



2011 International Conference on Risk and Engineering Management

## Engineering Risk Management Planning in Energy Performance Contracting in China

Hu Jinrong<sup>a</sup>, Zhou Enyi<sup>b</sup> \*

<sup>a</sup>*Xi'an University of Architecture and Technology, Xi'an, China*

<sup>b</sup>*Xi'an University of Architecture and Technology, Xi'an, China*

### Abstract

The main purpose of this article is to define engineering risk existing in the process of the development of Energy Performance Contracting (EPC) and to provide a system and quantitative evaluation method to reduce engineering risk of EPC. We systematically studied the engineering risk existing in EPC: the political and legal risk, market risk, technology risk, management risk, financial risk, project quality risk and client risk. By using the mature ideas, tools, and technology of risk management - experts' marking methods and synthetic evaluation method based on fuzzy theory, the target system of evaluation on EPC is discussed, qualitative and quantitative risk evaluation is conducted, and the guiding ideas and the model are provided. At last, by putting forward the corresponding measures for the EMC to control risk in the operation, this article provides reference point for the risk management planning of EPC.

*Keywords:* Engineering Risk; Energy Management Corporation(EMC); Energy Performance Contracting (EPC); Planning

### 1. Introduction

In the 1970s, the global Energy Crisis has hit the economy of most developed countries, but spawned a new industry - Energy Performance Contracting (EPC). After more than 30 years of development and improvement, EPC has been gradually popularized, applied and rapidly matured in North America, Europe as well as some developing countries, becoming a new market-based energy-saving mechanism. In 1996, Chinese government received the financial assistance from Global Environment Fund to launch the "Chinese energy-saving promotion project" and to organize three Energy Management Company (EMC) in Beijing, Liaoning and Shandong. After years of development, EPC has become more widespread in China. In the 2010 Copenhagen Conference, Chinese government pledged itself to reduce carbon emissions up to 40 - 45% by 2020. Since EPC is an immensely low-carbon and market-based energy-saving mechanism, Chinese central and local government have issued incentive policies to develop EPC.

### 2. The definition of EPC engineering risk

International Standardization Organization (ISO) gives a definition of risk: effects on objectives by uncertainties. The engineering risk of EPC is the negative deviation of the actual results from the EMC expectation brought by the objective uncertainties. EPC engineering risks have two aspects: on one hand, under the EPC mechanism which

\* Hu Jinrong. Tel.: 15339242969

E-mail address: 20366157@qq.com.

requires “zero-risk on the client side”, EMC undertakes most of the risk engineering from planning, decision making, and assessment to implementation. On the other hand, because of the uncertainties of EPC brought by its characteristics of large investment and long life cycle, it leads to the possibility of not reaching the expected technical and economic indicators to a point of suspension or failure of the project. There are three elements in EPC engineering risk: (1) the uncertainty factors: refers to various contingent factors in EPC, which may make EPC project deviate from the anticipated goal; (2) the anticipated goal: each EPC project subject has its own particular purpose or benefits, including economic gains or non-economic gains, in this paper it mainly refers to anticipated goal of EMC - economic gains from EPC, so risk is negative deviation degree between the actual results and the EMC decision expectation; (3) the extent of effect: negative degree between the actual effect and anticipation. Use the equation to express:  $\text{risk} = \text{uncertain factors effect} \cdot \text{the effect degree} / \text{anticipated goal}$ .<sup>[2]</sup>

### 3. Identification and Classification of Engineering Risks in EPC

The main engineering risks of EPC project include:

#### 3.1. Political and legal risk

A steady government and consistent policies are propitious to the development of the enterprise. A nation's overall economic development planning, regional development and industrial development will greatly affect EMC. Innovation activities which are consistent with the national planning direction tend to gain financial, credit and taxes support more easily. At present, the Chinese government launches corresponding incentive policies to implement EPC, such as the EPC Interim Administration Measures for Financial Incentives and Capital Management published in 2010, which is a positive factor for the development of EMC. However, once incentive policies are adjusted, engineering risks may appear.

#### 3.2. Market risk

Market risk is brought by uncertainties of the market, client demand and industry competition. It mainly displays in two aspects: (1) market demand risk. It is in the very beginning stage of EPC that the international advanced energy-saving technology has not been popular within China. Thus, there are still many problems in application. Many people have not been acquainted with EPC as an energy-saving mechanism, so the client market of EPC remains to be explored. Many enterprises lack technicians and energy management personnel, so the cost for introducing the technology is high. In addition, enterprises do not know EPC well enough that they are afraid to undertake the technical and economic risks; because of lacking funds, most entrepreneurs are willing to put money only into expanding production scale instead of energy-saving investment; Most EPC project scale is small, so the bank usually does not loan money to them. (2) market competition risk. Although the development of EMC in China is in the beginning stage, the energy-saving market and potential are great. Many foreign large EMC, relying on the abundant fund and advanced technology, is looking for opportunities to enter into Chinese energy-saving market.

#### 3.3. Technology risk

متن کامل مقاله

دریافت فوری ←

**ISI**Articles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات