tag{1}$$

Where, C_c represents the consequence (importance) level of the property loss; P_c represents the probability level of the occurrence of a risk event. The risk analysis matrix is shown in Table 3.

Step 4: remap the 25 risk values in the matrix to 1-5 levels according to the risk division standard: 5 or less is Level 1; 5-10 is Level 2; 10-15 is Level 3; 15-20 Level 4; 20 and above is Level 5. The risk level is shown in Table 4.

4	Very likely	Likely to occur in most cases
5	Almost certainly	Expected to occur in most cases

Table 3. Risk analysis matrix

Possibility: P_c	Consequence (importance of property) : C_c				
	1(Negligible)	2(Small)	3(Medium)	4(Large)	5 (Major)
5(almost certainly)	5	10	15	20	25
4 (probably)	4	8	12	16	20
3 (possibly)	3	6	9	12	15
2 (unlikely)	2	4	6	8	10
1 (rare)	1	2	3	4	5

Table 4. Risk level

Level	Identification	Detailed Description
1	Extremely low	Extremely low risk, leading to less impact on business
2	Low	Low risk, leading to general business impact
3	Medium	Medium risk, leading to large business impact
4	High	High risk, leading to serious business impact
5	Extremely high	Extremely high risk, leading to severe business impact

In this way, the possibility and consequences of the risk are evaluated from both quantitative (grade score) and qualitative (grade description) perspectives for various risks that need to be studied, and finally the risk grade is obtained to measure the risk scale and provide a reference basis for subsequent risk control and avoidance.

4.3. Risk Assessment Results: for Platform-based Business

Here we conduct risk assessment of emerging platform-based Energy Internet businesses. According to the identification and analysis of risk elements in the development of platform-based Energy Internet business, coupled with the occurrence probability and severity of each risk, the risk points of each development stage (incubation period, growth period, and maturity period) of the business are evaluated using the risk assessment matrix method. Finally, we integrate the risk assessment results of various elements to conduct a comprehensive assessment, and obtain the platform-based Energy Internet business risk assessment results as follows: During the **incubation period**, the human resource management mechanism are imperfect, there are insufficient professional and technical personnel required for business development, and the management risk is high. In addition, there are risks in network security, information security, and end-user privacy security, and the security protection system is not complete and security risks are severe. During the **growth period**, technological improvements cannot

match the increasing user traffic, and the platform faces more serious security risks. At the same time, the transaction volume of the platform increases, and the market risk increases accordingly. During the **maturity period**, it is highly important to ensure the fair operation of the platform, and new services of the energy platform face the risk of fairness supervision. **On the whole**, for platform-based Energy Internet businesses, regardless of their development stage, attention must be paid to prevent security risks, ensure platform security and protect user privacy. The results of comprehensive risk assessment are shown in Figure 2.

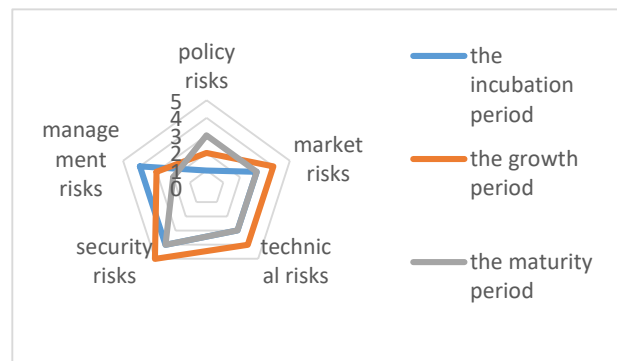


Figure 2 Results of comprehensive risk assessment.

5. RISK PREVENTION AND CONTROL STRATEGIES FOR EMERGING ENERGY INTERNET BUSINESS

In response to the problems that arise during the incubation, growth, and maturity phases of the emerging Energy Internet business, the following risk prevention and control strategies are proposed:

In terms of policy risks, closely follow up and study new policies, and formulate response plans on time. As soon as national and local governments issue policies, immediately conduct research to determine whether the policies may affect the enterprises and the emerging Energy Internet businesses. At the same time, actively guide the improvement and adjustment of laws and regulations related to the emerging Energy Internet businesses, maintain close contact with the government authorities, suggest possible problems in the policy to government authorities by considering the development needs of the emerging Energy Internet businesses, and propose suggestions on policies and regulations.

In terms of market risks, improve the operating system of various emerging Energy Internet businesses, establish the management of market monitoring indicators, and take early measures against behavior that may manipulate the market. At the same time, strengthen cross-industry cooperation and integration in the power industry, information and communication industry, internet industry, and electrical transportation industry, and establish a standardized market operation mechanism in response to new business and operating models emerging from enterprises, and create greater benefits for diversified cooperating entities.

In terms of technical risks, accelerate breakthroughs in the planning, design, construction, and operation of energy such as cooling, heat, oil, and gas, deepen the research and application of new technologies such as big data, cloud, IoT, AI, and blockchain, and enhance the data analysis and mining capabilities. At the same time, strengthen the process management of new technology research and development, application of results, and enhance the awareness of intellectual property protection. In particular, during the cooperative research and development, clarify the rights and interests of all stakeholders, apply for patents on time, and protect the legal rights of institutions and individuals.

In terms of security risks, build a professional data governance organization, set up appropriate positions and responsibilities, establish corresponding management processes and systems, implement data standards in every business link, continuously improve data quality, turn data into corporate assets, and realize data-driven process optimization, business innovation, and management decision-making. At the same time, establish a strong information communication network

framework to protect the information property from deliberate illegal or accidental disclosure, modification, and destruction, or illegal system identification and control, that is, ensure the integrity, confidentiality, availability, and controllability of the information.

In terms of management risks, enhance the training of professional talents, build a high-quality service guarantee system, and realize optimal allocation of human resources and high-quality service management and control. At the same time, further strengthen financial risk monitoring approaches, adjust the focus of monitoring, and establish a risk early warning system to shift the focus of financial risk monitoring from post-event supervision to pre-event prevention and mid-event control.

6. CONCLUSION

We have built a risk identification and assessment framework from three perspectives in this paper: risk identification, risk assessment, and risk prevention and control. On this basis, the risk identification and assessment of the emerging Energy Internet businesses was carried out. The risks of emerging Energy Internet businesses include external risks such as policies and markets, as well as internal risks such as technology, security, and management. The risk assessment of platform-based Energy Internet businesses shows that in different phases, these businesses pay attention to different aspects, such as preventing security risks, ensuring platform security, and protecting user privacy. Finally, we propose a risk prevention and control strategy for emerging Energy Internet businesses for each risk element. For example, to prevent security risks, it is necessary to build a special data governance organization to carry out normal data governance. At the same time, a strong information communication network needs to be established to resist network information attacks.

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