

**VARIATION ORDERS IN TRANSMISSION PROJECTS OF  
TENAGA NASIONAL BERHAD**

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**PESANAN PERUBAHAN DALAM PROJEK PENGANTARAN DI  
TENAGA NASIONAL BERHAD**

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Laporan projek ini di kemukakan sebagai memenuhi sebahagian daripada syarat  
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Dedicated to my family, who has bare with me during the two years of my study, climaxing with this report. To them, I give all my love for supporting me all the way.

## **ABSTRACT**

The project owner must accept that no construction method or for that matter the project, is free of changes and its subsequently activity of claims. Tenaga Nasional Berhad, in its implementation of capital infrastructure projects for the electrical power industry is not immune to variation orders. Every year an average of RM 19.4 million is spend on variation orders. This has impacted the company's budgeted capital expenditure and the completion of projects within time. The consequential effect is the non-commissioning of associated projects. This study has determined the most frequent causes of variation orders in transmission projects. The owners/project managers group has considered incomplete project scoping and inadequate bill of quantities as the main cause while new requirements was considered by the contractors group. These causes were confirmed during the oral interview as well as the results from the case study. The effect of these variation orders are increase in project cost and delay in project completion. The findings of this study also indicated that the detail project scoping during design stage and the understanding of contract and specification are the two most considered factors to minimising the occurrences of variation orders.

## ABSTRAK

Adalah menjadi kelaziman pada mana-mana projek pembinaan melibatkan tuntutan bagi kerja-kerja tambahan. Keadaan yang sama juga turut dialami oleh projek-projek infrastruktur untuk pembekalan letrik yang dijalankan oleh Tenaga Nasional Berhad (TNB). Secara purata nilai kerja-kerja tambahan yang berkaitan dengan perintah perubahan kerja bagi projek yang dijalankan oleh TNB berjumlah disekitar RM19.4 juta. Jumlah yang besar ini turut memberi impak terhadap anggaran asal perbelanjaan tahunan syarikat. Selain dari itu perubahan kerja yang banyak ini turut memberi implikasi terhadap tempoh penyiapan projek sebenar dimana kemungkinan besar akan berlaku kelewatan dan menjejaskan ujian perjalanan peralatan pembekalan elektrik yang dirancang. Kajian ini telah dijalankan dengan matlamat utama untuk menentukan faktor-faktor utama yang menyebabkan berlakunya perubahan kerja bagi projek penbekalan elektrik oleh TNB. Kaedah utama pengumpulan data dibuat dengan cara kajian kes dan pengedaran borang soal selidik. Dua kumpulan utama yang menjadi responden dalam pengumpulan data adalah mereka yang berpengalaman yang mewakili pihak klien dan kontraktor yang terlibat dalam projek TNB. Hasil daripada kajian yang dijalankan terhadap kedua-dua kumpulan responden mendapati punca utama berlakunya perubahan kerja adalah disebabkan skop projek dan kuantiti kerja yang tidak lengkap semada penenderan kerja dibuat. Kedua-dua punca utama ini disahkan dalam sesi temubual dengan mereka yang berpengalaman dalam projek juga melalui kajian kes yang dibuat. Kajian juga mengesahkan bahawa kesan utama daripada perubahan kerja ini adalah pertambahan kos projek dan masalah kelewatan penyerahan projek kepada klien. Bagi mengatasi masalah ini kajian mendapati bahawa kaedah yang perlu diberi tumpuan adalah dari aspek memastikan skop kerja yang dibuat semasa fasa rekabentuk hendaklah lengkap dan sempurna dan juga tahap pemahaman terhadap kehendak kontrak hendaklah ditingkatkan.

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## **CHAPTER 1**

### **INTRODUCTION OF STUDY**

#### **1.1 Introduction**

All major projects will somehow be subjected to changes in the scope of works. This is due to the complexity and the numerous processes that are required to finish the project. Changes are inevitable even with well and carefully planned projects. The changes are necessitate, mostly by a change in the clients or owner's requirements, changes in the design to suite the prevailing atmosphere, change in legislation or regulations, improvement of products identified for the project, additional works, etc. Variation orders are mostly encountered in hastily scope projects, but it does not mean that a well planned project does not have. Some times the variation is small that the contractor is willing to absorb into his cost.

In almost all transmission projects implemented by Tenaga Nasional Berhad (TNB), the projects have variation orders. These variation orders are encountered during the implementation of the projects. On many occasions these variation orders



and change to the work scope were identified towards the end of the contract period. It has put a lot of constraints in getting the approval of these variation orders, as TNB, being a government company, has many levels of approval. This again delays the project completion and the contractor will then claim for extension of time. These variation orders usually put a constraint in the completion of projects, budget and resources within the company and its stakeholders.

## **1.2 Background of Problem**

In order to sustain the physical, financial and industrial development of the country, TNB has also to be one step ahead of the electricity needs of these developments. With the adequate infrastructure to support the electric supply demand the country's economic growth will be curtailed. Therefore, TNB has to implement and construct major power plants, transmission lines, major and distribution substations, supporting distribution networks and other supporting systems to support the constant increasing demand of electric supply.

Tenaga Nasional Berhad's Directors on numerous occasions during their Board meetings and Board Tender Committee meetings has expressed their concern on the number of variation orders on the transmission projects. Almost on all the seatings of the Board Tender committees, papers for approval of variation orders were presented. These variation orders have an impact on the financial budget of the company, not also to mention the time of completion of the projects.

Variation orders can be positive or negative. TNB management is more concerned on the positive variation orders as these effects the company's financial capital investment allocations. Some of the variation orders can be resolved before the tendering process, which is during engineering and project scoping. There is also the human contribution to the variation order in terms of the technical competence when carrying out the project scoping. Since the operation of the electric supply grid is so intense detailed planning on the completion of projects has to be carried out. With the delay of any project on the critical list, the problem is escalated to the other projects. When this happens, some of the scope of the projects has to be change to suit the new situation. These changes constitute a variation order.

Below are statistics of variation orders encountered during project implementation.

**Table 1.1:** Value of variation orders in transmission projects in TNB

<b>Year</b>	<b>V.O Value (RM)</b>
2001	7,921,769.36
2002	31,568,399.31
2003	25,578,369.00
2004	12,549,011.87

### **1.3 Problem Statement**

Transmission projects encompasses three main facilities namely substation, transmission lines and cables. All these three facilities are interrelated in a project and

there are numerous occasions, scoping of the works are also interrelated and forgotten along the way. Under scoping and over scoping has contributed to the issuance of variations orders. There are many events and causes attribute to the issuance of variation orders in the implementation of transmission projects in Transmission Division of TNB. The company's management has voiced their concerned on the numbers and values of variation orders that were submitted for approval. The project managers has indicated that the causes of variation orders are due to change in the scope of works, changes in the project requirements, engineering requirements, operational requirements and delays attributes to the land and instructions from the asset owners. The changes that came about from the variation order have affected the capital expenditure of the Division for that financial year and its commitment to complete projects on the promised date.

Due to the many application of variation orders by the respective project managers in the implementation of projects, there is a cause for a study to be made on causes and effects of variations orders in TNB.

#### **1.4 Aim and Objective of Study**

Based on the problem statement above, the aim of the study is to mitigate and reduce, if not nullified, the issuance of variation orders during the implementation of transmission projects in TNB.

Following from the aim of the study, the main objectives of this study are:

- To study the extent and effect of variation orders during the implementation of TNB transmission projects in Transmission Division.
- To identify the main causes or sources those contribute to variation orders.
- To identify and suggest strategies to minimize variation orders.

### **1.5 Scope and Limitation of Study**

As there are many projects and contracts in TNB and most of them are associated directly and indirectly to the electric supply demand, the scope would be too large to tackle. In order to achieve the above objective, the study has confine itself to transmission projects, namely major substations, transmission lines and underground cables, from the system voltages of 132kV to 500kV.

The scope of this study is confined to:

- Transmission projects (substations, transmission lines & underground cables) undertaken by the Asset Development Department of Transmission Division, Tenaga Nasional Berhad.

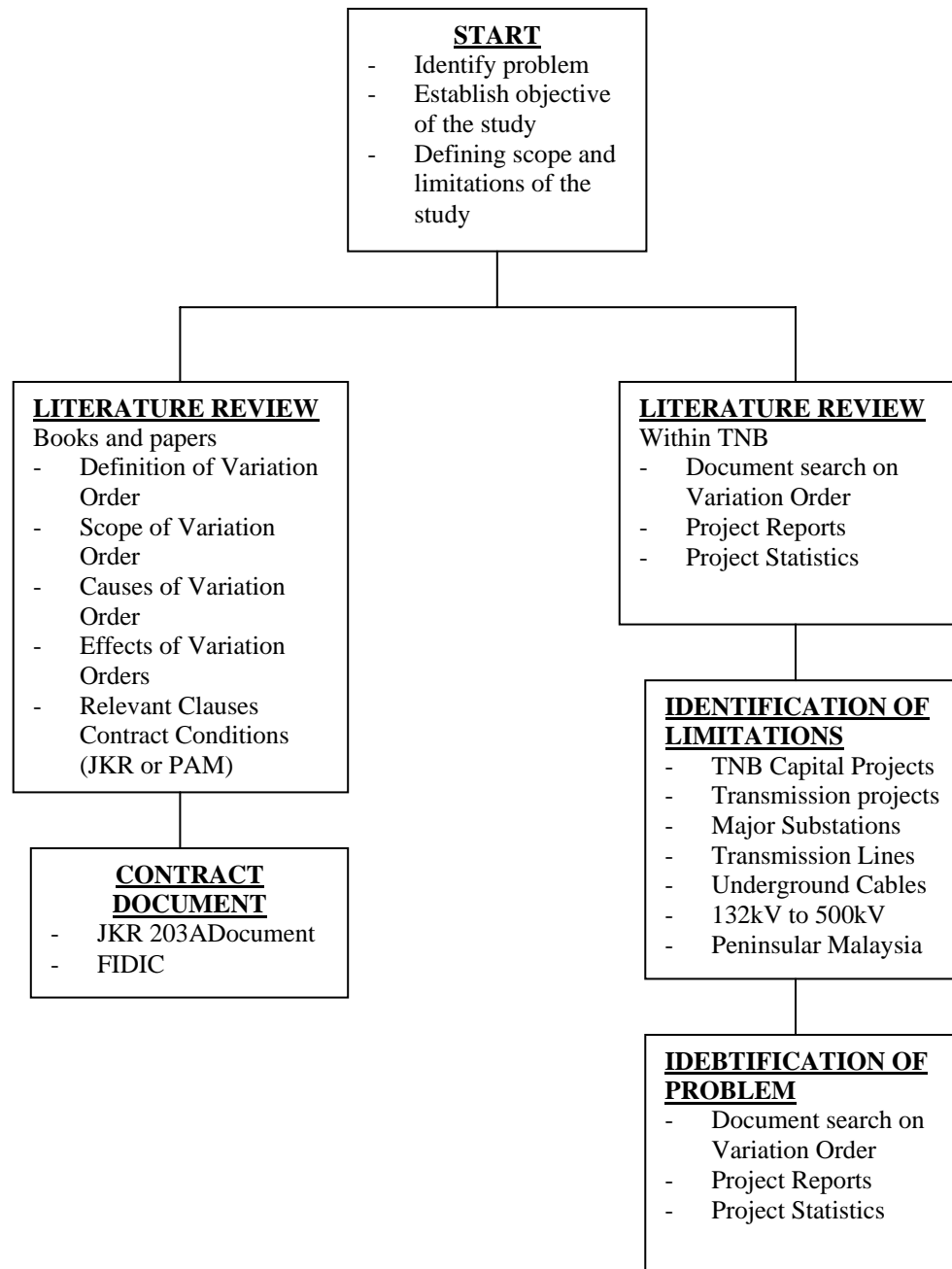
- Data collected are from capital projects within Peninsular Malaysia.
- The respondents comprised TNB project staff and project contractors carrying out transmission projects in Asset Development Department.
- Projects managed by the Project Management Unit of Asset Development Department, TNB.

## **1.6 Brief Research Methodology**

In this study, a literature search was initiated to understand what variation order has contributed to project management and completion. Its causes and impact to projects were investigated. Literature search on the subject was carried out on published papers and books. In identifying the actual problem and developing the problem statement another document search was also carried out within TNB Asset Development Department. The document search was conducted on contract files, project progress reports, department project and analysis reports and other associated documentation in the department. The departmental document search was intended to collect the following specific data:

- Number of projects effected by variation orders
- Value of variations orders
- Causes of the variation orders

The following flowchart indicates the preliminary research methodology for this study.



**Figure 1.1:** Research Methodology Flow Chart

## **1.7 Structure of Report**

Briefly, the study is divided into seven chapters, where Chapter 1 discussed on the problem statement, objectives, scope and limitation of the study and brief methodology adopted to achieve the objectives of the study.

Chapter 2 discusses on the principle of variation order and its impact as found and presented by other researches in the industry. A comparison of contract clauses widely used in the local construction industry is also included.

The understanding of the principles of variation orders in Chapter 2 is used in Chapter 3 to rationalize the problem encountered. A description of the works is presented and the areas where variation orders are encounter during the execution of the project are identified.

Chapter 4 rationalized the research methodology used to achieve the objectives of the study as outlined in Chapter 1. A flowchart of the methodology is presented which includes the target group, questionnaire design and analysis method.

The findings of case studies on selected transmission projects to find the causes and effects of variation orders is presented and discussed in Chapter 5. The findings from this Chapter are used to correlate the findings in the questionnaire survey of Chapter 6.

In Chapter 6, the data from the questionnaire survey is analyzed and discussed. The data from both the target groups are analyzed together to observe any correlation between the opinions of the two groups. Suggestions on minimizing of variation orders are presented.

Chapter 7, discussions on both the observations of the case study in Chapter 5 and the responses of Chapter 6 with the intention to find similarities and correlation. An analysis of similarities or otherwise is presented.

Lastly, Chapter 8, will conclude the findings from both the case study and questionnaire surveys. Suggestions to mitigated and other future measures are presented.



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