LEGAL FRAMEWORK GOVERNING THE CARRIAGE OF LIQUIFIED NATURAL GAS (LNG) WITHIN COASTAL WATER

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To my Dear Wife and my Sons,
My beloved Father and Mother, Brothers, Sisters and family,
My dearest Father and Mother (in-law), Brothers (in-law) and family,
Whose prayers always afforded me the power and morality
to accomplish this research.
To all I dedicate this work with great respect, wisdom and love.

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ABSTRACT

The evitable of LNG evolution into coastal waters had reflected the lack and absent of clear guidelines on legal framework for governing the carriage of liquefied natural gas (LNG) within coastal water. IMO (Agenda item 21, MSC 83/INF.3/2007) did not pay direct attention to sustainable coastal water transport development. This is because the novelty of such industry and the traditional procedures of UN developmental bodies, normally needs sufficient time to consider a new and emerging phenomenon in their agenda of work. Thus it is a major source of inefficient and unsafe operation of the LNG carriage along the coast line. To date, there is no extension for LNG carriage within coastal water on every established rules and regulation. The main purpose of this study is to develop a legal framework model for the LNG transportation and carriage by using the $IDEF_0$ structured modeling technique. The modeling process is divided into three phases, (i) the information gathering, (ii) the model development and (ii) the experts' evaluation and validation. In the first phase, information on existing current legal practices were obtained through the literature study from applicable rules, regulations, conventions, procedures, policies, research papers and accident cases. In the second phase, a process model was drafted through an iterative process using the $IDEF_0$ and the questionnaire is developed. From the questionnaire pilot test, each question blocks has shown an acceptable Cronbach's Alpha value which is above 0.70. In the third phase, the preliminary of legal framework model is tested through forty five (45) potential respondents from various fields in legal practices and thirty eight (38) responded. A promising result was obtained where data exhibit normal distribution trend, even though every group has their own stand on the legal framework. The ANOVA output has generated P-values of 0.000. If P is less than or equal to the a-level, one or more mean value are significantly different. Through data correlation test, the correlated element blocks show a range of 0.0 to 0.4. A legal framework model for the LNG carriage within coastal water was constructed in the stand alone mode covering each aspect.

Keywords: Legal framework model, LNG carriage, structured modelling technique definition, Cronbach's Alpha, ANOVA and Correlation.

ABSTRAK

Evolusi teknologi penghantaran Gas Cecair Asli (LNG) telah mula berubah ke arah penghantaran kawasan perairan pantai. Walaubagaimana terdapat kelemahan dan kekurangan dari aspek perundangan dalam pengoperasiannya di kawasan perairan pantai. Berdasarkan rujukan IMO (Agenda item 21, MSC 83/INF.3/2007), ia menunjukkan tiada penambaikkan yang dilakukan setakat ini, yang menjurus kepada keselamatan pengangkutan pantai. Ini adalah menjadi kebiasaan bagi pihak United Nation (UN) memerlukan masa untuk bertindak melakukan penambahbaikan. Ketidak seiringan perkembangan teknologi dan perundangan, secara tidak langsung meletakkan situasi tersebut dalam keadaan yang tidak selamat and juga mengurangkan keberkesanan dalam ertikata keselamatan. Kekurangan ini adalah jelas, di mana tidak wujudnya dalam undang-undang yang sedia ada. Oleh yang demikian, objektif kajian ini adalah untuk membangunkan 'kerangka perundangan' bagi tujuan penghantaran Gas Cecair Asli (LNG) di kawasan pantai dengan mengunakan teknik struktur model $IDEF_0$. kajian ini di bahagikan kepada tiga fasa utama yang mana fasa pertama membuat kajian literasi terhadap perundangan yang sediada. Fasa kedua, 'kerangka perundangan' dibangunkan dengan menggunakan teknik $IDEF_0$ .dan soalan kajian juga dibangunkan. Satu kajian rintis dijalankan bagi mengesahkan mutu soalan yang mana ia menunjukkan data Cronbach's Alpha yang diberikan adalah diatas 0.70. Seterusnya, kajian dibuat sepenuhnya dilakukan, didapati daripada empat puluh lima (45) orang, hanya tiga puluh lapan (38) orang sahaja yang memulangkannya semula. Melalui Ujian ANOVA, data menunjukan nilai penerimaan adalah Nilai-P adalah 0.000 bagi setiap kumpulan. Terdapatnya perbezaan pendapat bagi setiap kumpulan. Ujian pengesahan korelasi juga dijalankan, dalam penentuan nilai korelasi antara blok soalan. Pada dasarnya nilai korelasi yang dihasilkan adalah diantara 0.0 sehingga 0.4. Korelasi ini adalah lemah. Oleh yang demikian, model 'kerangka perundangan' yang wujud adalah ketidakkebergantungan diantaranya.

Katakunci: model kerangka perundangan, penghantaran LNG , teknik permodelan berstruktur, definasi, Cronbach's Alpha, ANOVA dan korelasi.

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Abbreviation

LNG	-	Liquefied Natural Gas
IMO	-	International Maritime Organization
UN	-	United Nation

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CHAPTER 1

INTRODUCTION

1.1 Overview on Legal Framework of LNG

Law is a reflection of the balance needs, the requirement of the coastal transportation of Liquefied Natural Gas (LNG) demand at the moment it is passed. Therefore an extraordinary attention needed focusing largely on the safety and security of Liquefied Natural Gas (LNG) of the hazardous chemicals transported by marine transportation at commercial facilities near populated areas is required. As the nation Liquefied Natural Gas (LNG) facility policies getting develop and mature, there is no special framework for the Liquefied Natural Gas (LNG) coastal transportation. In response to the overall safety and security environment, it is likely to seek a coastal water legal framework and a broader understanding of hazardous chemical marine shipments and efforts to secure them.

The same is true in varying degrees of regulations promulgate to interpret and guide the implementation of the law, depending on who drafts the regulations and the processes for issuing them. Recognizing these fatal factors is important in promoting legal framework for Liquefied Natural Gas (LNG) transportation in coastal water.

The escalating trend towards short term of international natural gas trade has been some fundamental changes in world oil markets and natural gas transportation. The world of shipping industry is not homogeneous, but consists of several discrete sectors, area, market, target groups and each of which operates in different commercial and regulatory regimes, whose needs are served by different types of purpose-built vessels.

Thus, this research will examine, and will analyse the evolution of legal framework on Liquefied Natural Gas (LNG) transportation in coastal water while continuing applicability which may boost the safe and effective future development of international maritime transport industry has been reliant on a broad degree of consensus between nations.

1.2 Research Background

In tandem with the increasing of Liquefied Natural Gas (LNG) production in the emerging market, the gas (LNG) depleting fast and will be required on a major scale to feed the world's biggest gas market. There are several key issues aroused to the which are LNG versus the alternative power options, risk exposure to the producers and end users, flexibility requirements, pricing, contractual arrangements, underpinning success factors in the multi supplies system has lead to the requirement of transportation transformation into an efficient and friendly condition especially in delivery to the end user site.

In the Industries Energy, Utilities & Mining (2007) has highlighted as the following:

> *"Many companies are struggling to optimize their LNG portfolio of assets and contracts in a way that maximizes value. Opportunities for 'arbitrage' profits require ever more clever valuation and modeling. The companies that identify, assess and manage the increasingly complex interdependencies and uncertainties in the evolving LNG market will be the ones who take the profits. LNG relies on two vital ingredients – infrastructure and gas"*

The situation has indirectly rerouted the existing LNG system into new market regime especially on its facilities from onshore to the coastal trend. It has induced the market player to get into this particular regime as it is so-called gave LNG players own trademarks on its own facilities, acquired no land requisition and to avoid the Cabotage Act.

The existing strict market patterns began to break up in the 1990s as LNG surpluses in the Asia Pacific market and uncommitted receipt terminal capacity – especially in the United States – made short term transactions possible. James T. Jensen, 2004 highlighted that while still small as a percentage of total international trade, these short-term transactions began to create price-driven linkages outside the traditional restricted regional markets. Thus a real 'new world gas market' began to emerge. But a 'world gas market' should not be confused with the much more flexible world oil market by Jensen (2004).

The different of LNG environment and the evolving of new era of supply, demands a mind-shift by many players away from the predominant linear fixed supplier and buyer chain of supply to a more flexible, disaggregated model of the market. Some of the future trends that still under the prototype and testing period are:

- Small-scale liquefaction
- Liquefaction hubs
- Alternative source and uses of LNG
- Gas storage for peak shaving
- Shipboard regasification

These technological innovations could open up the prospect of many more players with a greater number of loading and offloading options. However Lawford,H (2005) highlighted in his Liquefied Natural Gas (LNG) carrier Accident Report that few issues which caused accident occurred are:

• Ship owners with no LNG experience are entering the trade
• New containment and propulsion systems are being introduced
• Experienced LNG crews are in short supply
• Cross-trading ships may call at unfamiliar ports and terminals
• Quality of ship owner

The Industries Energy, Utilities & Mining (2007) has also highlighted on the regulatory as the following:

> *"Taking account of regulatory risk "LNG operations are spreading to many new locations. The maturity and format of regulatory frameworks vary considerably. The economic viability of an LNG chain can be influenced significantly by national or regional regulation, particularly on regasification facilities."*

Market expansion, technological innovation and supply-source diversification are now reshaping the global energy landscape especially from onshore, deep sea into coastal zone. In the benefit of the doubt of the technologies and landscape

advancement has granted the use of deep sea guideline or legal procedure for the application and implementation. Although there several frameworks have been developed by the Liquefied Natural Gas (LNG) player such as Ball et al, (2006) proposed a legal framework for Taiwanese government but is it specifically for procurement activities in Taiwan. As well as in Notteboom et al (2004), the only focused area in Snøhvit project Norway is on LNG port management. There is no formal framework to govern the carriage of this particular dangerous goods carriage. So it posed a special attention on the development of the Legal Framework on the Coastal Water for LNG transportation and application. The wave of invention is evitable.

1.3 Objective of the Research

The research on Analysis of Legal Framework Governing the Carriage of Liquefied Natural Gas (LNG) Within Coastal Water is expected to:

- To propose the relevant element(s) for legal framework on the carriage of LNG within coastal water

1.4 Research Statement

In order to create relevant legal framework element (s), there are several situation has directed of the influences factor for safe transportation. The situation that poses for the legal framework development are:

- Liberalization of importers, of power and gas market
- Limited number of receiving or import port and terminal
- Geographical topography reduce the ability of Liquefied Natural Gas (LNG) transportation which caused lack in end user supply
- The high cost of pipeline network and degasification area development and investment.
- As people keep pace with the development, energy plans faces high resistance of NIMBY and BANANA which are Not In My Backyard (NIMBY) and Build Absolutely Nothing Anywhere Near Anything (BANANA) are being highlighted from the end user where people perceive the Liquefied Natural Gas (LNG) storage is a timer bomb
- Imbalance demand and supply of the Liquefied Natural Gas (LNG)
- Natural phenomenon such as extreme weather

1.5 Significance of Study

The direct influence and significance of study will assist every party that involves in carriage of Liquefied Natural Gas (LNG) within coastal water in proper and safe handling of the dangerous goods especially in adaptation of new trend of carriage. In detail the research will discover Current situation of LNG and its legal framework, What are the safety issue in the range of LNG in coastal water?, What are the component of the legal framework for LNG transportation in coastal water?, Identify the whole act of legal framework? And what is the minimum requirement? The findings from this research and study will gave certain implication in developing the existing legal guides. The legal extension should be extended on the acquired field or area in safe caariage.

1.6 Scope of Work

The scope of Work of the research can be best described as the following:

- The proposed legal frameworks shall encompass all major and direct issues pertaining the carriage of LNG within coastal water. e.*g: it is a envisaged that there is no special design requirement for LNG coastal ship in term, say, safety.*
- The framework shall be developed based on published information and to be supplemented by questionnaire-based information
- The framework shall be generic and hence it could be taken as a basis for the development of individual framework

1.7 Dissertation Structure

This thesis consists of six chapters; Introduction, Literature Review, Methodology, Preliminary Results, Discussions and Conclusions and Recommendations.

1.7.1 Chapter 1

Chapter one is on the general introduction of the research. It is aimed to identify and introduce the thesis' background, statements of problems, objectives, significance and scope of study and thesis structure.

1.7.2 Chapter 2

This chapter presents the reviews on history background of Liquefied Natural Gas (LNG) properties, Liquefied Natural Gas (LNG) Carrier fleet, legal framework, authority, The definition and elements on carriage of Liquefied Natural Gas (LNG) and relevant legal document are also presented in this chapter. Apart from that, the factors that expedite the coastal transportation and system are included in this chapter as well.

1.7.3 Chapter 3

This chapter details the research methodology which concentrates on how's the process of producing legal framework includes the data collection method and data analysis method. The data collection covers journals, paperwork's, proposal, statistical researches and articles of topics related to this study. The sole resource for this study is from books and Internet. Meanwhile, the data analysis methods describe how the factors are evaluated with the purpose of developing the conceptual model.

1.7.4 Chapter 4

In chapter four, the final result which is the model itself is presented. Detailed description of the model and its elements are also presented in this chapter. The relationships between the elements and all the new findings from this study that structure the model are presented as well.

1.7.5 Chapter 5

Chapter five discusses the methods used in this research and the results obtained from the study. The arguments on the accuracy of the results are presented in this chapter as well.

1.7.6 Chapter 6

The last chapter will formulate the overall conclusion and findings obtained from this research. This chapter starts by restating the objective of the study and the outcome of the research. Four conclusions were made based on the methodology selected for this research and the results obtained. This chapter closes by presenting the constraints of this research and three recommendations for future work.

1.8 Summary

The write-up of chapter one discussed about the problems occurred which lead to the need of this study. An identification of the objectives and significance of this study give a clearer view of what sort of output shall be produced in the end of the research. The scope of the study is important in order to produce a significant output and to avoid misinterpretation. Further explanations regarding definition of related terms, concepts of systems, Liquefied Natural Gas (LNG) Carrier fleet, legal framework, authority, The definition and elements on carriage of Liquefied Natural Gas (LNG) and relevant legal document are also presented in this chapter will be discussed in chapter two.