



جامعة الجميع الذكية
EVERYONE'S SMART UNIVERSITY

Everyone's Smart University

Project (Spring 2021)

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Section

Master

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Project Risk Management

Instructions:

- اخر موعد للتسليم هو يوم السبت 2021-05-08 في تمام الساعة ٩ مساءً.
- الإجابة متاحة باللغة الإنجليزية أو اللغة العربية مع مراعاة أن تكون المصطلحات العلمية باللغة الانجليزية.
- يتم تسليم المشروع في صيغة ملف pdf مع الالتزام نموذج الجامعة ولن تقبل أي مستندات أخرى.
- يجب مراعاة أقسام البحث الرئيسية (مقدمة Introduction، دراسات علمية سابقة Literature Review، طريقة البحث Methodology، النتائج والمناقشة Results and Discussion، وأخيراً المراجع References. وان كان هناك ملحقات Appendices يتم إضافتها)
- يجب الالتزام بـ Theme موحد كما يلي:
- حجم الخط 12.
- نوع الخط Arial.
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- عدد صفحات البحث (لا يقل عن ثلاث صفحات ولا يزيد عن ست صفحات).

Instructor's Name: Eng. Mosaab M. Hamed

Building Substation

1. Introduction

The demand for electricity has a global growing trend. In Saudi Arabia , despite recession, it has been growing during the last years. Future prospects for the evolution of electricity consumption depend on some assumptions and possible macroeconomic scenarios. In order to serve consumers with supply and quality, some investments are required to improve its infrastructure works in the generation and transmission sectors.

In the transmission sector, the construction works for new substations and transmission lines, or expansion of existing facilities, are generally authorized by (Electricity & Cogeneration Regulation Authority) , through transmission auctions under a concession regime, authorizing resolutions or permission contracts. The construction sector involves a high number of workers which are involved in building electrical substations. As the civil construction implements new technologies (automation, telecontrol, telesupervision and computerization), there is a significant change in work organization, including outsourcing, adding cooperatives and voluntary redundancy plans. These changes have brought significant harm to workers, as it resulted in increased unemployment and a lack of health and safety conditions. Consequently, the construction industry suffered an increase in the number of work-related accidents involving the electric risk , which is just one of many risks present during the construction, expansion and renovation of Electrical Power Transmission Substations.

The construction work on electric power transmission substations includes electrical energy related risks, in addition to physical, chemical, ergonomic, and commonly presents construction-related risks. 28% of accidents in construction were related to falls, 17% to falls from height, and 2.8% to electrical shocks. However, these 2.8% represented 50% of fatal cases. electricity is an omnipresent risk; it must be managed differently than any other type of risk. Work on expansions or nearby services around powered installations is conducted in presence of high voltage electricity with values ranging from 69kV to 750kV, which are fatal for humans. In this work scenario, electrical accidents can easily occur, representing significant causes of occupational fatalities in the world .

In Saudi Arabia in 2016, compared to the previous year, there was an increase of work-related accidents and illnesses, costing the National Institute of Social Security (INSS, 2017) , 1.33 billion USD. In order to avoid accidents, the risk analysis has been widely used in different sectors.

An individual method may not achieve the optimal risk assessment results for workplaces. It is possible to associate several analysis tools, which aim to facilitate the study and direct to appropriate control actions. According to legal requirements, the Occupational Health and Safety Management guidelines, as a part of the quality system, oblige the employer to promote health and integrity to workers, including phases from implementation to maintenance of systems.

Nevertheless, although there are legal requirements, developed safety-management tools and techniques, the work-related accidents and illnesses continued to grow. Future trends show that electrical requirements will continue to grow, creating a need to build new power stations, and therefore remaining a high risk for those building them. There is an urgent need to improve safety conditions in construction of electrical energy transmission substations in order to improve the safety and health of workers involved. The objective of this work was to evaluate the perception of construction workers on risks to which they are exposed, investigate on which methods they use to evaluate and manage those risks. Further on, the objective was to discuss and compare these results with currently available data on work-related accidents and illnesses, finally to give suggestions for improving occupational safety and health.

2. Literature Review

Risk management is beneficial when it is implemented in a systematic manner from planning stages to the project completion. Since the 2000s, risk management has gained strong interest from academia and practice. Various methods have been proposed to assess the risk of projects, including the influence diagram method, Probability-Impact model, risk matrix analysis, fault tree analysis, Monte risk of projects based on influence diagrams. Li et al. used the risk matrix to evaluate project risk

level from two dimensions: risk impact and risk probability. Chen et al. used Monte Carlo

Simulation to simulate on the curves of both probability distribution and risks of network schedule and cost, and realized the project risk evaluation. Zhou et al. proposed a risk assessment method based on fault tree analysis and Analytic Hierarchy Process (AHP).

The fault tree analysis was used to identify risk events and factors associated with projects, and the AHP method was used to determine

risk degree. Liu et al. presented the use of neural network model in risk analysis of an Information

Technology Outsourcing (ITO) project, as well as realized risk early-warning aiming at overall risk of projects. However, compared with conventional projects, the HV power substation construction projects face more challenges and risks, and have essential

differences with other projects, which hamper the applicability of many risk assessment methods used widely for substation construction projects. First of all, the substation construction projects have unique characteristics, so the experience of other projects cannot be applied to this kind of project. Secondly, since the substation construction projects is in preliminary phases, the main source of information provided for the risk assessment is the knowledge of experienced engineers and experts, most of which is not precise data but vague verbal descriptions.

3. Methodology:

We will go through a process like 8Rs and 4Ts, to help ourselves finding the risk's probabilities and its impacts. Brainstorming is the first step to identify all the possible risks. We will make a list of them.

Table.1

No.	List of risk
1	Project approval policy risk
2	Land requisition and logging policy risk
3	Environmental protection law risk
4	Project design risk
5	Bidding management risk
6	Contract management risk
7	Security management risk
8	Quality management risk
9	Schedule risk
10	Supervision risk
11	Large equipment transportation risk

Now we have a list of risks, we will make a risks matrix (determine the probability and impact of each risk), which will go after that to risk register. (low = 0 to 0.29, medium = 0.3 to 0.69, high = 0.7 to 1).

Table.2

No.	List of risk	Probability	impact
1	Project approval policy risk	0.25	0.9
2	Land requisition and logging policy risk	0.5	0.85
3	Environmental protection law risk	0.8	0.3
4	Project design risk	0.9	0.8
5	Bidding management risk	0.4	0.1
6	Contract management risk	0.2	0.9
7	Security management risk	0.15	0.55
8	Quality management risk	0.85	0.85
9	Schedule risk	0.9	0.8
10	Supervision risk	0.5	0.7
11	Large equipment transportation risk	0.75	0.95

After collecting and evaluating the risks, it time to evaluate the severity to start thinking about the response plans for each risk and try to mitigate the impact. For calculating the severity, we used Risks Matrix and Bow-Tie to find the response plan.

Probability	0.7-1	high	high	medium
	0.3-0.69	high	medium	low
	0-0.29	medium	low	low
		0.7-1	0.3-0.69	0-0.29
		Impact		

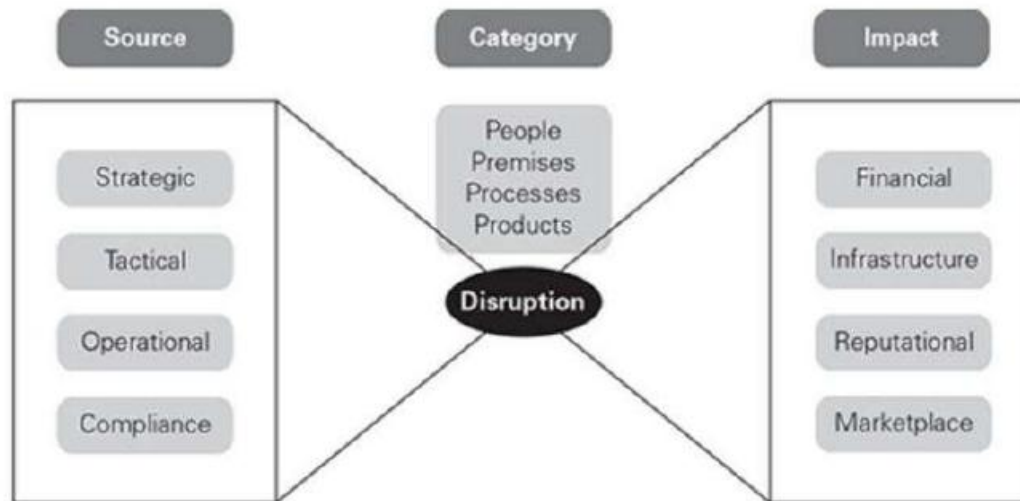


Table.3

No.	List of risk	Probability	impact	Severity	Response plan	Mitigate Action
1	Project approval policy risk	0.25	0.9	medium	Identify the list of the reviewers and approvers	Explain to the reviewers and approvers the importance of the project with arguments
2	Land requisition and logging policy risk	0.5	0.85	high	Determine the location of the land be suitable for the project	Approach the government to get reservation approve for using the land
3	Environmental protection law risk	0.8	0.3	high	Define and document the methods that will generate the environmental protection law risk	Make process by which risk is systematically monitored by evaluating performance of plans and strategies used to address
4	Project design risk	0.9	0.8	high	Identify the required information to complete the	Provide the missing information to enable design contractor to complete

					design	
5	Bidding management risk	0.4	0.1	Low	Inform decisions on contingency requirements	Identify scope/ risks that you might be able to negotiate out of the contract to reduce risk/ cost.
6	Contract management risk	0.2	0.9	medium	Determine all activities contractors and subcontractor's for the project	Immediate finalization of the contract requirements
7	Security management risk	0.15	0.25	low	Determine the security rate at the project location	provide required document and drawings to Contractor develop the security scope
8	Quality management risk	0.85	0.85	high	Identify the required standards and quality documents to be apply in the project	Assigned more QC and inspectors to monitor and insure the standards are applied
9	Schedule risk	0.9	0.4	medium	Identify the schedule time of the projects startup to close (end).	Monitor and insure the project are on the schedule time
10	Supervision risk	0.5	0.7	high	Determine all work list and activities of the project	Assigned more staff and supervisor to control and monitor the project activities
11	Large equipment transportation risk	0.75	0.95	high	Identify the large equipment and vendors and manufactures location.	Contact with transportation companies to have ability to transport the large equipment and follow up with to transfer on time

4.Results

Here we are going to calculate the EMV cost for Building Substation . All the numbers you are going to see are not exact cost but it was evaluated based on experience. The total potential impact on the plan is 1,250,000 SR, while the contingency cost is 742,000 SR.

Table.4

No.	List of risk	Probability	Impact cost SR	Risk contingency
1	Project approval policy risk	0.25	100,000	25,000
2	Land requisition and logging policy risk	0.5	50,000	25,000
3	Environmental protection law risk	0.8	70,000	56,000
4	Project design risk	0.9	300,000	270,000
5	Bidding management risk	0.4	150,000	60,000
6	Contract management risk	0.2	120,000	24,000
7	Security management risk	0.15	100,000	15,000
8	Quality management risk	0.85	200,000	160,000
9	Schedule risk	0.9	50,000	45,000
10	Supervision risk	0.5	80,000	40,000
11	Large equipment transportation risk	0.75	30,000	22,500
	Total		1,250,000	742,000

Discussion

In (Table 3) we can see the result of reposing plan and how to mitigate the risk. It is important to note that we should be aware of all risks but shouldn't waste the time on risks with green color, it is better to focus on orange and red risks because they have higher probability and huge impact.

In (Table 4) we can see the result of the risks cost on the budget. The higher number was for Project design risk, so it has the higher priority.

References

Fundamentals of risk Management