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Prioritizing Risks and Proposing a Risk Management Model in Wind Farms Developments According to Project Management Standards

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ABSTRACT: This article proposed project risk management model based on different project phases with emphasis on construction and installation phases and considering risk management in powerhouse projects. Accordingly, a case study on Manjil Wind Farm was conducted to firstly detect the most important risks of construction and installation phases in this project, considering different potential risks that identified and then, to propose the risk management model to evaluate the effect size, the possibility of diagnosis and risk incidence, and their impact on the main objectives of this project which are time, quality, expenses and security. Moreover, a model was proposed to prioritize the detected risks in this project based on group opinions and Analytic Hierarchy Process (AHP) method, and the following results were gathered. After determining the detected risks priorities, react or response programs to critical and important risks were provided and the consequence of react or revision actions in risk management program were recorded with offering some comments.

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1- Introduction

Today, risk management is the most critical part of the projects, and inappropriate management and inadequate forecasting in this regard is the cause of the failure of most projects. Powerhouse projects may be affected by risks, more than other types of projects, so that there are many reports about the poor performance of this type of projects due to time delays and increased costs, mainly due to the lack of proper management of risks during the construction and installation phase; it should be noted that this is mainly due to the nature of powerhouse projects. One of the problems that most project managers are involved with in a powerhouse project is identifying and prioritizing the risks during the construction and installing project phases and to allocate the appropriate resources and time to them. Powerhouse projects like other projects are faced with so many issues such as long time and complex processes, inappropriate environment, lack of financial recourses and dynamic structures of organizations In addition, the different interests of project stakeholders have exacerbated the changes and complexity of risks during the construction and installation phases in these projects

Since uncertainty of risk is one of its main features, many of them cannot be eliminated in various projects, especially in the phase of construction and installation of powerhouses. As a result, one of the appropriate strategies to prevent damage to the project while dealing with risks at the construction and installation phases is the management of risks properly. This is why identifying and evaluating risks during the construction and installation phases of projects is absolutely pivotal, and finding executive approaches and procedures solutions for improving and minimizing risks are of great importance.

The magnitude of a risk depends on many factors such as human factors, environmental factors, factors related to raw materials, factors related to equipment and etc. However, since taking all of these factors into consideration for risk estimation is a very time consuming and complex task, so in many studies, the severity and probability of occurrence of risk are used to determine its magnitude.

Now there is a fundamental question: what is the proper model for identifying and evaluating risks in different phases of powerhouse projects, or focusing on the constructing and installation phase of a project, and how to rank these risks by developing an appropriate risk ranking prioritization model. In order to overcome these deficiencies, in this research, a new risk structure applied based on various phases of the project, with emphasis on the construction and installation phase, and considering the various probable risks in the project of Manjil Wind farm in Iran as a case study. Based on this, we try to determine the severity of the effect, the probability of discovery and the probability of occurrence as a criterion for assessing the risks of construction and installation phases in this project.

2- Development of Wind Farm Industry

In recent years, wind farms have been astonishingly advanced and have been able to compete with other powerhouses, mainly due to the following:

- Advancements in wind turbine technology so the costs of their manufacturing process have been reduced.

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- Standardization wind turbine design decreased the costs.
- Being fossil fuels-free, so wind turbines utilization costs have been reduced.
- The difficulty in accessing wind turbines, and thereupon trying to improve their quality, has reduced maintenance costs.
- Being environmental pollution-free
- Providing abundant and permanent energy

3- Research Methodology

Due to the common structures in projects and the close relationship between the project management and technical sections, the Planning and Control Unit has been appointed as the executer at the risk planning phase, which in coordination with the senior management of the organization, outlines the organization's approach to deploying risk management. According to the scope of this research, the risks that occur during the construction and installation phases are investigated. The list of risks affecting the construction and installation phase of the Manjil Wind farm and a general overview is provided, based on the information contained in the articles and studies related to the construction projects, especially the power houses projects in Iran and other parts of the world, and also by gathering the opinions of the national and international experts and managers of the power houses projects [1-3]. Using quantitative methods for estimating the probability of occurrence of any risks, independent of its impact on each of the objectives by asking the respondents on a scale of (1 to 5) and based on the scale of the American Project Management Standard (Risk Management Division) [4].

4- Results and Discussion

4- 1- Probability of identified risks occurrence

In this section, we summarized and analyzed data. Accordingly, by identifying and evaluating the risks, their priority is ranked with the probability, discovery, effect size, and then the results of prioritizing the identified risks in the phase of construction and installation of powerhouses with a case study in the project of Manjil wind farm has been presented [5].

4- 2- Effects of risk owners on each of the project objectives

Based on the opinion of questioners, the level of influence and the share of each risk-owners associated with the project contained in the second level of the risk breakdown structure of this research. The most important risk-owners were ranked as follow: the contractor, the employer and, later on, bad economic conditions, designer and supplier [6-8].

5- Data Analysis

The matrix derived from the geometric mean of the peer to peer matrix of preferences of the received responses is presented in Table 1. Then, by normalizing the final matrix according to Table 2, the value of relative weight is determined as follows.

Table 1. The matrix resulting from the geometric mean of objectives priority in a group AHP method

	Safety	Time	Quality	Cost
Safety	1.00	0.45	0.83	0.62
Time	2.21	1.00	1.50	1.25
Quality	1.21	0.67	1.00	0.70
Cost	1.60	0.70	1.44	1.00
Total	6.02	2.82	4.76	3.57

6- Conclusion

In this paper, the project risk management model based on different phases of the projects with emphasis on the construction and installation phase, and considering the risks in powerhouse projects, is presented with a case study at the Manjil wind farm (Iran). Accordingly, the most important construction and installation phase risks were identified in this project initially. Then, by presenting the risk management model, we evaluated the effect size, the probability of the discovery and the probability of occurrence of the risks and their effect on the main objectives of the project under study - time, quality, cost and safety has been taken into consideration. In the following, a model for prioritizing the risks identified in this project was presented based on group opinions and AHP method. According to the obtained results, the simultaneous effect of risk effects on different project objectives (time, cost, quality and safety) and their probability of occurrence on The basis of the recent relationship was calculated in the quantitative analysis section. In the following, a model for prioritizing the risks identified in this project was presented, based on group opinions and AHP method. According to the obtained results, the simultaneous effect of risk effects on different project objectives (time, cost, quality and safety) and their probability of occurrence on the basis of the recent relationship was evaluated in the quantitative analysis section. Also, based on the views of the questioners, the extent of the impact and the contribution of each of the risk owners related to the project contained in the second level of the risk break down structure of the study was determined, and it was determined that the most influences on the part of the contractor, the employer and in the later stages of the unfavorable economic, design and supplier.

Table 2. The matrix resulting from normalization and determining the weighting value of goals

	Safety	Time	Quality	Cost	Project Objectives	Symbol	Relative Value
Safety	0.17	0.16	0.17	0.17	Safety	W_s	% 16.88
Time	0.37	0.35	0.31	0.35	Time	W_T	% 34.67
Quality	0.20	0.24	0.21	0.19	Quality	W_Q	% 21.05
Cost	0.27	0.25	0.30	0.28	Cost	W_C	% 27.41

References

[1] Braglia, M., Frosolini, M., & Montanari, R. (2003), Fuzzy TOPSIS approach for failure mode, effects and criticality analysis. Quality and Reliability Engineering International, 19, 425–443.

[2] [Carr, V., Tah, JH., (2001). A fuzzy approach to construction project risk assessment and analysis: construction project risk management system. advances in Engineering Software 32. pp.847-857.

[3] Ebrahimnejad, S., Mousavi, S.M., Seyrafianpour, H., (2010). Risk identification and assessment for build–operate–transfer projects: A fuzzy multi attribute decision making model. Expert Systems with Applications. 37, pp.575-586.

[4] Flanagan R, Norman G. (1993), Risk management and construction. Victoria, Australia: lack well Sci ence Pty Ltd.

[5] Gurcanli, G.E., Mungen, U.(2009), An occupational safety risk analysis method at construction sites using fuzzy sets. International Journal of Industrial Ergonomics. 39 (2), 371–387.

[6] Emblemsvåg, J., Kjølstad, L.E., (2002), Strategic risk analysis – a field version. Management Decision Journal., 40 (9) 842–852.

[7] Erich Hau Wind turbines: fundamentals, technologies, application, economics Birkhäuser, 2006 ISBN

[8] Jiahao Zeng, Min An , Nigel John Smith. (2007), Application of a fuzzy based decision making methodology to construction project risk assessment. International Journal of Project Management 25, 589–600.

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