FINAL PROJECT – TI 141501

DEVELOPMENT OF DECISION SUPPORT SYSTEM FOR SCHEDULING LPG SUPPLY-DISTRIBUTION AT TELUK SEMANGKA PORT (CASE STUDY: PT. PERTAMINA PERSERO)

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FINAL PROJECT

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SURABAYA
2015

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ABSTRACT

PT Pertamina (Persero) as the main contributor for LPG supply and distribution in Indonesia relies on the VLGC (Very Large Gas Capacity) for upstream transportation mode. All upstream activities are happened at Teluk Semangka Port, which is the main terminal for import supply and regional distribution throughout Java and Sumatra. The complexity in scheduling VLGC caused time consuming and high cost (demurrage cost and charter cost). Current report stated that through 2007 until 2013, there is a significant demurrage cost increased. This condition can jeopardized the supply and distribution process because of large budget allocation for covering the demurrage cost along with VLGC charter cost. A Decision Support System (DSS) is developed to generate schedule for each operated VLGC that both save time and gives the user recommendation in reducing cost. Several factors are considered in designing the DSS, such as lifting prioritization, demurrage cost, charter cost, and VLGC utilization. Besides its ability to generate complex schedule, an easy to use interface is designed for user to interact with the DSS. From several trials using real data taken from company database, it resulted five operated VLGCs as the best number of VLGCs to be operated. Therefore, it can be a recommendation for deciding the number of operated VLGCs in the following year.

Keywords: *Decision support system, VLGC, demurrage cost, charter cost*

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The author realizes that this research is far from perfect. Therefore, the author welcomes positive suggestion and constructive critics from anyone. May this research contribute to academic world and provide improvement for better future.

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CHAPTER I
INTRODUCTION

This chapter describes the background of the research, the problem formulation, the research scope, the objective and the benefit of the research, and the writing systematic in the report.

1.1 Background

Oil based fuel conversion to LPG has become national success until recent years. PT Pertamina (Persero) continues to increase national LPG supply level, which is now sufficient enough to prevent any fluctuation of supply and demand (LNG World News, 2012). A statistical data of LPG supply in Indonesia are gathered by Central Data and Information of Oil and Gas Directorate. Figure 1.1 shows the number of supplied LPG in Indonesia from 2000 until 2013. In 2007 there is a significant increase of supplies from 155000 MT to 531000 MT in 2013. This condition apprises the increased number of domestic demand. It can be said that the conversion program from oil based fuel to LPG was a success.

Figure 1. 1 LPG Supply in Indonesia (Directorate General of Oil and Gas, 2014)

PT Pertamina (Persero) has focused on LPG products through a certain department which main focuses are monitoring operational sectors, from planning, procurement, and monitoring the persistence LPG stock in Indonesia. To fulfill LPG

supply in Indonesia, all related departments cooperate to maintain LPG supply. The departments plan the LPG supply from gas fields that are located in Indonesia, oil refinery units, and imports from other country.

PT Pertamina (Persero) depends on its transportation to support the business process. LPG cargoes are moved from one point to other point by using maritime transportation mode. Currently, PT Pertamina (Persero) has VLGC (Very Large Gas Capacity), that operate as floating capacity for supply usage and midsize ships that operate for distribution usage. Many of the ships are contracted from domestic company, and the rest are owned by PT Pertamina (Persero).

LPG shipments start from import and domestic supply that are handled by VLGC which are located in Teluk Semangka, Lampung. The type of gas that supplied by PT Pertamina (Persero) is refrigerant gas, which is the combination of C3 (Propane) and C4 (Butane). Both gas components are extracted from gas field owned by KKKS (*Kontraktor Kontrak Kerja Sama*). Besides KKKS, LPG is also supplied by PT Pertamina (Persero) Refinery Unit. From several gas field sources, LPG is shipped to main terminal, which are located at Teluk Semangka, Lampung. As for import, PT Pertamina (Persero) cooperates with Petral and Petredec, which are located in Middle East. From Figure 1.2, most of the LPG supplies come from import section, 57%, followed by KKKS, 31%, and PT Pertamina (Persero) Refinery, 12%.

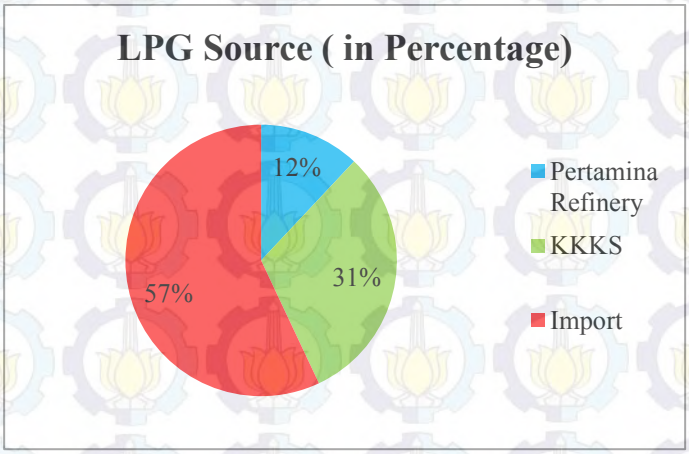

Figure 1. 2 PT Pertamina (Persero) LPG Sources (PT Pertamina, 2015)

LPG lifting process from KKKS is done by FOB (Fright On Board), while for imported LPG, is done by CFR (Cost and Freight) or CIF (Cost, Insurance, Freight)

with the main difference is in the additional insurance cost. Lifting LPG from import or domestic is shipped to main terminal, Teluk Semangka Port, by using VLGC which base location is at the main terminal.

Figure 1. 3 LPG Supply-Distribution Map for Sumatera & Java Region
(PT Pertamina, 2015)

Imported LPG is discharged by using Ship to Ship (STS) method, while domestic LPG is discharged by using shore tank method. The different discharge method is caused by the geographical condition of both sea conditions. Imported LPG is handled at Teluk Semangka with calm sea condition, so VLGC that comes from other country can berth to VLGC at Teluk Semangka, therefore the VLGC becomes floating storage. Different with sea condition at KKKS, which are located at Balanak and Jabung. Both locations have rough sea condition that makes VLGC from Teluk Semangka cannot directly discharge cargo at both locations. The decision for VLGC activity is done by VLGC availability status. For instance, if VLGC is available at Teluk Semangka and there is import shipment then VLGC will handle it. If there is no import shipment and Balanak or Jabung schedule, then VLGC will voyage to Balanak or Jabung. LPG stocks from main terminal will be distributed to main depots by using midsize ships and pressurized ships. The locations are shown in table 1.1.

Table 1.1 Main Depot Locations (PT Pertamina, 2015)

No	Main Depot
1	Lampung
2	Jakarta
3	Tanjung Sekong
4	Eretan
5	Balongan
6	Semarang
7	Cilacap
8	Panjang
9	Dumai
10	TTM

When supply and distribution activities have already underway, the company always faced by problems at the end of the month. Budget allocation for VLGC charter and demurrage claim that have been planned are shorter than the actual condition. Therefore, the company injects additional budget for covering the whole costs. This condition is not preferably by the Finance Department. The problem is caused when determining budget for the whole period. The budget allocation is based on the VLGC simulation that happens at the beginning of the month through group discussion.

The group discussion "simulate" the VLGC schedule by assigning each activities to each VLGC based on VLGC availability. Even though the scheduling method has been established, it is not reflected in the result. This is caused by scheduling process inconsistency. Therefore, there is a mismatch between simulated schedule and reality. From this problem, it will cause an unbalance utility between VLGC that leads to unnecessary operated VLGC. Common condition also happens when VLGCs are charted less than the reality. It resulted high demurrage claim that the company has to pay.

After fix schedule has been determined and supply-distribution is underway, the company cannot chart more or less VLGCs during the time period due to the company policy. If the company decides to chart more VLGC randomly, then there is a

possibility that a VLGC has low utility. Therefore, the company has to make an accurate decision on how many VLGCs needed for the whole period.

From this condition, a decision support system can be the solution for this problem. Through this system, it can save time and cost. Furthermore, it may resulted several scenarios based on the number of VLGC that are going to be used. It can be a consideration for the company to chart new VLGC or divest VLGC that is crucial for the shipments for the following months.

1.2 Problem Identification

As stated in the background, this research is conducted to design a system that can merge all conditions of scheduling process and cost factors such as demurrage cost and charter cost into one tool that generates the process automatically.

1.3 Research Objective

This research aims at several objectives, i.e. to:

1. Develop a decision support system for VLGC scheduling system.
2. Obtain the best cost combination from several scenarios based on the number of VLGCs as the parameter and factors resulting it.

1.4 Research Benefit

The benefits of conducting this research are to ease the company in deciding the number of VLGCs operated for the following months. Therefore, the budget allocation for transportation becomes more efficient.

1.5 Research Scope

The scope of this research is defined by limitation and assumption.

1.5.1 Limitation

Some limitations set for this research are:

1. The research is done for supply and distribution in Sumatra and Java Region.
2. The calculated costs are demurrage cost and VLGC charter cost.

1.5.2 Assumption

Some assumptions set for this research are:

- Cargo schedule is day to day time basis, which has considered shipment activities (loading, unloading, administration, etc).
- Ships reliability is high.
- Activity schedules (discharge, import, and KKKS lifting) are fixed.
- Weather condition is not considered.
- Supply sources and distribution depots are ready based on schedule.
- Midsize ship is ready when it is going to be used.

1.6 Report Outline

The following systematic framework will be used in structuring the content of this research report.

CHAPTER I INTRODUCTION

This chapter describes the background, problem identification, objectives, benefits, and scope of this research. In the last part, the report outline will also be described.

CHAPTER II LITERATURE REVIEW

This chapter describes theories and concepts based on existing literatures that have been developed and are used as basis of this research. Some concepts and theories provided in this chapter are LPG Supply Chain in Indonesia, Maritime Transportation, Ship Routing and Scheduling, Scheduling Algorithm, and Decision Support System (DSS).

CHAPTER III RESEARCH METHODOLOGY

This chapter describes all steps conducted in this research so that the research can be done systematically and well-organized. In general, the research methodology consists of data collection, data processing, model building, scenario generation and experiment, analysis and interpretation, and last, conclusion and recommendation.

CHAPTER IV DATA COLLECTION AND PROCESSING

This chapter includes all processes including data collection, data processing, DSS development, DSS testing, and scenario generation.

CHAPTER V NUMERICAL EXPERIMENT

This chapter includes numerical experiments of the simulation output for all scenarios generated.

CHAPTER VI CONCLUSION AND RECOMMENDATION

This chapter includes the conclusion obtained from the analysis and interpretation. It also provides recommendations for further researches.

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CHAPTER II
LITERATURE REVIEW

This chapter describes theories and concepts based on existing literatures that have been developed and are used as basis of this research. Some concepts and theories provided in this chapter are LPG Supply Chain in Indonesia, Maritime Transportation, Ship Routing and Scheduling, and Decision Support System.

2.1 LPG Supply Chain in Indonesia

LPG supply, which consists of C3 (Propane) and C4 (Butane), starts from four supply source, import, KKKS, Domestic Refinery, and Pertamina Refinery. Import source supplied from Saudi Arabia, where PT Pertamina (Persero) cooperates with PETRAL and PETRADEC for ordering process to the suppliers. KKKS (*Kontrak Kerja Kilang Swasta*) sources are private gas companies that established cooperation contracts with PT Pertamina (Persero). Domestic Refinery and Pertamina Refinery are both owned by PT Pertamina (Persero). Domestic Refinery is private refinery that has been acquired and managed by PT Pertamina (Persero) subsidiary company. As for Pertamina Refinery, it is established by PT Pertamina (Persero). Detailed source names are shown in Table 2.1. It is noted that, all source have long term contract and able to fulfill the necessary demand. But for import supply, it is done when there is LPG shortage from either KKKS or Domestic Refinery.

Table 1.1 LPG Supply Sources (PT Pertamina, 2015)

Import	**KKKS**	**Domestic Refinery**	**Pertamina Refinery**
Petral	Bontang, PT Badak NGL	PertaSamtan Gas	Dumai
Petradec	Jabung Petrochina	Media Karya Sentosa	Plaju
	Belanak Conoco Philips	Surya Esa Perkasa	Cilacap
	Arar Petrochina	TPPI	Balikpapan
	Chevron Indonesia	PDT (Pertagas)	Balongan
	HESS	Pertamina Hulu	
		Titis Sampurna	

LPG lifting from KKKS and Domestic Refinery are done by using FOB (Freight On Board) method. It means that PT Pertamina (Persero) will not get charged for load placed on board at the point of shipment. As for imported LPG, it is done by CFR (Cost and Freight) method or CIF (Cost, Insurance, and Freight) method. Both methods require import suppliers to arrange LPG carriage by sea to a destination port, and provide PT Pertamina (Persero) with necessary documents of the shipment. Both CFR and CIF are differentiate by the insurance cost. For CFR method, import suppliers do not have to procure insurance for loss or damaged LPG capacity during the shipment. As for CIF method, the insurance covers LPG capacity safety until it reaches PT Pertamina (Persero) port. All four methods that are used depend on the agreement between PT Pertamina (Persero) and supplier. LPG lifting either from import or domestic will be shipped to three Main LPG Terminals, which are Tanjung Uban Terminal, Kalbut Terminal, and Teluk Semangka Terminal.

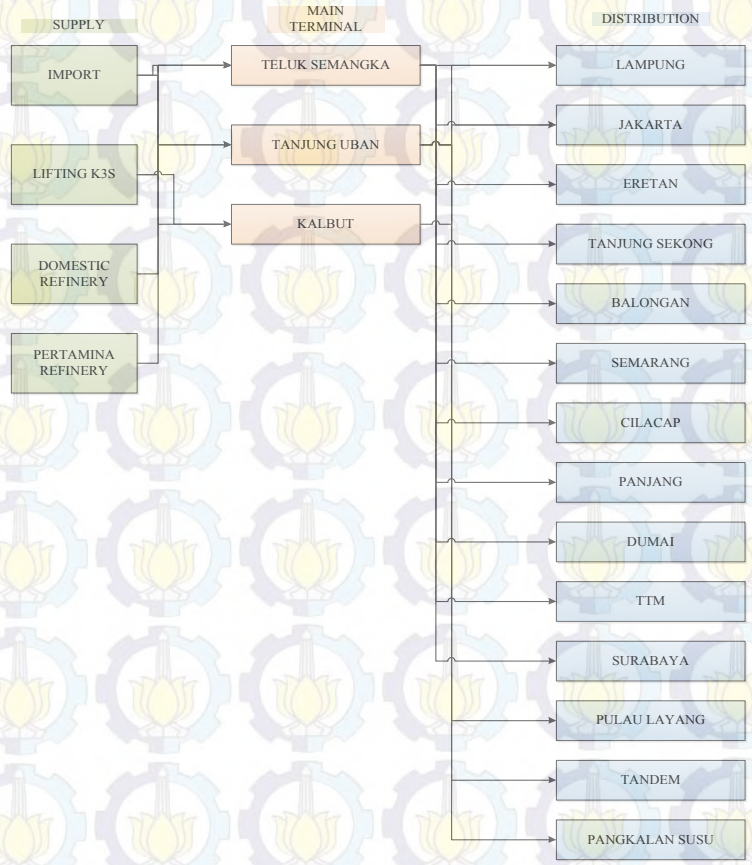

Figure 2. 1 Supply-Distribution of LPG (PT Pertamina, 2015)

Domestic LPG can be transferred by vessel or pipe, while imported LPG is transferred by import vessel. Import vessel from Teluk Semangka and Kalbut will discharge cargo to VLGC or floating storage by using Ship to Ship (STS) method. In STS transfer method, ships are positioned alongside each other when LPG is transferred between them. Different with both terminals, Tanjung Uban Terminal transfers LPG from shore tank to ship.

LPG from main terminal then transported to destination depot in all areas in Indonesia by using pressurized ship, midsize ship, small ship, truck, and pipe. Besides main depot, LPG from main terminal also transported to RU (Refinery Unit) by using ship or pipe, for example RU- III Plaju received LPG supply from Tanjung Uban Terminal.

LPG from RU will be transferred to each depot in order to fulfill the Depot DOT (Days of Throughput). Transferred LPG from RU to depot can be done by using pipe or ship. From depot, LPG is transferred to SPBE (*Stasiun Pengisian Bulk Elpiji*) or also directly to industries that use LPG as their main energy source.

At SPPBE (*Stasiun Pengumpulan dan Pengisian Bahan Bakar Elpiji*), LPG is bottled to three types of canisters, 3 kg, 12 kg, and 50 kg. After that, LPG in form of canisters are delivered to agent or household.

2.2 Maritime Transportation

Maritime transportation is the shipment of goods (cargo) and people by sea and other water ways (The Global Facilitation Partnership for Transportation and Trade, 2013). This mode of transportation becomes dependency for international trade activities. The involvement of ship fleet has significantly increased in the last few decade, it has been calculated an increase of 71% seaborne capacity from 1970 until 2012 (see Figure 2.2). Due to the increased capacity, shipment frequency also result the same tendency. Therefore, maritime transportation plays crucial part in terms of supply-demand. For company operating in long shoreline and multiple islands such as Indonesia, it becomes an advantage for using maritime transportation (Marielle Christiansen, 2007).

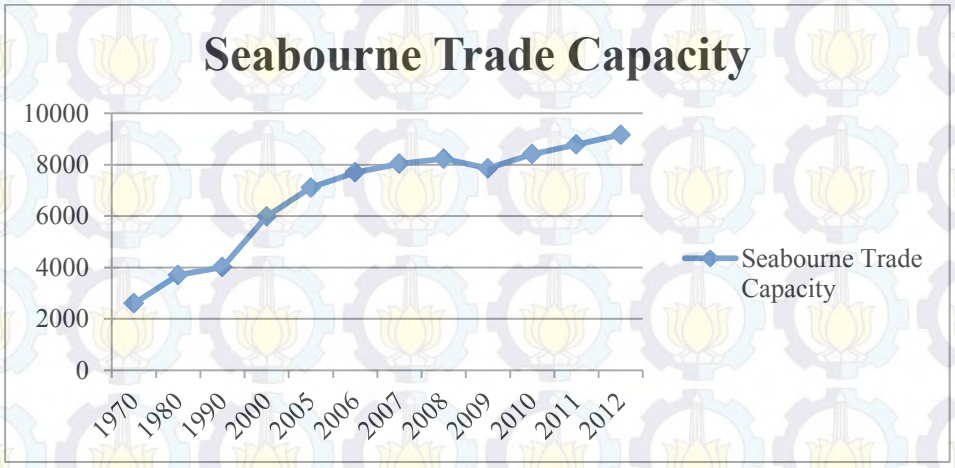

Figure 2. 2 Seabourne Trade Capacity from 1970 to 2012
(UNCTAD Report, 2013)

Activities related with maritime transportation generally distinguish into three categories, liner, industrial, and tramp shipping (Lawrence, 1972). Liner shipping is shipment based on ship route and fix schedule with repetition for each demand. In industrial shipping, customer can determine the ship route, thus the supplier has to fulfill each shipment with the consideration of transportation cost efficiency. As for tramp shipping, the shipment route is flexible, changes in shipment route happens because of profitable destinations that has to stop by first. Therefore, the origin destination changed.

There are various types of maritime transportation that commonly used for shipment in Indonesia. Each type of transportation has its own specific classification based on the business usage. In terms of LPG industry, the type of maritime transportation that is generally use is gas carrier. It carries compositions of LPG, which are C3 (Propane) and C4 (Butane).

Gas carriers are generally grouped into three types, fully pressurized, semi-pressurized, and fully refrigerated. Fully pressurized ship is the smallest type of liquefied gas carrier (up to 5000 cubic meters). It able to endure pressures up to 20 Bar because of the steel pressure vessels design. As for semi-pressurized ship, it splits the storage tank for pressurized and refrigerated type of gasses. Therefore, it becomes an advantage because of the ability to load or discharge more than one type of gas. Fully refrigerated ship is built to carry liquefied gasses between fully refrigerated storage terminals at low temperature and atmospheric pressure.

2.2.1 Demurrage

The terms of demurrage is the penalty cost that PT Pertamina (Persero) used for unfinished import unloading process in daily time basis. As stated in the background, import cargoes are handled by PETRAL and PETRADEC, which both companies handle the import shipments until it arrives at Teluk Semangka. Thus, the amount of penalty is based on agreement between PETRAL, PETRADEC, and ISC Department. To calculate the demurrage time, it follows the following equation.

$$demurrage\ time = total\ laytime\ used - laytime\ allowed \quad (2.1)$$

Demurrage time in Equation 2.1 calculates the gap between the actual duration and agreed duration of unloading process. Total laytime used is the time span between import ship arrivals until departures. As for laytime allowed is the agreed time for import ship to unload the cargo to VLGC until due date. Therefore, to calculate the demurrage cost is as follows.

$$demurrage\ cost = demurrage\ time\ x\ demurrage\ rate \quad (2.2)$$

Demurrage cost in Equation 2.2 is used when there is a time gap in Equation 2.1. If so, then it is multiply by the demurrage rate which is based on contract between PETRAL, PETRADEC, and ISC Department.

2.2.2 Ship Charter

Charter contract is the negotiation between ship owner and individual who wants to use ship as mode of transportation (Ozer & Cetin, 2012). There are several types of ship charter that are commonly use, such as bareboard charter, time charter, and voyage charter (Custom and Excise Module Team, 2008). Several types of ship charter are as follows:

1. Time charter, charter tariff is based on ship charter duration. In time charter, charter payment is in cost per day or cost per DWT tonnage. Charter cost allocations are as follows:

   Ship owner:

- Depreciation cost
- Insurance cost
- Ship crew cost
- Ship maintenance cost
- Supplies and lubricants cost
- Overhead cost

Ship tenant:

- Charter cost
- Bunker cost
- Port cost
- Stevedoring
- Cargodoring
- Water
- Loading-unloading company

2. Voyage charter, transport goods from loading source to unloading destination. In voyage charter it includes demurrage cost, which is cost that claimed to tenant if tenant late to unload goods from ship. However, if tenant is able to unload goods faster than duration, then the tenant will receive dispatch. Cost allocation in voyage charter are as follows:

   Ship owner:

   - Capital cost
   - Depreciation cost
   - Ship crew cost
   - Ship maintenance cost
   - Supplies and lubricants cost
   - Insurance cost
   - Overhead cost
   - Fuel cost
   - Port cost

Ship Tenant:

- Ship charter cost based on lifted weight for one shipping.

2.3 Ship Routing and Scheduling

Ship scheduling plays an important part in planning ship operations. It consists of detailed ship assignment, where and when a shipment will be done. Ronen (1993) stated that even though ship scheduling seems rigid, where a certain fleet must carried a set of shipments, it enables flexibility in the process for both ship (size and timing) and its availability (chartering in or out, lay ups, and spot charters). Thus, revisions often happen in order to have an optimal schedule.

Ship planning problem can be differentiate based on the planning horizon into three categories, strategic, tactical, and operational (Christiansen and Fagerholt, 2002). In strategic problem, it can be classified into several problems, market decision, ship design, transportation network design, fleet assignment (capacity, route, and ship type), location, and port design. As for tactical and operational, both mainly focus on routing and scheduling (Christiansen and Fagerholt, 2002). Tactical considers size and combination changes of assigned ship fleet, assignment for specific ship to trade route, ship routing and scheduling, inventory ship routing, berth scheduling, crane scheduling, container yard management, container stowage planning, ship management, and empty container distribution. And for operation, it generally deals with ship speed and ship loading process.

Numerous sources can be found related with ship routing and scheduling in this research. Bausch et al. (1998) proposed a simple spreadsheet interface to schedule a fleet of coastal tankers and barges transporting liquid bulk products among plants, distribution centers, and industrial customers. Inside the spread sheet, feasible alternate vessel employment schedules are generated. Also, an integer linear set partitioning model assign a schedule to a certain vessel in order to have complete deliveries at minimal cost while satisfying operational needs. Bruzzone & Orsoni (2002) proposed an AI (Artificial Intelligent) system for industrial shippers to manage the fleet management. The system architecture consists of dynamic database, decision heuristic, and a dynamic process simulation to generate cost-effective configuration.

2.4 Scheduling Algorithm

There are several operational scheduling algorithm that can be applied for ship scheduling. Ulfija (2007) analogized the ship as machine and activities as line of works that are waiting to be processed.

In scheduling, the algorithm usage is depends on designated priority. Several scheduling priority are as follow:

1. Random, priority rule based on random task. It does not considers whether the task needs to be handle first or last.
2. Smallest Processing Time (SPT), operational schedule based on the shortest operational time, commonly it is chosen to minimalized flow time.
3. First Come First Served (FCFS), scheduling based on activity arrival. This rule will choose job with earliest arrival time into the work center.
4. Earliest Due-Date (EDD), operation schedule to choose job with shortest due-date. The main goal is to minimalize lateness or tardiness. Referring to this research, there is a certain activity where the due date is more than one day, different with other activity. The due date is for three days, and after three days it does not able to unload then there is a certain cost that the company has to pay.
5. Critical Ratio (CR), schedule with smallest ratio between slack and available time until job due. Critical ratio is define as residue work time divided with amount of residue work time ratio with slack time.

Referring to one of the main goal of this research, which is to minimize the demurrage cost, the suitable priority rule is Earliest Due Date (EDD). This concept fits with the supply-distribution activities in this research where there are different due date for each activities.

2.5 Decision Support System (DSS)

The usage of decision support system (DSS) for research and practical has developed rapidly. Marakas (2003) defines Decision Support System as a system under one or more decision maker to help activities related with decision making by providing series of organized tools. These organized tools later on define as decision support

tools, which are used to capture the situation and increase the effectiveness of decision making.

According to Simon (1960), there are two types of decisions:

1. Programmed decision, repeated and routine decision. Company develops certain ways to control the decision. (e.g. arranging store products).
2. Unprogrammed decision, decision that happens only once and tends to be unstructured, if compared with programmed decision. (e.g. deciding what products to be sold).

In terms of maritime logistics and distribution, DSS becomes a usable tool for developing a ship schedule. Brown et al (1987) used DSS for developing a schedule system for crude oil ships by using set-partitioning model. The result showed that by using DSS it obtained optimal integer solutions in less than a minute. Further research by Downman et al (1995) showed that an implementation of DSS for solving US Coast Guard schedule resulted an annual saving up to US$30 million. Therefore, applying DSS for scheduling may result efficiency for both time and budget.

Besides operational benefits of applying DSS, it can be used to determine strategic plan (Korpela & Tuominen, 1996). Blanning (1979) defined several characteristic of DSS:

1. DSS facilitate the interaction between computer and decision-makers
2. DSS helps manager to make an unstructured decision
3. DSS provides information for several activities, i.e. planning, finance, marketing, and operational function.

Considering both benefits, this research fits with the desires from the researcher and company. It is also because the massive data, problem complexity, and numerous regulations related with the decisions that makes DSS suitable for this research.

To design and analyze a DSS, Asihanto (2010) suggested two types of strategies that can be used. Those are Specific DSS and Generator DSS.

1. Specific DSS

   This strategy design a DSS by using special programming language that arranged specifically to the problem. This strategy takes time to design the chosen programming language.

2. Generator DSS

This strategy use DSS that has already provided, for example Microsoft Excel. Thus, it does not take time to develop the programming language but rigid with complex problems.

In designing DSS, several components need to be considered. The relation between each component is as follows.

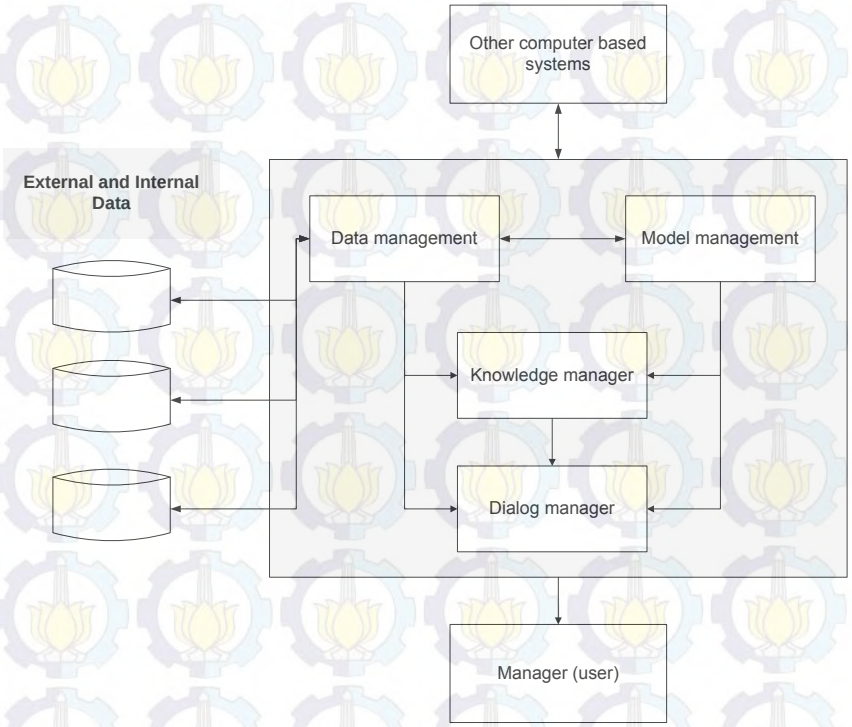

Figure 2. 3 DSS Components (Turban & Aronson, 2005)

1. Data managements, consists of relevant database for various situations and managed by Database Management System (DBMS).
2. Model management, involving financial model, statistical, management science, or any other quantitative model, thus it will give the system an analytical ability, also required software management.
3. Communication (dialog subsystem), user can communicate and give order to DSS through this subsystem.
4. Knowledge management, this optional subsystem supports other subsystem or act as an independent component.

CHAPTER III
RESEARCH METHODOLOGY

This chapter describes all steps conducted in this research so that the research can run in systematic way.

3.1 Data Collection

In this step, data related with the research will be gathered. After data have been gathered, data are processed to achieve the solution. Data that are gathered are:

1. Existing LPG supply & distribution policy.
2. Import shipment schedule.
3. KKKS lifting schedule (Jabung-Uban schedule and Belanak-Uban schedule).
4. Depot discharge schedule.
5. Maintenance schedule.
6. Number of VLGC.
7. VLGC capacity.

All data are gathered from Master Plan database ISC Department and interview with related employees.

3.2 Understanding Current System Condition

In designing a DSS, it is required to have a thorough understanding of the current system condition. Both the developer and the user must have the same understanding on the scheduling system that has already established by ISC Department. The DSS developer obtained the knowledge by an interview with employees that in charge the scheduling process and also from schedule simulation group discussion.

3.3 Defining Specific User Requirements

This step encompass the DSS user needs. The functions of proposed system and the interface requirements for communicating with the system are define to be able for understanding the problem context. Both objectives are achieved by interview session

with users. Through interview session with users, all necessary requirements that need to be included in DSS can be used by users. Requirement lists from users are translated into algorithms which are used for the following steps.

3.4 Decision Support System (DSS) Development

In this step, algorithms that have been defined are translated into programming language. It is then being used for designing DSS in VBA (Visual Basic Application) Microsoft Excel.

3.4.1 Designing Initial DSS Framework

Applied DSS is designed based on the initial framework that is being processed in this step. It consists of defining used decision model, input data, expected output, data file format, and also the DSS procedures.

3.4.2 Data-management subsystem (DBMS) Design

Database system which consists of relevant data is designed and managed by database management system (DBMS). It stores large size of data that are compatible with the problem that DSS has been designed to and provides logical data structure in which user interacts. Therefore, the user is separated from physical aspects of database structure and processing. Furthermore, the user is informed of available data and how to access the data.

3.4.3 Model management subsystem (MBMS) development

The role of MBMS is to transform data from DBMS into useful information in making decision. Since many problems that the user of a DSS will cope with may be unstructured, the MBMS should also be capable of assisting the user in model building (Druzdzel & Flynn, 2002).

3.4.4 User interface subsystem development

Communication system between DSS and user is developed. The communication system is in a form of common user interface that are intuitive and easy-to-use for the user.

3.4.5 DSS application development

The final step of designing DSS is integrating all DSS components into an integrated program, so it can easily interact with the user.

3.5 DSS Validation

In this stage, the DSS is tested, evaluated, and deployed a fully function DSS. For testing the DSS, it is done by validation. Testing the validation is done in two steps. First step is done to ensure that no error occurred when DSS is running. The next step is to assure that DSS runs according to the program logic. Both steps need to be conducted to make sure that input, process, and output are integrated and according to the algorithm.

3.6 Numerical Experiment

The next step after validating DSS is to generate several trials. The trials are generated based on supply and distribution historical data from 2013 and 2014. On both trials, the scenarios are generated by changing the number of operated VLGCs. The outputs for each trial are number of operated VLGCs, utilization of each VLGCs, charter cost, and demurrage cost. Then, results that are given from each trial are calculated in determining which combination is optimal to be applied.

3.7 Conclusion and Recommendation

Conclusion based on this research is extracted. The conclusion is based on research objectives that have been stated in previous chapter. Recommendations are also given for improvement and for the following research.

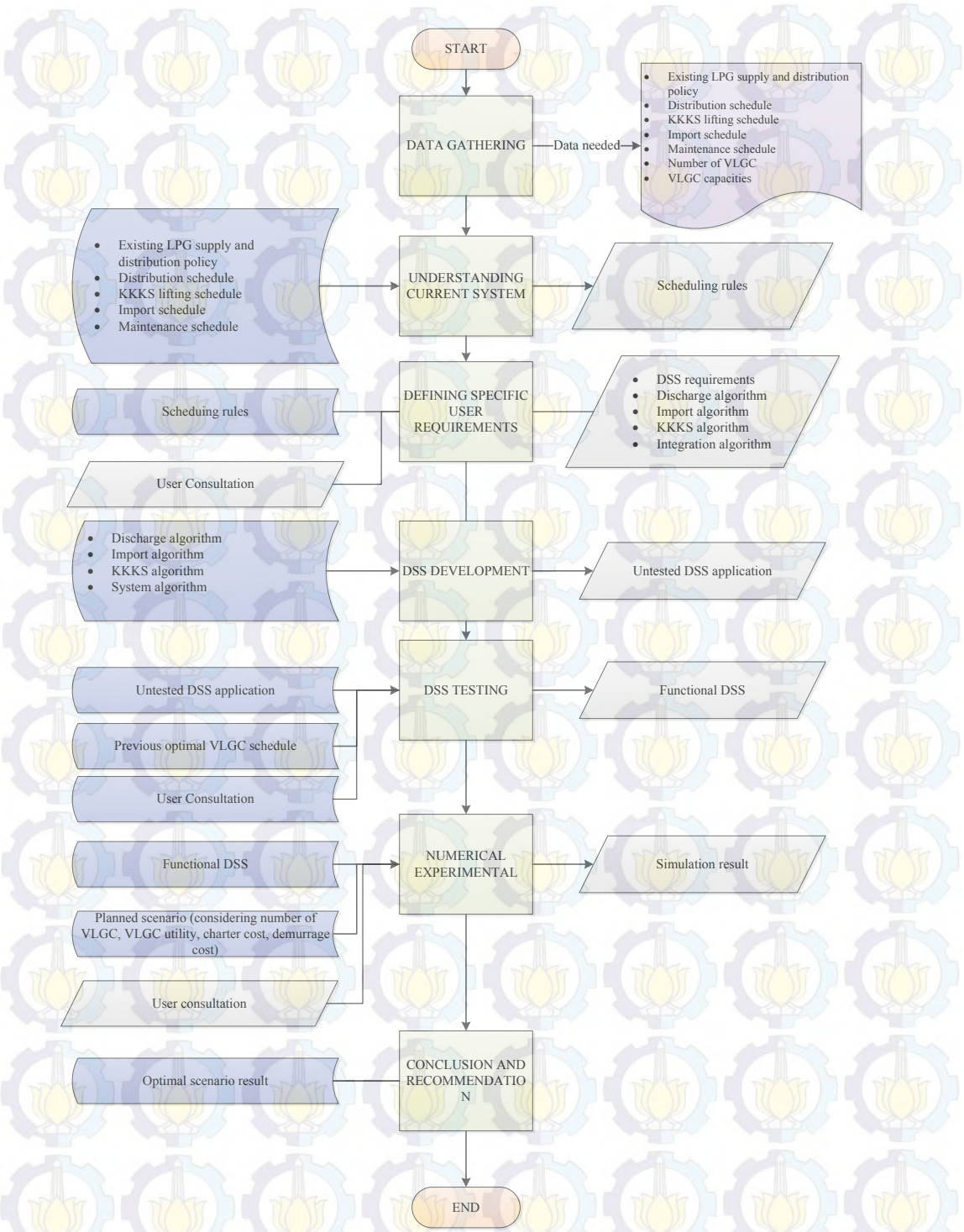

Figure 3. 1 Research Flowchart

CHAPTER IV
DATA COLLECTION AND PROCESSING

This chapter includes all processes regarding preparing data to build the research model. Those processes are of data collection, system algorithm, DSS development, and scenario generations.

4.1 Data Collection

Data that is used during this research includes import schedule, discharge schedule, K3S lifting schedule, maintenance schedule, existing LPG supply and distribution policy, number of VLGC, and VLGC capacities from January 2014 until December 2014. All data are taken from ISC Department Master Plan database.

4.2 Understanding Current System Condition

Scheduling actual condition is analyzed and illustrates into a simple system flow. This step is done to understand the scheduling flow before it is being translated into programming language. Figure 4.1 shows the current scheduling process.

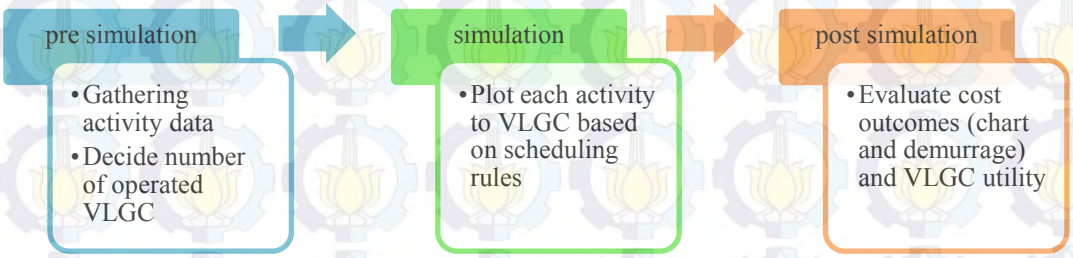

Figure 4. 1 Current Scheduling Process

The first step in scheduling process are gathering activity data and deciding the operated VLGC. Activity data is gathered from Master Plan data and additional data such as VLGC available list from Operational Department and budget allocation from Finance Department. There are three main lifting activities during scheduling process, K3S (Kontrak Kilang Swasta) lifting, discharge lifting, and import lifting. Both K3S (Kontrak Kilang Swasta) activity and import activity are define as supply activity. Whereas discharge activity is defined as distribution activity. Each lifting activity is

described in Table 4.1. Coincide with data gathering, the group decides on the number of operated VLGC for simulation process. The decision is based on historical data.

Table 4. 1 Lifting Activities Description

Activity Type	Lifting Activity	Description
Supply	K3S (Kontrak Kilang Swasta)	Lift LPG cargo from three location, Jabung, Uban, and Belanak.
	Import	Lift LPG cargo from import ship that berths at Teluk Semangka Port
Distribution	Discharge	Unload LPG cargo from VLGC to small ships to fulfill depot demands

The next step is the simulation process. The simulation process is done by plotting each activity based on the scheduling rules. The rules are based on conditions of each activities that is different one another. The activities plotting follow the scheduling rules which are composed based on general condition of import shipment and operational condition.

Table 4. 2 Scheduling Rules

ACTIVITY	RULES
GENERAL	Cargo loading (Import or K3S) has to considered VLGC maximum capacity (Ullage)
IMPORT	Unhandled import shipment more than the duration resulted demurrage cost
	Only VLGC can handles import shipment
Pre-K3S	Activity date is determine three days before K3S
	Determine VLGC for Pre-K3S by selecting the lowest LPG stock
	Selected VLGC will have privilege to choose the best discharge combination before K3S
	Inability to handle all K3S cargo, selected VLGC has two options to transfer stock. **First option**, Ship to Ship (STS) with other VLGC during Pre-K3S. If first option cannot be fulfilled, second option can be choose. **Second option** is Midsize Ship lifting. All left stock can be lifted by Midsize Ship.
K3S	VLGC lifting to Jabung or Belanak must allocate ten days to voyage, therefore there is no activities during this duration

ACTIVITY	RULES
DISCHARGE	VLGC allocation is based on capacity sequence from maximum to minimum capacity

There are several rules based on activities that happened during the VLGC scheduling. The general rule in scheduling VLGC is to load cargo by considering the limit stock. In terms of shipping, the limit stock is refers as ullage. If the cargo have been loaded to VLGC and exceeds ullage, the VLGC is not able to load the cargo. Therefore, it is shifted to other VLGC. As for import activity, there is a penalty cost occurred when the shipment cannot be handled during the import duration. This is refers as demurrage cost. The demurrage cost is counted at the first date after import duration and continues to count until all cargo loaded to VLGC. Currently, the demurrage rate is $ 160,000 per day and only import shipment occurred this type of penalty.

K3S activity, private refinery lifting, is done by assigning VLGC at Teluk Semangka to lift the cargo at designated private refinery locations. Mainly, the amount of cargo lifted are close to the VLGC ullage. To anticipate any excess stock and unnecessary voyage, a Pre-K3S activity is done first to prepare the VLGC for lifting cargo. The Pre-K3S activity is done for three days before departure date. During the preparation, the VLGC with lowest stock level is selected for lifting K3S and handled discharges activities by combination. The objective is to reach the lowest stock level that is sufficient when the VLGC is filled with K3S cargo. When the stock level excess ullage when loaded with K3S cargo, the VLGC is able to unload stock to other VLGC or midsize ship during Pre-K3S duration.

In lifting K3S, the designated VLGC voyage to several destinations. There are three destinations for K3S lifting, Jabung, Belanak, and Uban. All destinations have voyage duration that are listed in Table 4.3**.**

Table 4. 3 Voyage Duration for K3S Lifting

From	**Destination**	**Duration (day)**
Teluk Semangka	Jabung/Belanak	4
Jabung /Belanak	Uban	2
Uban	Teluk Semangka	4

As for discharge activity, midsize ships and small ships voyage to Teluk Semangka to lift LPG cargo from VLGC in order to fulfill each depot DOT (Days of Throughput). The rule for discharge activity is to sequence the activities based on VLGC stocks from maximum to minimum quantities. The sequence is used to determine which VLGC to handle certain discharge activity. The maximum stock VLGC is matched with maximum discharge activity and so on until the minimum stock VLGC is matched with minimum discharge activity. By using this sequence method, the VLGC stock is pressed to the lowest stock as possible. Furthermore, the nature of LPG that is easy to vaporize forced the VLGC to unload its stock as much as it could. Thus, this concept is applied in scheduling VLGC.

4.3 Defining Specific User Requirements

This step encompass the needs of DSS users. The functions of proposed system and the interface requirements for communicating with the system are defined to be able to understand the problem context.

Based on the interview session with users, the main function in designing the DSS is to simplify the scheduling simulation process. Convert the manual process which is reflected in group discussion to one program that can simulates and give reports (financial and VLGC utility). The developed program is requested in a user friendly form consisting all necessary information needed for scheduling and easy to understand result. The user form consists of input form, simulate spreadsheet, and report spreadsheet. In input form, it consists of VLGC information which are VLGC name, VLGC capacity for both C3 and C4, and charter cost. As for simulate spreadsheet, it consists columns of each operated VLGCs with simulation date on each columns. Finally, the resulted simulation is in report form.

The output of this step is algorithm that represents the flow of scheduling process. The algorithm is developed based on the actual system. Figure 4.2 presents the general scheduling algorithm.

The algorithm checked the schedule on daily basis (t), starting from the first entry date. When there is an activity happens at current date, it will be assigned based on the priority. The prioritized activities follow the most important until the least ones. Then it continuously checked the following date until the end of simulation period (T).

At the end of the simulation, the DSS provides information of VLGC utilization, demurrage cost that occurs during the time period, and VLGC charter cost when there is an additional VLGC.

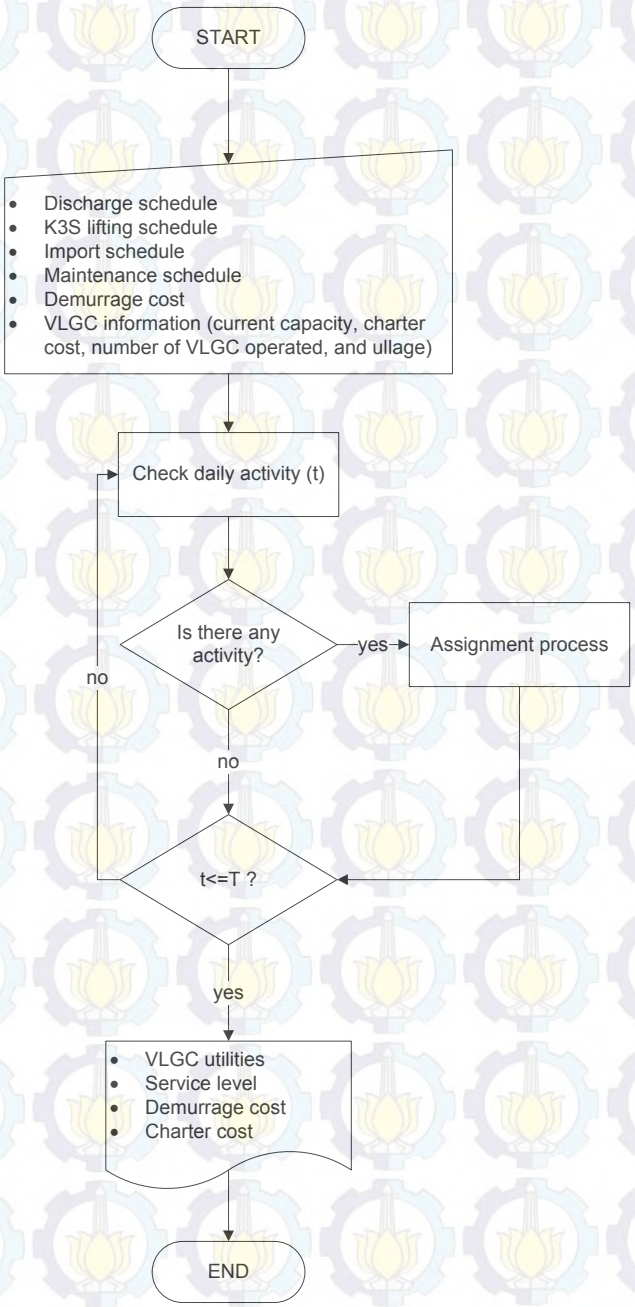

Figure 4. 2 General Scheduling Algorithm

4.4 System Assignment Algorithm

Scheduling rules and scheduling process flow that have been defined from the previous chapter are translated into algorithm or step-by-step set of operations that

reflect the scheduling process. The algorithm is breakdown into three main sections, K3S algorithm, discharge algorithm, and import algorithm. Furthermore, each main algorithm is specified according to the scheduling rules.

All algorithm are integrated by activity prioritization that is define based on the rigidness of activity schedule and the complexness of an activity that reflects from the amount of sub activities under the main activity. For K3S activity, it is specified into three activities. Predecessor activity (Pre-K3S) that prepares certain VLGC for lifting K3S cargo, shortage supports for Pre-K3S activity when specified VLGC is unable to lift all cargo from K3S destinations. As for discharge activity, it supplies LPG demands from various depots. Each demand must be fulfilled according to the required quantities. The last activity is import. A VLGC has the flexibility to perform lifting activity in more than one day that confined by three days berth. Based on each activity specification, an activity sequence prioritization can be defined. The activity sequence prioritize from K3S activity, discharge activity, and import activity.

4.4.1 Pre-K3S Algorithm

This algorithm consists of step-by-step activities during Pre-K3S duration. Pre-K3S duration starts from six days before the first K3S activity date. In this duration, two steps are conducted. First step is to determine VLGC with the lowest LPG stocks at the first date duration. Whereas the second step is to allocate discharge activity combination to the designated VLGC. The VLGC that is chosen for Pre-K3S is named Pre-K3S VLGC. The goal from these two steps is to be able for lifting K3S cargo when the date comes. If these step done randomly then there is a possibility that during K3S lifting date, there is a left over cargo that cannot be lifted. Therefore, to anticipate this condition the two steps are conducted. Figure 4.3 illustrates the Pre-K3S algorithm.

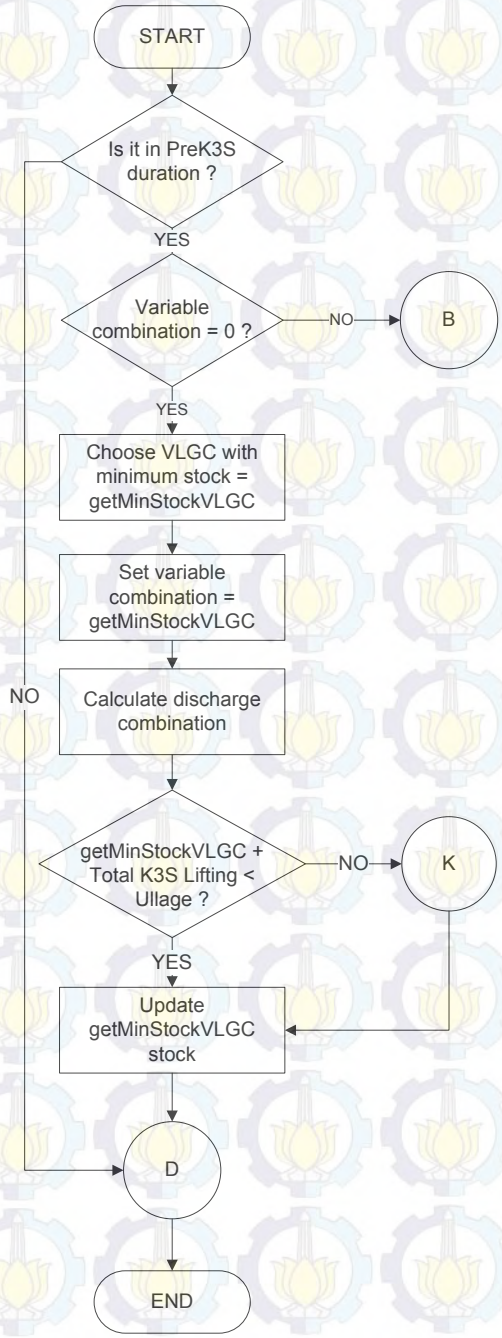

Figure 4. 3 Pre-K3S Algorithm

The system checks the current date if it is in Pre-K3S duration or not, the Pre-K3S duration is determined from input K3S data sheet. If it is not, then the system checks if the current date has other activity. Next step is to check the current date if it has defined the variable combination. Variable combination is defined when the system has calculated and selected VLGC with minimum stock quantities. If it has calculated

the variable combination, the value is the name of selected VLGC with minimum stock quantities. The selection process illustrates in Figure 4.4. When the value of variable combination has filled with a VLGC name, the system continues to check other activity at current date.

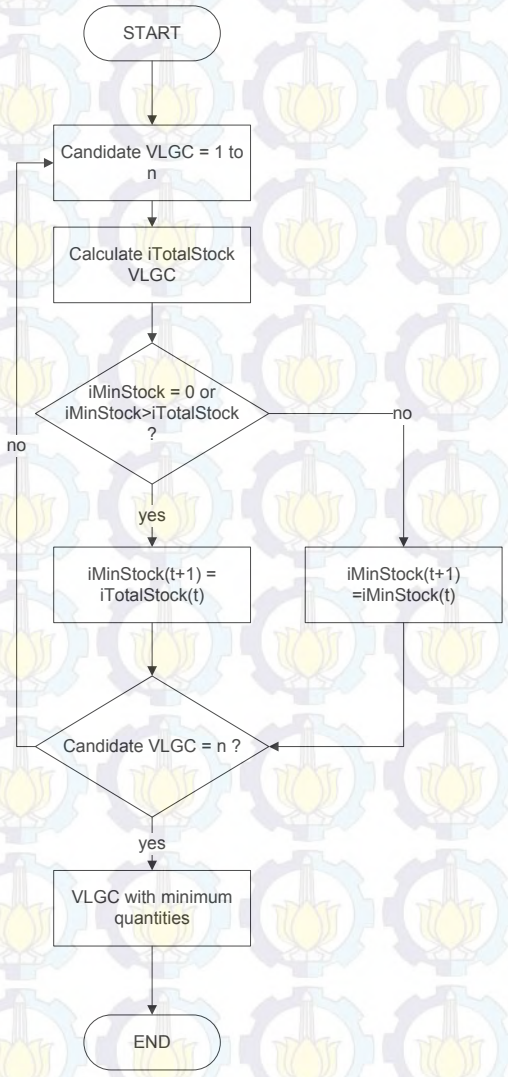

Figure 4. 4 Minimum VLGC Quantities Selection

The first step in determining the minimum stock VLGC is to check and collect data of all available VLGC. Collected data are current VLGC stock (C_3 and C_4). Then, the total stock of each VLGC is calculated. The total LPG stock is refer as iTotalStockVLGC. The calculation is done by adding C_3 and C_4 of each VLGC. The total stock of each VLGC are compared one by one and once the VLGC with minimum stock has determined, it is recorded in the system as iMinStock. When the first

calculation has not been done, the system recorded zero value as iMinStock. If iTotalStockVLGC value is less than iMinStock value, the total stock value overwrite the minimum value with its value. Otherwise, it is still recorded the same value. The process loops for the next VLGC candidates until the processed VLGC is the last VLGC available. Once the process ended, the recorded VLGC with minimum total stock value is selected as getMinStockVLGC. Hence, the selected VLGC will do the discharge activities from combination that is done at the following step.

The combination is done by calculating discharge possibilities during Pre-K3S duration. The possibilities are depend on the number of discharge happens each day during Pre-K3S duration. The goal from this combination is to get the lowest VLGC stock. The system calculates all combinations available then compare each combination based on VLGC stock that has been reduced by discharge combination. The lowest value of VLGC stock then used for VLGC adequacy test during K3S lifting at designated locations (Jabung-Uban or Uban-Belanak). If the stock value after added with K3S cargo exceeds ullage capacities, then there are options for VLGC to have sufficient stock for lifting K3S cargo. Other condition when the stock value is adequate to lift K3S cargo, the discharge combination is updated to the VLGC column.

4.4.2 Shortage Supports for Pre-K3S Algorithm

There are two options that can be chosen when the discharge combinations are insufficient to prepare VLGC for lifting K3S cargo during Pre-K3S period. The first option is Ship to Ship (STS) method. In this method, cargo can be transferred from one VLGC to other VLGC. It can only happen when VLGC receiver current status is not handling any activity. VLGC backer, VLGC that transferred the cargo, discharges its cargo (C_3 and C_4) to VLGC receiver. Therefore, the amount of stocks in VLGC backer decreased. The amount of cargo that can be transferred is based on the ability of VLGC receiver. The maximum ability of VLGC receiver is equal to ullage stock. Therefore, if there are leftover cargo that must be discharged from VLGC backer after STS, the leftover cargo are handled on the next day by available VLGC that meets the requirement. Sometimes leftover stocks are still happened when it reached the final day of Pre-K3S. When this happened, the second option can be chosen.

The second support option, midsize ship transfer, happens when the first option cannot successfully discharged all cargo. In this method, an additional ship will serves as container that receives all discharge cargo. The midsize ship is 15000 MT. Once it is filled, the ship will then voyage to other region to be transferred to other VLGC. The procedures of this method started by checking the stock quantities that has been calculated by first option. If the stock quantities after filled with K3S cargo exceed ullage than the second method will perform at the second day. If there is only one day and failed to perform STS, the system automatically performed midsize ship transfer. The illustration of both method is illustrates in Figure 4.5.

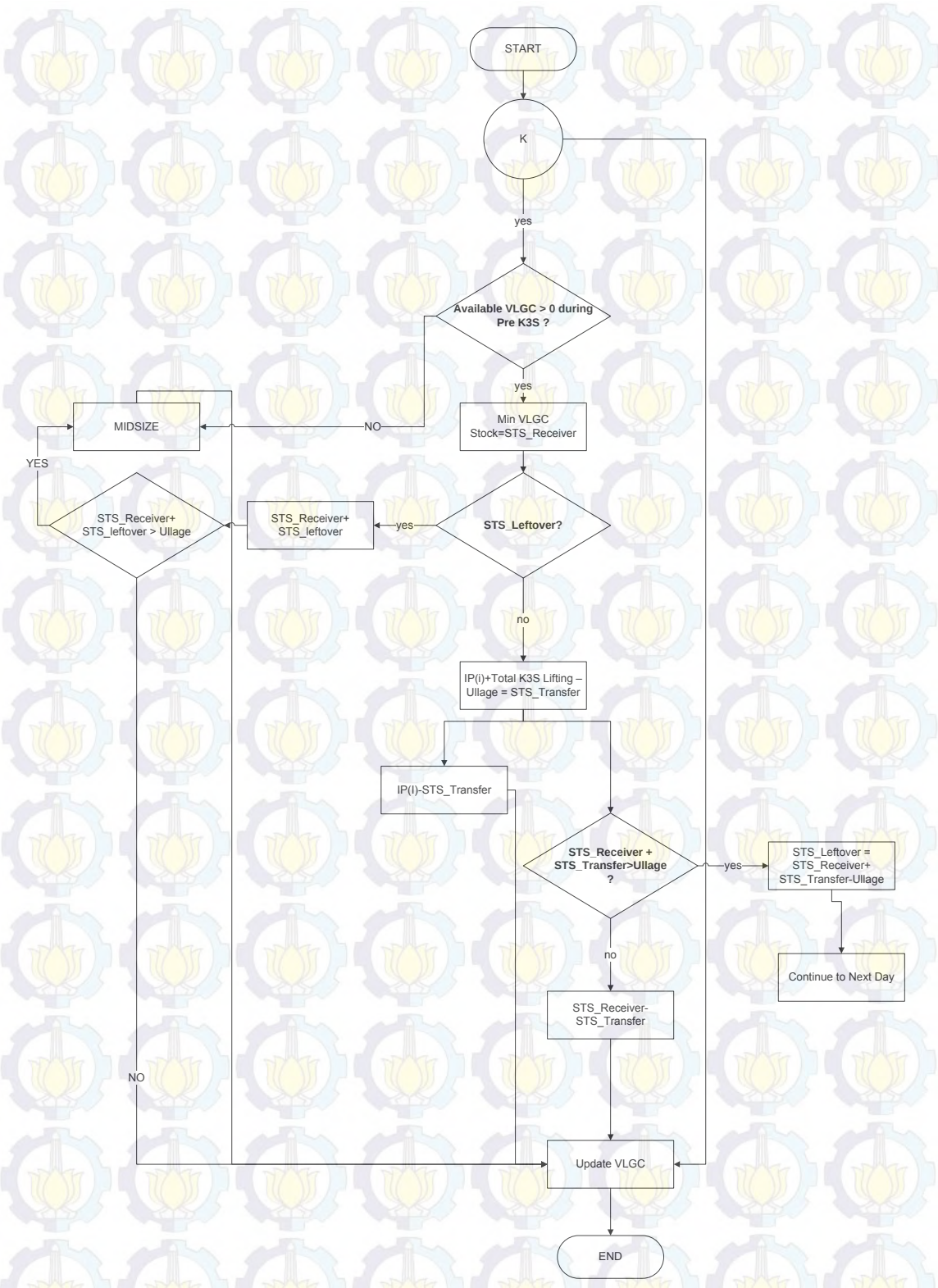

Figure 4. 5 Shortage Option Algorithm

4.4.3 K3S Lifting Algorithm

This algorithm processed the K3S lifting activity at the current date. From the previous subchapter, the first K3S lifting activity is done at the fourth day after the VLGC departed from Teluk Semangka Port. The voyage destinations are depend on schedule, whether the destinations are Jabung then Uban or Uban then Belanak, vice versa. If the current date is recorded as K3S departure date, then the system resets the combination variable from the previous step, which is the Pre-K3S discharge combination. The reset process is necessary for the following Pre-K3S schedule to be processed. Once the combination variable is reset, the designated VLGC for K3S lifting is added with the amount of K3S lifting cargo. Afterwards, the VLGC stock is updated with the amount of cargo lifted. After the stock has been updated, the next step is to check for any activities at current date. Figure 4.6 shows the step-by-step of processing the K3S lifting activity

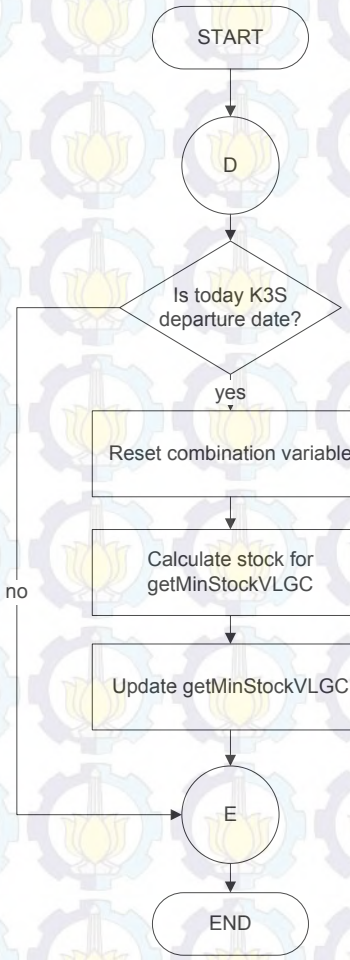

Figure 4. 6 K3S Departure Algorithm

4.4.4 Discharge Algorithm

Continuing from the previous algorithm step, the system continues to the next algorithm, which is shown in Figure 4.7. The system checks the current date for any discharge activities. All discharge activities are collected and sorted from maximum quantities to minimum quantities. After the discharge activities have been sorted, the available VLGCs are sorted likewise. The system match each discharge activity with available VLGC to handle the activity. The matching process is done according to the sorting sequence of both discharge activity and VLGC. Through this process, the activity is assigned to the VLGC that sufficient for receiving additional cargo to its stock.

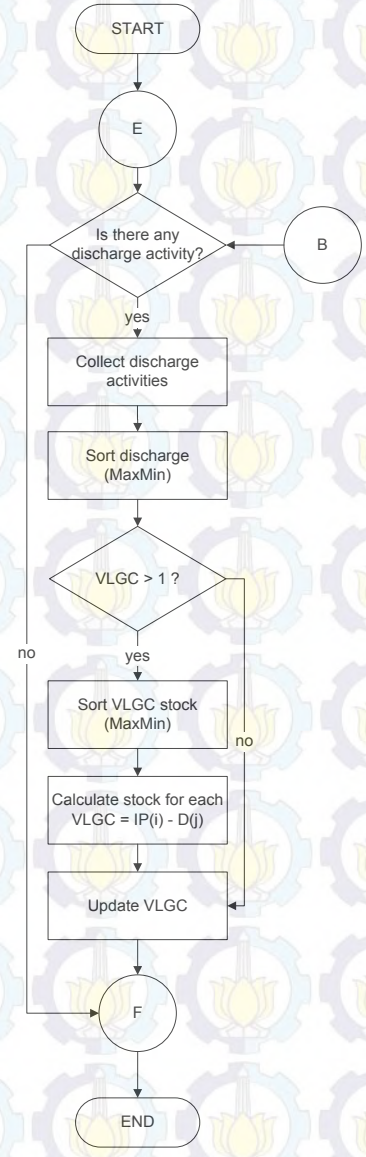

Figure 4. 7 Discharge Algorithm

The next step is to update each VLGC stock. The calculation is done for all matched pair between VLGC and discharge activity. Therefore, for VLGC that is not paired with any discharge activity will not be updated. The supply/discharge column in simulation sheet are updated with the amount of discharge activity for each paired VLGC. This means that the discharge cargoes are loaded to its paired VLGC. When all discharge activities have been calculated, the system continuous to check for any activities at current date.

4.4.5 Import Algorithm

The last activity is import. In import activity, VLGC receives import cargo from overseas suppliers. The main processes when receiving import cargo are selecting VLGC with minimum stock quantity to handle the shipment cargo, calculate stocks after added import cargo, calculate demurrage date, and calculate cost if happened. As shown in Figure 4.8, if there is a predecessor import cargo, the predecessor is handled first before the current import cargo. This is set to finish the demurrage cargo from the predecessor shipment. Therefore, the demurrage cost will not accumulates with the next import cargo.

Next, the system checks for available VLGCs at Teluk Semangka Port. The available VLGCs are sorted based on stock quantities from minimum to maximum. Then, the minimum stock is selected as the import cargo receiver. Through this concept, the demurrage possibilities are minimized. Once the VLGC has been selected, the system checks the import cargo status at the current date, whether it is the initial import shipment or import leftover. Initial import means the first date the import cargo arrived at Teluk Semangka Port, in which the quantity of import cargo are still in full condition. Import leftover is the excess VLGC stock when the import cargo has been loaded to VLGC. Then the import cargo can be classified into three conditions, normal initial import, leftover import shipment (on duration), and leftover shipment (over duration).

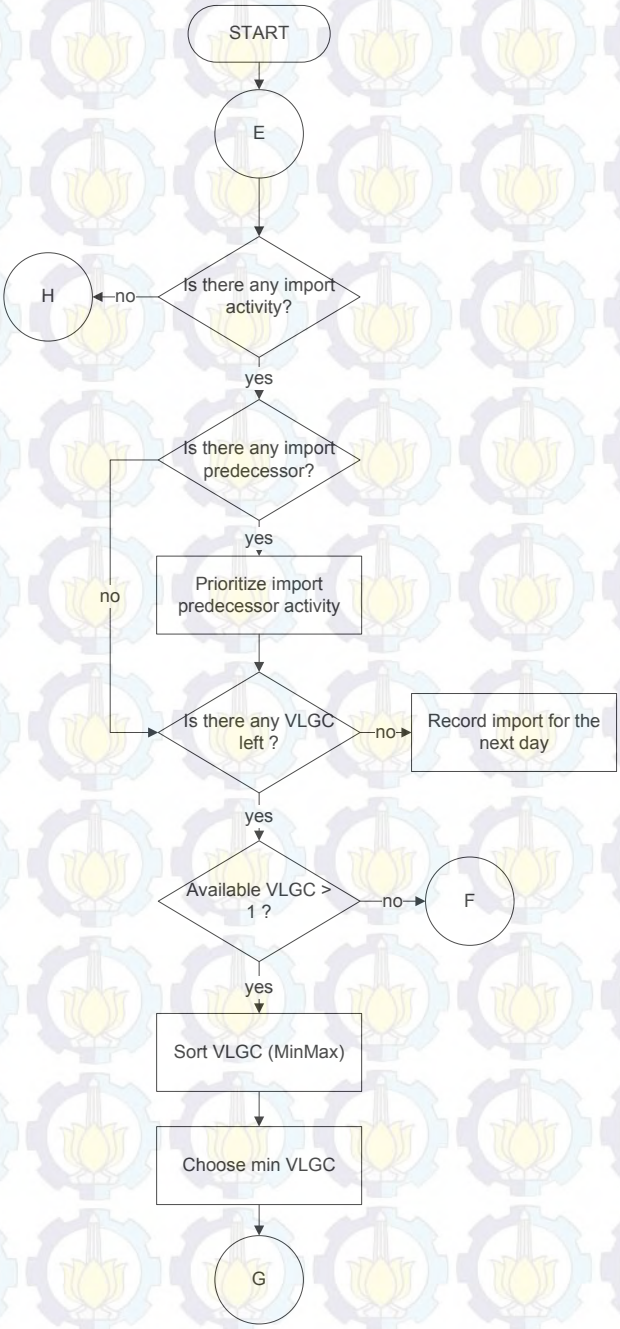

Figure 4. 8 Import Algorithm

If at current date the import cargo is recorded as initial import, the system update the import cargo to the selected VLGC, calculate the VLGC stock, and update VLGC stock. When there is leftover from the initial import, it is held for the following date. On the next day, the system checked whether it is in import duration or exceed the duration. It is done for determining the starting date and calculation of demurrage.

If it is in import duration, the system calculates the same as initial import. The system select the minimum stocked VLGC, update the import leftover to the VLGC stock and if there is leftover it will be handled for the next day. If the date is over the import duration, the system calculates the demurrage cost from the current date until all cargo are loaded to VLGC. The demurrage cost is calculated by multiplying the recorded demurrage time with demurrage rate. The following step is to check if the leftover cargo can be loaded to VLGC. Leftover cargo that can be loaded full to the VLGC will reset the demurrage accumulation to zero for the following import cargo. If from the calculation resulted leftover cargo, then it is recorded until all imports are loaded. Figure 4.9 illustrates the import calculation algorithm.

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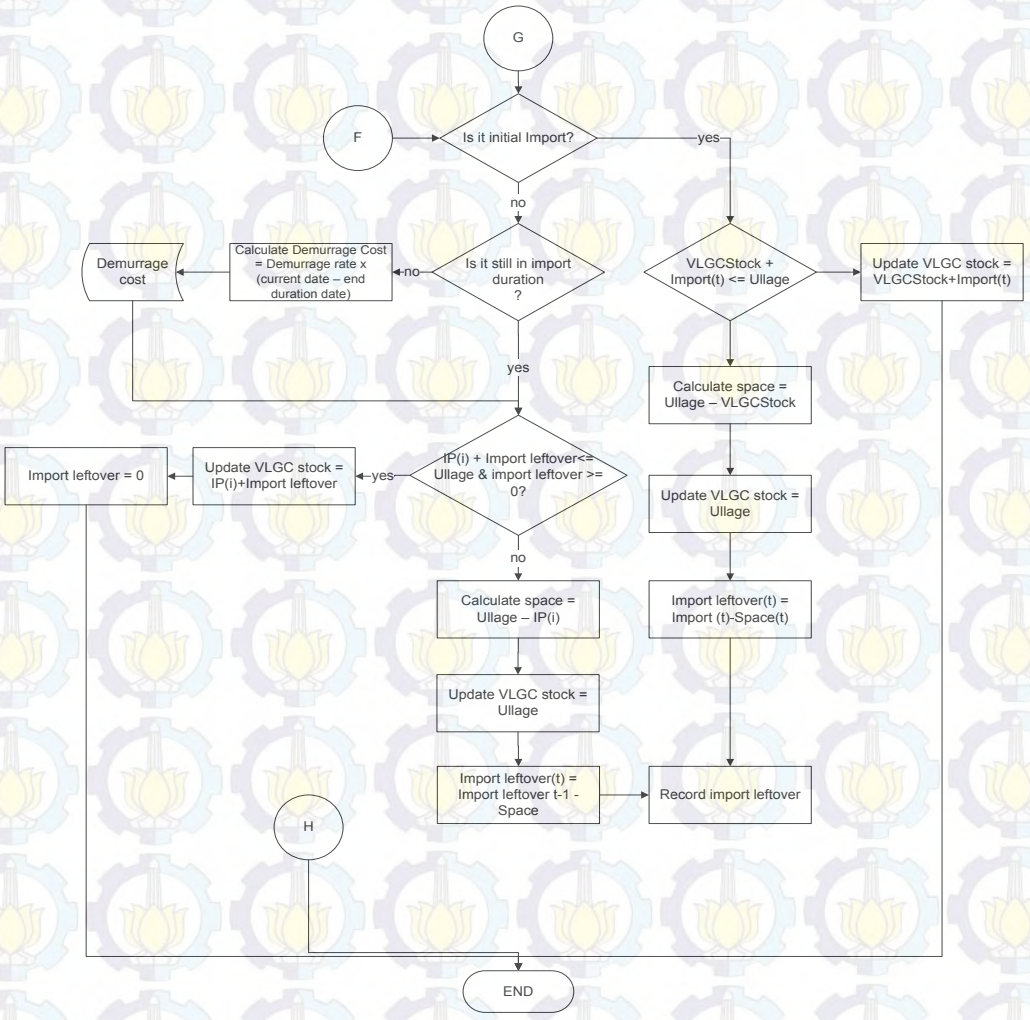


Figure 4. 9 Import Algorithm (cont'd)

4.5 DSS Development

In this stage, algorithms that have been defined at the previous stage are translated into programming language. The application is developed by using Visual Basic for Application (VBA). Besides the schedule development, the application interface and its features are developed as parts of DSS. The DSS consists of three main activities, input, simulation and report. In input, the user input data that are substantial for scheduling. Input data are then processed at simulation. Input schedule are assigned to each VLGC according to the scheduling rules that have been translated into programming language. Once the simulation has been done, the simulation reports are provided in the report.

4.5.1 Interface

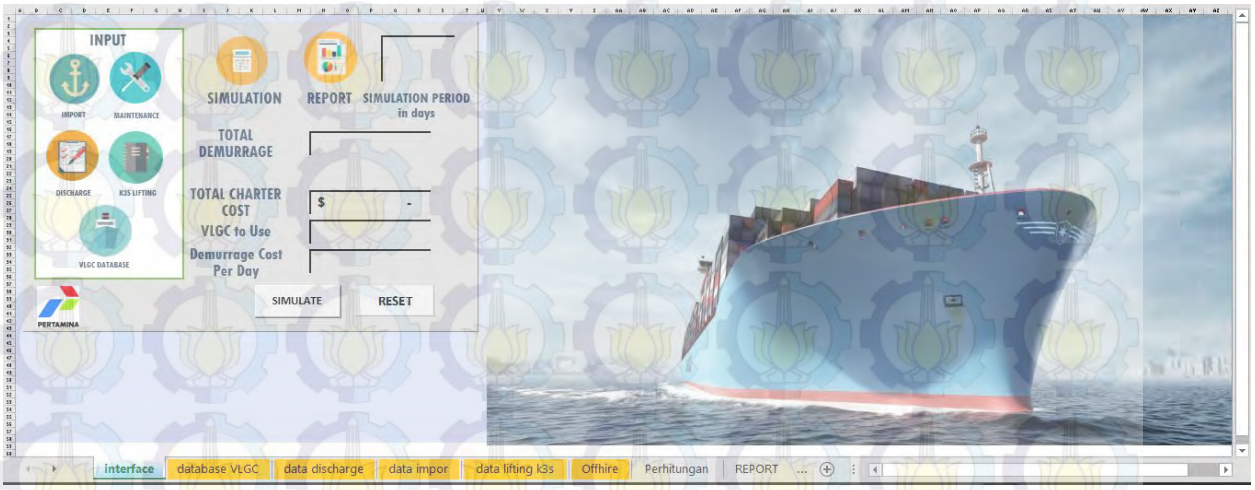


Figure 4. 10 DSS Interface

The DSS interface consists of information regarding the process that happens throughout the simulation. As shown in Figure 4.10, it consists of input section, where all necessary data that needs to be inputted for scheduling process such as import schedule, maintenance schedule, discharge schedule, K3S lifting schedule, and VLGC database. The VLGC to use option is function as an input for the user to decide the number of operated VLGCs during the simulation. Besides that, the user also determined the demurrage cost rate per day. After all input have been determined, the user clicked simulate button to generate the scheduling simulation. The full schedule of each VLGCs are provided in simulation section and the report regarding the VLGC

stock movements and demurrage cost payment dates are provided in report section. To begin another schedule, the user used reset button to reset all input.

4.5.2 Input

Input section consists of four schedules, discharge, import, K3S lifting, and maintenance. The detail explanations of each input data are as follows.

4.5.2.1 VLGC Database Input

This section provides the user with total charter cost that occurred during the simulation. The total charter cost is based on the charter duration (in days) and charter rate that has been inputted. Besides that, the user needs to input information regarding the VLGC initial stock and maximum capacity. Both information are used in the simulation as the first condition for each VLGCs when the simulation begin that are located on each VLGC columns. Figure 4.11 illustrates the VLGC database input

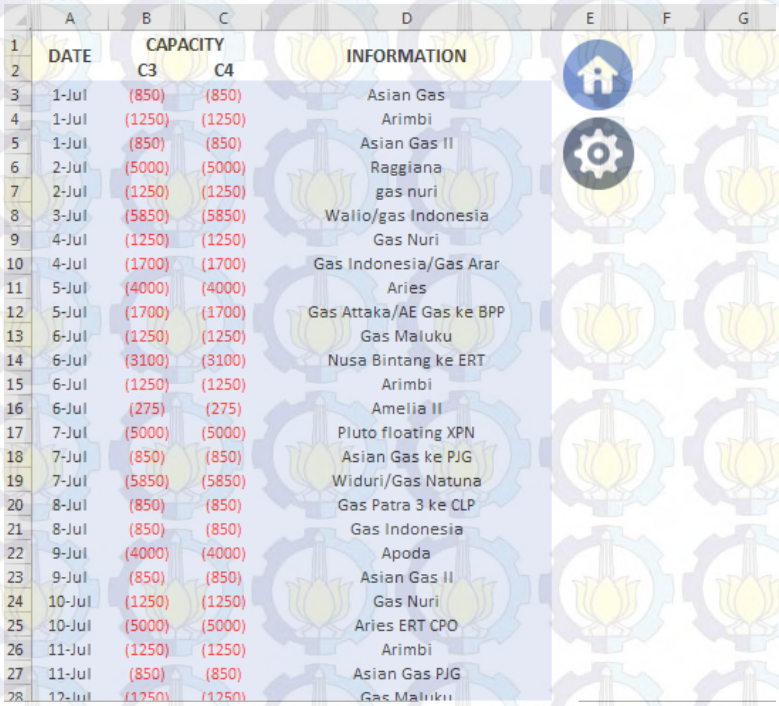
VLGC NAME	CAPACITY		INITIAL STOCK		CHARTER DURATION	CHARTER RATE per day	CHARTER COST
	C3	C4	C3	C4			
NUSA BRIGHT	23600	20800	19736	18360	123	$ 7,500.00	$ 922,500.00
CHALLENGER	22400	22957	6881	6794	123		$ -
CLIPPER	23200	23200	1325	28	123	$ 7,450.00	$ 916,350.00
KOMODO	23500	21200	19291	19067	123		$ -
GP-1	24000	23000	7084	5252	123	$ 9,000.00	$1,107,000.00
GP-2	24000	23000	0	0	123	$ 9,000.00	$1,107,000.00
Perta-A	23000	20500	0	0	123	$ 9,850.00	$1,211,550.00
Perta-B	23000	20500	0	0	123	$ 9,750.00	$1,199,250.00

database VLGC | data discharge | data impor | data lifting k3s | Offhire | Perhitungan | REPORT

Figure 4. 11 VLGC Database Input

4.5.2.2 Discharge Schedule Input

In discharge input section, the user types all discharge activities that happened during the simulation period. The DSS has provide the user with input table, which consists of date of activities, discharge capacity (C_3 and C_4), and information. The information column gives the user information regarding the ship name that lifts cargo from VLGC and also the ship destination. Figure 4.12 illustrates the discharge input section.



	A	B	C	D	E	F	G
1	DATE	CAPACITY		INFORMATION			
2		C3	C4				
3	1-Jul	(850)	(850)	Asian Gas			
4	1-Jul	(1250)	(1250)	Arimbi			
5	1-Jul	(850)	(850)	Asian Gas II			
6	2-Jul	(5000)	(5000)	Raggiana			
7	2-Jul	(1250)	(1250)	gas nuri			
8	3-Jul	(5850)	(5850)	Walio/gas Indonesia			
9	4-Jul	(1250)	(1250)	Gas Nuri			
10	4-Jul	(1700)	(1700)	Gas Indonesia/Gas Arar			
11	5-Jul	(4000)	(4000)	Aries			
12	5-Jul	(1700)	(1700)	Gas Attaka/AE Gas ke BPP			
13	6-Jul	(1250)	(1250)	Gas Maluku			
14	6-Jul	(3100)	(3100)	Nusa Bintang ke ERT			
15	6-Jul	(1250)	(1250)	Arimbi			
16	6-Jul	(275)	(275)	Amelia II			
17	7-Jul	(5000)	(5000)	Pluto floating XPN			
18	7-Jul	(850)	(850)	Asian Gas ke PJG			
19	7-Jul	(5850)	(5850)	Widuri/Gas Natuna			
20	8-Jul	(850)	(850)	Gas Patra 3 ke CLP			
21	8-Jul	(850)	(850)	Gas Indonesia			
22	9-Jul	(4000)	(4000)	Apoda			
23	9-Jul	(850)	(850)	Asian Gas II			
24	10-Jul	(1250)	(1250)	Gas Nuri			
25	10-Jul	(5000)	(5000)	Aries ERT CPO			
26	11-Jul	(1250)	(1250)	Arimbi			
27	11-Jul	(850)	(850)	Asian Gas PJG			
28	12-Jul	(1250)	(1250)	Gas Maluku			

Figure 4. 12 Discharge Schedule Input

In this section, two features are provided for the user. Home button and simulation button are featured in this section to ease the user on moving between sections. Home button is used to move from current section to interface and simulation button to move from current section to simulation section. Once all data have been inputted, the user continued to other input sections.

4.5.2.3 K3S Lifting Schedule Input

The user input data related with K3S by accessing K3S lifting section at the scheduling interface. The appearance of K3S lifting section is illustrated in Figure 4.13. Substantial data such as pick up dates, load capacity, and destinations are inputted by the user. The system automatically determine the Pre-K3S date and departure-arrival date at Teluk Semangka Port. Pre-K3S date determine the starting date of Pre-K3S calculation, which are calculating the designated VLGC for K3S lifting and discharge combinations. Departure date determine the date of designated VLGC to voyage to the K3S lifting destinations and also as the end of Pre-K3S duration. The VLGC arrival date from voyaging to K3S lifting destinations is based on the arrival column of this section. Same as the other input section, the update button is clicked after all data are

inputted. Features such as home button and simulation button are provided for moving between sections.

No	Lifting Date	Amount C3	Amount C4	Location	Pre-K3S	Departure	Arrival
1	20-Jul	2500	6000	uban	14-Jul	17-Jul	27-Jul
	23-Jul	16500	12000	jabung			
2	26-Jul	17000	12000	belanak	20-Jul	23-Jul	2-Aug
	29-Jul		6000	uban			
3	25-Aug	15000	8000	Jabung	19-Aug	22-Aug	1-Sep
	29-Aug		10000	Uban			
4	26-Aug	15000	11000	Belanak	20-Aug	23-Aug	2-Sep
	30-Aug	1000	8000	Uban			
5	13-Sep	12000	9000	Jabung	7-Sep	10-Sep	20-Sep
	16-Sep		6000	Uban			
6	21-Sep	17000	12000	Belanak	15-Sep	18-Sep	28-Sep
	24-Sep		7000	Uban			
7	27-Sep	14300	7000	Jabung	21-Sep	24-Sep	4-Oct
	30-Sep		6000	Uban			
8	12-Oct	17000	9000	Jabung	6-Oct	9-Oct	19-Oct
	14-Oct		7000	Uban			
9	22-Oct	16500	12000	Belanak	16-Oct	19-Oct	29-Oct
	25-Oct		5000	Uban			
10	29-Oct	15700	10000	Jabung	23-Oct	26-Oct	5-Nov
	31-Oct		5000	Uban			

Figure 4. 13 K3S Lifting Schedule Input

4.5.2.4 Import Lifting Schedule Input

Import activity information are recorded in this section. Information such as cargo capacities (C_3 and C_4) and the duration of berth in Teluk Semangka Port are inputted by the user. Same as the previous subchapter, in this section there are features that the user can use, such as home button and simulation button. Figure 4.14 shows the section appearance of import data that have been inputted.

Amount of Cargoes		Duration	
C3	C4	Start	Finish
22523	22026	1-Jul-13	3-Jul-13
23654	22998	10-Jul-13	12-Jul-13
22311	22311	20-Jul-13	22-Jul-13
22150	22150	1-Aug-13	3-Aug-13
22581	22074	5-Aug-13	7-Aug-13
23525	23101	17-Aug-13	19-Aug-13
22000	22000	28-Aug-13	30-Aug-13
22000	22000	7-Sep-13	9-Sep-13
22475	22989	21-Sep-13	23-Sep-13
22389	19847	11-Oct-13	13-Oct-13
22482	21938	19-Oct-13	21-Oct-13

Figure 4. 14 Import Schedule Input

4.5.2.5 Maintenance Schedule Input

This section provides the user to input the maintenance schedule. The user input the maintenance schedule according to the provided template. The VLGC name and duration of maintenance or offhire are define by the user. Figure 4.15 illustrates the maintenance schedule input.

Figure 4. 15 Maintenance Schedule Input

4.5.3 Process

All essentials data that have been inputted from each sections are stored at the left column, named mix supply distribution. Mix supply distribution column is sorted activities based on date. Thus, the column will give information to the user on all activities based on each date. This column is used as the system daily activity checking. The system will calculate the activity assignment to each VLGC depends on the algorithms that have been translated into programming language. The activities are assigned to each VLGC besides the mix supply-distribution column. There are eight VLGC table that consists of schedule date, VLGC current stock, and amount of cargo load or unload from VLGC, and shipment information. On the top of each VLGC table, there are the maximum capacities for C_3 (Propane) and C_4 (Butane). The VLGC stock is updated day to day by adding each date with amount of cargo shipped to or from VLGC. Therefore, the added stock will be the initial stock for the following date. Figure 4.16 displays the scheduling simulation section.

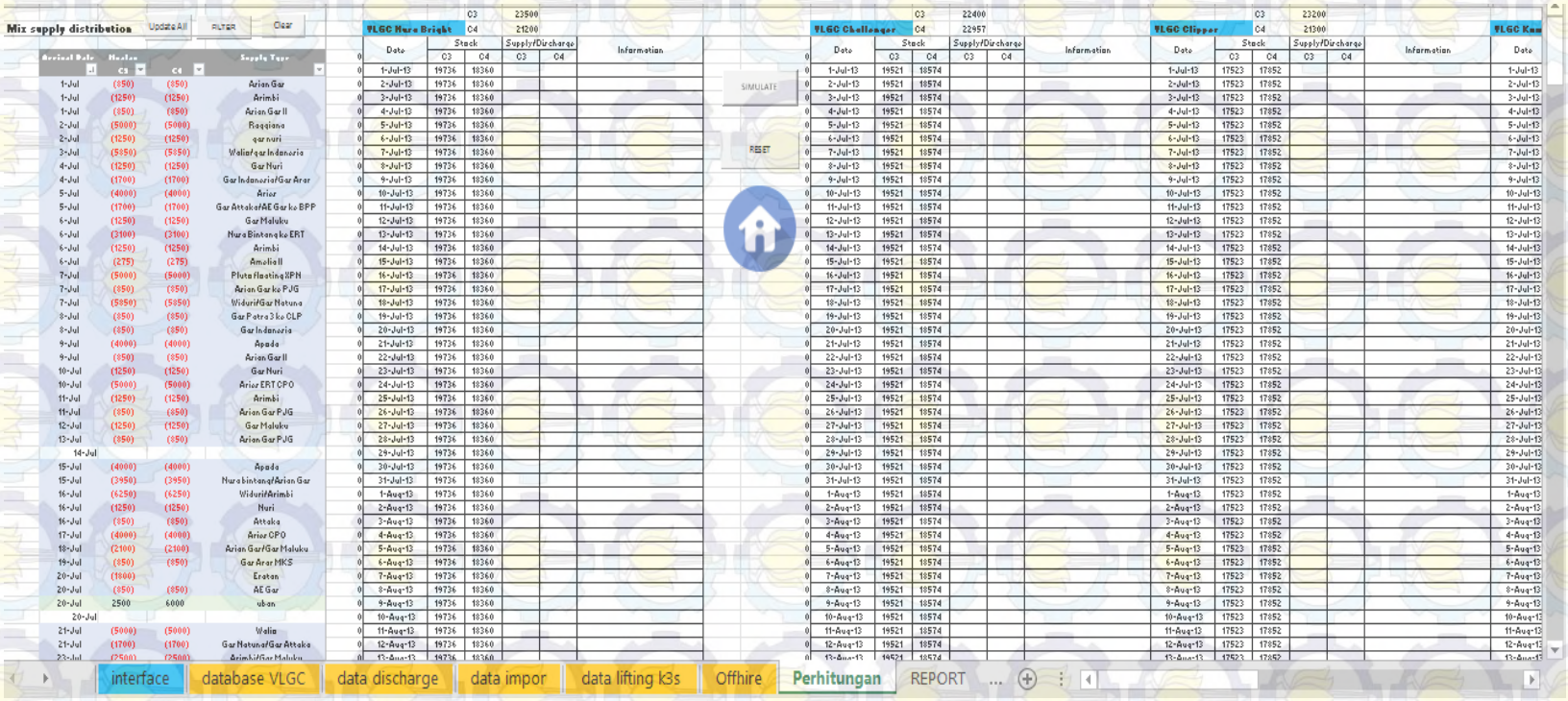


Figure 4. 16 Process Section Appearance

The user simulate the VLGC scheduling by clicking the simulate button. Once the button is clicked, the system processed each data on the mix supply distribution column and assign each activity to each VLGC. The information column informed the user about the current condition of the activity. If there is a demurrage at certain VLGC it is informed at the information column, the given information are demurrage cost total of import shipment and demurrage time. As for K3S activity, the information column provides the user with Pre-K3S date, K3S lifting destinations, and shortage option that is being used.

4.5.4 Output

The results of scheduling simulation are provided at report section, illustrates in Figure 4.17. This section provides the user with several information. The stock movement of each VLGC is shown in graph. It visualized the stock condition on each date of simulation. It ease the user in seeing the current date condition of each VLGC and the following date when the supply-distribution is underway. As for the VLGC utilization chart, it is based on the proportion of each VLGC to handle activities during simulation. From this proportion, it can be a recommendation for the user on deciding the number of VLGCs to be operated. Proportion below 10 % indicates that the VLGC is unnecessary to be charted, therefore the user can chart fewer VLGC with high utilization.

Other information regarding the financial factor such as demurrage cost recapitulation and total charter cost are informed in this section. The demurrage cost recapitulation consists of date of demurrage cost payment including the total cost on each import shipment. Total cost for all demurrage that happened during the simulation is summed up at the total demurrage row.

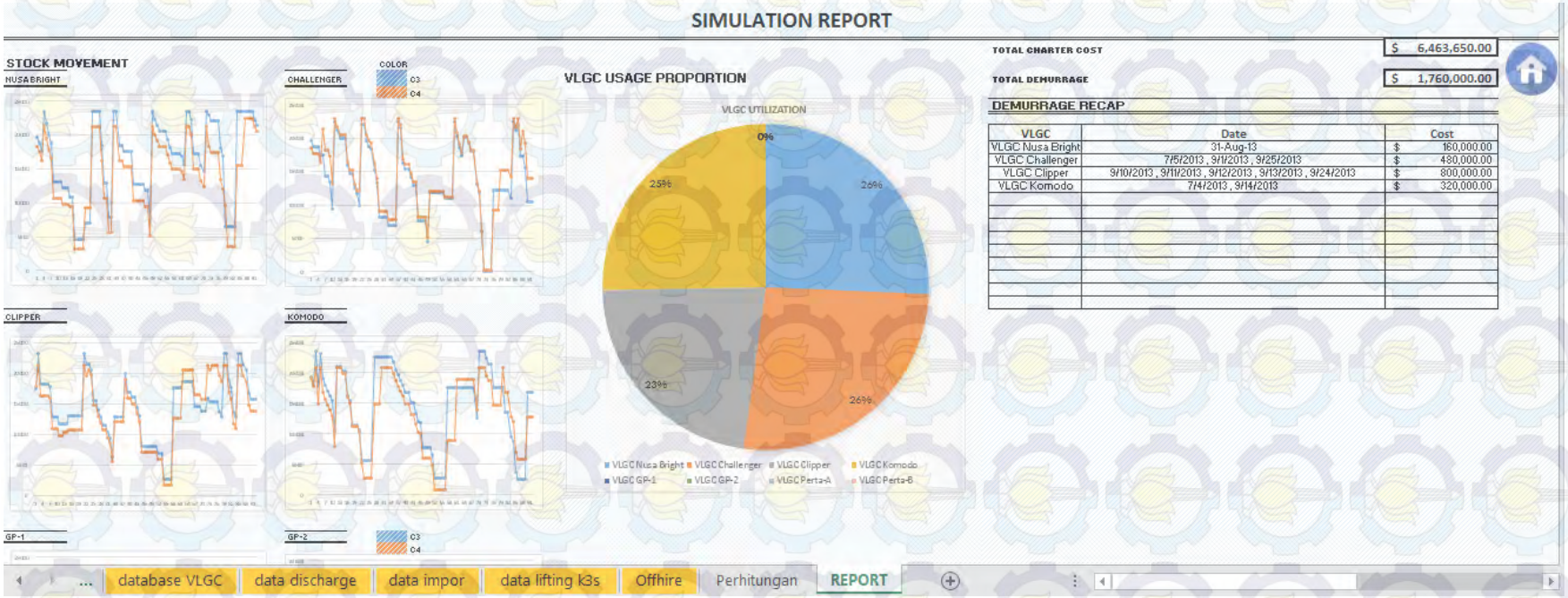


Figure 4. 17 Output Appearance

4.6 DSS Validation

The DSS simulation results are matched with manual calculation according to scheduling algorithm. The validation process in this testing is done manually. If both results have the same values, than the validation process is done. Then the next step is to generate several scenarios with the number of VLGCs as the parameter.

In this validation process, the input for both calculation are activity schedules in July 2014. The comparison factors for both calculations are schedule results and cost factors (demurrage cost and charter cost). The result is shown in Table 4.3 and Table 4.4.

Table 4. 3 Scheduling Result (DSS Application)

Date	VLGC NUSA BRIGHT				VLGC CHALLENGER				VLGC CLIPPER				VLGC KOMODO			
	Stock		Supply/Discharge		Stock		Supply/Discharge		Stock		Supply/Discharge		Stock		Supply/Discharge	
	C3	C4	C3	C4	C3	C4	C3	C4	C3	C4	C3	C4	C3	C4	C3	C4
1-Jul-14	19736	18360			6881	6794			1325	28	21875	21272	19291	19067	1250	1250
2-Jul-14	19736	18360			6881	6794	1682	1848	23200	21300			18041	17817		
3-Jul-14	19736	18360	4000	4000	8563	8642			23200	21300	5000	5000	18041	17817	850	850
4-Jul-14	15736	14360			8563	8642	4000	4000	18200	16300	850	850	17191	16967		
5-Jul-14	15736	14360			4563	4642	4000	4000	17350	15450			17191	16967	5000	5000
6-Jul-14	15736	14360	5000	5000	563	642			17350	15450	5000	5000	12191	11967		
7-Jul-14	10736	9360	12764	11840	563	642			12350	10450	850	850	12191	11967	5000	5000
8-Jul-14	23500	21200	1250	1250	563	642			11500	9600	320	320	7191	6967	9590	11092
9-Jul-14	22250	19950	4000	4000	563	642			11180	9280			16781	18059	850	850
10-Jul-14	18250	15950	11000	11000	563	642	2500	7000	11180	9280			15931	17209	1700	1700
11-Jul-14	7250	4950			3063	7642			11180	9280	1700	1700	14231	15509	4500	4500
12-Jul-14	7250	4950	850	850	3063	7642			9480	7580			9731	11009	1425	1425
13-Jul-14	6400	4100	4000	4000	3063	7642			9480	7580			8306	9584		
14-Jul-14	2400	100			3063	7642	15500	13500	9480	7580	13720	13720	8306	9584		
15-Jul-14	2400	100			18563	21142			23200	21300			8306	9584		
16-Jul-14	2400	100			18563	21142			23200	21300	850	850	8306	9584		
17-Jul-14	2400	100	18500	10500	18563	21142	4837	1815	22350	20450	850	850	8306	9584		
18-Jul-14	20900	10600			23400	22957	5000	5000	21500	19600	1250	1250	8306	9584		
19-Jul-14	20900	10600		10000	18400	17957	850	850	20250	18350	5000	5000	8306	9584		
20-Jul-14	20900	20600			17550	17107	4000	4000	15250	13350	3605	6487	8306	9584		
21-Jul-14	20900	20600			13550	13107	1250	1250	18855	19837	4000	4000	8306	9584		
22-Jul-14	20900	20600			12300	11857	850	850	14855	15837	1250	1250	8306	9584		
23-Jul-14	20900	20600			11450	11007			13605	14587	5000	5000	8306	9584		

Date	VLGC NUSA BRIGHT				VLGC CHALLENGER				VLGC CLIPPER				VLGC KOMODO			
	Stock		Supply/Discharge		Stock		Supply/Discharge		Stock		Supply/Discharge		Stock		Supply/Discharge	
	C3	C4	C3	C4	C3	C4	C3	C4	C3	C4	C3	C4	C3	C4	C3	C4
24-Jul-14	20900	20600	850	850	11450	11007			8605	9587			8306	9584		
25-Jul-14	20050	19750	1250	1250	11450	11007			8605	9587	14595	11713	8306	9584		
26-Jul-14	18800	18500	4000	4000	11450	11007	8460	11345	23200	21300	5000	5000	8306	9584		
27-Jul-14	14800	14500			19910	22352	4000	4000	18200	16300	1600	1600	8306	9584		
28-Jul-14	14800	14500			15910	18352	5000	5000	16600	14700			8306	9584		
29-Jul-14	14800	14500	1250	1250	10910	13352			16600	14700	4000	4000	8306	9584		
30-Jul-14	13550	13250	2500	2500	10910	13352			12600	10700			8306	9584		
31-Jul-14	11050	10750	300	800	10910	13352			12600	10700	300	800	8306	9584		

Table 4. 4 Scheduling Result (Manual Calculation)

Date	VLGC NUSA BRIGHT				VLGC CHALLENGER				VLGC CLIPPER				VLGC KOMODO			
	Stock		Supply/Discharge		Stock		Supply/Discharge		Stock		Supply/Discharge		Stock		Supply/Discharge	
	C3	C4	C3	C4	C3	C4	C3	C4	C3	C4	C3	C4	C3	C4	C3	C4
1-Jul-14	19736	18360			6881	6794			1325	28	21875	21272	19291	19067	1250	1250
2-Jul-14	19736	18360			6881	6794	1682	1848	23200	21300			18041	17817		
3-Jul-14	19736	18360	4000	4000	8563	8642			23200	21300	5000	5000	18041	17817	850	850
4-Jul-14	15736	14360			8563	8642	4000	4000	18200	16300	850	850	17191	16967		
5-Jul-14	15736	14360			4563	4642	4000	4000	17350	15450			17191	16967	5000	5000
6-Jul-14	15736	14360	5000	5000	563	642			17350	15450	5000	5000	12191	11967		
7-Jul-14	10736	9360	12764	11840	563	642			12350	10450	850	850	12191	11967	5000	5000
8-Jul-14	23500	21200	1250	1250	563	642			11500	9600	320	320	7191	6967	9590	11092
9-Jul-14	22250	19950	4000	4000	563	642			11180	9280			16781	18059	850	850
10-Jul-14	18250	15950	11000	11000	563	642	2500	7000	11180	9280			15931	17209	1700	1700
11-Jul-14	7250	4950			3063	7642			11180	9280	1700	1700	14231	15509	4500	4500
12-Jul-14	7250	4950	850	850	3063	7642			9480	7580			9731	11009	1425	1425
13-Jul-14	6400	4100	4000	4000	3063	7642			9480	7580			8306	9584		
14-Jul-14	2400	100			3063	7642	15500	13500	9480	7580	13720	13720	8306	9584		
15-Jul-14	2400	100			18563	21142			23200	21300			8306	9584		
16-Jul-14	2400	100			18563	21142			23200	21300	850	850	8306	9584		
17-Jul-14	2400	100	18500	10500	18563	21142	3837	1815	22350	20450	850	850	8306	9584		
18-Jul-14	20900	10600			22400	22957	5000	5000	21500	19600	1250	1250	8306	9584		
19-Jul-14	20900	10600		10000	17400	17957	850	850	20250	18350	5000	5000	8306	9584		
20-Jul-14	20900	20600			16550	17107	4000	4000	15250	13350	4605	6487	8306	9584		
21-Jul-14	20900	20600			12550	13107	1250	1250	19855	19837	4000	4000	8306	9584		
22-Jul-14	20900	20600			11300	11857	850	850	15855	15837	1250	1250	8306	9584		

Date	VLGC NUSA BRIGHT				VLGC CHALLENGER				VLGC CLIPPER				VLGC KOMODO			
	Stock		Supply/Discharge		Stock		Supply/Discharge		Stock		Supply/Discharge		Stock		Supply/Discharge	
	C3	C4	C3	C4	C3	C4	C3	C4	C3	C4	C3	C4	C3	C4	C3	C4
23-Jul-14	20900	20600			10450	11007			14605	14587	5000	5000	8306	9584		
24-Jul-14	20900	20600	850	850	10450	11007			9605	9587			8306	9584		
25-Jul-14	20050	19750	1250	1250	10450	11007			9605	9587	13595	11713	8306	9584		
26-Jul-14	18800	18500	4000	4000	10450	11007	9460	11345	23200	21300	5000	5000	8306	9584		
27-Jul-14	14800	14500			19910	22352	4000	4000	18200	16300	1600	1600	8306	9584		
28-Jul-14	14800	14500			15910	18352	5000	5000	16600	14700			8306	9584		
29-Jul-14	14800	14500	1250	1250	10910	13352			16600	14700	4000	4000	8306	9584		
30-Jul-14	13550	13250	2500	2500	10910	13352			12600	10700			8306	9584		
31-Jul-14	11050	10750	300	800	10910	13352			12600	10700	300	800	8306	9584		

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CHAPTER V
NUMERICAL EXPERIMENT

In this chapter a numerical experiment regarding the developed DSS is conducted. The experiment is done by generating several scenarios continued by result comparisons. Throughout the experiment, data are taken from July until October. At that duration, all activities are recorded and updated according to the filed reports. Therefore, the time period is chosen.

5.1 1st Trial

In this trial, data are taken from July 2013-October 2013. The data are generated by using DSS application by several conditions, the initial condition (six VLGCs) and scenarios conditions.

5.1.1 Initial Condition

For initial condition, the operated VLGCs are six. In this year, LPG demands are increased and several destination depots are opened. Therefore, the company decided to operate six VLGCs to anticipate any shortage in each depot. Table 5.1 shows the VLGC information data for this condition.

Table 5. 1 Input Data for Initial Condition (1st Trial)

#VLGC	VLGC Name	Ullage		Initial Stock		Charter Cost	
		C3	C4	C3	C4		
6	Nusa Bright	23600	20800	19736	18360	$	7,500.00
	Challenger	22400	22957	19521	18574		
	Clipper	23200	23200	17523	17852	$	7,450.00
	Komodo	23500	21200	19291	19067		
	GP-1	24000	23000	20000	20000	$	9,000.00
	GP-2	24000	23000	13500	13500	$	9,000.00

The demurrage cost in this trial is $ 480,000. It happened three times, two days in July and one day in September. Table 5.2 shows the demurrage recap for this trial. From this table can be concluded that there is a shortage number of VLGC

Table 5. 2 Demurrage Recap (1st Trial-Initial Condition)

VLGC	Date	Cost	
VLGC Clipper	7/4/2013 , 9/24/2013	$	320,000.00
VLGC Komodo	9/10/2013	$	160,000.00

in the first import shipment (1st July 2013-3rd July 2013), eighth import shipment (7th September 2013 – 9th September 2013), and ninth import shipment (21st September 2013- 23rd September 2013). There are two factors that caused demurrage, low available VLGC stocks and high VLGC stock levels. The low available VLGC stock is caused by a number of discharge activities or K3S activities that happened during import duration. Based on the activity prioritization, the discharge activities are prioritized first. Therefore, the available VLGCs are dedicated to handle discharge activities and caused import activity to postpone the loading process. Even if there is an available VLGC that handles the import shipment throughout the import duration, the demurrage can still happened. The VLGC stock that handles the import shipment can caused the demurrage. High VLGC stock or near ullage VLGC stock caused low amount of import cargo loaded to VLGC. Thus, at the end of import duration there is still leftover that needs to be unloaded form import ship. The high VLGC stock is caused by the initial stock of the simulation. The initial stock for each VLGC is based on the last date stock level in the previous month. If the initial are high for all VLGC, then it caused slow import cargo transfer during the import duration. Therefore, the determination of initial stock in simulation is important throughout the simulation.

The resulted charter cost in this trial is $ 6,463,650. This cost is calculated by multiplying the charter cost of each operated VLGC with the scheduling duration. In this simulation, the charter duration is 123 days. It may different one another depends on the simulation length. Based on the information given from VLGC database, there are several VLGC that are not charged by charter cost. This is because Several VLGCs are owned by the company, therefore the charter cost is not charged.

Midsize ship option is not used during this simulation. It shows that when there is an over capacity stock during Pre-K3S activity, there is a sufficient VLGC to receive the transferred stock. Therefore, the number of operated VLGCs in this condition are sufficient enough to perform STS activities when there is an overcapacity stock.

All VLGCs are also checked for its utilization in the simulation. This become one of the parameter to decide the number of operated VLGCs because it determine the amount of budget. Charted VLGCs have to perform as high as it could, so all VLGCs become useful to all activities. As shown in Figure 5.1, all VLGCs have different percentage value. One of the operated VLGCs has the lowest utilization percentage with

the score of 28%. This VLGC indicates that it is not used frequently because other VLGC has already covered the shipment activities. The VLGC become idle during the simulation. By reducing the number of VLGCs there is a possibility of increased utilization for each VLGC. In this condition, the company is likely to choose it compare to the existing. Therefore, it is necessary to generate several scenarios by changing the number of operated VLGCs to find the right number of VLGC by considering not only the financial factors but also VLGC utilization.

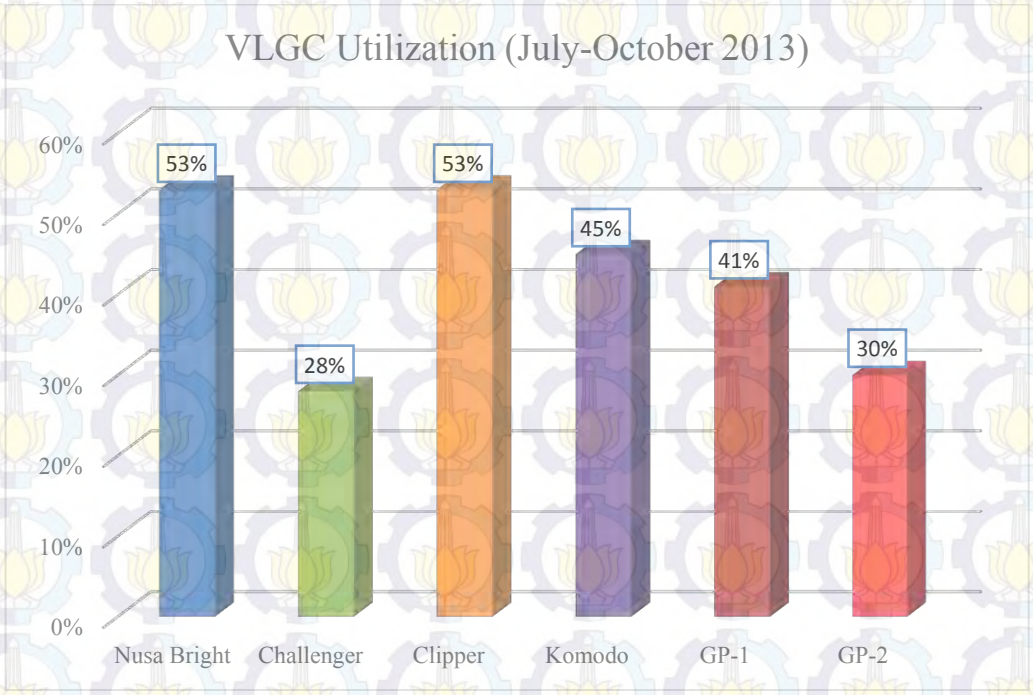

Figure 5. 1 VLGC Utilization Graph (July-October 2013)

5.1.2 Scenario Condition

Several scenarios are generated based on the number of VLGC that can be dENoperated. The scenarios are started from four VLGCs until eight VLGCs. The scenario cannot be generated below four VLGCs due to insufficient number of VLGC that can handle activities. Therefore, there will be unhandled activity during the simulation. The input data for each scenarios are summarized in Table 5.3.

Table 5. 3 Input Data (1st Trial – Scenario Condition)

Scenario	# Operated VLGC	VLGC Name	Ullage		Initial Capacity		Charter Cost per Day
			C3	C4	C3	C4	

1	4	NUSA BRIGHT	23600	20800	19736	18360	$ 7,500.00
		CHALLENGER	22400	22957	19521	18574	
		CLIPPER	23200	23200	17523	17852	$ 7,450.00
		KOMODO	23500	21200	19291	19067	
Scenario	#Operated VLGC	Additional VLGC*	Ullage		Initial Capacity		Charter Cost per Day
			C3	C4	C3	C4	
2	5	GP-1	24000	23000	20000	20000	$ 9,000.00
3	7	GP-2	24000	23000	13500	13500	$ 9,000.00
		Perta-A	23000	20500	0	0	$ 9,850.00
4	8	Perta-B	23000	20500	0	0	$ 9,750.00

Figure 5. 2

*Scenario 1 as base number of operated VLGCs

The first scenario consists of four VLGCs, which are Nusa Bright, Challenger, Clipper, and Komodo. The next scenarios are based on the additional VLGC until all VLGs are operated. The additional VLGC for each scenario is in order because it has been determine upon the contract agreement with the VLGC providers. All input are run through in the DSS application and the results are in Table 5.4.

Table 5. 4 Scenario Result (1st Trial-Scenario Condition)

Parameter	Scenario 1	Scenario 2	Scenario 3	Scenario 4
# VLGC	4	5	7	8
# Midsize Ship	1	1		
Demurrage Cost	$ 1,760,000.00	$ 480,000.00	$ -	$ -
VLGC Charter	$ 1,838,850.00	$ 2,945,850.00	$ 5,264,400.00	$ 6,463,650.00

From all scenarios, the demurrage cost occurred at scenario one and two. Moving to the next scenario, the demurrage cost is equal to zero, which means that demurrage is not happened when the VLGCs are operated. As for charter cost, the numbers are continuously increased when the number of operated VLGCs are increased. For midsize usage, throughout each scenarios the midsize option are used in scenario 1 and scenario 2. This shows that there is an insufficient number of VLGCs during certain time for both scenarios. This is not a preferable option for the company because it takes time to assign the midsize ship form other region. But, if it is necessary needed than it can be done.

5.1.3 Result Comparison

All results that have been generated from DSS application are compared and determined the best condition for this schedule. In determining the right condition, several factors are considered. Demurrage cost, VLGC charter cost, and VLGC utility are considered factors during the simulation. Table 5.5 shows the result summarization for all conditions.

Table 5. 5 DSS Results for Initial Condition and Scenarios (1st Trial)

Parameter	Scenario 1	Scenario 2	Initial	Scenario 3	Scenario 4
# VLGC	4	5	6	7	8
# Midsize Ship	1	1			
Demurrage Cost	$ 1,760,000.00	$ 480,000.00	$ 480,000.00	$ -	$ -
VLGC Charter	$ 1,838,850.00	$ 2,945,850.00	$ 4,052,850.00	$ 5,264,400.00	$ 6,463,650.00
Total Cost	$ 3,598,850.00	$ 3,425,850.00	$ 4,532,850.00	$ 5,264,400.00	$ 6,463,650.00
VLGC Utility					
Nusa Bright	65%	53%	53%	50%	42%
Challenger	67%	53%	28%	33%	40%
Clipper	68%	41%	53%	50%	20%
Komodo	69%	56%	45%	20%	30%
GP-1		41%	41%	22%	22%
GP-2			30%	40%	26%
Perta-A				24%	21%
Perta-B					20%

From the results given in Table 5.5, it is clear that scenario two has the best combination compare to other conditions. The demurrage cost and VLGC charter cost are $ 480,000 and 2,945,850, therefore the total cost is $ 3,425,850. The total cost is the lowest compared to other conditions. But looking at the cost combination, the demurrage cost and VLGC charter cost are not the lowest among all conditions. In considering the lowest penalty, it is suitable to choose scenario three or four because both scenarios resulted no demurrage cost. For this case, the determination of best condition is based the total cost that occurred. So, the cost factors are not as partial but as total.

Looking at more detail on each cost factors, the demurrage cost that occurred throughout the conditions are decreased when the number of VLGC added up. Figure 5.2 illustrates the demurrage cost resulted on each conditions. From four VLGCs to five VLGCs, the demurrage cost is decline for about 72 %. It indicates that during the simulation, the additional VLGCs in scenario 2 are performed to decrease $ 1,280,000 demurrage cost. In other word, the additional VLGC is utilized for the eight days loss of unhandled import. From scenario 2 to the initial condition, the demurrage cost resulted the same value at $ 480,000. This happens because the additional stock VLGC level cannot lift import cargoes in large amount. The lowest stock that commonly near ullage

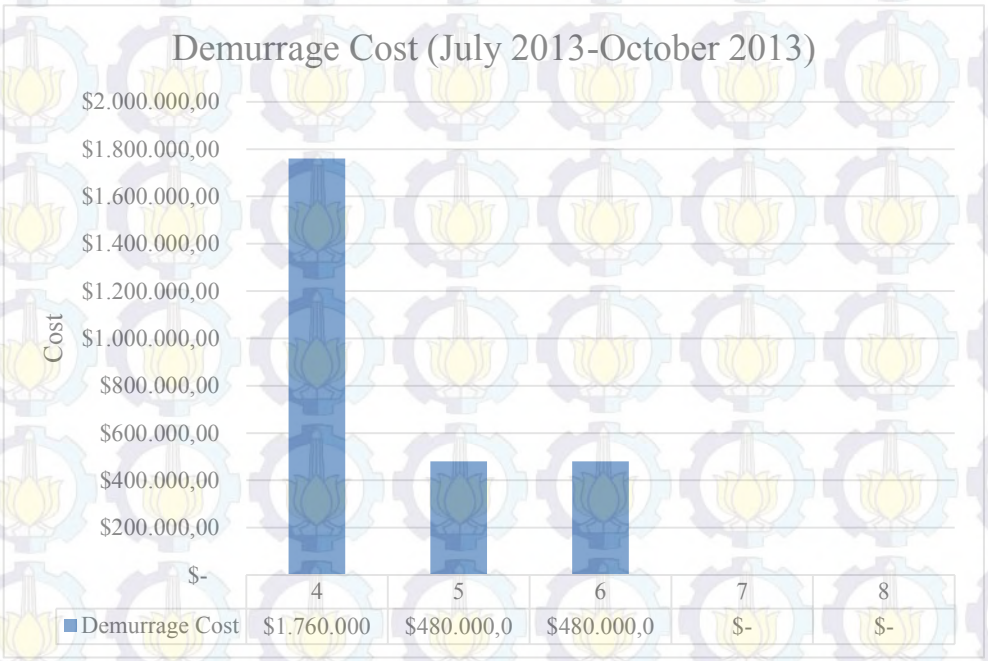

Figure 5. 2 Demurrage Cost Graph (July 2013 – October 2013)

level causing low import cargoes that can be transferred. Until the end of import duration, there is leftover that has to be handled at the following date. Therefore, it indicates that by operating five or six VLGCs resulted the same demurrage cost. The following scenarios of seven VLGCs and eight VLGCs resulted no demurrage cost occurred which means that all import shipments can be handled according to the duration.

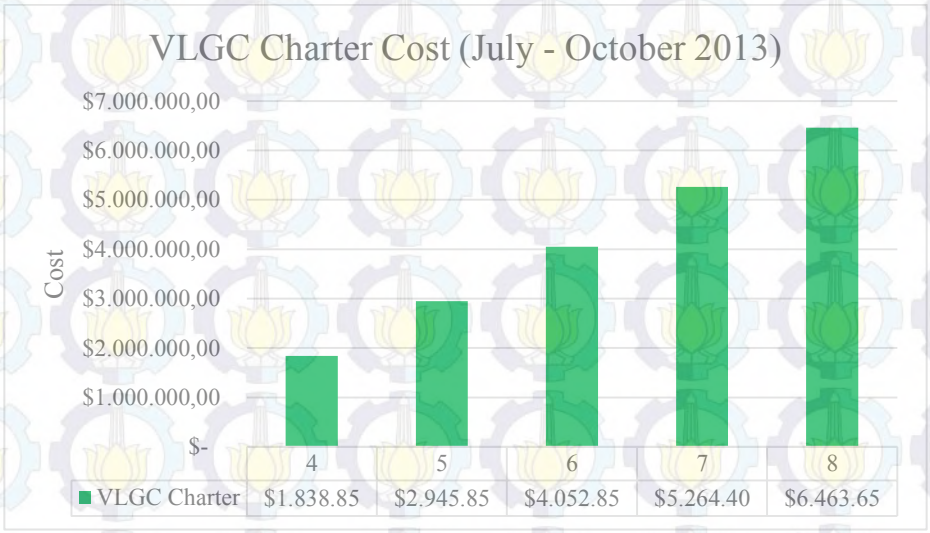

Figure 5. 3 Charter Cost (July-October 2013)

The results of charter cost for each conditions is shown in Figure 5.3. The graph shows a linear increased from initial conditions to scenario four. From the following graph, can be seen that an increased number of operated VLGCs caused an increased in charter cost. Therefore, the ideal number of VLGC to be chosen are four VLGC. It is because the lowest charter cost of $1,838,850 for the whole period. But even so, other cost factor has to be considered in order to choose the best solution. Therefore, both factors need to be seen thoroughly.

The combination between both cost factors are plotted to a graph to conclude the best condition for this schedule. Figure 5.4 illustrates the graph between VLGC charter

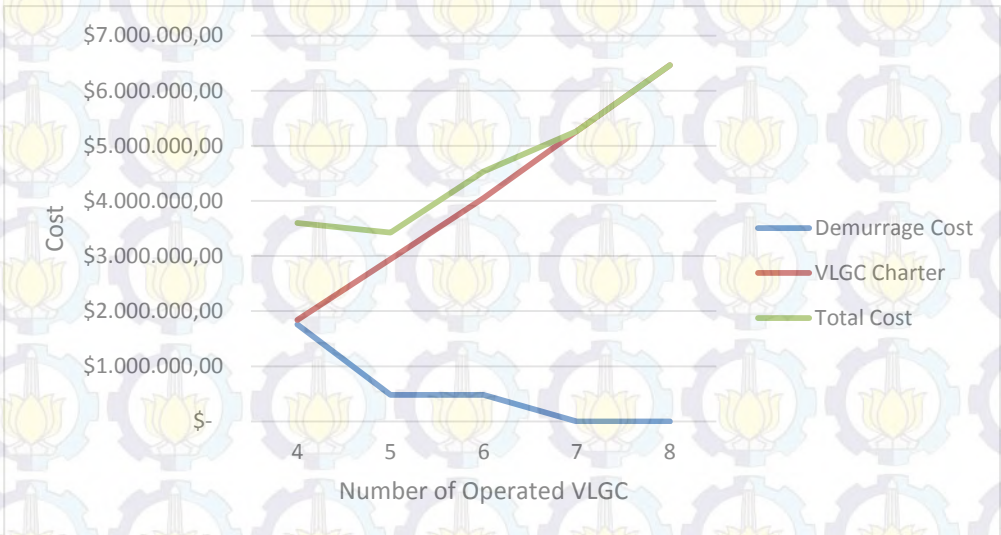

Figure 5. 4 Demurrage Cost and Charter Cost Graph (1st Trial)

cost and demurrage cost. There is no intersection between VLGC charter cost and demurrage cost. As can be seen in the green line that represents the total cost, the line reached the lowest value at five VLGCs and surge continuously until it has the same value as the VLGC charter. The lowest point of total cost is the objective in determining the best scenario. Therefore, the best solution is to chart five VLGCs, because it has the lowest total cost. The value is $ 3,425,850.

The VLGC utilization for each VLGC in scenario 2 shows no VLGC that is dominant from other VLGC. It shows that all VLGCs are utilized and no VLGC is idle longer than the other. Figure 5.5 illustrates the VLGC utilization for scenario 2.

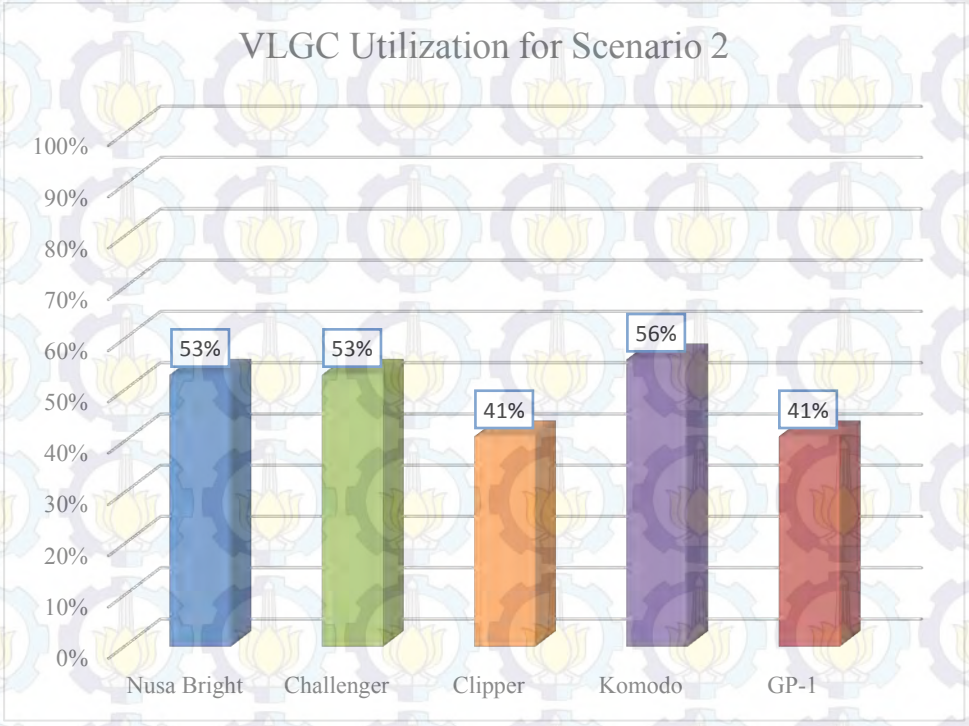

Figure 5. 5 VLGC Utilization for Scenario 2

5.2 2nd Trial

In the second trial, data from July 2014 to October 2014 are calculated by using DSS application. The DSS is generated for several conditions based on the number of operated VLGCs.

5.2.1 Initial Condition

For initial condition, the number of operated VLGCs are different from the first trial. Due to the increased shipments to east region, the initial VLGCs are less than the

previous year which is now four. In this year, the existing operated VLGCs are four. The operated VLGCs, VLGC information (ullage, initial stocks, and charter cost), and input data are the same with Master Plan 2014 data. Table 5.6 shows the input data for second trial. As shown in the following table, some VLGCs have no charter cost occurred, it is because those VLGCs are owned by the company.

Table 5. 6 Input Data for Initial Condition (2nd Trial)

#VLGC	VLGC Name	Ullage		Initial Stock		Charter Cost per day
		C3	C4	C3	C4	
4	Nusa Bright	23600	20800	19736	18360	$ 7,500.00
	Challenger	22400	22957	6881	6794	
	Clipper	23200	23200	1325	28	$ 7,450.00
	Komodo	23500	21200	19291	19067	

The results based on existing condition input are total demurrage of $ 3,040,000 ($ 160,000 x 19 days of demurrage) and total charter cost of $ 1,838,850 (123 days of simulation x ($ 7,500 + $ 7,450)). During the Pre-K3S duration, midsize option is chosen because of stock overcapacity. It is happened at 20th August 2014 in VLGC Challenger. This indicates that there is still not enough discharge activities to prepare VLGC for lifting K3S on the following dates. Therefore, the company have to chart a midsize ship to handles the excess stocks and transferred it to other region. According to the off hire schedule that have been inputted, there are schedule for offhire or maintenance between 13th September 2014 until 30th October 2014 for Komodo and 13th September 2014 until 13th October 2014 for Nusa Bright. Therefore, the ship utility are lower between other VLGC. Results in Figure 5.6 show that both VLGCs have lower proportion compare to other VLGCs. This indicates that offhire or maintenance schedule effects the VLGC performance to handle shipment activities.

Looking at the utilization of al VLGCs, the scores are the maximum that can be reached throughout the trial. The number of operated VLGCs cannot be decreased because the number of activities at certain date are higher than the VLGCs. The utilization of each VLGC become important to determine if there is necessary to decrease the number of operated VLGCs. It will determine the budget allocation for VLGC charter. The preferred condition is to have high utilization percentage of each VLGC. It indicates that all VLGCs are frequently used during the simulation.

Therefore, to achieve high utilization for each VLGC the company has to chart four VLGC.

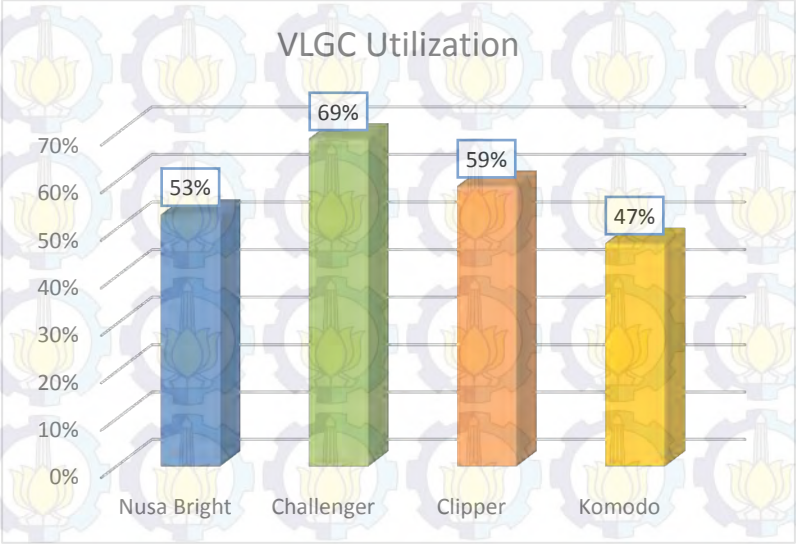

Figure 5. 6 VLGC Utilization (2nd Trial-Initial Condition)

5.2.2 Scenario Condition

In this step, the number of VLGCs are changed until the maximum number of VLGCs that the company can operate. The scenarios for less operated VLGCs are not generated because the activities for a day are more than number of operated VLGCs, therefore simulation cannot be operated. The goal of generating scenarios is to find the ideal number of VLGCs to be used by considering several factors (VLGC utility, demurrage cost, and charter cost). Table 5.7 shows the input data for each scenarios.

Table 5. 7 Scenario Data Input (2nd Trial)

Scenario	# Operated VLGC	# VLGC Added*	VLGC Name	Ullage		Initial Stock		Charter Cost per day
				C3	C4	C3	C4	
1	5	1	GP-1	24000	23000	7084	5252	$ 9,000.00
2	6	2	GP-1	24000	23000	7084	5252	$ 9,000.00
			GP-2	24000	23000	0	0	$ 9,000.00
3	7	3	GP-1	24000	23000	7084	5252	$ 9,000.00
			GP-2	24000	23000	0	0	$ 9,000.00
			Petra-A	24000	23000	0	0	$ 9,850.00
4	8	4	GP-1	24000	23000	7084	5252	$ 9,000.00
			GP-2	24000	23000	0	0	$ 9,000.00
			Petra-A	24000	23000	0	0	$ 9,850.00
			Petra-B	24000	23000	0	0	$ 9,750.00

* Existing condition as base amount of VLGCs

The number of scenarios are generated based on the additional operated VLGC. As can be seen in Table 5.8, only GP-1 has the initial stock. It is because GP-1 is used for the previous schedule, therefore it has leftover cargoes. The additional VLGCs for each scenarios are in sequence, it is because the contract of each VLGCs provider when the company needed an additional VLGC has been determined first. As for the charter cost may vary, but for GP-1 and GP-2 have the same cost because both VLGCs come from the same provider. Each scenarios are generated by using DSS application and the results are as follows.

Table 5. 8 Scenario Results (2nd Trial)

Parameter	Scenario1	Scenario 2	Scenario 3	Scenario 4
# VLGC	5	6	7	8
# Midsize Ship				
Demurrage Cost	$ 960,000.00	$ -	$ -	$ -
VLGC Charter	$ 2,945,850.00	$ 4,052,850.00	$ 5,264,400.00	$ 6,463,650.00

Throughout each scenarios, demurrage cost only occurs in the first scenario when five VLGCs are operated. After added VLGC one by one, there is no demurrage cost occurred. It can be concluded that a big difference happened when the number of operated VLGC is increased, the demurrage cost is decreased and at certain number of VLGC the demurrage cost will not occurred. At this point the company can chart additional VLGC until there is no demurrage cost for budget efficiency, but there is a VLGC charter cost that the company faced when adding additional VLGC.

As for charter cost, it increased gradually throughout each scenarios. It started around 2.9 million dollar until 6.4 million dollar when it reached the maximum number of VLGC or around 20% cost increase when the numbers added up. An additional VLGC may increase charter cost but it also decrease the demurrage cost at one point. Therefore, there is a tradeoff for both costs when VLGCs are added.

5.2.3 Result Comparison

Results from initial condition and scenarios are compared and determine the best number of operated VLGCs. In determining the suitable number of fleet, there are several factors considered. Demurrage cost, VLGC charter cost, midsize usage, and VLGC utility are factors for deciding the number of operated VLGCs. The objective is

to choose the right combination which consist of lowest total cost and high VLGC usage proportion. The value of each factors are taken from the calculation that has been done by DSS application. Table 5.9 shows the results for each conditions.

Table 5. 9 DSS Results for Initial Condition and Scenarios (2nd Trial)

Parameter	Existing	Scenario1	Scenario 2	Scenario 3	Scenario 4
# VLGC	4	5	6	7	8
# Midsize Ship	1				
Demurrage Cost	$ 3,040,000.00	$ 960,000.00	-	$ -	$ -
VLGC Charter	$ 1,838,850.00	$ 2,945,850.00	$ 4,052,850.00	$ 5,264,400.00	$ 6,463,650.00
Total Cost	$ 4,878,850.00	$ 3,905,850.00	$ 4,052,850.00	$ 5,264,400.00	$ 6,463,650.00
VLGC Utillity					
Nusa Bright	53%	30%	35%	28%	38%
Challenger	69%	60%	36%	31%	26%
Clipper	59%	50%	43%	26%	32%
Komodo	47%	36%	24%	34%	24%
GP-1		45%	28%	31%	14%
GP-2			47%	38%	33%
Perta-A				24%	24%
Perta-B					21%

From the results given in Table 5.9, it is clear that scenario one has the best combination compare to other conditions. It resulted $ 960,000 for demurrage cost and $ 2,945,850, therefore the total cost is $ 3,905,850. The total cost resulted in scenario one is the lowest among all conditions. Eventhough on each cost aspects scenario one is not the lowest, the total cost is the main consideration in this research.

For existing condition, it resulted the lowest VLGC charter cost which is 1,838,850. It is not chosen as the best solution because of high demurrage cost at $ 3,040,000. Not only initial condition has the lowest VLGC charter cost, but also the highest demurrage cost. The high demurrage cost indicates that there is only one or two VLGC that are available to handle import shipment. It can be caused by K3S lifting activities that have close date one another. And also, the VLGC offhire or maintenance schedule that when it is scheduled for maintenance, a VLGC is not available for certain time. It caused fewer available VLGCs to handle activities. When there is only one or two VLGC available and there are discharge activities for the following days, then the discharge activities have to be prioritized first because the distribution flow cannot be

stopped. Therefore, import activities have to wait until there is no discharge activities or an additional VLGC that arrived from lifting K3S cargoes and maintenance facility.

By adding the number of operated VLGCs, then the problems that caused fewer VLGCs can be minimized. There are an additional VLGCs that can handle the activities when there is a maintenance schedule for certain VLGC or lifting K3S. As shown in Figure 5.7, a drastic cost decreased happens from four VLGCs to five VLGCs. A demurrage cost efficiency from $ 3,040,000 to $ 960,000 which is one quarter amount of demurrage cost resulted from initial condition. It shows that an additional VLGC is necessary for this schedule. The available VLGC shortages are

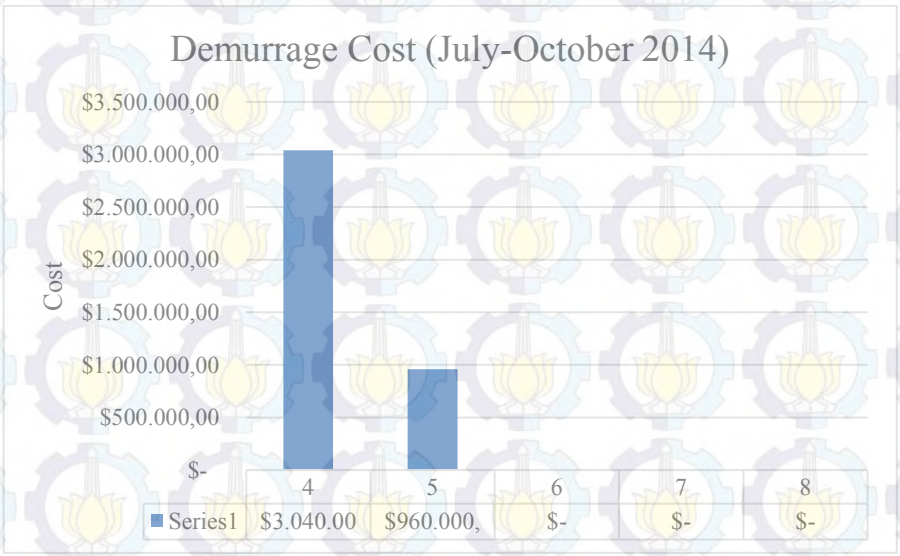

Figure 5. 7 Demurrage Cost Graph from July-October2014 (2nd Trial)

frequently happened throughout the schedule therefore by adding one VLGC it can handle either the import shipment or discharge. After five VLGC operated, an additional VLGC is added one by one until maximum number of VLGC that can be used which are eight VLGCs. From six VLGCs to eight VLGCs, there is no demurrage cost happened. It explains that by operating six or more VLGCs is enough to handle all activities. By looking at the demurrage cost transition from five VLGC to six VLGC, it cuts the demurrage cost for $ 960,000 or no demurrage cost occurred. Comparing the cost decreased from previous transition which is $ 2,080,000, it shows an insignificant cost efficiency. This shows that during the simulation, the number of handled import shipments are not as many as the previous number of VLGCs. It is supposed to be suitable to choose scenario two until scenario four compare to scenario one. But, other

cost factor which related with additional VLGC is need to be considered. Therefore, it can be concluded the best condition for this schedule.

The charter cost for each condition is shown in Figure 5.8. The graph shows the same trend as the previous year, this is due to the same charter cost for each condition.

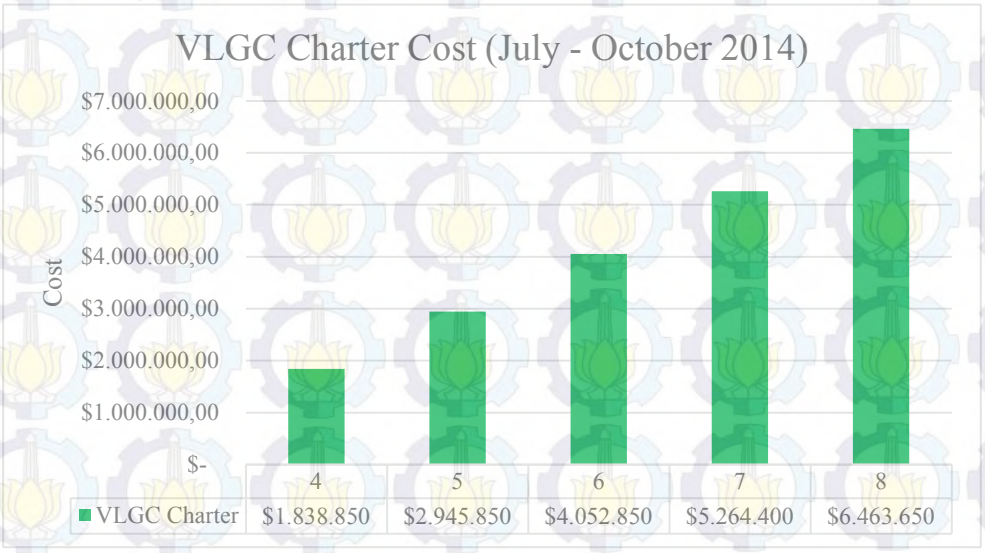

Figure 5. 8 VLGC Charter Cost from July-October 2014 (2nd Trial)

The similarity results are happened because the VLGCs that are used for each condition are same in both years. Therefore, the same results occurred for both years.

The combination between demurrage cost and charter cost are plotted in a graph to see the intersection between both costs. The intersection between both costs show the best condition. As mention earlier, in this case the combination can be reflected as the total cost that occurred for each conditions. Figure 5.9 illustrates the graph between demurrage cost and charter cost.

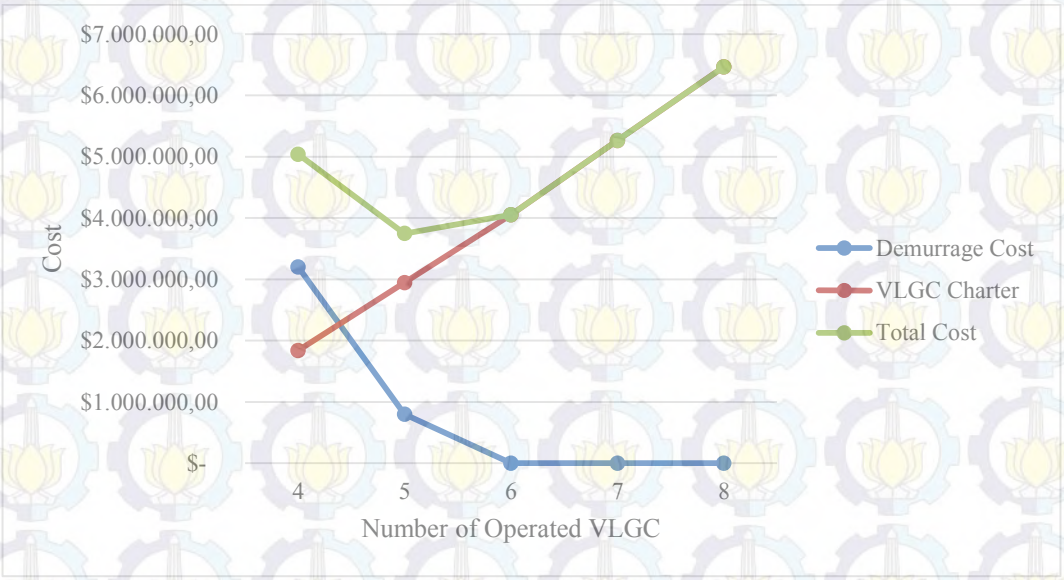

Figure 5. 9 Demurrage Cost and Charter Cost Graph (2nd Trial)

Both costs are intersect between operated VLGCs four and five. The intersection have two interpretation, whether to choose less VLGCs which means operated four, or more VLGCs by five. Therefore, to decide the number of operated VLGCs both cost factors in initial condition and scenario one are seen as the total cost, as illustrated in green line at Figure 5.9. The total cost shows the lowest value at scenario one, which is $ 3,905,850.00. Therefore, scenario one is chosen for this schedule.

The VLGC utilization for scenario one are more varied compare to the initial condition. The percentage range from 30% to 60%. This showed an idle VLGCs throughout the simulation and it is likely to be not chosen compare to the initial condition. VLGC Nusa Bright and VLGC Komodo have the lowest percentage compare to other VLGCs. These are caused by maintenance or offhire schedule that happened for both VLGCs. An additional VLGC, GP-1, covered up the loss activities that can be done by both VLGCs. Even if there are two VLGC that are idle longer than other VLGCs, it still resulted the lowest total stock. Figure 5.10 shows the VLGC utilization for scenario 1.

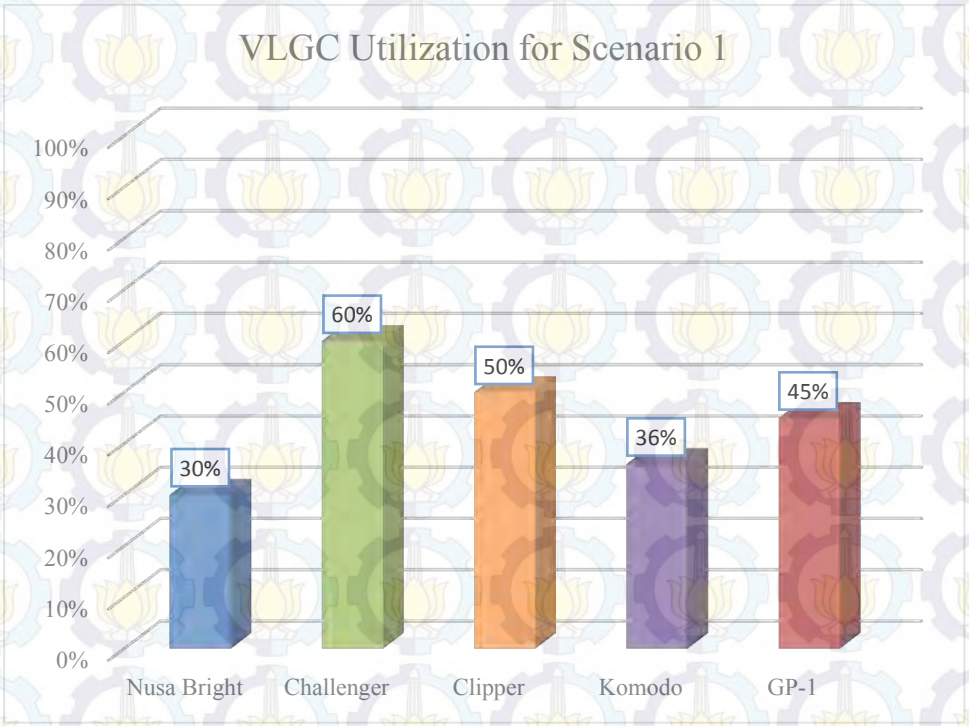

Figure 5. 10 VLGC Utilization for Scenario 1 (2nd Trial)

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CHAPTER VI
CONCLUSION AND RECOMMENDATION

This chapter includes the conclusion obtained from analysis and interpretation. It also provides recommendations for further researches.

6.1 Conclusion

After conducting this research, several conclusions to present are:

1. Decision Support System is developed according to the user requirements. The input section consists of import schedule, discharge schedule, maintenance schedule, and K3S lifting schedule. From this data, the schedules for each VLGC are generated and shown in simulation button. Simulation results such as demurrage cost, charter cost, VLGC utility, and stock movement are provided in report button for further analysis.
2. The best cost combination from both numerical experiment are shown when charted five VLGCs. It is happened because the total cost is the lowest among all conditions. For both cost factors, demurrage cost plays the crucial part because it is based on the number of available VLGCs and how much the import shipment can be loaded to VLGC in a day. As for charter cost, it follows the number of VLGCs that are operated.

6.2 Recommendation

1. For the company, the possible number of operated VLGCs are five VLGCs. Therefore, the company can chart one additional VLGC for scheduling this year LPG supply and distribution.
2. For further research, other regions VLGC schedule can be included so the result is broader and can cover all aspects of supply and distribution.

APPENDIX

Supply and Distribution Data (July 2013 – October 2013)

- Discharge (July 2013 – October 2013)

DATE	CAPACITY		INFORMATION
	C3	C4	
1-Jul	(850)	(850)	Asian Gas
1-Jul	(1250)	(1250)	Arimbi
1-Jul	(850)	(850)	Asian Gas II
2-Jul	(5000)	(5000)	Raggiana
2-Jul	(1250)	(1250)	gas nuri
3-Jul	(5850)	(5850)	Walio/gas Indonesia
4-Jul	(1250)	(1250)	Gas Nuri
4-Jul	(1700)	(1700)	Gas Indonesia/Gas Arar
5-Jul	(4000)	(4000)	Aries
5-Jul	(1700)	(1700)	Gas Attaka/AE Gas ke BPP
6-Jul	(1250)	(1250)	Gas Maluku
6-Jul	(3100)	(3100)	Nusa Bintang ke ERT
6-Jul	(1250)	(1250)	Arimbi
6-Jul	(275)	(275)	Amelia II
7-Jul	(5000)	(5000)	Pluto floating XPN
7-Jul	(850)	(850)	Asian Gas ke PJG
7-Jul	(5850)	(5850)	Widuri/Gas Natuna
8-Jul	(850)	(850)	Gas Patra 3 ke CLP
8-Jul	(850)	(850)	Gas Indonesia
9-Jul	(4000)	(4000)	Apoda
9-Jul	(850)	(850)	Asian Gas II
10-Jul	(1250)	(1250)	Gas Nuri
10-Jul	(5000)	(5000)	Aries ERT CPO
11-Jul	(1250)	(1250)	Arimbi
11-Jul	(850)	(850)	Asian Gas PJG
12-Jul	(1250)	(1250)	Gas Maluku
13-Jul	(850)	(850)	Asian Gas PJG
15-Jul	(4000)	(4000)	Apoda
15-Jul	(3950)	(3950)	Nusa bintang/Asian Gas
16-Jul	(6250)	(6250)	Widuri/Arimbi
16-Jul	(1250)	(1250)	Nuri
16-Jul	(850)	(850)	Attaka
17-Jul	(4000)	(4000)	Aries CPO

18-Jul	(2100)	(2100)	Asian Gas/Gas Maluku
19-Jul	(850)	(850)	Gas Arar MKS
20-Jul	(1800)		Eratan
20-Jul	(850)	(850)	AE Gas
21-Jul	(5000)	(5000)	Walio
21-Jul	(1700)	(1700)	Gas Natuna/Gas Attaka
23-Jul	(2500)	(2500)	Arimbi/Gas Maluku
23-Jul	(850)	(850)	Gas Indo BPP
24-Jul	(850)	(850)	Asian Gas
24-Jul	(5000)	(5000)	Widuri
25-Jul	(350)	(350)	Amelia
26-Jul	(3100)	(3100)	Nusa Bintang
26-Jul	(1700)	(1700)	AE Gas/Gas Arar
27-Jul	(5000)	(5000)	Aries
27-Jul	(2100)	(2100)	Gas Nuri/Asian Gas
27-Jul	(1100)	(1100)	Gas 9/ Gas Indo
28-Jul	(5000)	(5000)	Apoda
28-Jul	(1250)	(1250)	Gas Maluku
28-Jul	(5600)	(5600)	Gas Attaka/Walio
30-Jul	(1250)	(1250)	Arimbi
30-Jul	(5000)	(5000)	Raggiana
31-Jul	(850)	(850)	Asian Gas
1-Aug	(1250)	(1250)	Gas Nuri
1-Aug	(3100)	(3100)	Nusa Bintang
3-Aug	(5000)	(5000)	Aries
3-Aug	(850)	(850)	Asian Gas
4-Aug	(1250)	(1250)	Arimbi
5-Aug	(850)	(850)	Gas Patra III
5-Aug	(850)	(850)	Gas Indonesia
6-Aug	(850)	(850)	Asian Gas ke PJG
6-Aug	(850)	(850)	AE Gas
7-Aug	(3100)	(3100)	Nusa Bintang
7-Aug	(5250)	(5250)	Raggiana/Gas Nuri
7-Aug	(850)	(850)	Gas Natuna
8-Aug	(1250)	(1250)	Arimbi
8-Aug	(850)	(850)	Asian Gas II
9-Aug	(850)	(850)	Asian Gas ke CLP
9-Aug	(5000)	(5000)	Widuri
10-Aug	(1250)	(1250)	Gas Maluku
10-Aug	(1700)	(1700)	Attaka/Gas Indo
11-Aug	(1250)	(1250)	Arimbi
11-Aug	(1700)	(1700)	Gas Patra III/AE Gas

12-Aug	(1250)	(1250)	Gas Nuri
12-Aug	(1700)	(1700)	Asian Gas II/Gas Patra 3
13-Aug	(1250)	(1250)	Gas Maluku
13-Aug	(5000)	(5000)	Apoda
13-Aug	(5320)	(5320)	Gas Nine/walio
14-Aug	(850)	(850)	Asian Gas ke CLP
14-Aug	(275)	(275)	amelia II
15-Aug	(4000)	(4000)	Raggiana
16-Aug	(4500)	(4500)	Eratan
17-Aug	(3100)	(3100)	Nusa Bintang
18-Aug	(1250)	(1250)	Gas Maluku
19-Aug	(850)	(850)	Asian Gas
19-Aug	(1125)	(1125)	Amelia II/Gas Patra 3
20-Aug	(1250)	(1250)	Arimbi
20-Aug	(4000)	(4000)	Raggiana
20-Aug	(850)	(850)	Gas Ararr
22-Aug	(4250)	(4250)	Eratan
23-Aug	(1200)	(1200)	Amelia I/Gas Indonesia
24-Aug	(1250)	(1250)	Gas Maluku
24-Aug	(850)	(850)	Asian Gas ii ke BPP
25-Aug	(850)	(850)	Gas Patra III
29-Aug	(2100)	(2100)	Asian Gas/Gas Nuri
29-Aug	(275)	(275)	Amelia II
30-Aug	(1250)	(1250)	Gas Maluku
30-Aug	(1700)	(1700)	Ae Gas/Gas Attaka
31-Aug	(1250)	(1250)	Arimbi
2-Sep	(1250)	(1250)	Gas Nuri
3-Sep	(5000)	(5000)	Pluto
3-Sep	(850)	(850)	Asian Gas
4-Sep	(4000)	(4000)	Eretan
4-Sep	(1250)	(1250)	Arimbi
6-Sep	(5000)	(5000)	Apoda
6-Sep	(5000)	(5000)	Walio
6-Sep	(1700)	(1700)	Asian Gas II/Attaka
7-Sep	(1250)	(1250)	Gas Maluku
7-Sep	(850)	(850)	Asian Gas
7-Sep	(850)	(850)	Ae Gas
8-Sep	(5850)	(5850)	Widuri/Gas Indonesia
9-Sep	(500)	(3000)	Clipper
9-Sep	(5850)	(5850)	AE Gas/Widuri
10-Sep	(850)	(850)	Asian Gas
10-Sep	(1250)	(1250)	Arimbi

10-Sep	(670)	(670)	Gas Nine/Amelia
11-Sep	(850)	(850)	Gas Natuna
13-Sep	(4000)	(4000)	Eratan
14-Sep	(4000)	(4000)	apoda
14-Sep	(1700)	(1700)	Asian Gas II/Gas Indonesia
15-Sep	(1250)	(1250)	Arimbi
15-Sep	(850)	(850)	Attaka
18-Sep	(4320)	(4320)	Pluto
18-Sep	(4000)	(4000)	Nusa Bintang
19-Sep	(1150)	(1150)	Elpindo/Gas Arar
20-Sep	(4000)	(4000)	Apoda
20-Sep	(4000)	(4000)	Eratan
20-Sep	(1200)	(1200)	Amelia I/Gas Patra III
21-Sep	(850)	(850)	Asian Gas
21-Sep	(850)	(850)	Gas Melawi
22-Sep	(5000)	(5000)	Aries
22-Sep	(1200)	(1200)	Asian Gas II/Gas Nine
23-Sep	(1125)	(1125)	Gas Natuna/Amelia II
24-Sep	(4550)	(4550)	Global
24-Sep	(1700)	(1700)	Gas Indonesia/Gas Attaka
25-Sep	(850)	(850)	Asian Gas
26-Sep	(4000)	(4000)	Nusa Bintang
26-Sep	(1700)	(1700)	Gas Arar/AE Gas
27-Sep	(5250)	(5250)	Arimbi/Eratan
27-Sep	(850)	(850)	Gas Patra III
28-Sep	(1200)	(1200)	Amelia I/Gas Natuna
29-Sep	(850)	(850)	Asian Gas
30-Sep	(850)	(850)	Gas Melawi
30-Sep	(275)	(275)	Amelia II
1-Oct	(2000)	(2000)	Nusa Bintang
1-Oct	(1250)	(1250)	Arimbi
1-Oct	(850)	(850)	Attaka
3-Oct	(1200)	(1200)	Gas Maluku
3-Oct	(2000)	(2000)	Global
3-Oct	(2000)	(2000)	Eratan
4-Oct	(850)	(850)	Apoda
4-Oct	(850)	(850)	Asian Gas
4-Oct	(850)	(850)	AE Gas
5-Oct	(350)	(350)	Amelia I
6-Oct	(850)	(850)	Asian Gas
6-Oct	(4000)	(4000)	Nusa Bintang
6-Oct	(850)	(850)	Asian Gas II

7-Oct	(850)	(850)	Gas Melawi
7-Oct	(2500)	(2500)	Walio
8-Oct	(1250)	(1250)	Arimbi
9-Oct	(4500)	(4500)	Eratan
10-Oct	(3000)	(3000)	Global
11-Oct	(2500)	(2500)	Apoda
12-Oct	(1200)	(1200)	Gas Maluku
12-Oct	(850)	(850)	Gas Indo/Amelia I
13-Oct	(1500)	(1500)	Raggiana
13-Oct	(1700)	(1700)	AE Gas/Gas Arar
14-Oct	(1250)	(1250)	Arimbi
14-Oct	(850)	(850)	Gas Melawi ke BAL
14-Oct	(275)	(275)	Amelia II (Asian Gas II ke HESS)
15-Oct	(4025)	(4000)	Aries
15-Oct	(5000)	(5000)	Walio
16-Oct	(3000)	(3000)	Eratan ke TSE
17-Oct	(1000)	(1500)	Gas Maluku
17-Oct	(610)	(610)	Amelia/Gas Nine
19-Oct	(1250)	(1250)	Arimbi
20-Oct	(5000)	(5000)	Reggiana
21-Oct	(5000)	(5000)	Nusa Bintang
21-Oct	(850)	(850)	Gas Arar
23-Oct	(1250)	(1250)	Gas Maluku
23-Oct	(5000)	(5000)	Walio
24-Oct	(4000)	(4000)	Apoda
24-Oct	(850)	(850)	Asian gas II
25-Oct	(1700)	(1700)	Asian Gas/Gas Melawi
25-Oct	(1250)	(1250)	Arimbi
26-Oct	(5000)	(5000)	Raggiana, ERT/CPO
26-Oct	(4000)	(4000)	Nusa Bintang
27-Oct	(1250)	(1250)	Arimbi
28-Oct	(4000)	(4000)	Global Ke JKT
30-Oct	(5858)	(5858)	walio/asian gas

- Import Discharge (July 2013 – October 2013)

Amount of Cargoes		Duration	
C3	C4	Start	Finish
22523	22026	1-Jul-13	3-Jul-13
23654	22998	10-Jul-13	12-Jul-13
22311	22311	20-Jul-13	22-Jul-13
22150	22150	1-Aug-13	3-Aug-13
22581	22074	5-Aug-13	7-Aug-13
23525	23101	17-Aug-13	19-Aug-13
22000	22000	28-Aug-13	30-Aug-13
22000	22000	7-Sep-13	9-Sep-13
22475	22989	21-Sep-13	23-Sep-13
22389	19847	11-Oct-13	13-Oct-13
22482	21938	19-Oct-13	21-Oct-13

- Lifting K3S Discharge (July 2013 – October 2013)

No	Lifting Date	Amount		Location	Pre-K3S	Departure	Arrival
		C3	C4				
1	20-Jul	2500	6000	uban	14-Jul	17-Jul	27-Jul
	23-Jul	16500	12000	jabung			
2	26-Jul	17000	12000	belanak	20-Jul	23-Jul	2-Aug
	29-Jul		6000	uban			
3	25-Aug	15000	8000	Jabung	19-Aug	22-Aug	1-Sep
	29-Aug		10000	Uban			
4	26-Aug	15000	11000	Belanak	20-Aug	23-Aug	2-Sep
	30-Aug	1000	8000	Uban			
5	13-Sep	12000	9000	Jabung	7-Sep	10-Sep	20-Sep
	16-Sep		6000	Uban			
6	21-Sep	17000	12000	Belanak	15-Sep	18-Sep	28-Sep
	24-Sep		7000	Uban			
7	27-Sep	14300	7000	Jabung	21-Sep	24-Sep	4-Oct
	30-Sep		6000	Uban			
8	12-Oct	17000	9000	Jabung	6-Oct	9-Oct	19-Oct
	14-Oct		7000	Uban			
9	22-Oct	16500	12000	Belanak	16-Oct	19-Oct	29-Oct
	25-Oct		5000	Uban			
10	29-Oct	15700	10000	Jabung	23-Oct	26-Oct	5-Nov
	31-Oct		5000	Uban			

Supply and Distribution Data (July 2014 – October 2014)

- Discharge (July 2014 – October 2014)

DATE	CAPACITY		INFORMATION
	C3	C4	
1-Jul	(1250)	(1250)	Arimbi CLP
3-Jul	(4000)	(4000)	Raggiana ERT8
3-Jul	(5000)	(5000)	Apoda PJG3JKT7
3-Jul	(850)	(850)	asian Gas STS BNJ
4-Jul	(4000)	(4000)	Nusa Bintang SEK8
4-Jul	(850)	(850)	gas arar
5-Jul	(4000)	(4000)	Eratan JKT8
5-Jul	(5000)	(5000)	aries MEM10
6-Jul	(5000)	(5000)	Walio ERT5SBY5
6-Jul	(5000)	(5000)	global SBY10
7-Jul	(5000)	(5000)	widuri CPO 10
7-Jul	(850)	(850)	AE Gas TTM
8-Jul	(1250)	(1250)	Arimbi
8-Jul	(320)	(320)	Gas Nine
9-Jul	(4000)	(4000)	nusa bintang SEK8
9-Jul	(850)	(850)	GP II TTM/Elpindo
10-Jul	(11000)	(11000)	PG II
10-Jul	(1700)	(1700)	gas arar BPP/gas patra III STS Anggrek
11-Jul	(4500)	(4500)	Gas Artemis/Raggiana ERT10
11-Jul	(1700)	(1700)	Gas indo MKS/Asian Gas II BAL
12-Jul	(850)	(850)	Asian gas I PJG
12-Jul	(1425)	(1425)	AE Gas TTM/Amelia II/Elpindo II KENDARI
13-Jul	(4000)	(4000)	Eratan JKT 8
16-Jul	(850)	(850)	Asian gas I pjg
17-Jul	(850)	(850)	Asian Gas II BAL dilaihkan ke PJG
18-Jul	(5000)	(5000)	Raggiana ERT 4 CPO 6
18-Jul	(1250)	(1250)	artemis CLP
19-Jul	(5000)	(5000)	Widuri CPO7 ERT3
19-Jul	(850)	(850)	Asian gas I PJG
20-Jul	(4000)	(4000)	eratan JKT
21-Jul	(1250)	(1250)	Arimbi CLP
21-Jul	(4000)	(4000)	nusa bintang SEK
22-Jul	(850)	(850)	Asian gas II CLP
22-Jul	(1250)	(1250)	gas artemis CLP
23-Jul	(5000)	(5000)	Aries ERT2CPO8
24-Jul	(850)	(850)	Asian gas I PJG

25-Jul	(1250)	(1250)	arimbi CLP
26-Jul	(4000)	(4000)	Eretan JKT
26-Jul	(5000)	(5000)	widuri CPO10
27-Jul	(4000)	(4000)	nusa bintang SEK
27-Jul	(1600)	(1600)	asian gas I PJG/tarakan TTM
28-Jul	(5000)	(5000)	Raggiana ERT10
29-Jul	(4000)	(4000)	Apoda JKT
29-Jul	(1250)	(1250)	artemis CLP
30-Jul	(2500)	(2500)	aries SBY
1-Aug	(1250)	(1250)	arimbi CLP
2-Aug	(4000)	(4000)	Eratan JKT
3-Aug	(4000)	(4000)	Nusa Bintang SEK
3-Aug	(850)	(850)	Asian gas I PJG
4-Aug	(1250)	(1250)	gas artemis CLP
6-Aug	(5000)	(5000)	widuri CPO
6-Aug	(1250)	(1250)	Arimbi
7-Aug	(5000)	(5000)	Raggiana ERT
7-Aug	(850)	(850)	asian gas PJG
9-Aug	(4000)	(4000)	eratan JKT
11-Aug	(1250)	(1250)	Gas Artemis CLP
12-Aug	(4000)	(4000)	Nusa Bintang SEK
13-Aug	(1250)	(1250)	Arimbi CLP
15-Aug	(5000)	(5000)	raggiana ERT
15-Aug	(1250)	(1250)	arimbi CLP
16-Aug	(3600)	(3600)	nusa bintang SEK
16-Aug	(750)	(750)	tarakan PJG
17-Aug	(1250)	(1250)	gas artemis
18-Aug	(4000)	(4000)	Eratan CPO4JKT4
21-Aug	(4000)	(4000)	apoda JKT
21-Aug	(6250)	(6250)	arimbi CLP/Walio CPO
22-Aug	(750)	(750)	tarakan PJG
23-Aug	(1250)	(1250)	gas artemis
24-Aug	(750)	(750)	tarakan PJG
24-Aug	(4000)	(4000)	nusa Bintang SEK
25-Aug	(4000)	(4000)	Eratan JKT8
26-Aug	(2000)	(2000)	arimbi CLP/tarakan PJG
27-Aug	(4000)	(4000)	Apoda jkt
28-Aug	(5000)	(5000)	walio ERT5CPO5
28-Aug	(4000)	(3000)	Nusa Bintang SEK
29-Aug	(1250)	(1250)	Gas tarakan PJG/gas artemis
30-Aug	(750)	(750)	tarakan TTM
1-Sep	(1250)	(1250)	arimbi CLP

2-Sep	(5000)	(5000)	Apoda PJG2,5 JKT7,5
3-Sep	(4000)	(4000)	nusa bintang SEK
3-Sep	(4500)	(4500)	raggiana ERT 9
4-Sep	(3500)	(3500)	Eratan SEK
4-Sep	(1250)	(1250)	Gas artemis CLP
5-Sep	(5000)	(5000)	walio CPO
7-Sep	(1250)	(1250)	arimbi CLP
8-Sep	(4000)	(4000)	nusa bintang SEK
9-Sep	(5000)	(5000)	widuri ERT5CPO5
9-Sep	(4000)	(4000)	eratan JKT
10-Sep	(1250)	(1250)	artemis CLP
11-Sep	(850)	(850)	gas patra PJG
11-Sep	(4000)	(4000)	apoda JKT
12-Sep	(5000)	(5000)	walio CPO
13-Sep	(850)	(850)	gas patra I PJG
14-Sep	(4000)	(4000)	eratan JKT
15-Sep	(1250)	(1250)	Arimbi CLP
16-Sep	(5000)	(5000)	widuri CPO
17-Sep	(4500)	(4500)	apoda JKT
17-Sep	(4000)	(4000)	nusa bintang SEK
18-Sep	(850)	(850)	gas patra I BAL
18-Sep	(2100)	(2100)	gas artemis CLP/asian gas PJG
19-Sep	(4000)	(4000)	eratan JKT
19-Sep	(3500)	(3500)	Walio CPO7
21-Sep	(850)	(850)	asian gas PJG
21-Sep	(4000)	(4000)	nusa bintang SEK
22-Sep	(1250)	(1250)	arimbiCLP
23-Sep	(1250)	(1250)	artemis CLP
23-Sep	(850)	(850)	asian gas PJG
25-Sep	(4500)	(4500)	Apoda JKT 9
26-Sep	(3000)	(3000)	nusa bintang SEK
27-Sep	(3500)	(3500)	asian gas PJG
28-Sep	(1250)	(1250)	arimbi CLP
28-Sep	(4000)	(4000)	Eratan JKT
29-Sep	(5000)	(5000)	Widuri jkt10
30-Sep	(6250)	(6250)	artemis CLP/apoda ERT10
2-Oct	(4000)	(4000)	Nusa Bintang SEK
5-Oct	(6250)	(6250)	arimbl CLP/Walio CPO10
6-Oct	(2100)	(2100)	asian gas PJG/gas artemis CLP
7-Oct	(5000)	(5000)	apoda ERT10
8-Oct	(4000)	(4000)	Eratan JKT
8-Oct	(850)	(850)	Asian Gas PJG

9-Oct	(5000)	(5000)	Widuri JKT 10
9-Oct	(2000)	(2000)	Nusa bintang SEK
10-Oct	(1250)	(1250)	Arimbi CLP
10-Oct	(850)	(850)	Asian gas PJG
12-Oct	(2000)	(2000)	Nusa bintang SEK
12-Oct	(1250)	(1250)	Artemis CLP
13-Oct	(4000)	(4000)	Eretan JKT8
14-Oct	(5000)	(5000)	walio ERT5CPO5
16-Oct	(2000)	(2000)	Nusa Bintang SEK
17-Oct	(4000)	(4000)	raggiana JKT8
17-Oct	(1250)	(1250)	Arimbi CLP
17-Oct	(5000)	(5000)	widuri JKT
18-Oct	(4000)	(4000)	apoda ERT8
20-Oct	(4000)	(4000)	raggiana JKT8
20-Oct	(7000)	(7000)	nusa bintang SEK/walio CPO10
22-Oct	(1250)	(1250)	Arimbi CLP
23-Oct	(2000)	(2000)	nusa bintang SEK
24-Oct	(850)	(850)	asian gas PJG
25-Oct	(9000)	(9000)	widuri JKT/apoda JKT8
25-Oct	(2000)	(2000)	nusa bintang SEK
26-Oct	(1250)	(1250)	ambalat CLP
26-Oct	(4000)	(4000)	raggiana ERT
27-Oct	(1250)	(1250)	arimbi CLP
28-Oct	(4000)	(4000)	walio JKT
29-Oct	(4000)	(4000)	nusa bintang SEK
31-Oct	(1250)	(1250)	ambalat CLP
31-Oct	(5000)	(5000)	widuri JKT

- Import Discharge (July 2014 – October 2014)

Amount of Cargoes		Duration	
C3	C4	Start	Finish
23557	23120	01-Jul-14	02-Jul-14
22354	22932	07-Jul-14	09-Jul-14
22162	22022	14-Jul-14	16-Jul-14
23055	23058	25-Jul-14	27-Jul-14
22600	22200	03-Aug-14	05-Aug-14
22252	21998	15-Aug-14	17-Aug-14
22266	22246	24-Aug-14	26-Aug-14
22621	22043	09-Sep-14	11-Sep-14
22435	22431	13-Sep-14	15-Sep-14
22472	21451	25-Sep-14	27-Sep-14
22055	23597	01-Oct-14	03-Oct-14
22525	22029	11-Oct-14	13-Oct-14
23391	23500	18-Oct-14	20-Oct-14

- Lifting K3S Discharge (July 2014 – October 2014)

No	Lifting Date	Amount		Location	Pre-K3S	Departure	Arrival
		C3	C4				
1	10-Jul	2500	7000	uban	4-Jul	7-Jul	17-Jul
	14-Jul	15500	13500	Belanak			
2	17-Jul	18500	10500	Jabung	11-Jul	14-Jul	24-Jul
	19-Jul		10000	Uban			
3	6-Aug	18000	11500	Jabung	31-Jul	3-Aug	13-Aug
	9-Aug		5000	Uban			
4	14-Aug		4000	uban	8-Aug	11-Aug	21-Aug
	18-Aug	17000	11000	Belanak			
5	25-Aug	18000	10500	Jabung	19-Aug	22-Aug	1-Sep
	27-Aug		5000	Uban			
6	11-Sep		9000	Uban	5-Sep	8-Sep	18-Sep
	14-Sep	17000	10000	Jabung			
7	1-Oct		6000	uban	25-Sep	28-Sep	8-Oct
	4-Oct	17500	13500	belanak			
8	3-Oct	18000	12000	Jabung	27-Sep	30-Sep	10-Oct
	5-Oct		4500	uban			
9	24-Oct	15500	10000	belanak	18-Oct	21-Oct	31-Oct
	27-Oct		7000	uban			

- Offhire/Maintenance Discharge (July 2014 – October 2014)

VLGC Name	Offhire Periode	
	Start Date	End Date
VLGC Komodo	7/13/2014	8/30/2014
VLGC Nusa Bright	9/13/2014	10/13/2014

SIMULATION RESULT (2013)

VLGC Nusa Bright C3 23500 C4 21200

VLGC Challenger C3 22400 C4 22957

Date	Stock		Supply/Discharge		Information	Stock		Supply/Discharge		Information
	C3	C4	C3	C4		C3	C4	C3	C4	
1-Jul-13	19736	18360	850	850	Asian Gas II	19521	18574			
2-Jul-13	18886	17510	4614	3690		19521	18574	1250	1250	gas nuri
3-Jul-13	23500	21200	5850	5850	Walio/gas Indonesia	18271	17324			
4-Jul-13	17650	15350	5850	5850	DEMURRAGE DAY-1	18271	17324			
5-Jul-13	23500	21200	4000	4000	Aries	18271	17324			
6-Jul-13	19500	17200	1250	1250	Arimbi	18271	17324			
7-Jul-13	18250	15950				18271	17324	5000	5000	Pluto floating XPN
8-Jul-13	18250	15950	850	850	Gas Indonesia	13271	12324			
9-Jul-13	17400	15100				13271	12324			
10-Jul-13	17400	15100	5000	5000	Aries ERT CPO	13271	12324			
11-Jul-13	12400	10100	11100	11100		13271	12324			
12-Jul-13	23500	21200	1250	1250	Gas Maluku	13271	12324			
13-Jul-13	22250	19950	850	850	Asian Gas PJG	13271	12324			
14-Jul-13	21400	19100				13271	12324			PreK3S
15-Jul-13	21400	19100				13271	12324	4000	4000	PreK3S
16-Jul-13	21400	19100	1250	1250	Nuri	9271	8324	6250	6250	PreK3S
17-Jul-13	20150	17850	4000	4000	Aries CPO	3021	2074			Lifting K3S
18-Jul-13	16150	13850				3021	2074			Lifting K3S
19-Jul-13	16150	13850	850	850	Gas Arar MKS	3021	2074			Lifting K3S
20-Jul-13	15300	13000				3021	2074	2500	6000	Lifting K3S-UBAN
21-Jul-13	15300	13000				5521	8074			Lifting K3S
22-Jul-13	15300	13000	4131	7851		5521	8074			Lifting K3S
23-Jul-13	19431	20851				5521	8074	16500	12000	Lifting K3S-JABUNG

24-Jul-13	19431	20851	5000	5000	Widuri	22021	20074			Lifting K3S
25-Jul-13	14431	15851				22021	20074			Lifting K3S
26-Jul-13	14431	15851				22021	20074			Lifting K3S
27-Jul-13	14431	15851				22021	20074	5000	5000	Aries
28-Jul-13	14431	15851	5000	5000	Apoda	17021	15074	5600	5600	Gas Attaka/Walio
29-Jul-13	9431	10851				11421	9474			
30-Jul-13	9431	10851				11421	9474			
31-Jul-13	9431	10851				11421	9474			
1-Aug-13	9431	10851				11421	9474	1250	1250	Gas Nuri
2-Aug-13	9431	10851				10171	8224			
3-Aug-13	9431	10851				10171	8224			
4-Aug-13	9431	10851				10171	8224			
5-Aug-13	9431	10851				10171	8224	12229	14733	
6-Aug-13	9431	10851	10352	7341		22400	22957	850	850	Asian Gas ke PJG
7-Aug-13	19783	18192	3100	3100	Nusa Bintang	21550	22107	5250	5250	Raggiana/Gas Nuri
8-Aug-13	16683	15092				16300	16857			
9-Aug-13	16683	15092				16300	16857			
10-Aug-13	16683	15092				16300	16857	1250	1250	Gas Maluku
11-Aug-13	16683	15092	1250	1250	Arimbi	15050	15607			
12-Aug-13	15433	13842				15050	15607	1700	1700	Asian Gas II/Gas Patra 3
13-Aug-13	15433	13842	5320	5320	Gas Nine/walio	13350	13907			
14-Aug-13	10113	8522				13350	13907	850	850	Asian Gas ke CLP
15-Aug-13	10113	8522				12500	13057	4000	4000	Raggiana
16-Aug-13	10113	8522				8500	9057			
17-Aug-13	10113	8522				8500	9057			
18-Aug-13	10113	8522				8500	9057	9375	8951	
19-Aug-13	10113	8522				17875	18008			
20-Aug-13	10113	8522	1250	1250	PreK3S	17875	18008			
21-Aug-13	8863	7272	0	822	PreK3S-STS to VLGC Clipper	17875	18008			

22-Aug-13	8863	6450	4250	4250	PreK3S	17875	18008			
23-Aug-13	4613	2200			Lifting K3S	17875	18008			
24-Aug-13	4613	2200			Lifting K3S	17875	18008	850	850	Asian Gas ii ke BPP
25-Aug-13	4613	2200			Lifting K3S	17025	17158	850	850	Gas Patra III
26-Aug-13	4613	2200	15000	11000	Lifting K3S-BELANAK	16175	16308			
27-Aug-13	19613	13200			Lifting K3S	16175	16308			
28-Aug-13	19613	13200			Lifting K3S	16175	16308			
29-Aug-13	19613	13200			Lifting K3S	16175	16308	6225	6649	
30-Aug-13	19613	13200	1000	8000	Lifting K3S-UBAN	22400	22957	1700	1700	Ae Gas/Gas Attaka
31-Aug-13	20613	21200			Lifting K3S	20700	21257	1250	1250	Arimbi
1-Sep-13	20613	21200			Lifting K3S	19450	20007			
2-Sep-13	20613	21200	1250	1250	Gas Nuri	19450	20007			
3-Sep-13	19363	19950				19450	20007	850	850	Asian Gas
4-Sep-13	19363	19950	1250	1250	Arimbi	18600	19157			
5-Sep-13	18113	18700				18600	19157			
6-Sep-13	18113	18700	1700	1700	Asian Gas II/Attaka	18600	19157	5000	5000	Walio
7-Sep-13	16413	17000	850	850	Asian Gas	13600	14157	1250	1250	PreK3S
8-Sep-13	15563	16150				12350	12907	5850	5850	PreK3S
9-Sep-13	15563	16150				6500	7057	5850	5850	PreK3S
10-Sep-13	15563	16150	0	548	DEMURRAGE DAY-1,COST:$160000	650	1207			Lifting K3S
11-Sep-13	15563	16698				650	1207			Lifting K3S
12-Sep-13	15563	16698				650	1207			Lifting K3S
13-Sep-13	15563	16698				650	1207	12000	9000	Lifting K3S-JABUNG
14-Sep-13	15563	16698				12650	10207			Lifting K3S
15-Sep-13	15563	16698				12650	10207			Lifting K3S
16-Sep-13	15563	16698	7937	4502	STS from VLGC Komodo	12650	10207		6000	Lifting K3S-UBAN
17-Sep-13	23500	21200				12650	16207			Lifting K3S
18-Sep-13	23500	21200	4320	4320	Pluto	12650	16207			Lifting K3S
19-Sep-13	19180	16880	1150	1150	Elpindo/Gas Arar	12650	16207			Lifting K3S

20-Sep-13	18030	15730	4000	4000	Apoda	12650	16207	1200	1200	Amelia I/Gas Patra III
21-Sep-13	14030	11730	9470	9470		11450	15007			
22-Sep-13	23500	21200	1200	1200	Asian Gas II/Gas Nine	11450	15007			
23-Sep-13	22300	20000				11450	15007	4435	2449	
24-Sep-13	22300	20000	1700	1700	Gas Indonesia/Gas Attaka	15885	17456			
25-Sep-13	20600	18300	850	850	Asian Gas	15885	17456			
26-Sep-13	19750	17450	4000	4000	Nusa Bintang	15885	17456			
27-Sep-13	15750	13450				15885	17456	5250	5250	Arimbi/Eratan
28-Sep-13	15750	13450				10635	12206			
29-Sep-13	15750	13450				10635	12206			
30-Sep-13	15750	13450				10635	12206			
1-Oct-13	15750	13450	850	850	Attaka	10635	12206			
2-Oct-13	14900	12600				10635	12206			
3-Oct-13	14900	12600	2000	2000	Eratan	10635	12206			
4-Oct-13	12900	10600				10635	12206			
5-Oct-13	12900	10600				10635	12206			
6-Oct-13	12900	10600				10635	12206	4000	4000	PreK3S
7-Oct-13	12900	10600				6635	8206	2500	2500	PreK3S
8-Oct-13	12900	10600				4135	5706	1250	1250	PreK3S
9-Oct-13	12900	10600				2885	4456			Lifting K3S
10-Oct-13	12900	10600				2885	4456			Lifting K3S
11-Oct-13	12900	10600				2885	4456			Lifting K3S
12-Oct-13	12900	10600	850	850	Gas Indo/Amelia I	2885	4456	17000	9000	Lifting K3S-JABUNG
13-Oct-13	12050	9750				19885	13456			Lifting K3S
14-Oct-13	12050	9750				19885	13456		7000	Lifting K3S-UBAN
15-Oct-13	12050	9750				19885	20456			Lifting K3S
16-Oct-13	12050	9750	3000	3000	PreK3S	19885	20456			Lifting K3S
17-Oct-13	9050	6750	1000	1500	PreK3S	19885	20456			Lifting K3S
18-Oct-13	8050	5250	1050	1050	PreK3S-STS to VLGC Clipper	19885	20456			Lifting K3S

19-Oct-13	7000	4200			Lifting K3S	19885	20456	1250	1250	Arimbi
20-Oct-13	7000	4200			Lifting K3S	18635	19206			
21-Oct-13	7000	4200			Lifting K3S	18635	19206	850	850	Gas Arar
22-Oct-13	7000	4200	16500	12000	Lifting K3S-BELANAK	17785	18356			
23-Oct-13	23500	16200			Lifting K3S	17785	18356	1250	1250	Gas Maluku
24-Oct-13	23500	16200			Lifting K3S	16535	17106			
25-Oct-13	23500	16200		5000	Lifting K3S-UBAN	16535	17106			
26-Oct-13	23500	21200			Lifting K3S	16535	17106	5000	5000	Raggiana, ERT/CPO
27-Oct-13	23500	21200			Lifting K3S	11535	12106			
28-Oct-13	23500	21200			Lifting K3S	11535	12106			
29-Oct-13	23500	21200				11535	12106			
30-Oct-13	23500	21200	5858	5858	walio/asian gas	11535	12106			
31-Oct-13	17642	15342				11535	12106			

	VLGC Clipper		C3 C4	23200 21300		VLGC Komodo		C3 C4	23600 20800	
Date	Stock		Supply/Discharge		Information	Stock		Supply/Discharge		Information
	C3	C4	C3	C4		C3	C4	C3	C4	
1-Jul-13	17523	17852	5677	3448		19291	19067	850	850	Asian Gas
2-Jul-13	23200	21300	5000	5000	Raggiana	18441	18217			
3-Jul-13	18200	16300	5000	5000		18441	18217			
4-Jul-13	23200	21300	1700	1700	Gas Indonesia/Gas Arar	18441	18217			
5-Jul-13	21500	19600	1700	1700	Gas Attaka/AE Gas ke BPP	18441	18217			
6-Jul-13	19800	17900	1250	1250	Gas Maluku	18441	18217	275	275	Amelia II
7-Jul-13	18550	16650	850	850	Asian Gas ke PJG	18166	17942	5850	5850	Widuri/Gas Natuna
8-Jul-13	17700	15800				12316	12092			
9-Jul-13	17700	15800	4000	4000	Apoda	12316	12092			
10-Jul-13	13700	11800				12316	12092	11284	8708	
11-Jul-13	13700	11800				23600	20800	1250	1250	Arimbi
12-Jul-13	13700	11800	1270	3190		22350	19550			
13-Jul-13	14970	14990				22350	19550			
14-Jul-13	14970	14990				22350	19550			
15-Jul-13	14970	14990				22350	19550	3950	3950	Nusa bintang/Asian Gas
16-Jul-13	14970	14990				18400	15600	850	850	Attaka
17-Jul-13	14970	14990				17550	14750			
18-Jul-13	14970	14990				17550	14750	2100	2100	Asian Gas/Gas Maluku
19-Jul-13	14970	14990				15450	12650			
20-Jul-13	14970	14990	1800	0	Eratan	15450	12650	8150	8150	
21-Jul-13	13170	14990	10030	6310		23600	20800	1700	1700	Gas Natuna/Gas Attaka
22-Jul-13	23200	21300				21900	19100			
23-Jul-13	23200	21300	2500	2500	Arimbi/Gas Maluku	21900	19100	850	850	Gas Indo BPP
24-Jul-13	20700	18800	850	850	Asian Gas	21050	18250			
25-Jul-13	19850	17950				21050	18250	350	350	Amelia

26-Jul-13	19850	17950	1700	1700	AE Gas/Gas Arar	20700	17900	3100	3100	Nusa Bintang
27-Jul-13	18150	16250	2100	2100	Gas Nuri/Asian Gas	17600	14800	1100	1100	Gas 9/ Gas Indo
28-Jul-13	16050	14150	1250	1250	Gas Maluku	16500	13700			
29-Jul-13	14800	12900				16500	13700			
30-Jul-13	14800	12900	1250	1250	Arimbi	16500	13700	5000	5000	Raggiana
31-Jul-13	13550	11650	850	850	Asian Gas	11500	8700			
1-Aug-13	12700	10800	3100	3100	Nusa Bintang	11500	8700	12100	12100	
2-Aug-13	9600	7700	10050	10050		23600	20800			
3-Aug-13	19650	17750				23600	20800	850	850	Asian Gas
4-Aug-13	19650	17750				22750	19950	1250	1250	Arimbi
5-Aug-13	19650	17750	850	850	Gas Indonesia	21500	18700	850	850	Gas Patra III
6-Aug-13	18800	16900				20650	17850	850	850	AE Gas
7-Aug-13	18800	16900				19800	17000	850	850	Gas Natuna
8-Aug-13	18800	16900	850	850	Asian Gas II	18950	16150			
9-Aug-13	17950	16050	850	850	Asian Gas ke CLP	18950	16150	5000	5000	Widuri
10-Aug-13	17100	15200				13950	11150			
11-Aug-13	17100	15200	1700	1700	Gas Patra III/AE Gas	13950	11150			
12-Aug-13	15400	13500				13950	11150			
13-Aug-13	15400	13500	5000	5000	Apoda	13950	11150			
14-Aug-13	10400	8500				13950	11150			
15-Aug-13	10400	8500				13950	11150			
16-Aug-13	10400	8500				13950	11150	4500	4500	Eratan
17-Aug-13	10400	8500				9450	6650	14150	14150	
18-Aug-13	10400	8500				23600	20800	1250	1250	Gas Maluku
19-Aug-13	10400	8500				22350	19550	850	850	Asian Gas
20-Aug-13	10400	8500				21500	18700	850	850	Gas Ararr
21-Aug-13	10400	8500	0	822	STS from VLGC Nusa Bright	20650	17850			
22-Aug-13	10400	9322				20650	17850			
23-Aug-13	10400	9322				20650	17850	1200	1200	Amelia I/Gas Indonesia

24-Aug-13	10400	9322				19450	16650	1250	1250	Gas Maluku
25-Aug-13	10400	9322				18200	15400			
26-Aug-13	10400	9322				18200	15400			
27-Aug-13	10400	9322				18200	15400			
28-Aug-13	10400	9322	12800	11978		18200	15400			
29-Aug-13	23200	21300	2100	2100	Asian Gas/Gas Nuri	18200	15400	275	275	Amelia II
30-Aug-13	21100	19200	1250	1250	Gas Maluku	17925	15125	2975	3373	
31-Aug-13	19850	17950				20900	18498			
1-Sep-13	19850	17950				20900	18498			
2-Sep-13	19850	17950				20900	18498			
3-Sep-13	19850	17950				20900	18498			
4-Sep-13	19850	17950				20900	18498	4000	4000	Eretan
5-Sep-13	19850	17950				16900	14498			
6-Sep-13	19850	17950	5000	5000	Apoda	16900	14498			
7-Sep-13	14850	12950	8350	8350		16900	14498	850	850	Ae Gas
8-Sep-13	23200	21300				16050	13648	7550	7152	
9-Sep-13	23200	21300	500	3000	Clipper	23600	20800			
10-Sep-13	22700	18300	670	670	Gas Nine/Amelia	23600	20800	1250	1250	Arimbi
11-Sep-13	22030	17630				22350	19550	850	850	Gas Natuna
12-Sep-13	22030	17630				21500	18700			
13-Sep-13	22030	17630				21500	18700			
14-Sep-13	22030	17630	1700	1700	Asian Gas II/Gas Indonesia	21500	18700	4000	4000	apoda
15-Sep-13	20330	15930	850	850	Attaka	17500	14700	1250	1250	PreK3S
16-Sep-13	19480	15080				16250	13450	7937	4502	PreK3S-STS to VLGC Nusa Bright
17-Sep-13	19480	15080				8313	8948	1713	7148	PreK3S-Midsize
18-Sep-13	19480	15080	4000	4000	Nusa Bintang	6600	1800			Lifting K3S
19-Sep-13	15480	11080				6600	1800			Lifting K3S
20-Sep-13	15480	11080				6600	1800			Lifting K3S

21-Sep-13	15480	11080	850	850	Gas Melawi	6600	1800	17000	12000	Lifting K3S-BELANAK
22-Sep-13	14630	10230	8570	11070		23600	13800			Lifting K3S
23-Sep-13	23200	21300				23600	13800			Lifting K3S
24-Sep-13	23200	21300	4550	4550	Global	23600	13800		7000	Lifting K3S-UBAN
25-Sep-13	18650	16750				23600	20800			Lifting K3S
26-Sep-13	18650	16750	1700	1700	Gas Arar/AE Gas	23600	20800			Lifting K3S
27-Sep-13	16950	15050	850	850	Gas Patra III	23600	20800			Lifting K3S
28-Sep-13	16100	14200				23600	20800	1200	1200	Amelia I/Gas Natuna
29-Sep-13	16100	14200				22400	19600	850	850	Asian Gas
30-Sep-13	16100	14200	275	275	Amelia II	21550	18750	850	850	Gas Melawi
1-Oct-13	15825	13925	1250	1250	Arimbi	20700	17900	2000	2000	Nusa Bintang
2-Oct-13	14575	12675				18700	15900			
3-Oct-13	14575	12675	1200	1200	Gas Maluku	18700	15900	2000	2000	Global
4-Oct-13	13375	11475	850	850	AE Gas	16700	13900	850	850	Asian Gas
5-Oct-13	12525	10625				15850	13050			
6-Oct-13	12525	10625				15850	13050	850	850	Asian Gas II
7-Oct-13	12525	10625				15000	12200			
8-Oct-13	12525	10625				15000	12200			
9-Oct-13	12525	10625				15000	12200			
10-Oct-13	12525	10625				15000	12200	3000	3000	Global
11-Oct-13	12525	10625				12000	9200	11600	11600	
12-Oct-13	12525	10625				23600	20800	1200	1200	Gas Maluku
13-Oct-13	12525	10625				22400	19600	1700	1700	AE Gas/Gas Arar
14-Oct-13	12525	10625	275	275	Amelia II (Asian Gas II ke HESS)	20700	17900	1250	1250	Arimbi
15-Oct-13	12250	10350				19450	16650	5000	5000	Walio
16-Oct-13	12250	10350				14450	11650			
17-Oct-13	12250	10350				14450	11650	610	610	Amelia/Gas Nine
18-Oct-13	12250	10350	1050	1050	STS from VLGC Nusa Bright	13840	11040			

19-Oct-13	13300	11400	9900	9900		13840	11040			
20-Oct-13	23200	21300	5000	5000	Reggiana	13840	11040	9760	9760	
21-Oct-13	18200	16300				23600	20800	5000	5000	Nusa Bintang
22-Oct-13	18200	16300				18600	15800			
23-Oct-13	18200	16300				18600	15800			
24-Oct-13	18200	16300	850	850	Asian gas II	18600	15800			
25-Oct-13	17350	15450				18600	15800	1250	1250	Arimbi
26-Oct-13	17350	15450	4000	4000	Nusa Bintang	17350	14550			
27-Oct-13	13350	11450				17350	14550	1250	1250	Arimbi
28-Oct-13	13350	11450				16100	13300	4000	4000	Global Ke JKT
29-Oct-13	13350	11450				12100	9300			
30-Oct-13	13350	11450				12100	9300			
31-Oct-13	13350	11450				12100	9300			

VLGC GP-1			C3	24000	
			C4	23000	
Date	Stock		Supply/Discharge		Information
	C3	C4	C3	C4	
1-Jul-13	20000	20000	1250	1250	Arimbi
2-Jul-13	18750	18750			
3-Jul-13	18750	18750			
4-Jul-13	18750	18750	1250	1250	Gas Nuri
5-Jul-13	17500	17500	1382	4038	DEMURRAGE DAY-2,COST:$320000
6-Jul-13	18882	21538	3100	3100	Nusa Bintang ke ERT
7-Jul-13	15782	18438			
8-Jul-13	15782	18438	850	850	Gas Patra 3 ke CLP
9-Jul-13	14932	17588	850	850	Asian Gas II
10-Jul-13	14082	16738	1250	1250	Gas Nuri
11-Jul-13	12832	15488	850	850	Asian Gas PJG
12-Jul-13	11982	14638			
13-Jul-13	11982	14638			
14-Jul-13	11982	14638			
15-Jul-13	11982	14638			
16-Jul-13	11982	14638			
17-Jul-13	11982	14638			
18-Jul-13	11982	14638			
19-Jul-13	11982	14638			
20-Jul-13	11982	14638	850	850	PreK3S
21-Jul-13	11132	13788	5000	5000	PreK3S
22-Jul-13	6132	8788	0	3788	PreK3S-Midsize
23-Jul-13	6132	5000			Lifting K3S
24-Jul-13	6132	5000			Lifting K3S
25-Jul-13	6132	5000			Lifting K3S
26-Jul-13	6132	5000	17000	12000	Lifting K3S-BELANAK
27-Jul-13	23132	17000			Lifting K3S
28-Jul-13	23132	17000			Lifting K3S
29-Jul-13	23132	17000		6000	Lifting K3S-UBAN
30-Jul-13	23132	23000			Lifting K3S
31-Jul-13	23132	23000			Lifting K3S
1-Aug-13	23132	23000			Lifting K3S
2-Aug-13	23132	23000			
3-Aug-13	23132	23000	5000	5000	Aries
4-Aug-13	18132	18000			
5-Aug-13	18132	18000			
6-Aug-13	18132	18000			
7-Aug-13	18132	18000			
8-Aug-13	18132	18000	1250	1250	Arimbi
9-Aug-13	16882	16750			
10-Aug-13	16882	16750	1700	1700	Attaka/Gas Indo
11-Aug-13	15182	15050			

12-Aug-13	15182	15050	1250	1250	Gas Nuri
13-Aug-13	13932	13800	1250	1250	Gas Maluku
14-Aug-13	12682	12550	275	275	amelia II
15-Aug-13	12407	12275			
16-Aug-13	12407	12275			
17-Aug-13	12407	12275	3100	3100	Nusa Bintang
18-Aug-13	9307	9175			
19-Aug-13	9307	9175	1125	1125	PreK3S
20-Aug-13	8182	8050	4000	4000	PreK3S
21-Aug-13	4182	4050			PreK3S
22-Aug-13	4182	4050			Lifting K3S
23-Aug-13	4182	4050			Lifting K3S
24-Aug-13	4182	4050			Lifting K3S
25-Aug-13	4182	4050	15000	8000	Lifting K3S-JABUNG
26-Aug-13	19182	12050			Lifting K3S
27-Aug-13	19182	12050			Lifting K3S
28-Aug-13	19182	12050			Lifting K3S
29-Aug-13	19182	12050		10000	Lifting K3S-UBAN
30-Aug-13	19182	22050			Lifting K3S
31-Aug-13	19182	22050			Lifting K3S
1-Sep-13	19182	22050			
2-Sep-13	19182	22050			
3-Sep-13	19182	22050	5000	5000	Pluto
4-Sep-13	14182	17050			
5-Sep-13	14182	17050			
6-Sep-13	14182	17050			
7-Sep-13	14182	17050			
8-Sep-13	14182	17050			
9-Sep-13	14182	17050	6100	5950	
10-Sep-13	20282	23000	850	850	Asian Gas
11-Sep-13	19432	22150			
12-Sep-13	19432	22150			
13-Sep-13	19432	22150	4000	4000	Eratan
14-Sep-13	15432	18150			
15-Sep-13	15432	18150			
16-Sep-13	15432	18150			
17-Sep-13	15432	18150			
18-Sep-13	15432	18150			
19-Sep-13	15432	18150			
20-Sep-13	15432	18150	4000	4000	Eratan
21-Sep-13	11432	14150	850	850	PreK3S
22-Sep-13	10582	13300	5000	5000	PreK3S
23-Sep-13	5582	8300	1125	1125	PreK3S
24-Sep-13	4457	7175			Lifting K3S
25-Sep-13	4457	7175			Lifting K3S
26-Sep-13	4457	7175			Lifting K3S

27-Sep-13	4457	7175	14300	7000	Lifting K3S-JABUNG
28-Sep-13	18757	14175			Lifting K3S
29-Sep-13	18757	14175			Lifting K3S
30-Sep-13	18757	14175		6000	Lifting K3S-UBAN
1-Oct-13	18757	20175			Lifting K3S
2-Oct-13	18757	20175			Lifting K3S
3-Oct-13	18757	20175			Lifting K3S
4-Oct-13	18757	20175	850	850	Apoda
5-Oct-13	17907	19325	350	350	Amelia I
6-Oct-13	17557	18975	850	850	Asian Gas
7-Oct-13	16707	18125	850	850	Gas Melawi
8-Oct-13	15857	17275			
9-Oct-13	15857	17275	4500	4500	Eratan
10-Oct-13	11357	12775			
11-Oct-13	11357	12775	2500	2500	Apoda
12-Oct-13	8857	10275	10789	8247	
13-Oct-13	19646	18522	1500	1500	Raggiana
14-Oct-13	18146	17022	850	850	Gas Melawi ke BAL
15-Oct-13	17296	16172	4025	4000	Aries
16-Oct-13	13271	12172			
17-Oct-13	13271	12172			
18-Oct-13	13271	12172			
19-Oct-13	13271	12172			
20-Oct-13	13271	12172			
21-Oct-13	13271	12172	2822	2278	
22-Oct-13	16093	14450			
23-Oct-13	16093	14450	5000	5000	PreK3S
24-Oct-13	11093	9450	4000	4000	PreK3S
25-Oct-13	7093	5450	1700	1700	PreK3S
26-Oct-13	5393	3750			Lifting K3S
27-Oct-13	5393	3750			Lifting K3S
28-Oct-13	5393	3750			Lifting K3S
29-Oct-13	5393	3750	15700	10000	Lifting K3S-JABUNG
30-Oct-13	21093	13750			Lifting K3S
31-Oct-13	21093	13750		5000	Lifting K3S-UBAN

SIMULATION RESULT (2014)

VLGC Nusa Bright		C3	23500			VLGC Challenger		C3	22400	
		C4	21200					C4	22957	
Date	Stock		Supply/Discharge		Information	Stock		Supply/Discharge		Information
	C3	C4	C3	C4		C3	C4	C3	C4	
1-Jul-14	19736	18360				6881	6794			
2-Jul-14	19736	18360				6881	6794			
3-Jul-14	19736	18360	4000	4000	Raggiana ERT8	6881	6794			
4-Jul-14	15736	14360				6881	6794	850	850	PreK3S
5-Jul-14	15736	14360				6031	5944	5000	5000	PreK3S
6-Jul-14	15736	14360	5000	5000	Walio ERT5SBY5	1031	944			PreK3S
7-Jul-14	10736	9360	850	850	AE Gas TTM	1031	944			Lifting K3S
8-Jul-14	9886	8510	320	320	Gas Nine	1031	944			Lifting K3S
9-Jul-14	9566	8190				1031	944			Lifting K3S
10-Jul-14	9566	8190				1031	944	2500	7000	Lifting K3S-UBAN
11-Jul-14	9566	8190				3531	7944			Lifting K3S
12-Jul-14	9566	8190	1425	1425	AE Gas TTM/Amelia II/Elpindo II KENDARI	3531	7944			Lifting K3S
13-Jul-14	8141	6765				3531	7944			Lifting K3S
14-Jul-14	8141	6765	15359	14435		3531	7944	15500	13500	Lifting K3S-BELANAK
15-Jul-14	23500	21200				19031	21444			Lifting K3S
16-Jul-14	23500	21200	850	850	Asian gas I pjg	19031	21444			Lifting K3S
17-Jul-14	22650	20350	850	850	Asian Gas II BAL dilaihkan ke PJG	19031	21444			
18-Jul-14	21800	19500	5000	5000	Raggiana ERT 4 CPO 6	19031	21444	1250	1250	artemis CLP
19-Jul-14	16800	14500	850	850	Asian gas I PJG	17781	20194	5000	5000	Widuri CPO7 ERT3
20-Jul-14	15950	13650				12781	15194			
21-Jul-14	15950	13650	4000	4000	nusa bintang SEK	12781	15194	1250	1250	Arimbi CLP
22-Jul-14	11950	9650				11531	13944	1250	1250	gas artemis CLP
23-Jul-14	11950	9650				10281	12694	5000	5000	Aries ERT2CPO8

24-Jul-14	11950	9650				5281	7694			
25-Jul-14	11950	9650				5281	7694	17119	15263	
26-Jul-14	11950	9650				22400	22957	5000	5000	widuri CPO10
27-Jul-14	11950	9650				17400	17957	4000	4000	nusa bintang SEK
28-Jul-14	11950	9650				13400	13957			
29-Jul-14	11950	9650				13400	13957	1250	1250	artemis CLP
30-Jul-14	11950	9650				12150	12707	2500	2500	aries SBY
31-Jul-14	11950	9650				9650	10207			PreK3S
1-Aug-14	11950	9650				9650	10207	1250	1250	PreK3S
2-Aug-14	11950	9650				8400	8957	4000	4000	PreK3S
3-Aug-14	11950	9650	850	850	Asian gas I PJG	4400	4957			Lifting K3S
4-Aug-14	11100	8800				4400	4957			Lifting K3S
5-Aug-14	11100	8800				4400	4957			Lifting K3S
6-Aug-14	11100	8800				4400	4957	18000	11500	Lifting K3S-JABUNG
7-Aug-14	11100	8800				22400	16457			Lifting K3S
8-Aug-14	11100	8800	600	0	PreK3S-STS to VLGC GP-1	22400	16457			Lifting K3S
9-Aug-14	10500	8800	4000	4000	PreK3S	22400	16457		5000	Lifting K3S-UBAN
10-Aug-14	6500	4800			PreK3S	22400	21457			Lifting K3S
11-Aug-14	6500	4800			Lifting K3S	22400	21457			Lifting K3S
12-Aug-14	6500	4800			Lifting K3S	22400	21457			Lifting K3S
13-Aug-14	6500	4800			Lifting K3S	22400	21457	1250	1250	Arimbi CLP
14-Aug-14	6500	4800		4000	Lifting K3S-UBAN	21150	20207			
15-Aug-14	6500	8800			Lifting K3S	21150	20207	5000	5000	raggiana ERT
16-Aug-14	6500	8800			Lifting K3S	16150	15207	750	750	tarakan PJG
17-Aug-14	6500	8800			Lifting K3S	15400	14457			
18-Aug-14	6500	8800	17000	11000	Lifting K3S-BELANAK	15400	14457			
19-Aug-14	23500	19800			Lifting K3S	15400	14457	2900	400	STS from VLGC GP-1
20-Aug-14	23500	19800			Lifting K3S	18300	14857			
21-Aug-14	23500	19800	4000	4000	apoda JKT	18300	14857			

22-Aug-14	19500	15800				18300	14857			
23-Aug-14	19500	15800				18300	14857			
24-Aug-14	19500	15800	4000	4000	nusa Bintang SEK	18300	14857	750	750	tarakan PJG
25-Aug-14	15500	11800	8000	9400		17550	14107			
26-Aug-14	23500	21200	2000	2000	arimbi CLP/tarakan PJG	17550	14107	4850	8726	
27-Aug-14	21500	19200				22400	22833	4000	4000	
28-Aug-14	21500	19200	5000	5000	walio ERT5CPO5	18400	18833			
29-Aug-14	16500	14200				18400	18833	1250	1250	Gas tarakan PJG/gas artemis
30-Aug-14	16500	14200				17150	17583	750	750	tarakan TTM
31-Aug-14	16500	14200				16400	16833			
1-Sep-14	16500	14200				16400	16833			
2-Sep-14	16500	14200				16400	16833			
3-Sep-14	16500	14200				16400	16833	4000	4000	nusa bintang SEK
4-Sep-14	16500	14200	1250	1250	Gas artemis CLP	12400	12833			
5-Sep-14	15250	12950				12400	12833			
6-Sep-14	15250	12950				12400	12833			
7-Sep-14	15250	12950				12400	12833			
8-Sep-14	15250	12950	4000	4000	nusa bintang SEK	12400	12833			
9-Sep-14	11250	8950	12250	12250		12400	12833	4000	4000	eratan JKT
10-Sep-14	23500	21200	1250	1250	artemis CLP	8400	8833			
11-Sep-14	22250	19950	4000	4000	apoda JKT	8400	8833			
12-Sep-14	18250	15950	5000	5000	walio CPO	8400	8833			
13-Sep-14	13250	10950			OFFHIRE	8400	8833	14000	14124	
14-Sep-14	13250	10950			OFFHIRE	22400	22957	4000	4000	eratan JKT
15-Sep-14	13250	10950			OFFHIRE	18400	18957			
16-Sep-14	13250	10950			OFFHIRE	18400	18957			
17-Sep-14	13250	10950			OFFHIRE	18400	18957	4500	4500	apoda JKT
18-Sep-14	13250	10950			OFFHIRE	13900	14457			
19-Sep-14	13250	10950			OFFHIRE	13900	14457	3500	3500	Walio CPO7

20-Sep-14	13250	10950			OFFHIRE	10400	10957			
21-Sep-14	13250	10950			OFFHIRE	10400	10957			
22-Sep-14	13250	10950			OFFHIRE	10400	10957			
23-Sep-14	13250	10950			OFFHIRE	10400	10957			
24-Sep-14	13250	10950			OFFHIRE	10400	10957			
25-Sep-14	13250	10950			OFFHIRE	10400	10957			
26-Sep-14	13250	10950			OFFHIRE	10400	10957	11264	9208	
27-Sep-14	13250	10950			OFFHIRE	21664	20165			
28-Sep-14	13250	10950			OFFHIRE	21664	20165	1250	1250	arimbi CLP
29-Sep-14	13250	10950			OFFHIRE	20414	18915			
30-Sep-14	13250	10950			OFFHIRE	20414	18915	6250	6250	artemis CLP/apoda ERT10
1-Oct-14	13250	10950			OFFHIRE	14164	12665	8236	10292	
2-Oct-14	13250	10950			OFFHIRE	22400	22957	4000	4000	Nusa Bintang SEK
3-Oct-14	13250	10950			OFFHIRE	18400	18957	4000	4000	
4-Oct-14	13250	10950			OFFHIRE	22400	22957			
5-Oct-14	13250	10950			OFFHIRE	22400	22957	6250	6250	arimbI CLP/Walio CPO10
6-Oct-14	13250	10950			OFFHIRE	16150	16707	6250	6250	DEMURRAGE DAY-3
7-Oct-14	13250	10950			OFFHIRE	22400	22957	5000	5000	apoda ERT10
8-Oct-14	13250	10950			OFFHIRE	17400	17957			
9-Oct-14	13250	10950			OFFHIRE	17400	17957	2000	2000	Nusa bintang SEK
10-Oct-14	13250	10950			OFFHIRE	15400	15957			
11-Oct-14	13250	10950			OFFHIRE	15400	15957			
12-Oct-14	13250	10950			OFFHIRE	15400	15957			
13-Oct-14	13250	10950			OFFHIRE	15400	15957	5105	7000	
14-Oct-14	13250	10950	0	2284	DEMURRAGE DAY-1,COST:$160000	20505	22957	5000	5000	walio ERT5CPO5
15-Oct-14	13250	13234				15505	17957			
16-Oct-14	13250	13234				15505	17957			
17-Oct-14	13250	13234				15505	17957			
18-Oct-14	13250	13234	4000	4000	PreK3S	15505	17957			

19-Oct-14	9250	9234			PreK3S	15505	17957			
20-Oct-14	9250	9234	7000	7000	PreK3S	15505	17957			
21-Oct-14	2250	2234			Lifting K3S	15505	17957			
22-Oct-14	2250	2234			Lifting K3S	15505	17957			
23-Oct-14	2250	2234			Lifting K3S	15505	17957			
24-Oct-14	2250	2234	15500	10000	Lifting K3S-BELANAK	15505	17957			
25-Oct-14	17750	12234			Lifting K3S	15505	17957			
26-Oct-14	17750	12234			Lifting K3S	15505	17957			
27-Oct-14	17750	12234		7000	Lifting K3S-UBAN	15505	17957			
28-Oct-14	17750	19234			Lifting K3S	15505	17957	4000	4000	walio JKT
29-Oct-14	17750	19234			Lifting K3S	11505	13957			
30-Oct-14	17750	19234			Lifting K3S	11505	13957			
31-Oct-14	17750	19234	5000	5000	widuri JKT	11505	13957			

	VLGC Clipper		C3	23200		VLGC Komodo		C3	23600	
			C4	21300				C4	20800	
Date	Stock		Supply/Discharge		Information	Stock		Supply/Discharge		Information
	C3	C4	C3	C4		C3	C4	C3	C4	
1-Jul-14	1325	28	21875	21272		19291	19067	1250	1250	Arimbi CLP
2-Jul-14	23200	21300				18041	17817			
3-Jul-14	23200	21300	5000	5000	Apoda PJG3JKT7	18041	17817	850	850	asian Gas STS BNJ
4-Jul-14	18200	16300	4000	4000	Nusa Bintang SEK8	17191	16967			
5-Jul-14	14200	12300				17191	16967	4000	4000	Eratan JKT8
6-Jul-14	14200	12300	5000	5000	global SBY10	13191	12967			
7-Jul-14	9200	7300				13191	12967	5000	5000	widuri CPO 10
8-Jul-14	9200	7300				8191	7967	7120	7032	
9-Jul-14	9200	7300				15311	14999	850	850	GP II TTM/Elpindo
10-Jul-14	9200	7300				14461	14149	1700	1700	gas arar BPP/gas patra III STS Anggrek
11-Jul-14	9200	7300				12761	12449	4500	4500	Gas Artemis/Raggiana ERT10
12-Jul-14	9200	7300				8261	7949			
13-Jul-14	9200	7300				8261	7949			OFFHIRE
14-Jul-14	9200	7300				8261	7949			OFFHIRE
15-Jul-14	9200	7300	6803	7587		8261	7949			OFFHIRE
16-Jul-14	16003	14887				8261	7949			OFFHIRE
17-Jul-14	16003	14887				8261	7949			OFFHIRE
18-Jul-14	16003	14887				8261	7949			OFFHIRE
19-Jul-14	16003	14887				8261	7949			OFFHIRE
20-Jul-14	16003	14887	4000	4000	eratan JKT	8261	7949			OFFHIRE
21-Jul-14	12003	10887				8261	7949			OFFHIRE
22-Jul-14	12003	10887	850	850	Asian gas II CLP	8261	7949			OFFHIRE
23-Jul-14	11153	10037				8261	7949			OFFHIRE
24-Jul-14	11153	10037				8261	7949			OFFHIRE
25-Jul-14	11153	10037				8261	7949			OFFHIRE

26-Jul-14	11153	10037	5936	7795		8261	7949			OFFHIRE
27-Jul-14	17089	17832	1600	1600	asian gas I PJG/tarakan TTM	8261	7949			OFFHIRE
28-Jul-14	15489	16232	5000	5000	Raggiana ERT10	8261	7949			OFFHIRE
29-Jul-14	10489	11232				8261	7949			OFFHIRE
30-Jul-14	10489	11232				8261	7949			OFFHIRE
31-Jul-14	10489	11232				8261	7949			OFFHIRE
1-Aug-14	10489	11232				8261	7949			OFFHIRE
2-Aug-14	10489	11232				8261	7949			OFFHIRE
3-Aug-14	10489	11232	4000	4000	Nusa Bintang SEK	8261	7949			OFFHIRE
4-Aug-14	6489	7232	8200	9800		8261	7949			OFFHIRE
5-Aug-14	14689	17032				8261	7949			OFFHIRE
6-Aug-14	14689	17032	1250	1250	Arimbi	8261	7949			OFFHIRE
7-Aug-14	13439	15782	850	850	asian gas PJG	8261	7949			OFFHIRE
8-Aug-14	12589	14932				8261	7949			OFFHIRE
9-Aug-14	12589	14932				8261	7949			OFFHIRE
10-Aug-14	12589	14932				8261	7949			OFFHIRE
11-Aug-14	12589	14932	1250	1250	Gas Artemis CLP	8261	7949			OFFHIRE
12-Aug-14	11339	13682				8261	7949			OFFHIRE
13-Aug-14	11339	13682				8261	7949			OFFHIRE
14-Aug-14	11339	13682				8261	7949			OFFHIRE
15-Aug-14	11339	13682	1250	1250	arimbi CLP	8261	7949			OFFHIRE
16-Aug-14	10089	12432	7602	6748		8261	7949			OFFHIRE
17-Aug-14	17691	19180				8261	7949			OFFHIRE
18-Aug-14	17691	19180				8261	7949			OFFHIRE
19-Aug-14	17691	19180				8261	7949			OFFHIRE
20-Aug-14	17691	19180				8261	7949			OFFHIRE
21-Aug-14	17691	19180				8261	7949			OFFHIRE
22-Aug-14	17691	19180	750	750	tarakan PJG	8261	7949			OFFHIRE
23-Aug-14	16941	18430	1250	1250	gas artemis	8261	7949			OFFHIRE

24-Aug-14	15691	17180	7509	4120		8261	7949			OFFHIRE
25-Aug-14	23200	21300	4000	4000	Eratan JKT8	8261	7949			OFFHIRE
26-Aug-14	19200	17300				8261	7949			OFFHIRE
27-Aug-14	19200	17300	1907	0	DEMURRAGE DAY-1,COST:$160000	8261	7949			OFFHIRE
28-Aug-14	21107	17300	4000	3000	Nusa Bintang SEK	8261	7949			OFFHIRE
29-Aug-14	17107	14300				8261	7949			OFFHIRE
30-Aug-14	17107	14300				8261	7949			OFFHIRE
31-Aug-14	17107	14300				8261	7949			
1-Sep-14	17107	14300				8261	7949			
2-Sep-14	17107	14300				8261	7949			
3-Sep-14	17107	14300				8261	7949			
4-Sep-14	17107	14300	3500	3500	Eratan SEK	8261	7949			
5-Sep-14	13607	10800				8261	7949	5000	5000	PreK3S
6-Sep-14	13607	10800				3261	2949			PreK3S
7-Sep-14	13607	10800				3261	2949	1250	1250	PreK3S
8-Sep-14	13607	10800				2011	1699			Lifting K3S
9-Sep-14	13607	10800				2011	1699			Lifting K3S
10-Sep-14	13607	10800				2011	1699			Lifting K3S
11-Sep-14	13607	10800				2011	1699		9000	Lifting K3S-UBAN
12-Sep-14	13607	10800				2011	10699			Lifting K3S
13-Sep-14	13607	10800				2011	10699			Lifting K3S
14-Sep-14	13607	10800	8435	8307		2011	10699	17000	10000	Lifting K3S-JABUNG
15-Sep-14	22042	19107	1250	1250	Arimbi CLP	19011	20699			Lifting K3S
16-Sep-14	20792	17857	5000	5000	widuri CPO	19011	20699			Lifting K3S
17-Sep-14	15792	12857				19011	20699			Lifting K3S
18-Sep-14	15792	12857	850	850	gas patra I BAL	19011	20699	2100	2100	gas artemis CLP/asian gas PJG
19-Sep-14	14942	12007				16911	18599	4000	4000	eratan JKT
20-Sep-14	14942	12007				12911	14599			
21-Sep-14	14942	12007	850	850	asian gas PJG	12911	14599	4000	4000	nusa bintang SEK

22-Sep-14	14092	11157	1250	1250	arimbiCLP	8911	10599			
23-Sep-14	12842	9907	850	850	asian gas PJG	8911	10599			
24-Sep-14	11992	9057				8911	10599			
25-Sep-14	11992	9057	11208	12243		8911	10599	4500	4500	PreK3S
26-Sep-14	23200	21300	3000	3000	nusa bintang SEK	4411	6099	0	1299	PreK3S-STS to VLGC GP-1
27-Sep-14	20200	18300				4411	4800	3500	3500	PreK3S
28-Sep-14	20200	18300				911	1300			Lifting K3S
29-Sep-14	20200	18300				911	1300			Lifting K3S
30-Sep-14	20200	18300				911	1300			Lifting K3S
1-Oct-14	20200	18300				911	1300		6000	Lifting K3S-UBAN
2-Oct-14	20200	18300	3000	3000		911	7300			Lifting K3S
3-Oct-14	23200	21300				911	7300			Lifting K3S
4-Oct-14	23200	21300			DEMURRAGE DAY-1	911	7300	17500	13500	Lifting K3S-BELANAK
5-Oct-14	23200	21300			DEMURRAGE DAY-2	18411	20800			Lifting K3S
6-Oct-14	23200	21300	2100	2100	asian gas PJG/gas artemis CLP	18411	20800			Lifting K3S
7-Oct-14	21100	19200	569	55	DEMURRAGE DAY-4,COST:$640000	18411	20800			Lifting K3S
8-Oct-14	21669	19255	4000	4000	Eratan JKT	18411	20800	850	850	Asian Gas PJG
9-Oct-14	17669	15255				17561	19950	5000	5000	Widuri JKT 10
10-Oct-14	17669	15255	850	850	Asian gas PJG	12561	14950			
11-Oct-14	16819	14405				12561	14950	11039	5850	
12-Oct-14	16819	14405	6381	6895		23600	20800	2000	2000	Nusa bintang SEK
13-Oct-14	23200	21300	4000	4000	Eretan JKT8	21600	18800			
14-Oct-14	19200	17300				21600	18800			
15-Oct-14	19200	17300				21600	18800			
16-Oct-14	19200	17300				21600	18800	2000	2000	Nusa Bintang SEK
17-Oct-14	19200	17300	5000	5000	widuri JKT	19600	16800	4000	4000	raggiana JKT8
18-Oct-14	14200	12300	9000	9000		15600	12800			
19-Oct-14	23200	21300				15600	12800	8000	8000	
20-Oct-14	23200	21300	4000	4000	raggiana JKT8	23600	20800			

21-Oct-14	19200	17300				23600	20800			
22-Oct-14	19200	17300				23600	20800			
23-Oct-14	19200	17300				23600	20800	2000	2000	nusa bintang SEK
24-Oct-14	19200	17300				21600	18800			
25-Oct-14	19200	17300				21600	18800	2000	2000	nusa bintang SEK
26-Oct-14	19200	17300	4000	4000	raggiana ERT	19600	16800	1250	1250	ambalat CLP
27-Oct-14	15200	13300				18350	15550	1250	1250	arimbi CLP
28-Oct-14	15200	13300				17100	14300			
29-Oct-14	15200	13300				17100	14300	4000	4000	nusa bintang SEK
30-Oct-14	15200	13300				13100	10300			
31-Oct-14	15200	13300	1250	1250	ambalat CLP	13100	10300			

	VLGC GP-1		C3	24000	
			C4	23000	
Date	Stock		Supply/Discharge		Information
	C3	C4	C3	C4	
1-Jul-14	7084	5252			
2-Jul-14	7084	5252	1682	1848	
3-Jul-14	8766	7100			
4-Jul-14	8766	7100			
5-Jul-14	8766	7100			
6-Jul-14	8766	7100			
7-Jul-14	8766	7100	15234	15900	
8-Jul-14	24000	23000	1250	1250	Arimbi
9-Jul-14	22750	21750	4000	4000	nusa bintang SEK8
10-Jul-14	18750	17750	11000	11000	PG II
11-Jul-14	7750	6750	1700	1700	PreK3S
12-Jul-14	6050	5050	850	850	PreK3S
13-Jul-14	5200	4200	4000	4000	PreK3S
14-Jul-14	1200	200			Lifting K3S
15-Jul-14	1200	200			Lifting K3S
16-Jul-14	1200	200			Lifting K3S
17-Jul-14	1200	200	18500	10500	Lifting K3S-JABUNG
18-Jul-14	19700	10700			Lifting K3S
19-Jul-14	19700	10700		10000	Lifting K3S-UBAN
20-Jul-14	19700	20700			Lifting K3S
21-Jul-14	19700	20700			Lifting K3S
22-Jul-14	19700	20700			Lifting K3S
23-Jul-14	19700	20700			Lifting K3S
24-Jul-14	19700	20700	850	850	Asian gas I PJG
25-Jul-14	18850	19850	1250	1250	arimbi CLP
26-Jul-14	17600	18600	4000	4000	Eretan JKT
27-Jul-14	13600	14600			
28-Jul-14	13600	14600			
29-Jul-14	13600	14600	4000	4000	Apoda JKT
30-Jul-14	9600	10600			
31-Jul-14	9600	10600			
1-Aug-14	9600	10600			
2-Aug-14	9600	10600			
3-Aug-14	9600	10600	14400	12400	
4-Aug-14	24000	23000	1250	1250	gas artemis CLP
5-Aug-14	22750	21750			
6-Aug-14	22750	21750	5000	5000	widuri CPO
7-Aug-14	17750	16750	5000	5000	Raggiana ERT
8-Aug-14	12750	11750	600	0	STS from VLGC Nusa Bright
9-Aug-14	13350	11750			
10-Aug-14	13350	11750			
11-Aug-14	13350	11750			

12-Aug-14	13350	11750	4000	4000	Nusa Bintang SEK
13-Aug-14	9350	7750			
14-Aug-14	9350	7750			
15-Aug-14	9350	7750	14650	15250	
16-Aug-14	24000	23000	3600	3600	nusa bintang SEK
17-Aug-14	20400	19400	1250	1250	gas artemis
18-Aug-14	19150	18150	4000	4000	Eratan CPO4JKT4
19-Aug-14	15150	14150	2900	400	PreK3S-STS to VLGC Challenger
20-Aug-14	12250	13750			PreK3S
21-Aug-14	12250	13750	6250	6250	PreK3S
22-Aug-14	6000	7500			Lifting K3S
23-Aug-14	6000	7500			Lifting K3S
24-Aug-14	6000	7500			Lifting K3S
25-Aug-14	6000	7500	18000	10500	Lifting K3S-JABUNG
26-Aug-14	24000	18000			Lifting K3S
27-Aug-14	24000	18000		5000	Lifting K3S-UBAN
28-Aug-14	24000	23000			Lifting K3S
29-Aug-14	24000	23000			Lifting K3S
30-Aug-14	24000	23000			Lifting K3S
31-Aug-14	24000	23000			Lifting K3S
1-Sep-14	24000	23000	1250	1250	arimbi CLP
2-Sep-14	22750	21750	5000	5000	Apoda PJG2,5 JKT7,5
3-Sep-14	17750	16750	4500	4500	raggiana ERT 9
4-Sep-14	13250	12250			
5-Sep-14	13250	12250			
6-Sep-14	13250	12250			
7-Sep-14	13250	12250			
8-Sep-14	13250	12250			
9-Sep-14	13250	12250	5000	5000	widuri ERT5CPO5
10-Sep-14	8250	7250	10371	9793	
11-Sep-14	18621	17043	850	850	gas patra PJG
12-Sep-14	17771	16193			
13-Sep-14	17771	16193	850	850	gas patra I PJG
14-Sep-14	16921	15343			
15-Sep-14	16921	15343			
16-Sep-14	16921	15343			
17-Sep-14	16921	15343	4000	4000	nusa bintang SEK
18-Sep-14	12921	11343			
19-Sep-14	12921	11343			
20-Sep-14	12921	11343			
21-Sep-14	12921	11343			
22-Sep-14	12921	11343			
23-Sep-14	12921	11343	1250	1250	artemis CLP
24-Sep-14	11671	10093			
25-Sep-14	11671	10093			
26-Sep-14	11671	10093	0	1299	STS from VLGC Komodo

27-Sep-14	11671	11392			PreK3S
28-Sep-14	11671	11392	4000	4000	PreK3S
29-Sep-14	7671	7392	5000	5000	PreK3S
30-Sep-14	2671	2392			Lifting K3S
1-Oct-14	2671	2392			Lifting K3S
2-Oct-14	2671	2392			Lifting K3S
3-Oct-14	2671	2392	18000	12000	Lifting K3S-JABUNG
4-Oct-14	20671	14392			Lifting K3S
5-Oct-14	20671	14392		4500	Lifting K3S-UBAN
6-Oct-14	20671	18892			Lifting K3S
7-Oct-14	20671	18892			Lifting K3S
8-Oct-14	20671	18892			Lifting K3S
9-Oct-14	20671	18892			Lifting K3S
10-Oct-14	20671	18892	1250	1250	Arimbi CLP
11-Oct-14	19421	17642			
12-Oct-14	19421	17642	1250	1250	Artemis CLP
13-Oct-14	18171	16392			
14-Oct-14	18171	16392			
15-Oct-14	18171	16392			
16-Oct-14	18171	16392			
17-Oct-14	18171	16392	1250	1250	Arimbi CLP
18-Oct-14	16921	15142			
19-Oct-14	16921	15142			
20-Oct-14	16921	15142	6391	6500	
21-Oct-14	23312	21642			
22-Oct-14	23312	21642	1250	1250	Arimbi CLP
23-Oct-14	22062	20392			
24-Oct-14	22062	20392	850	850	asian gas PJG
25-Oct-14	21212	19542	9000	9000	widuri JKT/apoda JKT8
26-Oct-14	12212	10542			
27-Oct-14	12212	10542			
28-Oct-14	12212	10542			
29-Oct-14	12212	10542			
30-Oct-14	12212	10542			
31-Oct-14	12212	10542			