LNG Truck Loading Services

Operational Procedures

REV. 02 **SEPTEMBER 2023**

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1. INTRODUCTION

The scope of this document is to provide the standard procedure governing access to the Truck Loading Facility of DESFA at the LNG Terminal of Revithoussa Island. It shall apply to all Users subscribing to LNG Services offered by the Terminal Operator within the framework of Chapter 11A of the Network Code.

LNG Truck-Loading Service is the process of filling specially designed trucks, trailers, and ISO containers to transport natural gas in liquefied form ("LNG").

Technical requirements for Trucks/LNG Tanks & Drivers along with compatibility procedure are described in detail in the document 'LNG Truck Loading Services-Technical Requirements and Approval Procedure for LNG Trucks/Tanks and Drivers'.

DESFA, is the Owner & Operator of the LNG Terminal in Revithoussa, and responsible for operating the facility in a safe, reliable, and economically efficient manner, in compliance with the Greek and EU Legislative framework.

2. ABBREVIATIONS

ADR Accord Dangereux Routier (European regulations concerning the international transport of dangerous goods by road)

DCS Distributed Control System

FCV Flow Control Valve

FT Flow Transmitter

LNG Liquified Natural Gas

MOV Motor-Operated Valve OP Output variable

NG Natural Gas

QR Quick Response

TLF Truck loading Facility

TLS Truck Loading Service

SSD Shut-Down System

3. OFFERED SERVICES

There is a single offered service (the "Truck Loading Service" - "Υπηρεσία Φόρτωσης Φορτηγού ΥΦΑ" as included in the Network Code), offered through Standard Truck Loading Timeslots (Photo 01).

Each Standard Timeslot includes the TLS, which comprises of the following elements:

- Security Control of the Road Transportation Documents of the TLS-User, the Truck/LNG Tank & Driver at the Transit Port,
- Truck/LNG Tank Driver submission of a declaration that will state the LNG Tank have been Cooled Down properly,
- Sea-Transportation of the Truck/LNG Tank & Driver from the Transit Port to the Destination Port of TLF,
- Truck/LNG Tank & Driver Technical Status checks at the Destination Port of LNG TLF,
- Entrance of the Truck/l=LNG Tank to the TLF for Pre-Loading checks and followingly LNG Truck Loading with the declared LNG quantity,
- Print-out of the relevant documentation (LNG TLS Certificate, ADR Transportation Document)
- Sea-transportation of the LNG Truck from the Destination Port of LNG TLF back to the Transit Port,
- Conducting all necessary measurements and procedures required for the effective, safe, and cost-efficient operation of the TLF according to the Network Code, the TLS Framework Agreement, and the Technical Requirements for LNG Trucks/Tanks & Drivers.

Photo 01: Truck Loading Facility

4. TRANSIT PORT

The LNG Trucks/Tanks will be transported to Revithoussa island by Ferry Boat.

The transportation service to TLF Destination Port in Revithoussa Island will be facilitated at the Transit Port (located at the Perama Ferry Port) of the Municipality of Megara. (Photo 02)

Photo 02: Perama Ferry Port

The road distance from E94 (Olympia Odos) to Transit Port of Perama is approximately 4,6 km.

The one-way trip from the Transit Port of Perama to the TLF Destination Port of Revithoussa Island is approximately 3.5 Nautical Miles and lasts 20 minutes. (Figure 01)

Figure 01: Routes to Revithoussa LNG Terminal

5. LOGISTICS

Details about Truck Loading Services and Logistics are provided in Table 01, 02:

Truck Loading Facility	
Operation Day / Week	6
TLS Operation Hours	08:00 - 20:00
Peak Loading Capacity	100 m^3 LNG/h
Number of Loading Bays	1
Maximum estimated Truck Loadings Annually	4,300*
*For the year of 2024	

Table 01

Logistics	
Number of Trucks/LNG Tanks Onboard per trip	4
Maximum TLS-Timeslots per day	4*
One-way trip duration (Perama Megaridas-Revithoussa)	20 min
Truck loading Time Duration	60 min**
*Due to substructure restrictions of the Port of Perama Megaridas **The process of LNG Truck Loading during the initial operating period may take longer due to various technical issues arising from the Market available fleet.	

Table 02

6. OPERATIONAL PROCEDURES

As a prerequisite to perform any LNG Truck Loading services, the relevant framework contract should be concluded between DESFA and the TLS User according to Chapter 11A of the Network Code. Truck loading operation consists of the following steps:

- Contract Conclusion.
- Approval of entities.
- TLS Nomination.
- Transit Port – Road Transportation Document Control & Driver's Declaration.
- Destination Port – Truck & Driver Technical Control.
- TLF Loading Bay Pre-Loading Control
- Loading Operations
- TLS Print-out of Documents & Departure.

6.1 CONTRACT CONCLUSION

In accordance with the provisions of chapter 11A of the Network Code, between DESFA and TSL User a framework agreement is concluded.

6.2 APPROVAL OF ENTITIES

Subsequently, the TLS User must submit the Compatibility Approval Checklist Declaration necessary documents for the approval of a compatibility study of the entities of the service, which are:

- Trucks/LNG Tanks
- Drivers
- Transportation Companies

The procedure is described in detail at the document "Technical Requirements & Approval Procedure for Trucks/LNG Tanks & Drivers.

6.3 TLS NOMINATION

In the initial period of the TLS the operating procedures for LNG Truck Loading shall commence with the Client's Nomination via e-mail to DESFA (Revithoussa LNG Terminal Representatives):

(e-mail to: c.silamianos@desfa.gr, cc: a.nastos@desfa.gr)

The Required data for the TLS User to book an appointment will consist of:

- Approved LNG Nomination
- Client
- Transportation company
- Truck / LNG Tank
- Driver
- Preferred Loading Slot

A unique Code (Slot Number) identifying the data for the approval of the Loading Slot, the Truck/LNG Tank and the Driver will be acknowledged to the TLS User, to the Security Guard of DESFA at the Transit Port and to the Field Operator of DESFA at the Destination Port (Revithoussa LNG Terminal).

The TLS User is obligated to explicitly annotate in the loading request if the vessel has undergone any of the following situations:

- A major actuation that involves a modification in the atmosphere from the last LNG cargo.
- A new vessel has been used for the transport of any substance other than LNG.

In any of these circumstances, the Terminal operator after the arrival of the truck-vessel has the right to ask for a certification from a third party for sampling the internal atmosphere to check the levels of O2, CO2, water vapor or other contaminants.

6.4 TRANSIT PORT (Road Transportation Document Control & Driver's Declaration)

Upon arrival at the Port (at least 30 minutes in advance of the departure of the ferry), the driver must present the Unique Code ID (Slot Number) for the Operator's Security Guard to check and verify the identity of the Truck/LNG Tank and the Driver.

There are special provisions foreseen for possible violation of these lead-times, depending on the direction (early or late arrival) and the extent (how early, or how late) of the time- violation.

As stated in the Access Rules for Truck-Loading (Chapter 11A of the Network Code), DESFA will try to rearrange for small time-violations, to the extent that no conflicts with other TLS-Users occur.

A. Before boarding in Ferry Truck/LNG Tank & Driver will be controlled by Operator's Security Guard via *Checklist of Road Transportation Documents & Declaration Frames* which include:
   - ✓ Time Slot Loading Number
   - ✓ Name of loading LNG Owner
   - ✓ Name of loading LNG Carrier
   - ✓ Driver full name
   - ✓ Driver ID Card No.
   - ✓ Tractor ID
   - ✓ LNG Tank Trailer ID
   - ✓ Vehicle Technical Inspection Card (KTEO)
   - ✓ Vehicle Insurance Certificate
   - ✓ Driver ADR Certificate
   - ✓ Vehicle ADR Certificate

   Subsequently, the Driver will submit a Declaration that will state the LNG Tank has been Cooled Down properly according to the Checklist.

B. If the truck arrives before the time of its slots it will have to wait until the correct Loading slot. In case that there is an empty Loading Slot, or another truck is late, the waiting truck can be allowed to get into the ferry after the operator makes a last-minute change in the Loading Slot, subject to the fulfillment of all the requirements presented in point A above. The Driver will accept this change on the Checklist on the Operator's Checklist Declaration frame.
C. If the truck arrives after the nominated time slot, the Operator will evaluate the possibility to shift the Loading Slot to perform the TL operation later within the day. In case that there is an empty Loading Slot, the late truck can be allowed to get into the ferry after the operator makes a last-minute change in the Loading Slot, subject to the fulfillment of all the requirements presented in point A above. The Driver will accept this change on the Operator's Checklist Declaration frame.

6.5 DESTINATION PORT (Truck & Driver Technical Status)

Following the checks at the transit port the Truck/LNG Tank is entered in the Ferry Boat to be transferred to the TLF at Revithoussa LNG Terminal.

Upon the arrival at Revithoussa Destination Port, The Truck/LNG Tank & Driver will be controlled by the Field Operator according to the *Checklist of Truck & Driver Technical Control Frame*, which checks the availability of:

- ✓ Driver Training Certificate for SS LNG Facilities
- ✓ Personal Protective Equipment suitable for LNG
- ✓ Visual Check for the Good Condition of the Truck and LNG Tank
- ✓ ADR UN Placards/Panels/Haz Labels for the carriage of LNG
- ✓ 2 Fire Extinguishers with a total capacity of ≥ 12 kg
- ✓ ADR Kit Bag
- ✓ Immobilization Chocks

The first successful LNG Truck Loading Service Operation of a user at TLF shall be considered as a Truck Loading Certification Test of the Truck/LNG Tank & Driver

The first Truck will be allowed to go to the TLF, while the others are waiting in the indicated location at Revithoussa port area. Once the first Truck Loading has finished, the second will be allowed to get to the loading station etc.

The route that the Trucks/LNG Tanks will follow from Revithoussa jetty (Destination Port) to TLF is depicted in Figure 02.

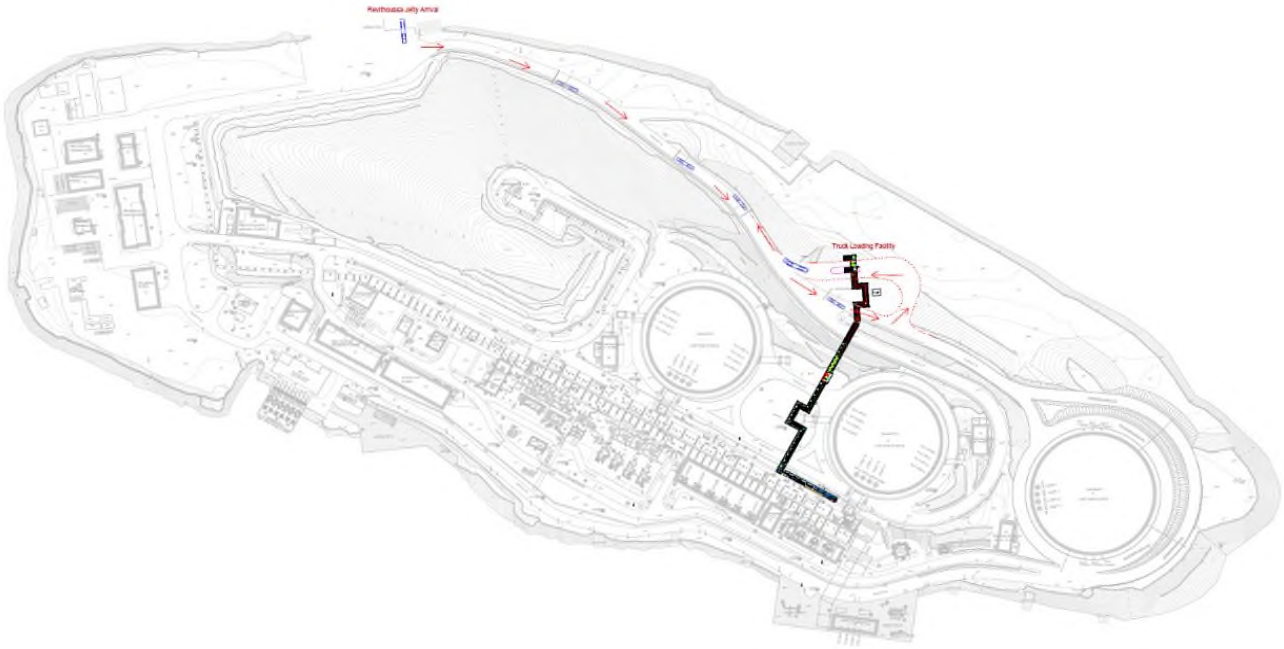

Figure 02: Plot Plan of TLS

6.6 TLF LOADING BAY PRE-LOADING CHECKS

To perform a safe and reliable loading operation (Photo 03), under no circumstance's traces of oxygen, carbon dioxide, water or any other contaminants or impurities are allowed inside the Truck/LNG Tank or its associated piping. Field Operator shall be entitled to carry out spot checks for ppm to check the levels of O_2, CO_2 or water vapor or other contaminants.

In case the Truck/LNG Tank shows ppm levels of O_2, CO_2 or water vapor or other contaminants above the limits mentioned below, LNG Terminal Representative has the right to refuse to load LNG into the TLF User's Truck/LNG Tank.

In case the Truck/LNG Tank had been inerted and/or cooled down with nitrogen, no liquid nitrogen shall be present in the vessel, this will be checked by opening the internal vaporized of the Truck/LNG Tank that should show no massive icing.

TLF User shall declares that, upon arrival at the LNG Terminal, the vessel shall be under natural gas atmosphere in cold condition with the following gas specifications: (a) maximum 1 ppm HO vapor; (b) maximum 100 ppm CO_2; and (c) maximum 100 ppm O_2 or, shall be under inerted nitrogen atmosphere in cold condition with the following gas specifications (trace components): (a) maximum 1 ppm HO_2 vapor; (b) maximum 100 ppm O_2.

Once the Truck/LNG Tank enters to the Loading Bay, the Field Operator will check according to the *Checklist of Pre-Loading Checks*:

- ✓ Absence of work incompatible with safety in the vicinity of the loading point
- ✓ Visual check of the general good condition of the tank service team
- ✓ Immobilization of the vehicle by a chock
- ✓ Engine stopped and ignition keys under control of the Field Operator
- ✓ Battery disconnected.
- ✓ Ground connection connected.
- ✓ LNG Tank Pressure Check
- ✓ LNG Tank Level Check
- ✓ LNG Tank under natural gas or nitrogen atmosphere

Photo 03: Truck Loading Facility Loading Bay

6.7 LOADING OPERATION

The safety checks performed during the loading are:

- ✓ Driver outside the cabin and available.
- ✓ Absence of leaks and spills.
- ✓ Surveillance and constant control of the operation.
- ✓ Prohibition of smoking (also applies to electronic cigarettes and other similar devices).
- ✓ Loading arms or hose without tension.
- ✓ The maximum degree of filling is not exceeded.
- ✓ Capacity of the receiving tank is not exceeded.

And after the loading:

- ✓ Fill openings closed and blind plugs attached.
- ✓ Shim and ground removed.
- ✓ Good general apparent condition of tank.
- ✓ Pressure check in the tank.
- ✓ Absence of leaks or spills.
- ✓ Discharge of surplus if any.

6.8 EMERGENCY CONDITIONS

In the event of LNG or NG leak, the following risks are considered:

- Asphyxiation.
- Frostbites.
- Fire and/or Thermal radiation.
- Explosion.

Therefore, when managing events involving an actual or potential loss of containment, it is very important to establish safety zones and ensure that any intervention is taken from a safe distance. According to the Greek legislation and the Greek Fire brigade practice, three impact zones are defined in case of a fire (pool fire or jet fire) scenario or explosion (Table 03).

Impact Zones	Thermal radiation		Overpressure
	Dose (TDU)	Intensity (kW/m^2) 40 min exposure	mbar
ZONE I - Protect Emergency Teams (HOT): Severe injuries and high rate of deaths.	1500	15	350
ZONE II - Protect Population-Severe Impacts (WARM): Irreversible damages for the people and low rate of deaths. Significant rescue measures are made in this zone by the rescue crews.	450	6	140
ZONE III - Protect Population-Medium Impacts (COLD): Deaths aren't expected in this zone. A small rate of the person might have some health problems. Rescue crews aren't necessary for the rescue.	170	3	50

Table 03: Impact Zones of Fire & Explosion

Thus, to ensure the safety of the employees and emergency response teams, a safety zone shall be established during each event to isolate the Hot Zone and the Warm Zone.

The safety perimeters are shown as circles with different radii as in Figure 03.

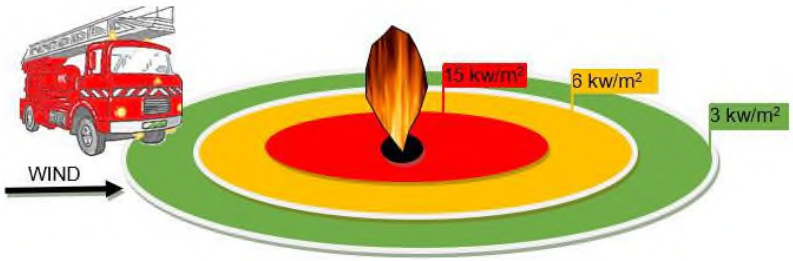

Figure 03: Safety Zones in case of an Incident

ATTENTION

- Zones in real conditions are very likely not to be circular due to wind and obstacles.
- The impact zones must cover the downwind areas which could be affected by the gas cloud or/and heat radiation.
- Any personnel not involved in the response shall stay out of the 3kw/m2 thermal radiation impact zone.
- The fire will continue to burn until the hydrocarbon is depleted. Thus, the sizes of the zones will be reduced accordingly.

According to the above requirements impact zones have been calculated for the leakage scenarios at the TLS and 2 SAFE POINTS (Figure 04) were defined for moving in case of an incident:

i. Safe Point 1 is on the West side of the TLS,
ii. Safe Point 2 is on the East Side of the TLS.

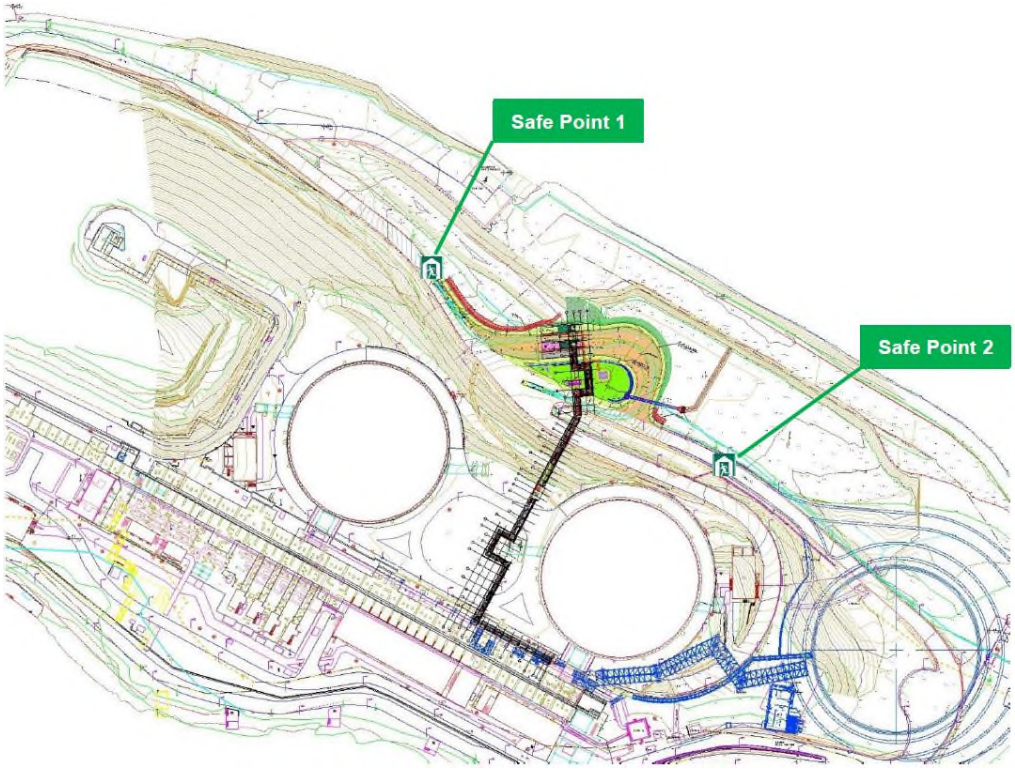

Figure 04: Plot Plan of TLS Evacuation Safe Points

To the possibility of an emergency incident which may be due to:

- LNG Leakage at the TLS during loading
- Pool Fire at the TLS during loading
- NG Leakage at the TLS during loading
- Jet Fire at the TLS during loading
- Truck Road Accident/Overturning

The Truck/LNG Tank driver should:

- ✓ PRESS the nearest ESD, if not already activated
- ✓ STOP any loading operations and close the vessel isolation valves.
- ✓ NOT MOVE the Truck/LNG Tank
- ✓ GO to the safe position indicated by TLS Field Operator.
- ✓ Wait for instructions from the TLS Field Operator.

6.9 TLS PRINT-OUT OF DOCUMENTS & DEPARTURE

After completion of the loading operations, the Field Operator will disconnect the earthing and the flexible LNG and gas hoses and place them in the signaled location.

The software logic will activate the green light confirming that everything thing is in the safe position.

The Truck/LNG Tank Driver will be able to print out all the relevant documents at the Administration Building, including the TLS Certificate (Quality and Quantity paper) and the ADR Transportation Documents (including the check lists).

Then the first truck will go to the safe area in the port and the second truck will start its own operations etc.

Once the Ferry has arrived and the new Trucks are safe in Revithoussa the Loaded Trucks will be able to get on the Ferry and start the transport to the Transit Port, and then they are allowed to leave the port towards the first destination declared in the ADR papers.

APPENDIX I: TLS Truck/LNG Tank & Driver Checklist

National Natural Gas System Operator (DESFA S.A.)
Revithoussa LNG Terminal O&M Department

Truck Loading Service – Truck/LNG Tank & Driver Checklist for LNG Loading

TLS Truck/LNG Tank & Driver Checklist No:	Date:	Time:

Έγγραφα Οδικής Μεταφοράς - Road Transportation Documents (Transit Port)		YES	NO
Αριθμός Χρονοθυρίδας-Time Slot Loading No.			
Τοποθεσία Υπηρεσίας φόρτωσης-TLS Order Entity	DESFA S.A. TLF – Revithoussa LNG Terminal		
Κάτοχος Ποσότητας Φόρτωσης ΥΦΑ-LNG Owner			
Μεταφορέας Ποσότητας Φόρτωσης ΥΦΑ-LNG Carrier			
Οδηγός Driver – Ονοματεπώνυμο-Full Name			
Οδηγός Driver – Αριθμός Δελτίου Αστυνομικής Ταυτότητας-ID Card No.			
Αριθμός Άδειας Κυκλοφορίας Φορτηγού-Tractor ID			
Αριθμός Άδειας Κυκλοφορίας Ρυμουλκούμενης Δεξαμενής ΥΦΑ-LNG Tank Trailer ID			
Κάρτα Ελέγχου ΚΤΕΟ-Vehicle Technical Inspection Card			
Ασφαλιστήριο Συμβόλαιο Οχήματος–Vehicle Insurance Certificate			
Πιστοποιητικό ADR Οδηγού-Driver ADR Certificate			
Πιστοποιητικό ADR Οχήματος-Vehicle ADR Certificate			

Υπεύθυνη Δήλωση Οδηγού Φ-ΥΦΑ – Truck/LNG Tank Driver Declaration (Transit Port)	YES	NO
Το Όχημα είναι τεχνικά κατάλληλο για μεταφορά ΥΦΑ–The Vehicle is technically fit for LNG carriage		
Η δεξαμενή είναι ψυγμένη κι έτοιμη για φόρτωση ΥΦΑ-The Tank is cooled and ready for LNG loading		
Η τελευταία φόρτωση έγινε στη Ρεβυθούσα?-Does last LNG cargo was loaded at the Revithoussa TLF		
Έλαβα γνώση για την επεξεργασία προσωπικών δεδομένων-Received information about the processing of personal data		
LNG Truck Driver Signature		

Τεχνικός Έλεγχος Φ-ΥΦΑ & Οδηγού – Truck/LNG Tank & Driver Technical Status (Destination Port)	YES	NO
Πιστοποίηση Οδηγού για Εγκαταστάσεις ΥΦΑ Μικρής Κλίμακας-Driver Training Certificate for SS LNG Facilities		
Μέσα Ατομικής Προστασίας κατάλληλα για ΥΦΑ–Personal Protective Equipment suitable for LNG		
Οπτικός Έλεγχος καλής κατάστασης Φ-ΥΦΑ -Visual Check for the Good Condition of the Truck and LNG Tank		
Απαιτούμενη Σήμανση ADR για μεταφορά ΥΦΑ–ADR UN Placards/Panels/Haz Labels for the carriage of LNG		
2 Πυροσβεστήρες συνολικής χωρητικότητας ≥ 12 kg-2 Fire Extinguishers with a total capacity of ≥ 12 kg		
Σάκος ADR – ADR Kit Bag		
Τάκοι Ακινητοποίησης –Immobilization Chocks		

Έλεγχοι πριν τη Φόρτωση – Pre-Loading Checks (TLF Loading Bay)	YES	NO
Απουσία εργασιών ασύμβατων για την ασφαλή λειτουργία–No work incompatible for the safe TLF operation		
Οπτικός Έλεγχος Εξοπλισμού Φόρτωσης Δεξαμενής Φ-ΥΦΑ–Visual Check of LNG Tank Service Equipment		
Ακινητοποίηση Οχήματος με Τάκους–Vehicle Chock Immobilization		
Σβήσιμο Μηχανής. Κλειδιά υπό τον έλεγχο Λειτουργού–Engine stop. Ignition keys under Load Operator control		
Αποσύνδεση Μπαταρίας–Battery Disconnection		
Σύνδεση Γείωσης–Grounding Connection		
Έλεγχος Πίεσης Δεξαμενής Φ-ΥΦΑ–LNG Tank Pressure Check		
Έλεγχος Στάθμης Δεξαμενής Φ-ΥΦΑ–LNG Tank Level Check		
Δεξαμενή Φ-ΥΦΑ σε περιβάλλον φυσικού αερίου–LNG Tank under Natural Gas atmosphere		
Δεξαμενή Φ-ΥΦΑ σε περιβάλλον Αζώτου- LNG Tank under Nitrogen atmosphere		

Security Guard	TLF Field Operator	LNG O&M Department Representative

Designed: Charalampos Sifamianos, MSc - LNG O&M Department Advisor

APPENDIX II: LNG Truck Loading Service Certificate

National Natural Gas System Operator (DESFA S.A.)
Revithoussa LNG Terminal O&M Department

LNG Truck Loading Service Certificate

TLS Certificate No:	**TLS Time Slot No:**

Transport Data

TLS Order Entity:	DESFA S.A. Truck Loading Facility – Revithoussa LNG Terminal
LNG Owner:	
LNG Carrier:	
LNG Customer:	
Truck ID:	
LNG Tank Trailer ID:	
LNG ISO Tank Container ID:	
Cargo Destination:	
Date:	
TLS Start Time:	
TLS Finish Time:	

Cargo Data

Cargo:	Liquified Natural Gas (LNG)
ADR Characteristics:	UN 1972–Methane Refrigerated Liquid Natural Gas 2.1 (B/D)

Quantity Data

Truck Tare Weight (TTW)		Kg
Truck Gross Weight (TGW)		Kg
Total Loaded LNG Quantity (TGW-TTW)		Kg
Total Loaded Volume		Nm^3
Total Loaded Volume		m^3
Total Amount of Energy of Loaded LNG		KWh
Gross Calorific Value of Loaded LNG		MJ/Kg

Quality Data

Methane	CH_4		%mol
Ethane	C_2H_6		%mol
Propane	C_3H_8		%mol
n-Butane	$n\text{-}C_4H_{10}$		%mol
Isobutane	$i\text{-}C_4H_{10}$		%mol
n-Pentane	$n\text{-}C_5H_{12}$		%mol
neo-Pentane	$neo\text{-}C_5H_{12}$		%mol
Isopentane	$i\text{-}C_5H_{12}$		%mol
Hexane	C_6H_{14}		%mol
Carbon Dioxide	CO_2		%mol
Nitrogen	N_2		%mol
LNG Density	D		Kg/m^3
LNG Temperature			°C

LNG O&M Department Representative (Name/Signature)

Designed: Charalampos Silamianos, MSc - LNG O&M Department Advisor

APPENDIX III: ADR Transportation Document

ADR Transportation Document			
Transportation Document No.	Date of Loading	Date of Receipt	
001	00/00/0000	00/00/0000	
LNG O&M Department Communication Data		Shipper's Communication Data	
DESFA S.A. Representative: Charalampos Silamianos, MSc Revithoussa LNG Terminal O&M Department Advisor			
Carrier Communication Data		Receiver's Communication Data	
TLS Time Slot No.	Truck ID	LNG Tank Trailer ID	LNG ISO Tank Container ID
Vessel Name	Port/Place of Loading	Port/Place of Discharge	Place of Final Destination
Cargo of Dangerous Goods	Quantity-Net Weight	Truck Tare Weight	Truck Gross Weight
UN 1972 Methane, Refrigerated Liquid or Natural Gas, Refrigerated Liquid with high methane content, 2.1 (B/D)			
THE SHIPPER declares that the contents of this consignment are fully and accurately described above by the shipping name, and are classified, packaged, marked and labelled/placard and are in all respects in proper condition for transport according to the applicable international and governmental regulations			
CONTAINER/VEHICLE PACKING CERTIFICATE. It is declared that the packing of the goods into the container/vehicle identified above has been carried out in accordance with the applicable provisions.			
THE DRIVER declares that: The cargo can be transported by road. The cargo quantity shall be within the capacity of the vehicle's LNG tank. The cargo transportation is in compliance with all applicable requirements of the ADR.			
Shipping Remarks			
Driver's Name		Signature	
LNG O&M Department Representative Name/Signature		Receiver's Signature	

Designed: Charalampos Silamianos, MSc - LNG O&M Department Advisor