

# PORT INFORMATION



## BAHIA LNG REGASIFICATION TERMINAL

TRBA

Review 4  
June/2015

Review	Date	Control
0	10/10/2013	First issued
1	15/12/2013	Text revision
2	10/01/2014	Adaptation to the "Portaria nº 01/2014" CPBA. As-built review.
3	14/02/2014	Review: Position of buoys. Review items 6.3.2., 9.1 and 10.1. Inclusion of Annex G and Annex H
4	19/06/2015	General Review after "Portaria nº 08/2015 CPBA"(approval of Port Authority)

## SUMMARY

1.	INTRODUCTION .....	4
2.	DEFINITIONS .....	4
3.	NAUTICAL CHARTS AND REFERENCE DOCUMENTS .....	6
4.	DESCRIPTION OF TODOS OS SANTOS BAY AND ANCHORAGE AREAS.....	6
4.1.	General Description of Todos os Santos Bay.....	6
4.2.	Harms to BTS navigation .....	6
4.3.	Environmental Factors .....	7
4.4.	Port and Anchorage Organization.....	8
4.5.	Anchorage areas approaches .....	10
4.6.	Terminal Approach.....	11
4.7.	Arrangements for Berthing and Mooring.....	13
4.8.	Management and Control of Berthing and Stay .....	14
4.9.	Main Risks to Berthing and Stay.....	15
4.10.	Compliance with ISPS Code .....	15
5.	TERMINAL DESCRIPTION.....	16
5.1.	General description.....	16
5.2.	FSRU Facilities .....	17
5.3.	Characteristics of the Jetty.....	17
5.4.	Weather Limitations .....	18
5.5.	Fenders .....	18
5.6.	Access to FSRU and Carrier .....	19
6.	OPERATIONAL PROCEDURES .....	20
6.1.	Before arrival.....	20
6.2.	At Arrival .....	21
6.3.	Berthing.....	21
6.4.	Before LNG/CNG Transfer:.....	22
6.5.	Pre Cargo Transfer Operations.....	23
6.6.	During the LNG/CNG transfer .....	25
6.7.	Emergency Shutdown: .....	25
6.8.	LNG Ship to Ship Operations.....	27
6.9.	Post Cargo Transfer Operations .....	28
6.10.	Assisting unmooring and departure .....	29
7.	SAFETY PROCEDURES.....	30
7.1.	Safety Inspections .....	30
7.2.	Emergency and Fire Fighting Plans .....	30
7.3.	Safety & Emergency Response.....	30
7.4.	FSRU / LNG Carrier Safety Checklist .....	31
7.5.	Fire Prevention .....	31
7.6.	Incidents Onboard FSRU or LNG CARRIER vessels .....	32
7.7.	Security Incidents.....	35
7.8.	Escape routes & Rescue .....	35
7.9.	Restarting Operations .....	36
7.10.	Operations and Tasks Not Mentioned.....	36
	Appendix 1 – OCIMF SHIP/SHORE SAFETY CHECKLIST .....	37
	Appendix 2 – LNG SHIP TO SHIP SAFETY CHECKLIST .....	40
	Appendix 3 – NATIONAL PETROLEUM AGENCY- REGULATION nº 16 .....	45
	Appendix 4 – GOLAR WINTER MOORING OPERATION PROCEDURE .....	46
	Appendix 5 – SAFETY LETTER – LNG CARRIER.....	47
	Appendix 6 – INFORMATION TO BE EXCHANGED BEFORE TRANSFER.....	48
	Appendix 7 – EMERGENCY AND CONTACT LIST .....	49
	Appendix 8 – MOORING POINTS AND DOLPHINS LOCATION .....	50
	Appendix 9 – TYPICAL MOORING FOR SBS LAY OUT.....	52
	Appendix 10 – PNEUMATIC FENDERS LAYOUT .....	53

## 1. INTRODUCTION

This Port Information was elaborated by Petrobras Transportes S.A. (TRANSPETRO) which operates the Bahia Terminal for Regasification of Liquefied Natural Gas (TRBA). CARRIERS using the TRBA facilities shall also read and comply with this Port Information.

The operation of ships at the TRBA must be in accordance with the recommendations of the *International Safety Guide for Oil Tankers Terminals* (ISGOTT) and the convention of *International Maritime Organization* (IMO) and must follow the operation guidelines of the terminal.

The information contained in this publication are intended to give support, never to supersede or change any other kind of legislation, instructions, guidelines or official publications, national or international. Therefore, must be ignored any information contained in this Port Information that be on the contrary of any item of the above mentioned documents.

The Terminal reserves to itself the right to change any operational information herein presented, without previous notice.

The TRANSPETRO will analyze any suggestions, recommendations or corrections to the matters here dealt, envisaging information improvement. Please, come in contact with:

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## 2. DEFINITIONS

- **ANP** – National Petroleum Agency.
- **Authorized Craft** - means any tug, barge, water boat authorized by the Maritime Authority to operate at TRBA and which complies with the safety requirements.
- **BP** – “Bollard Pull” – Vessel longitudinal static tensile.
- **CARRIER** – an LNG TANKER intended to operate at Bahia LNG Regasification Terminal – TRBA, moored alongside the FSRU in double banked configuration for transferring LNG to FSRU (Ship to Ship). The same as LNGC or LNG CARRIER.
- **CARRIER’s Master** - the Captain of a LNG CARRIER or his Chief Officer or any person who for the time being is duly authorized to be in charge of the LNG CARRIER.
- **CNCO** – the Pipeline Operation Control Center (Centro Nacional de Controle Operacional) is located at TRANSPETRO headquarters, in Rio de Janeiro.
- **CNG** (or HPNG) - Compressed Natural Gas (or High Pressured Natural Gas).
- **Cool Down** - cooling of the cargo tanks, lines and equipment to gradually meet the cargo temperature, thereby avoiding fracture of the material. CARRIER shall carry out the cool down process by transferring LNG at low rate to FSRU.
- **CTMS** - Custody Transfer Measuring System.
- **DHN** - is the department of the Brazilian Navy (Diretoria de Hidrografia e Navegação).
- **Emergency Response Plan** - Plan establishes a set of guidelines for emergency response, defining roles and responsibilities for emergency situations.
- **ERS** – Emergency Release System installed on CNG and LNG arms.
- **ESD** – Emergency Shutdown, The safety shutdown is configured in two different levels:
  - ESD1: shuts off **FSRU** pumps, interrupts the operations, blocks the CNG or LNG marine loading arms valves and release the pressure to vent stack.
  - ESD2: is the sequence of the ESD, complemented by the emergency disconnection of either CNG or LNG arms.
- **FSRU** - Floating Storage and Regasification Unit. It is the GOLAR WINTER Vessel.
- **FSRU Master** - the person accountable and responsible, on behalf of GOLAR LNG LIMITED, for connection and disconnection of loading arms, communication and shutdown cables, pre/post discharge meeting, discharge procedures and emergency response and for all activities

associated with the ship to ship transfer of LNG CARRIER vessels to FSRU and operation of the regasification system and other systems onboard the FSRU.

- **Harbor Master (or Port Captain)** - means the **Maritime Authority** or its deputy, the person in charge of Bahia State Ports including all ports in Todos os Santos Bay. Called by “Capitania dos Portos da Bahia”. This **C.P.BA** is responsible to approve the “Port Rules and Regulations” (“NPCP” - Normas e Procedimentos da Capitania dos Portos da Bahia).
- **Hot Work** - means work involving sources of ignition or temperatures sufficiently high to cause the ignition of a flammable gas mixture. This includes any work requiring the use of welding, burning or welding equipment, blow torches, power-driven tools, portable electrical equipment which is not intrinsically safe or contained within an approved explosion-proof housing, sandblasting, internal combustion engine or any other tool that could generate sparks.
- **HPNG** – High Pressured Natural Gas – Same as CNG.
- **Inert Gas** - means a gas such as Nitrogen or Carbon Dioxide, or a mixture of such flue gases, containing insufficient oxygen to support the combustion of hydrocarbons.
- **ISGOTT** - International Safety Guide for Oil Tanker and Terminal.
- **MOP** - Mutual Operation Procedure, signed by Transpetro and Golar Wilhelmsen Management, defining the procedures (for CNG and LNG operations) and emergency actions to be taken by TRANSPETRO, CARRIERS and FSRU.
- **NOR** – Notice Of Readiness
- **PETROBRAS** - the TRBA’s owner. The company responsible for building and hiring TRANSPETRO to run and operate the TRBA facilities. Also hires the FSRU to storage and regasifying LNG.
- **PFSO** – Port Facility Security Officer
- **Port Authority** – The TRANSPETRO Administration (TEMADRE’s General Manager) answer as Port Authority regarding to TRBA operations, as per Regulation n. 08/2014, 14/January, 2015 from CPBA.
- **Ready To Operate** - statement from operator or vessel duty officer, informing that the alignments and other facilities are in operating conditions, ready to start or restart transfer and send out operations.
- **Responsible LNG CARRIER’s Officer** - the Master or any Officer to whom the Master may delegate authority for any operation or duty on board of LNG CARRIER.
- **Safety Inspector** - an TRANSPETRO professional, responsible to carry out before STS operation a Safety Inspection jointly to FSRU’s Representative by the criteria of Ship-Shore Safety Checklist from OCIMF/ISGOTT and Ship To Ship Safety Checklist from SIGTTO. He will assist the Masters in the STS operations, including mooring, unmooring and the complete cargo transfer.
- **STS Superintendent** - The advisory control (including mooring, unmooring and the LNG transfer) shall be undertaken by the GOLAR’s Master.
- **Ship-to-Shore Link (SSL1)** - the TRBA and FSRU have a ship-to-shore link interface, enabling systems to connect their respective Emergency Shutdown System (ESD) according SIGTTO recommendations.
- **Ship-to-Ship Link (SSL2)** - similarly, the FSRU has a ship-to-ship connections enabling vessels to perform an ESD during STS transfer, if necessary, with a fiber optic and electric cable as well.
- **SIGTTO** – The Society of International Gas Tanker and Terminal Operators Ltd.
- **Surveyor** - an independent surveyor appointed to witness the LNG STS transfer and the calculation quantity delivered.
- **TRANSPETRO** - It’s the PETROBRAS subsidiary responsible to run and operate PETROBRAS Terminals alongside Brazilian coast. There is a TRANSPETRO General Operational Manager in charge for Bahia State in Madre de Deus island responsible for the safety operation of TRBA.

### 3. NAUTICAL CHARTS AND REFERENCE DOCUMENTS

AREAS	BRAZIL (DHN)	BRITISH ADMIRALTY
Proximities of the Port of Salvador	Chart 1101	NZ 541
Port of Salvador	Chart 1102	
Todos os Santos Bay (Northeast part)	Chart 1104	
Todos os Santos Bay (West part)	Chart 1107	
Todos os Santos Bay (General)	Chart 1110	NZ 545
Rules and Procedures of the Port Authority	NPCP Salvador Port	
Support to navigation at the East Shore	DH1– II	
<a href="#">Tide Table</a>	Porto de Madre de Deus (BAHIA)	

### 4. DESCRIPTION OF TODOS OS SANTOS BAY AND ANCHORAGE AREAS

#### 4.1. General Description of Todos os Santos Bay

The Todos os Santos Bay (called “BTS”) is one of the Brazilian greatest bays. It has its harbor located between the Ponta de Santo Antônio, at E, and the island of Itaparica, at W, with a width of 5 miles; extending by 22 miles at the direction N – S having a maximum width of 18 miles at the direction E-W.

Its East margin is occupied by the city of Salvador, capital of the state of Bahia; the Northeast margin is low, and the margins North and West are mountainous. In the interior of the bay there are many islands and to the margins flow several rivers, being the Paraguaçu River the most important. The contours of the bay elevate themselves gradually and are much chopped forming anchorages well protected.

The islands of Maré, Frade, Vacas, Madre de Deus, Itaparica, Bom Jesus dos Passos, Maria Guarda and some smaller ones are located at the North area of the bay. The island of Frade is located between 5 and 8 miles at the direction Nor-northeast of the North extreme of the island of Itaparica. At the Northeast extreme of the island of Frade is the Ponta do Cavalo. Approximately 0.5 mile to the North of the Ponta do Cavalo is the island Madre de Deus. At the Ponta Mirim on the Southern limit of the island Madre de Deus, there are the facilities of the Terminal of Madre de Deus – TEMADRE.

The facilities of the Bahia LNG Regasification Terminal – TRBA are situated on the Todos os Santos Bay, at West of the island of Frade, at approximately 4 Km.

#### 4.2. Harms to BTS navigation

The bottom of the BTS is normally formed by mud. The positions of the sand banks which are demarked by buoys may be more easily identified at the charts of the region. Around 1.75 miles at West-northwest of the spotlight of Ponta de Monte Serrat there is a buoy with red lamp emitting a red



glimmer at each 5 seconds, equipped with radar reflector demarking a high depth where there is sounded 8.5 to 11m (28 to 36 ft.).

The islands of Maré, Frade, Vacas, Madre de Deus, Itaparica, Bom Jesus dos Passos, Maria Guarda and some others smaller are in the North area of the bay and are collectively named, Recôncavo Islands. The island of Frade is between 5 and 8 miles at the direction North-northeast of the Ponta de Itaparica at the North extreme of the island of Itaparica. The lighthouse of the island of Frade, international nº G 0266 Gr. Lp 2 B 6sec 5M 9m, is at an elevation of 35m (114 ft.). It is a concrete quadrangular building of 5 meters (16 ft.) of height at the Ponta de Nossa Senhora de Guadalupe.

During the navigation at the BTS, the attention must be reinforced by the ships crews, since that in the region there is a traffic of small vessels with and without own propulsion, besides the traffic of ferry boat crossing the BTS at the route Salvador- Itaparica island.

**Wrecked hulls (submerged):**

- Marker 212º from the Lighthouse Garcia d'Ávila and a distance of 4.4 miles
- Marker 170º from the Lighthouse of Santo Antônio and distances of 2.9 miles
- Marker 185º from the Lighthouse Garcia d'Ávila and distance of 5.0 miles
- Marker 218º from the Lighthouse Santo Antônio and distance of 300 meters
- Marker 291º from the Lighthouse Santo Antônio and distance of 500 meters

**Bottom risings, banks, crowns and others at the bay and Access Channel:**

- Bank of **"Panela"** – Great sand bottom rising, between the markers 245º and 009º of the Salvador Port South Jetty spotlight, at distances of 0.2 to 0.9 miles and minimum depth of 4.4 meters. This bank is demarked at S by a luminous green buoy and, at W and at N, by luminous red buoys.

**4.3. Environmental Factors**

- **Winds:** The prevailing winds are from E at the months of January, February, March, May, September, November and December, and winds from ESE at the months of April, June, July, August and October. The winds from S use to blow at the new moon and at full moon, agitating much the bay waters. The prevailing winds at the region are from E/SE with a mean speed of 12 knots. Strong gusts of wind may arise with the maximum recorded speed of 23.7 m/s (47 knots).
- **Waves:** The final value of wave height (Hs) that can actuate over the Terminal, when actuating the cold front at the NE shore, it will be the sum of the waves developed at open sea, waves with regular shape and sometimes with great height, designed by undulation. The waves generated by the wind at the observing place, generally irregular and chaotic, designed as waves. The mouth of the Todos os Santos Bay, turned to South, and its large water body extension, creates the conditions for the development of these waves when cold fronts arrive.
- **Rains:** The average annual rainfall at the region is 2,100mm.
- **Visibility:** During the winter there occur intermittent rains and the visibility may be considered from regular to good. Normally the weather conditions are considered good to operate with tanker ships. The visibility is greater than 10 km at 90% of time.
- **Tides and Currents:** The tide at the Todos os Santos Bay has characteristics semi-diurnals. The tide amplitude is situated in the range from -0.53m to 3.55m. At the Terminal access channel the current may reach the speed of approximately 1.5 knots, but the maximum current acting over the surface of the pier is of 0.6 m/s (≈1,2 knots). The winds of E will prevail with influence

over the maneuvers, mainly on offloaded ships. Use the Tide Table for PORTO DE SALVADOR (ESTADO DA BAHIA) at: <http://www.mar.mil.br/dhn/chm/box-previsao-mare/tabuas>.

- **Salinity:** The average salinity of the salt water is 35.5 ups, with small seasonal variations, with maximum values above 36 ups. (Petrobras / Fundespa, 2003; Petrobras / FUSP, 2005; Genz, 2006).
- **Density:** The average density of the salt water varies from 1022.0 to 1026.5 kg/m<sup>3</sup>.
- **Atmospheric Pressure:** The local atmospheric pressure reaches a maximum value of 1,011.5 mb, in July, and a minimum value of 1,006.2 mb, in December, resulting in an annual average variation of 5.3 mb. This amplitude is next to the value of 6.5 mb, reported at the project PROMARLAM (PETROBRAS/FUSP, 2005).
- **Air Humidity:** The relative humidity of the air reaches its maximum in May (83%), coinciding with the maximum rainfall. (INMET, 1992. Station of Ondina, for the period of 1961-1990).
- **Temperatures:** The maximum temperatures reach the highest values at the months of January, February and March, around 30 °C. The minimum climatologic temperatures occur at the months de July, August and September, between 21 °C and 22 °C. The annual average temperature is around of 25.2°C (INMET,1992).

#### 4.4. Port and Anchorage Organization

##### 4.4.1. Port Control (VTS)

The Port of Salvador doesn't have special service for traffic and navigation control.

##### 4.4.2. Maritime Authority

The Maritime Authority to which the TRBA is subordinated is the Port Authority of Salvador. Is the Maritime Authority at the limits of the ports of Salvador, Aratu and Madre de Deus, it has the responsibility to determine the actions and proceed the responsible by any incident within the port limits.

It determines that the visit of fiscal and sanitary authorities occurs before the ship berthing at TRBA pier. The inspections realization for issuance of the SOC - Statement of Compliance for LNG vessels serving the TRBA when requested by the Maritime Administration, must occur before to mooring with the Supplier at anchor in area 3 of the Salvador Port.

The ships intended to the TRBA will be visited by the Ports Health, Customs and Federal Police. The ship agent must take the measures in this sense.

All documents related with the ship dispatch at the last port visited must be shown to the port authorities.

##### 4.4.3. Pilotage

The use of Pilots is compulsory for vessels bound to TRBA from anchorage area. It's also compulsory for sailing or any other maneuver.

The three Pilotages Services ("Salvador Pilots", "Bahia Pilots" and "Todos os Santos Bay") of the BTS in standby 24 hours per day. The request for Pilot will be done by the Ship Agent, with at least 3 hours of antecedence from the time of the ship leaving the anchorage and 4 hours before the beginning of the undocking at the TRBA. The contact may be made also by means of the channel 16, VHF.



The Pilot embarkation will be done in the following coordinates: Lat.12°58'10"S – Long.38° 32'22"W, at the BTS.

The ship Master is the responsible by the maneuver. Any ship abnormalities or difficulties, like defects in mooring apparatus and equipment, rudder, deficiency of engines and/or boilers or lack of necessary equipment which could create harm for the ship navigation, berthing and undocking must be informed to the Maritime Authority.

If the Master decides not to follow the Pilot instructions to preserve the safety of ship maneuver, the Ports Captain must be communicated by written, about it through its Agent. This fact shall also be reported to the TRBA by the Agency.

#### **4.4.4. Tugs and others Maritime Services**

##### **Criteria for use Tugs:**

To escort upon entry and departure from Todos os Santos Bay, one (1) tug and pilot are to be assigned to escort from pilot boarding station to anchorage and/or terminal, and vice versa.

It is hereby established the minimum of four (4) tugs for berthing and unberthing maneuvers, out of which none with less than 40 ton Bollard Pull (BP) and reaching a total sum of the not less than 200 BP.

One (1) Fire Fighter type vessel (may be one of the tugboats taking part in the maneuver) to remain in the surroundings of the vessels during the entire "ship to ship" LNG transfer operation between the FSRU and LNG carrier.

The Safety Inspectors of TRBA will make periodic inspections (each 6 months) at the tugs which will affect the terminal maneuvers. TRBA can provide more information about the tugs, if is requested by the Master of LNG Carrier or Pilots.

##### **Communication between Tugs and Ships:**

The tugs are equipped with VHF for continuous communication ship/tugs during the mooring and undocking maneuvers. The watch is maintained during the 24 day hours at the channel 16 in order to attend the needing in case of emergency. During the maneuvers, in case of radio communication fault between the tugs and the ship, must be used International Code of Signals (from the Fourth Assembly of the Inter-Governmental Maritime Consultative Organization in 1965). The Safety Inspector stays on board during the STS operations and he can proceed the communications with tug boats and Pilots. The FSRU can contact direct the terminal control room during other periods.

##### **Port Services:**

The Terminal will provide the mooring service by means of two diesel powered motorboats to help in the cables maneuver during the docking and for undocking maneuvers when necessary. The Terminal may allow motorboats for material's delivery and provisions for the FSRU ship ONLY by previous planning.

**Carriers: provisions, crew change and other services must be done at the anchorage. The Terminal DOESN'T HAVE a motorboat for crew transportation.**

#### **4.4.5. Other Maritime Terminals**

- **PORT OF SALVADOR:** Geographic Location and Characteristics: At Todos os Santos Bay, between Ponta do Monte Serrat, at North and Ponta de Santo Antônio, at South. Geographic Coordinates: Latitude: 13° 00' 37 S, Longitude: 38° 35' 00 W. UNCTAD Locode BR SSS TIME ZONE: GMT - 3 h. Address: Av. da

França, 155 I, Comércio. CEP: 40.010-000. Salvador – Bahia. Tel: (71) 3320-1299/1268. E-mail: [portosalvador@codeba.com.br](mailto:portosalvador@codeba.com.br).

- MADRE DE DEUS TERMINAL - TEMADRE:** The Temadre is the main point of production outflow from the Mataripe Refinery (RLAM), which products supply the regions North and Northeast of the country. Geographic Location and Characteristics: situated at the Port of Madre de Deus, at the island with the same name, at approximately 15,5 miles from the anchorage at Southwest of Banco da Panela, on the Port of Salvador. Geographic Coordinates: Latitude - 12° 45'12" S, Longitude: 038° 37'27" W. UNCTAD Locode BR SSS TIME ZONE: GMT - 3 h. Address: Rua Milton Bahia Ribeiro, s/n, Suape, CEP: 42.600-000. Madre de Deus – Bahia. Tel.: 55 (71) 3642-3707/3206. E-mail: [transpetro.temadre@petrobras.com.br](mailto:transpetro.temadre@petrobras.com.br)

#### 4.5. Anchorages areas approaches

**Anchorage recommended or Designated:** The area for a LNG vessel at **Anchorage III** must be the main area for anchorage of the LNG ships arriving to Salvador for health inspection, from the authorities of ports and others. In this area only is allowed the anchorage of one LNG ship at a time. The external **Anchorage area V** will be used when there is a LNG ship occupying the internal area.

Name	Latitude and Longitude	Anchorage	Remarks
Area for a LNG vessel at Anchorage III (inside of Todos os Santos bay)	$\phi = 12^{\circ}56,20' S$ and $\lambda = 038^{\circ}35,12' W$	0.25 miles radius, 15 meters water depth; Distance of 1.3 miles west from the coast	Referred area, northwest from Area III, is established, preferably, for LNG vessels that shall operate in TRBA. Exceptionally for LNG vessels, anchorage maneuver at Area III must be performed with pilot on board and with assistance of an escort tug.
Anchorage V (outside of Todos os Santos bay)	$\phi = 13^{\circ}00,30' S$ and $\lambda = 038^{\circ}36,60' W$ $\phi = 13^{\circ}01,50' S$ and $\lambda = 038^{\circ}35,00' W$ $\phi = 13^{\circ}03,90' S$ and $\lambda = 038^{\circ}36,80' W$ $\phi = 13^{\circ}02,70' S$ and $\lambda = 038^{\circ}38,40' W$	Rectangular Area	Intended to the free anchorage of ships waiting for vacancy at the internal anchorages of the BTS (Todos os Santos Bay).

**Anchorage not Designated:** There are many areas where the anchorage is forbidden, due to the existence of underwater ducts and cables, like the following areas described below:

Name	Latitude and Longitude	Remarks
Anchorage I	$\phi = 12^{\circ}55,70' S$ and $\lambda = 038^{\circ}32,88' W$ $\phi = 12^{\circ}55,70' S$ and $\lambda = 038^{\circ}31,46' W$ $\phi = 12^{\circ}56,95' S$ and $\lambda = 038^{\circ}30,45' W$ $\phi = 12^{\circ}56,35' S$ and $\lambda = 038^{\circ}32,88' W$	Intended for refueling, inspections, small repairs and disembarkation of crews of ships with draft equal or lower than ten meters.
Anchorage II	$\phi = 12^{\circ}56,70' S$ and $\lambda = 038^{\circ}32,88' W$ $\phi = 12^{\circ}58,47' S$ and $\lambda = 038^{\circ}32,88' W$	Intended to the free anchorage of ships with draft equal or lower than ten meters.

	$\phi = 12^{\circ}57,20'S$ and $\lambda = 038^{\circ}30,89'W$	
Anchorage III	$\phi = 12^{\circ}58,47'S$ and $\lambda = 038^{\circ}33,16'W$ $\phi = 12^{\circ}58,47'S$ and $\lambda = 038^{\circ}34,92'W$ $\phi = 12^{\circ}55,98'S$ and $\lambda = 038^{\circ}35,58'W$ $\phi = 12^{\circ}56,62'S$ and $\lambda = 038^{\circ}33,16'W$	Intended for refueling, inspections, small repairs and disembarkation of crews of ships with draft equal or greater than ten meters.
Anchorage IV	$\phi = 12^{\circ}55,80'S$ and $\lambda = 038^{\circ}33,60'W$	Intended for ships in quarantine situation, designed by the Maritime Authority.

#### Restricted Areas:

**Exclusion Zone** - It is hereby established the exclusion zone within a radius of 150 meters around the side shell of the LNG vessels berthed / moored. Within the established zone, it is prohibited to carry out any service, including maintenance, which can generate any source of ignition, without the prior port authority consent.

**Safety Zone** - While at anchorage, it is hereby established Safety Zone the area comprehended by a 500 meters radius around the ship, where it is forbidden the entry, transit or stay of vessels that are not service providers nor are supporting the maneuvers, without the prior permission of the port authority.

#### 4.6. Terminal Approach

##### Location:







Latitude  $12^{\circ}48'52'' S$  and Longitude  $038^{\circ}40'45'' W$ .

##### Access Channel and Evolution Basin:

**Access Channel:** The access to the TRBA is done by the channel of São Roque/Paraguaçu that has lighting beacons. The ships may demand to the Terminal facilities during the daily hours. The access channel is indicated by the following navigational aids: 1) Lateral buoy BB REGAS 2; 2) Coroa das Pedras buoy; 3) Lateral buoys BE REGAS 1, 3, 5 and 7.

**Evolution Basin:** The evolution basin consists of the ellipse contained in the quadrilateral bounded by the signaling Especial REGAS 1 and 2 buoys, composed by two circles of 630 meters in diameter, limited at NW by the 15 meters isobathimetric curve, supporting vessels with up to 315 meters in length.

The buoys are distributed according the following table, as Technical Report nº: RL-4100.25-6443-933-PIG-001 Rev. 0 - Release of singling buoys of the access channel to Paraguaçu River and Regasification Terminal.

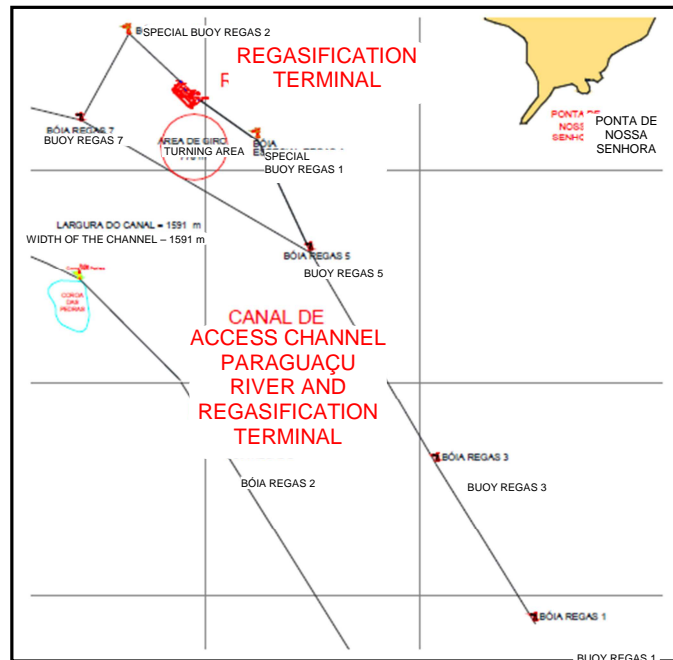
	Color	Geographic Coordinates		UTM Coordinates	
		Longitude	Latitude	E	N
BUOY REGAS 1		$038^{\circ}38'31.09'' W$	$12^{\circ}52'15.81'' S$	538,845.62	8,577,096.34
BUOY REGAS 2		$038^{\circ}40'39.67'' W$	$12^{\circ}51'09.04'' S$	534,972.97	8,579,152.48
BUOY REGAS 3		$038^{\circ}39'09.35'' W$	$12^{\circ}51'23.01'' S$	537,694.64	8,578,719.68
BUOY REGAS 5		$038^{\circ}39'59.39'' W$	$12^{\circ}49'54.73'' S$	536,189.93	8,581,433.63
BUOY REGAS 7		$038^{\circ}41'25.81'' W$	$12^{\circ}49'03.40'' S$	533,586.73	8,583,013.65
BUOY SPECIAL 1		$038^{\circ}40'25.92'' W$	$12^{\circ}49'02.11'' S$	535,391.13	8,583,050.50

<b>BUOY SPECIAL 2</b>		038°41'07.76" W	12°48'30.02" S	534,132.03	8,584,132.03
<b>FTE DOLFIN 1</b>		038°40'48.50" W	12°48'47.29" S	534,712.11	8,583,507.54
<b>FTE DOLFIN 2</b>		038°40'40.99" W	12°48'54.64" S	534,938.39	8,583,281.26
<b>Coroa de Pedras</b>		038°41'24.34" W	12°49'57.92" S	533,629.03	8,581,338.77

**Signs Detailing:**

	Type	Luminous Charact.	Period	Detailed phase	Height	Altitude
<b>BUOY REGAS 1</b>	Articulated Buoy	Lp. E	3s	E.0.3 Ecl. 2.7	x	x
<b>BUOY REGAS 2</b>	Articulated Buoy	Lp. V	3s	E.0.3 Ecl. 2.7	x	x
<b>BUOY REGAS 3</b>	Articulated Buoy	Lp. E	5s	E.4.0 Ecl. 1.0	x	x
<b>BUOY REGAS 5</b>	Articulated Buoy	Lp. E	3s	E.0.3 Ecl. 2.7	x	x
<b>BUOY REGAS 7</b>	Articulated Buoy	Lp. E	5s	E.4.0 Ecl. 1.0	x	x
<b>BUOY SPECIAL 1</b>	Articulated Buoy	Lp. A	2s	E.0.8 Ecl. 1.2	x	x
<b>BUOY SPECIAL 2</b>	Articulated Buoy	Lp. A	2s	E.0.8 Ecl. 1.2	x	x
<b>FTE DOLFIN 1</b>	Spotlight	ISSO	x	F. A	4.80m	4.975m
<b>FTE DOLFIN 2</b>	Spotlight	ISSO	x	F. A	4.80m	4.975m

The draw above shows this configuration.



- **Speed restrictions, crossing and overtaking:** During all LNG vessels maneuvers within the Pilotage Area (ZP) of Salvador or while at anchorage it is FORBIDDEN the approach of any vessel less than 500 meters from the ship, except those intended for escort and maneuver support. The agency designated by the FSRU or LNG carrier is the responsible for the coordination

amongst the various involved parties (Pilots, Ferry-Boats, ports, terminals, etc) and the provision of the necessary means to ensure achieving the above purpose.

- **Draft:** The maximum draft foreseen for the ship will be 12.50 meters. The minimum depth at the access channel is approximately 17 meters. The limit of draft for berthing and undocking does not change during the year.
- **Maximum speed of Navigation:** The maneuver speed at the channel shall not be greater than 6 (six) knots at the bottom and the ship may not show list. The maximum speed for approach to the evolution basin shall not exceed 4 knots.

#### **4.7. Arrangements for Berthing and Mooring**

**Determinants for maneuvers:** (as presented at Portaria 08/2015 CPBA)

- I - The berthing and unberthing maneuvers of LNG vessels (FSRU and Carrier) will be carried out only during daytime;
- II - Daytime maneuver: That in which POB is comprehended between sunrise subtracted 1h30min and sunset subtracted 02h30min (berthing) and sunrise subtracted 30 minutes and sunset subtracted in 1h (unberthing);
- III - The maximum recommended draft for berthing is 12.5 meters;
- IV – Pilot boarding is to take place at the pilot boarding station (PEP);
- V - Maneuvers are conditioned to wind speed of up to 20 knots, exception made for winds coming from SOUTH and SOUTHEAST, limited at 15 knots;
- VI – Current velocity of up to one (1) knot;
- VII – Wave height not greater than 0.9 meters;
- VIII - Berthing of the LNG carrier is only to occur with the FSRU equipped with a minimum of 04 YOKOHAMA type fenders alongside the latter.
- IX - The agency designated by either the regasification vessel or the LNG carrier is to communicate to all involved parties (Port Authority, pilotage, navigation agencies and tugs) the LNG vessels (FSRU and Carrier) maneuver intent 72 hours in advance;
- X - Tides ranging: from -0.53 up to 3.55 meters;
- XI – Berthing: daytime maneuver, at flood tide, with ship leaving Salvador within the period of 2 hours before low tide up until 3 hours before high tide. Unberthing: daytime maneuver, nondependent on tide; and
- XII – Berthing: Portside.

#### **Berthing Speed and Angle:**

It is limited by the absorption capacity of the fenders and of the pier structure. The maximum speed of berthing will be **15cm/s**. The Docking Aid System is available for the Master and the Pilot, this is a monitoring system of speed and berthing angle for maneuvers.

#### **Recommended Mooring:**

The Petrobras/LNG Shipping will simulate by OPTIMOOR software the position between FSRU and Carrier due to define the compatibility of LNG arms vs manifold and the position of mooring lines.

Every ship intended to the TRBA must be capacitated to execute the mooring below. The mooring safety is of ship master responsibility and will be assessed by a qualified safety inspector. The berthing of Carrier in side by side configuration is a FSRU master responsibility.

The Terminal may cancel or interrupt an operation in which the Ship berthing is deemed unsatisfactory. The minimum configuration mooring is defined below.

**Jetty Mooring System:**

The TRBA has 6 (six) Mooring Dolphins (named DAM 1 to 6) and 4 (four) Breasting Dolphins (named DAT 1 to 4). Mooring system is dimensioned following the recommendation of OCIMF. The total number of hooks is 18 (eighteen). The release of the mooring lines is done by remote control, or even manually through a lever. The safety system of overload is provided with loading cells located in the pins of the hooks.

	DOLPHIN	BITS / TRIP HOOKS	MAXIMUM LOAD
<b>BERTHING</b>	DAT 1	01 bit/2 hooks	2x125 tons each
	DAT 2	01 bit/2 hooks	2x125 tons each
	DAT 3	01 bit/2 hooks	2x125 tons each
	DAT 4	01 bit/2 hooks	2x125 tons each
<b>MOORING</b>	DAM 1	02 bits/6 hooks	3x150 tons each / 3x125 tons each
	DAM 2	01 bit/3 hooks	3x125 tons each
	DAM 3	01 bit/3 hooks	3x125 tons each
	DAM 4	01 bit/3 hooks	3x125 tons each
	DAM 5	01 bit/3 hooks	3x125 tons each
	DAM 6	02 bits/6 hooks	3x125 tons each / 3x150 tons each

**FSRU Mooring System (for LNG Carriers):**

The system installed on board the FSRU consists of 6 (six) triple 150 t QRH complete with 3 t capstan and hook release system, and 1 (one) double 150 t QRH complete with 3 t capstan and hook release system at the Jetty - minimum proof load is in accordance with OCIMF - Mooring Equipment Guidelines. Each QRH is also equipped with a load monitoring system with adjustable Load alarm.

The hook release system provides the means of releasing mooring lines from QRH units efficiently and with high level of safety.

A QRH can be manually, locally or remotely released. In addition, two triple hooks on the jetty are part of the LNGC mooring system and are controlled by the FSRU).

**Note:** The arrangements for berthing and mooring available are described at Appendix 8 and 9.

**4.8. Management and Control of Berthing and Stay**

The maneuvers of berthing and undocking of ships at the TRBA must be executed always with the participation of Pilot capacitated and utilizing tugs in quantity and with the tensile capacity specified in this document.

All maneuvers are followed and recorded by TRBA through mobile cameras of closed circuit of television.

At the FSRU berthing, the Safety Inspector will be positioned to assess the maneuver and guide the positioning of the FSRU relatively to the loading arms.

At the Carrier berthing, the FSRU Master will be in charge to guide this positioning.

A linesmen team is available (at the jetty and FSRU) to place the mooring lines at bits and slip hooks.

#### 4.9. Main Risks to Berthing and Stay

The climatic conditions at the access channel, evolution basin and piers of berthing are normally very favorable and safe for navigation, maneuver and stay.

During the transfer operations of LNG and CNG the mooring lines must be constantly monitored in order to avoid the excessive tensioning of lines to avoid the tearing of the same.

In case of atmospheric discharges (lighting), the operations must be suspended until the meteorological conditions are restored.

When the limits of winds are reached the operation and berthing at the TRBA must be suspended.

#### 4.10. Compliance with ISPS Code

The TRBA is a installation operated by the Maritime Terminal Alves Câmara - TEMADRE. This port installation is certified by ISPS Code with IMO Number: 24064BRSSA.

The TRBA implemented protection measures of enterprise safety applicable to the ships and port installations, at terms of the requirements of the IMO, through the adoption of the International Ship and Port Facility code.

In case of needing, these protection measures may be initiated by the ship through the supervisor of Terminal Port Safety (PFSO - *Port Facility Security Officer*) or through the channel 16 of VHF.

The access control will occur before the embarkation of the visitant to the transport mean that will bring him to Terminal, regardless of its place of embarkation (Madre de Deus or Salvador). This procedure is considered as preventive and don't avoid or impede new checking by the watchman in service at the platform entrance of the TRBA duly said.

The TRBA is considered as restrict with access only for the people which work there routinely or which have real need for entrance duly authorized by the Management of TEMADRE and duly accompanied by effective personnel from the own installation.

The terminal is provided with an internal watching circuit (CCTV) for monitoring the activities and ships at the TRBA area and for compliance with the ISPS Code.

The TRBA Reception watchman will receive the information related to the authorized vessels, persons and material with authorized access. This data will be received from shore, according to the foreseen in the movement program existing for this terminal, from the responsible by the embarkation control and check. The identification, authorization and register to access the TRBA must be obtained yet onshore, before embarkation, using the same procedures existing in the ISPS Code.

At the platform reception, the watchman in duty will check and inspect of persons and luggage, not supplying badges or any procedures for local register and release of access to that installation.

All persons wishing to access the FSRU through the Terminal must be previously identified by the Agent (all of crew change, embark of maintenance technicians; material, spare parts or provisions delivery or garbage removal). See the table below.

	Federal Police authorization	Documents	Baggage Inspection	Remarks
Access for Agent	No	Brazilian ID card	Randon choice	Prior notice to TRBA by the Agent Access by boat (only)
Access for Technicians (only for FSRU)	No	Brazilian ID card	Randon choice	Prior notice to TRBA by the Agent
Access for Technicians (foreigner) to the FSRU	Yes	Passport	Randon choice	Prior notice to TRBA by the Agent



Crew change (only for FSRU)	Yes	Brazilian ID card or Passport	Randon choice	Prior notice to TRBA by the Agent
Provision delivery (only for FSRU)	No	Brazilian ID card	No	Prior notice to TRBA by the Agent Need pre approval by ANVISA
Garbage removal (only for FSRU)	No	Brazilian ID card	No	Prior notice to TRBA by the Agent Need pre approval by ANVISA
Relatives access (only for FSRU)	Yes	Brazilian ID card or Passport	Randon choice	Prior notice to TRBA by the Agent

## 5. TERMINAL DESCRIPTION

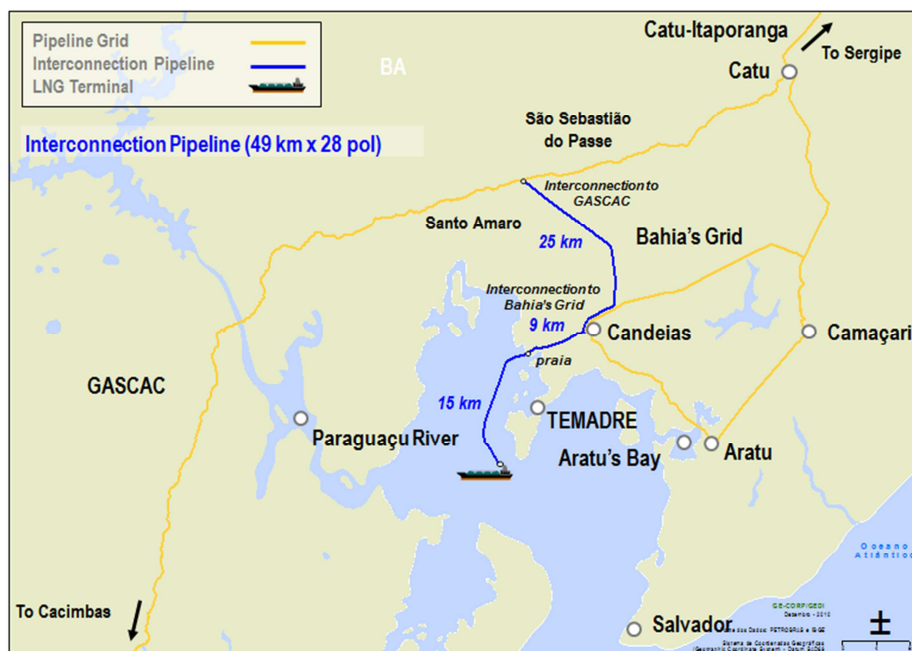
### 5.1. General description

The Bahia Regasification Terminal is a pier offshore type island, built in 2013, with 01 berth for mooring of a storing and regasification ship (FSRU - Floating Storage and Regasification Unit) capacitated to store and regasification 125,000 m<sup>3</sup> (FSRU Golar Winter) and 216,000 m<sup>3</sup> (Q-Flex) of Liquefied Natural Gas (LNG).

This FSRU Golar Winter, by means of regasification skids able to vaporize the LNG turning it in CNG (compressed natural gas), at a flow rate up to 14 million m<sup>3</sup>/day (@20 °C and 1 atm), at a pressure of up to 102 kgf/cm<sup>2</sup>.

A supplier ship (Carrier) with capacity (max) to transport up to 140,000 gross tons (TPB) is eventually berthed alongside of the ship FSRU, following the configuration *side by side*, using pneumatic fenders installed between them, for the transference of LNG using two cryogenic loading arms installed on board of the regasification ship (FSRU).

After the vaporization of the LNG, the CNG is offloaded by means of two offloading arms for high pressure natural gas installed at the pier operations platform and injected at the gas pipes net through a Gas Pipe with 28 inches (diameter) that crosses a 15.5 km underwater stretch and other terrestrial of 29.5 km.



## 5.2. FSRU Facilities

The FSRU Golar Winter is a prismatic type vessel converted into an FSRU. It has approximately 277 meters in length, 43,4 meters in width, rising approximately 43 meters above the water line to its highest point. The FSRU's draft is from 9,7 to 12,50 meters depending on cargo onboard. The FSRU has a net storage of approximately 138,000 CM of LNG in four prismatic containment tanks. It has peak vaporization capabilities of 14 MMCMD. The vaporization system is capable to operate at a minimum send-out rate of 1,5 MMCMD.

The FSRU is equipped with three x 12" LNG loading arms on starboard side to connect to the CARRIER manifold equipped with sensors in order to Shut Down the operations and disconnect the arms.

### Physical Details of FSRU for side by side operation:

Note: The data are not from the pier, but from the FSRU, as it refers to compliance with the Supplier in SBS configuration, and not from the Supplier with TRBA (at SBS the terminal is the FSRU Golar Winter).

CHARACTERISTICS	MIN	MAX
Summer deadweight	48,857 t	110,000 t
Maximum displacement	-	150,000 t
Volumetric capacity	89,000 m <sup>3</sup>	217,000 m <sup>3</sup>
Length (LOA)	239 m	315 m
Maximum width	-	50 m
Body Length Total Parallel	62 m	
PBL Forward of Manifold	23 m	
PBL Aft of Manifold	39 m	
Bow to Manifold Distance	97 m	188 m
Stern to Manifold Distance	117 m	188 m
Height of Manifold above the waterline (envelope of LNG arms)	13 m	28 m
Air draft	No restrictions	No restrictions

## 5.3. Characteristics of the Jetty

### Berth Characteristics:

- Total length of the pier: 330 m
- Deadweight tonnes (DWT) up to 125,000 tons;
- Depth of 17 meters;
- Length of vessel up to 315 meters;
- Distance between fenders (external / internal) - 110/80 meters;
- Berthing - starboard or port side.

### Size Restrictions:

- |  |   |
|--|---|
| <p style="text-align: center;"><b>Regasification Ship</b></p> <ul style="list-style-type: none"> <li>• Deadweight tonnes (DWT) up to 125,000 ton;</li> </ul> | <p style="text-align: center;"><b>LNG Carrier</b></p> <ul style="list-style-type: none"> <li>• Deadweight tonnes (DWT) up to 125,000 tons;</li> </ul> |
|--|---|

- |  |  |
|--|--|
| <ul style="list-style-type: none"> <li>• Maximum displacement of 146,500 tons;</li> <li>• Draft of up to 12.5 meters;</li> <li>• Length of up to 315 meters;</li> <li>• Breadth of up to 50 meters.</li> </ul> | <ul style="list-style-type: none"> <li>• Maximum displacement of up to 146,500 tons;</li> <li>• Draft of up to 12.5 meters;</li> <li>• Length of up to 315 meters;</li> <li>• Breadth of up to 50 meters.</li> </ul> |
|--|--|

#### 5.4. Weather Limitations

ACTIVITY		WIND (knots)	WAVE (meters)	ACTION
FSRU or CARRIER	Mooring	< 20 < 15 (S, SE)	0,9	
	Unmooring	> 20		Mooring and Unmooring shall be suspended
		> 35		Tugs shall be requested to be close to the FSRU or CARRIER LNG loading Arms drain and disconnection previously.
	Operations	> = 30 persistent		Interruption of STS operations.
STS Operation	LNG arms disconnection	> 35 persistent		

#### 5.5. Fenders

##### Jetty Fenders:

The dimensioning of the JETTY fenders has taken into consideration the berthing energy. The energy absorbed by the fender was calculated based on PIANC recommendations, considering a Q-Flex type vessel.

Main recommendation is to limit the approximation angle during docking, which must be less than 15º between the longitudinal axis of the ship and the longitudinal axis of the TRBA, with a maximum berthing velocity of 0,15 m/s.

##### Floating Fenders:

There are at least 04 (four) pneumatic floating fenders (9m x 4,5m) and 2 (two) baby fenders (3,0m x 1,5m) to berth a CARRIER alongside FRSU.

The fenders are designed according to PIANC recommendations. The maximum relative approach velocity should not exceed 0,10 m/s, which shall be ensured by LNGC Master and Pilot onboard the latter.

The pneumatic floating fenders is inspected and certified by the terminal after unmooring every CARRIER, in order to maintain the integrity of the equipment.

According to the project and Port regulation, only four (4) fenders is needed to moor a CARRIER alongside the FSRU.

## 5.6. Access to FSRU and Carrier

### Access to FSRU:

The TRBA is fitted with a hydraulic gangway, located on the portside aft of the FSRU cargo arms. The gangway shall be operated by TRANSPETRO personnel. GOLAR shall notice TRBA of any problem regarding access to and from the jetty to the FSRU.

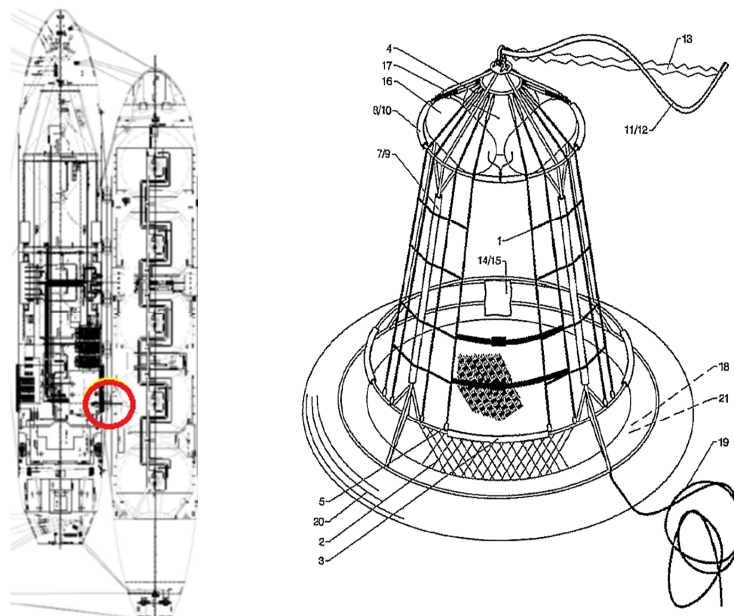
### Access to CARRIER:

Due to the risk nature of personnel transfer using a crane, the FSRU Master must be in charge of, or at least aware of, the transfer taking place and be confident that the FSRU's procedures are being followed. The offshore basket is type ESVAGT 1145-4.

Carriers have to provide availability of clear deck space, with no obstructions.

Basket characteristics:

Diameter	Height	Capacity	Weight (with 4 people)
2,6 m	3,15m	4 people	1000kg



### ATTENTION:

- If doesn't have enough space to land the basket properly, the carrier must build a platform (by scaffolds or wooden).
- If a boat is required to access the ship, the master of this ship needs to arrange this boat.

Some examples of platforms:



## **6. OPERATIONAL PROCEDURES**

### **CONDITIONS OF USE:**

- Masters of all LNG FSRUs and LNG CARRIERS using the TRBA facilities shall be in accordance and be subjected to Port, State and National regulations.
- As per signing the Safety Letter before beginning of operations, acknowledging the responsibility and liabilities whilst using TRBA facilities.
- During the ship stay at TRBA are executed several actions to ensure a safe operation and manage the risks in a way to minimize them. At all phases, as described in the below sub-items, the provisions are taken with the purpose of facilitate the operations and planning them adequately.

### **6.1. Before arrival**

The official limit of the port is the inlet harbor that is on the breast of the lighthouse of Santo Antônio. The time when passing by the breast will be considered as official time of arrival (NOR). The port authorities are called by the ships agents as a function of arrival and prevision for berthing.

### **FSRU Pin configuration of the Electrical Pyle national ESD system in use:**

- PYLE 06/07 – ELEC TEL HOTPHONE
- PYLE 13/14 - ESD FSRU to Ship
- PYLE 15/16 - ESD Ship to FSRU
- PYLE 17/18 - ESD Umbilical continuity

### **Cool down Procedures:**

- The vessel (Carrier) is to arrive with her lines warm. The cooldown process of LNGC and FSRU at the same time.

### **Tank Pressure limits:**

- The vessel (Carrier) is to arrive with tank pressure around 100 mbar max (recommendation).

### **Carrier's Pre-Arrival Communications:**

- To assist in planning and to satisfy contractual obligations, the pre-arrival messages shall be sent to FSRU GOLAR Winter, PETROBRAS and TRANSPETRO.

**Pre-arrival Messages:**

- On Departure from Loading Port, and 96, 48, 24, 12 and 06 Hours prior to arrival at Salvador Port anchor area; LNG Carrier shall send notices to update its position. Agent's shall be requested any other additional information required by the Port and local authorities: LNG carrier's name & call sign; BB ETA and Arrival Draught; Estimated average cargo temperature on arrival; Confirm the all the navigation, mooring, safety & engine systems, cargo & boil off systems, gas detection and safety alarms have been tested and/or are fully operational; Cargo tanks/lines are free of oxygen and have no leakage; ISPS Security Level. The Vessel shall establish the first contact with the port control on the port working frequency (channel 16) at least of 2 hours before her ETA. If the ETA changes by more than 4 hours, the notification shall be updated.

**On Arrival:**

- Once the LNG Carrier has arrived at the pilot station or customary anchorage, has cleared the necessary formalities with the relevant authorities and is ready in all respects to proceed to berth and commence unloading, the Master of the LNG Ship shall give a notice (Notice of Readiness) sent by electronic mail or facsimile to the FSRU Master.

**6.2. At Arrival**

Repairs on board must be done at the anchorage area. Only the ship FSRU may execute services with the ship berthed, through previous authorization of the Terminal.

When berthed, after the safety inspection done by the Operations Safety Inspector, based on the Safety Checklist of the ISGOTT and SIGTTO, if there is pendency not solved by the crew, the ship will not receive authorization from the Terminal to begin the operation. The beginning of the operation will only happen after the fulfillment of the Initial Letter, by the representatives of shore and board. The Safety Checklist Ship/Land contained at (Annex A of "ISGOTT" and SIGTTO) is checked and fulfilled by the Safety Inspector during the initial release of the ship.

**6.3. Berthing**

**System AIS:**

- The TRBA has a system of ships maneuvers monitoring, based on the Automatic Identification System (AIS). The AIS must be turned on while the ship is navigating, anchored, in the stage of mooring or undocking.
- The ISGOTT recommends that on terminals with the presence of flammable vapors the equipment must be kept on, or alternatively be earthed during the operations of load/offload, in order to preserve the data manually inserted. After the berthing the equipment must be turned off earthed, and after the disconnection and before undocking must be turned on again to allow that the terminal keeps monitoring the vessel.

**Ship berthing:**

- The mooring lines must receive permanent care in order to keep the ship always berthed. All lines must be kept under suitable tensioning during the operation, with winches under brake, being not permitted the use of automatic tensioning winches. All mooring lines must be of same type, gauge and material (fiber or wire), not being permitted the use of mixed moorings.
- Lines of emergency tug must be left pending up to the water line, by the bow and quarter of the opposite board of the berthing, and passed at the bits of board, keeping the lines eyes at the height of the water during all operation.

- The Terminal has vessels and personnel to transport the mooring lines from the ships to the pier and from the Supplier to the FSRU.

#### **6.4. Before LNG/CNG Transfer:**

##### **Authority and Accountability:**

- The FSRU's GOLAR Master shall be responsible for the safety of the entire LNG Ship to Ship transfer, and is appointed as advisory control superintendent from the LNG CARRIER mooring until the unmooring and departure.
- Moreover, the FSRU's Master shall be responsible for the safe operation of his ship (including cargo-handling operations) and the safety of the FSRU's personnel at all times. The FSRU Master shall sign this document in acknowledgment of his own responsibility.
- The LNG CARRIER's Master shall also be responsible for the safety operation of his own ship, including cargo-handling operations and the safety of the LNG CARRIER's personnel at all times.
- The Master shall be required to sign a Safety Letter of acknowledgment (Appendix 5 – Safety Letter - Carrier).
- A FSRU's Officer shall be present in the LNG CARRIER's Cargo Control Room (CCR) to monitor operations and assist in communications when necessary, up until the unloading rate is achieved.

##### **Electrical earthing:**

- The loading arms are electrically earthed individually. The ship electrical earthing may be done also by means of the earth cable, connected to the terminal structure.

##### **Communication Means:**

- The communications are made with the ships by means of radios VHF in a maritime frequency previously agreed and recorded. A secondary way, through radio VHF and/or UHF terrestrial, is agreed for fault on the main system.

##### **Communication Means of the Control Room:**

- For external and internal contacts with the several operational and administrative areas are described at Appendix 7.

##### **Soot Blowing:**

- It is forbidden to make soot blowing or cleaning of boiler's tubing with the ship berthed. Precautions must be taken to avoid the escape of sparks by the stack. The fault with this regulations will cause one or more of the following penalties: immediate interruption of the operations; fine by competent authorities; obligatory undocking of the ship from pier; infraction communication to the owners; charge on the ship by the fines, time lost and all any other expenses related incurred by this fact.

##### **Access of small vessels:**

- Must be strictly observed the prohibition of the permanency of small vessels not authorized alongside berthed ships or at their proximities. Only the service vessels of the Terminal or the authorized ones may be at the proximities or at alongside, since they comply with all safety conditions. The fault with this rule must be communicated to the competent authority.

##### **Protection against product return and overflow:**

- To avoid eventual product return to the FSRU during the offload operation (regasification) to the gas pipeline, there are installed check valves at the discharge lines 12"-G99-6443-001-Fc and 12"-G99-6443-002-Fc downstream of the offload arms BC-6443001-A/B.



**Propeller Maintenance:**

- The ships berthed may not movement their propeller(s) whilst connected to the loading arms. A ratchet may be used after the due notice to the terminal operator and approval by the Safety Inspector, but the propeller must be moved in so slow way that the absolute safety is reached. The ships will be in charge of any damages resulting from these procedures.

**6.5. Pre Cargo Transfer Operations**

**Access between the FSRU and LNG Carrier:**

- The FSRU is fitted with a hydraulic operated personnel transfer basket which is located on the starboard side aft of the FSRU's cargo arms. The personnel transfer basket will land aft of the LNG Carriers cargo manifolds and form part of the pre-arrival compatibility checks.
- On completion of mooring the Pilot and LNG carrier's Master will confirm to the FSRU Master that the LNG carrier is securely moored ("All Fast") and that the personnel transfer basket can now be perated and land on the LNG Carrier's deck and ESD cable to be connected.
- Before landing the personnel transfer basket on to the LNG CARRIER, a Responsible LNG CARRIER's Officer must agree with the FSRU Officer who operates the equipment that it is safe to land the personnel transfer basket. Thereafter boarding of FSRU personnel can take place.

**Connecting ESD:**

- The LNG carrier will connect to the FSRU's ESD system. The FSRU's Primary ESD connection is an optical link and the secondary (back up) system is electrical.

**Mooring Integrity & Safety Checks:**

- Prior to connecting the unloading arms and/or commencement of the 'Pre-Unloading Meeting', the FSRU Master or his authorised deputy shall together with a Responsible LNG CARRIER's Officer check and confirm that all moorings are tight, brakes properly hardened up and winches are out of gear, fire fighting equipment is deployed, fire wires are rigged correctly, offshore manifolds are fully blanked and tight and other areas of general safety.
- On completion of confirming mooring integrity and safety, and following the conclusion of the safety meeting connection of unloading arms may proceed.
- The master of the LNG Carrier must ensure that the vessel is moored properly and safe according to provided agreed mooring layout.
- In the process of conducting the mooring integrity other safety checks as per the LNG CARRIER/FSRU Checklist, should be confirmed as far as possible. Any defects discovered during the inspections will be raised and discussed with the Master and Chief Officer. If necessary an Observation Note will be raised by the FSRU. On completion of the visual inspection the LNG CARRIER/FSRU Safety Checklist shall be completed.

**Water Sprays:**

- After When the LNG CARRIER is safely moored to the FSRU, and the arms connected, the water curtain should be started, both, on the LNG CARRIER and on the FSRU. The Fire hoses will remain pressurised at all times on both the FSRU and the LNG CARRIER.

**Pre Cargo Transfer Meeting:**

- After the LNG CARRIER/FSRU Safety Checklist has been completed and prior to the opening Custody Transfer readings a 'Pre Cargo Transfer Meeting' shall be held on board the LNG CARRIER.

- The attendees of this meeting shall be the LNG CARRIER's officer responsible for cargo management and the FSRU's responsible officer for cargo management, the Independent cargo SURVEYOR, PETROBRAS representative and any other individual with a recognized and legitimate interest in the cargo transfer operation.
- The purpose of this meeting is to ensure that all aspects of the cargo transfer and associated activities are clearly understood and documented, using the FSRU's "Activity Schedule". The agenda for this meeting shall include as a minimum for normal cargo transfer, but not necessarily be limited to the following: Status of cargo tanks on arrival (temperature and pressure); Sequence of ESD tests; Cargo Arms Cool-down procedure – Cooldown; Vapour handling; Ramp up; Bulk cargo transfer procedure; Ramp down; Drain purging and disconnecting; Ballasting; Anticipated weather and sea conditions; Communications between FSRU, LNG CARRIER & stand-by tug boat; Emergency Procedures and Marine Security.

**Communications Alongside:**

- Communications between LNG CARRIER and FSRU must be established before commencement of cargo transfer operations. Communications systems will be confirmed at the compatibility stage and FSRU configuration will be confirmed to the LNG carrier separately.
- The FSRU provides a hot phone between LNG carrier cargo control room and FSRU's cargo control room. In addition FSRU will provide the LNG carrier with a hand held UHF Radio, spare battery and charger for the unloading operation. In addition FSRU and LNG carrier will also monitor VHF Channel 16.

**Connecting Cargo Arms:**

- The LNG Carrier shall arrive with short distance pieces fitted to the cargo manifold assigned for unloading. 2 liquid and 1 vapour strainers/filters shall be fitted to the LNG CARRIER assigned unloading lines and the filters should be of 60 mm mesh.
- Earth connection should follow recommendation in ICS Guide for Liquid Gas.
- The FSRU Operator shall be in charge of connecting the Cargo and Vapour Arms to the LNGCarrier and connection for the arms shall be performed from the FSRU Terminal Platform and/or remotely controlled at the LNG Carriers Cargo Manifold.
- The first cargo arm to be connected shall be the Vapour line from the FSRU to the LNG CARRIER's Vapour Manifold. Thereafter, the two liquid cargo arms shall be connected to the LNG CARRIER's assigned cargo manifolds.

**Pressure Test & Purging of Cargo Arms:**

- Cargo arms will be pressure tested with nitrogen to a pressure of 4 bar (g) for liquid arms and 1 bar(g) for vapour arm. A leak test will be carried out on the LNG CARRIER's manifold flange using a soap solution.
- The arms will be depressurised by opening the vent at the LNG CARRIER's manifold and Oxygen (O<sub>2</sub>) readings will be taken at this vent. The process of pressurising and purging shall be repeated until the Oxygen (O<sub>2</sub>) content is less than 1% by volume.

**Gas Burning:**

- Gas burning on board of the LNG CARRIER is NOT permitted from just before opening CTMS prior to discharge until after closing CTMS (see "DEFINITIONS") after completion of discharge unless specifically agreed with FSRU Master and PETROBRAS or TRANSPETRO Representative.

**Gauging – Custody Transfer Measurement:**

- Before the LNG CARRIER's manifold valves are opened, gauging of the LNG CARRIER's tanks will take place on all occasions. This process is to be witnessed by the Responsible LNG CARRIER's Officer, the

Responsible FSRU Officer, the Independent CARGO SURVEYOR, TRANSPETRO Representative and any other individual with a recognized and legitimate interest in the loading operation.

**Warm ESD Test:**

- In addition to any tests that may be carried out by the FSRU prior to the LNG carrier's arrival, ESD tests shall be conducted in conjunction with each arriving LNG carrier.
- When both FSRU and LNG CARRIER have confirmed ready for test, the LNG CARRIER shall initiate an ESD. After resetting the FSRU shall initiate an ESD test with the LNG CARRIER (if is possible, during the operation of spray/stripping pumps on circulation).
- All valves and equipment connected to the ESD system must be operating properly when the ESD System is released. Upon completion of a successful ESD test, the cool down operation is ready to commence.

**6.6. During the LNG/CNG transfer**

**Monitoring of Operation Pressures and Flow Rates:**

- The load transfer is recorded by the representatives of board and shore at the ship manifold at each hour. The Terminal controls the internal variables pressure and flow rate, which are checked in real time by means of the supervisory system available at control room. Any change at the operation conditions must be communicated and documented between the parts.

**Repairs on board and at pier:**

- Repairs or maintenance services of any nature shall not be affected, if they involve or come to involve, risk of sparks or others means of ignition, while the ship is berthed to the Terminal piers. At extreme cases, all safety rules must be observed and followed. Repairs that involve the pier installations or cause any restriction to ship FSRU during the stay must be previously authorized by the Terminal, after formally requested by the ship representative.

**Safety Inspection:**

- The intermediate inspections, according to Annex A of "ISGOTT", will be realized by the Safety Inspector during the LNG transfer operation from Carrier to FSRU, in continuous periods each 2 hours. The inspections at FSRU must be realized preferably at each 6 hours, when transferring CNG.

**6.7. Emergency Shutdown:**

**"Ship to Shore Link" (SSL1) and "Ship to Ship Link" (SSL2):**

- The TRBA is equipped with optical fiber and electric cable reels.
- The FSRU has a SSL1 link interface interconnected with the ESD system of the control room of the TRBA, enabling systems to connect their respective ESD according SIGTTO recommendations.
- The FSRU also has a SSL2 interface equipped with fiber optic (6-way ST FO connector) and electric (37-way PYLE connector) cable reels, also with a pneumatic system, in order to connect with the LNG CARRIER.

**Emergency Shutdown System (ESD1 and ESD2):**

- The Pier has an emergency shutdown device, which interconnects the ship FSRU and the Terminal. The manual or automatic actuation by any party provokes the operation shutdown, stopping the pumps and closing of valves (ESD 1). The Terminal loading arms have an emergency disconnecting mechanism, which can be actuated by the Pier control room, or automatically, in case of ship distancing outwards the arms envelope (ESD 2). Any emergency situation must be dealt with according foreseen at the TRBA Emergency Response Plan.

- The functions of the ESD are safely stop CNG send out from FSRU to TRBA or the LNG transfer between FSRU and CARRIER. The ESD activation isolate them in the event of an emergency case, constituting the called ESD-1, which is initiated from failure to signal shutdown, among other factors, and it has as a consequence of stopping transfer pumps and automatic closing shutdown valves. ESD-1 can also be activated by fire or smoke detection on jetty.
- The activation of the ERS installed on the CNG (TRBA) and LNG (GOLAR) loading arms, which configures the ESD-2, is initiated from the events of excessive relative motion between the FSRU vessel and the TRBA or by a push bottom at jetty control room. The primary function is protecting the physical integrity of the loading arms.
- The ESD-1 and ESD-2 events have characteristics in common closing shutdown valves (SDV's). During the event ESD-2, the loading arms are disconnected, through the performance of its system of valves and couplers that allow the quick disconnecting and secure the arms.
- The CNG ESD is configured in two different levels as following:
  - **ESD1:** shuts off feed pumps, interrupts the operations, depressurizes the jetty manifold and CNG loading arms and blocks the arm valves.
  - **ESD2:** is the sequence of the ESD 1, complemented by the emergency disconnection of the arms.

**Note:** Release of arms may cause serious injury to persons in vicinity of the manifold. TRBA operators, FSRU and CARRIER crew shall be aware that despite audible alarms, in some cases the disconnection goes on automatically. When arms are connected, the best policy is to keep far from them.

- The operations also must be provisionally suspended during occurrence of electrical discharges at the terminal proximities and/or strong winds. The terminal operation personnel is authorized to stop/suspend the operation in case of incompliance with any regulations and rules concerned to safety, universally admitted and adopted at the maritime transportation of LNG.
- The ship master has the right to interrupt the operation, if he has reasons to believe that the shore operations are not granting safety, since he gives a notice with antecedence to the pier operators. For any emergency situation, the TRBA interrupts the operations actually being realized for the use of all resources in the incident mitigation.
- The ships and terminal shall be informed that the operation will be stopped in the following situations: Fire; Explosion; Leakage; Sea Pollution; Change of pressures and flow rates; Change at product quality; Winds above 30 knots; Ship distancing from the Pier, outwards the arms envelope; High tensioning of ship lines at the mooring hooks; Communication fault with the supplier ship and regasification ship; Communication fault between the FSRU and terminal.

#### **CNG Transfer Shutdown:**

- Interruption of the CNG send out may occur if requested by CNCO. In the occurrence of such event, TRBA shall inform GOLAR to stop the CNG transfer with at least 30 minutes in advance, allowing thus sufficient time for a normal shutdown to take place. After confirming with GOLAR the time of interruption, TRBA shall close the SDV valves close to the arm manifold.
- An emergency shutdown shall also occur if the following settings are reached:

OPERATION TEMPERATURE (°C)	OPERATION PRESSURE (kgf/cm <sup>2</sup> )		
	WORKING	Alarm	Shutdown
LOWER THAN 38°C	98kgf/cm2	100 kgf/cm2	102 kgf/cm2
BETWEEN 38°C to 50°C	98kgf/cm2	100 kgf/cm2	102 kgf/cm2
ABOVE 50°C	SHUTDOWN AT ANY PRESSURE		
BELOW 0°C	SHUTDOWN AT ANY PRESSURE		

- Under normal conditions, no shutdown shall be made without formal authorization from the CNCO, even in the situation that the scheduled quota has been reached.
- TRBA shall keep GOLAR updated regarding any interruption or ending up requested from CNCO.

#### **6.8. LNG Ship to Ship Operations**

The STS transfer shall be accomplished with the attendance of the crew from both ships and operators of TRBA.

##### **Cargo Handling and Controlling**

###### **Normal Discharging:**

- On completion of ESD tests the FSRU Chief Officer and the LNG CARRIER Chief Officer shall confirm that all systems are lined up and ready.

###### **Control of Return Gas to LNG Carrier**

- Gas will be returned to the LNG CARRIER via free flow or by use of high duty compressors. It is the responsibility of the LNG CARRIER to monitor the pressure in its tanks and keep the FSRU informed. In the event that pressure in the return gas line falls to 80 mbar(g) or below then the LNG CARRIER must adjust its unloading rate until pressures return to normal levels. It is important that FSRU Cargo Control Room is informed if there is any problem with the ship taking return gas in order that the FSRU can increase gas burning and to closely monitor tank pressures. It is important to note that the FSRU tanks pressure relief valves are set at 250 mbar(g).

###### **Cold ESD Test:**

- Before initiating the cold ESD test both LNG carrier and FSRU shall confirm their readiness to each other to conduct this test. The FSRU following a countdown will initiate the ESD. Both LNG carrier and FSRU will check their respective ESD valves for proper closure. Closing time of both LNG carrier and FSRU valves are to be recorded. Only one ESD is required.

###### **Bulk Unloading & Finishing:**

- The FSRU will be in charge of the cargo transfer due to the FSRU being the receiving and production facility. The cargo operation will be executed in careful cooperation between the LNG CARRIER and the FSRU.
- Prevention of Rollover procedures is incorporated into FSRU's cargo operation manual and must be complied with at all times.
- The FSRU and the LNG CARRIER will line up respectively for the cargo transfer. When all parties have completed the cargo pipe lineup and are ready for cargo transfer, both FSRU and LNG CARRIER Officers in charge of transfer will acknowledge to each other that cargo transfer can commence.
- One of primary variables that dictate the LNG cargo transfer rate is the gas production rate from the FSRU into the pipeline. The LNG cargo transfer rate may have to be reduced in order to control FSRU tank pressure and levels within operating limits.
- During the LNG cargo transfer a carefully check of the tank pressure must be maintained throughout. To maintain tank pressure on the LNG CARRIER BOG from the FSRU will be returned via the vapour system utilizing the pressure difference.
- Simultaneously with the cargo transfer the LNG CARRIER will be ballasting and the FSRU will be deballasting accordingly. Both the FSRU and the LNG CARRIER must have a stability plan prepared for this operation.
- At the final stage of the LNG cargo transfer the agreed ramp down procedures will be executed as agreed on the pre cargo transfer operation meeting.

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**Draining & Inerting of Cargo Arms:**

- On completion of the cargo transfer, the FSRU liquid cargo arm valves will be closed. The LNG CARRIER's manifold valves should only be closed after confirmation that FSRU valves have been closed. The vapour line should remain open throughout draining and purging of liquid arms.
- The FSRU will then pressurize the liquid cargo arms with nitrogen up to 4.0bar(g). The FSRU will then drain back the cargo arms to the LNG carrier via the drain line. The cargo arms will then be re-pressurized with nitrogen and lines drained back to the FSRU tanks until clear of liquid.
- Purging will be continued with nitrogen back to LNG CARRIER until all cargo arms contain less than 2% hydrocarbon by volume, measured at the manifold vent.
- Liquid cargo arms may then be disconnected when hydrocarbon reads less than 2% by volume. Ensure the correct meter has been used – measuring hydrocarbon in an inert atmosphere.

**Note:** the Cargo Arms MUST NOT be disconnected until after the ESD has been inhibited (made safe).

- With the agreement of the LNG carrier the vapour manifold valve can then be closed, the vapour arm purged with nitrogen until a reading of less than 2% hydrocarbon by volume is recorded after which the vapour arm can be disconnected.

**Transferred and fulfillment of stay documentation:**

- On completion of draining and purging of the cargo arms and confirmation that all the LNG CARRIER's manifolds are closed, cargo tank gauging can commence.
- The Responsible LNG CARRIER's Officer, the FSRU's Chief Officer, the Independent Cargo Surveyor, the PETROBRAS Representative and any other individual with a recognised and legitimate interest in the cargo transfer operation will be present to witness and verify.
- On completion of cargo calculation and agreement of the cargo quantity transferred, any documentation will be prepared by the LNG CARRIER, for signing by all interested parties.

**Removal of ESD Cable:**

- The ESD cable will be removed 15-20 minutes before the planned departure of the LNG CARRIER. Ship personnel should be available to disconnect at this time. Prior to securing of the FSRU's personnel crew basket, Ship's Agent is to confirm to the FSRU's Chief Officer that all visitors and officials have disembarked the LNG CARRIER and that the Pilot is on board the LNG CARRIER.

## **6.9. Post Cargo Transfer Operations**

**Custody Transfer Measurement**

- After the end of the regasification and injection of CNG at the gas pipeline, there must be initiated the drainage of the loading arms utilized.
- The terminal operators will provide the depressurization of the CNG arms. The ship representative must provide the drainage of the line stretch on board.
- The task of liquid drainage from the arms utilized at the offload of LNG is assigned to the FSRU crew.
- The measurement of level, pressure and temperature of the tanks from the ships operating at the Terminal must be made according to the procedure defined by PETROBRAS.

**Final measurements on board:**

- They will be done by the ship personnel and followed by the Terminal representatives. At measurements of Supplier ships, the measurement will be followed by Inspection Companies. The calculation of the quantities and the checking of the quality compliance will be done by an

inspection company because it is an imported product. The Terminal representative will confer the calculations and quality certificates and, in case of divergences will question the ship.

- Loads out of the specification will only be received with formal authorization from the area of Petrobras/Gas & Energy.
- The origin certificate may be used for the initial calculation and analysis of conformity. The calculation of quantities will be done based on the ship measurement, with the origin certificate of analysis supplied by the terminal. At the final calculation will be discounted the vapor returned to the Supplier ship.
- The LNG quality determination will be done by the chromatograph installed at the FSRU, during all the offload operation.
- The chromatograph report will be used for calculation of mass and calorific value at the operation end. At the detection of product out of specification at any time during the operation, it will be immediately suspended.
- The CNG Quality and Quantities will be based on the Resolution ANP nº 16, of 17, June, 2008 - DOU 18/06/2008 or another replacing it. The automatic chromatograph of CNG is installed at the CNG discharge line (downstream of the loading arms).
- Final release of the ship: it will be given after compare the quantities

#### **6.10. Assisting unmooring and departure**

- Prior to unmooring both vessels need to understand the order in which lines will be released in order that winches can be properly manned. Unmooring operations should be conducted in accordance with procedures agreed between both Masters and particular attention should be given to prevailing weather and tidal conditions.
- The services of a pilot and tug support is required by local regulation. Bow and stern thrusters, when fitted, may be used to full advantage. Consideration should be given to the effects that the use of the thrusters may have on the 'discharging ship' and any other vessels alongside.
- Both vessels should provide crew to release the lines. Should the spring lines be used for springing off, due consideration should be given to the added force likely to be placed on the discharging ship's moorings. Secondary fenders should be ready at hand to prevent contact between the hulls.



## **7. SAFETY PROCEDURES**

The following procedures shall be used as a supplement to and in conjunction with the appropriate TRBA, FSRU and LNG Carrier Emergency Response Plans.

### **7.1. Safety Inspections**

The TRBA Safety Inspector shall perform the safety inspections on the FSRU and on the CARRIER together with GOLAR Representative filling in the Safety Checklist.

### **7.2. Emergency and Fire Fighting Plans**

#### **Jetty Fire Fighting System**

The TRBA is provided with the following firefighting resources: two Fire water fighting pumps, each one with capacity to supply 100% of the required water demand, providing thus full system redundancy. Heat, gas and smoke detectors are in place.

#### **Emergency plans and Preventive measures on board**

The TRBA, Golar FSRU and the LNG Carrier, by each Emergency Response Plan, will work together to provide the resources to hand and mitigate of emergency events or sea pollution.

The TRBA will give support for oil spill events by the Emergency Response Center at TEMADRE, which in case of necessity, can be required by any Master. The costs shall be on charge of the requiring vessel.

The ships berthed shall keep the emergency tug lines passed by the board bits and pendent till the waterline height during all operation, by bow and quarter of the opposite board of the berthing.

The emergency equipment of firefighting must be kept ready for use, while the ship remains berthed. The operation fire hoses must be extended, one to forward and the other to aft of the load intakes.

### **7.3. Safety & Emergency Response**

#### **Emergency Communications**

The FSRU shall announce immediately to TRBA and CARRIER by VHF radio or Hot-Line phone any emergency on board. For Emergency Response Contacts, see the Appendix 7.

As the same, the TRBA shall announce immediately to the FSRU by VHF radio or Hot-Line phone any emergency on Jetty.

Throughout the STS LNG transfer operation, the LNG CARRIER Officer on duty shall keep the FSRU advised of any circumstances that shall possibly have an impact on the cargo transfer or safety of the LNG CARRIER. Moreover, an hourly FSRU/TRBA exchange of information is advised.

All communications between the TRBA, the CARRIER and the FSRU shall be conducted in ENGLISH and in a 'positive' reporting, i.e. all messages shall be repeated back by the recipient and acknowledged by the sender.

#### **FSRU and TRBA Emergency Alarms**

The FSRU is equipped with a visual and acoustic alarm system. The emergency alarms shall be as per following (PSD: prompt shut down):

	Acoustic Alarm	Alarm Characteristics	
		TRBA	FSRU
<b>General alarm</b>	HORN	Continuous - 1minute	Seven short followed by one long
<b>Abandon</b>	HORN	Continuous - 3 minutes	
<b>Fire</b>	HORN	---	Continuous
<b>Emergency ending</b>	HORN	3 short each 15 seconds	---

The “All Clear” signal onboard FSRU shall be an announcement on the FSRU Emergency Alarm system. The LNG CARRIER and TRBA shall be notified by VHF radio or Hot-Line phone.

LNG Carrier Emergency Alarm: The Carrier shall have an announcement as stated at the first meeting. Also the FSRU and TRBA shall be immediately notified by VHF radio.

#### 7.4. FSRU / LNG Carrier Safety Checklist

##### LNG Ship to Ship Operation:

An FSRU and an LNG CARRIER Safety Checklist as per APPENDIX 2 shall be completed jointly by the responsible Officers of the ships (FSRU and LNG CARRIER) and by the TRBA representative following the safety inspection.

The Safety Checklist shall be completed and signed by both LNG CARRIER and FSRU representatives prior to the start of any transshipment operations.

Follow-up safety checks shall be conducted at agreed intervals, not exceeding 4 (four) hours throughout the LNG cargo transfer period, and the checklist shall be signed accordingly by respective Responsible Officers of the LNG CARRIER and the FSRU.

##### Testing of Lifeboats and Rescue Boats

Lifeboats and rescue boats shall not be permitted to be lowered to the water and tested for maintenance purposes whilst the LNG CARRIER is alongside the FSRU.

##### Diving Operations

Diving Operations shall not be permitted whilst the LNG CARRIER is alongside the FSRU. Arrangements for diving operations shall be made through the Ship’s Agents who can then coordinate with Port management at the anchorage zone.

##### Safe protection layer inhibition

Inhibit safe protection layer ON BOARD (FSRU) is strictly forbidden unless it has been written authorized by a General Manager (GOLAR LNG), communicated and upon agreement with PETROBRAS (GE/AGNL).

#### 7.5. Fire Prevention

##### Sources of ignition

Any source of ignition including smoking, shall be restricted to designated areas on board the FSRU. Smoking is not be permitted anywhere on the jetty.

All portable electrical equipment, including hand held torches, radios and gas analyzers, which shall be operated in gas dangerous zones, shall be Approved Equipment for use in the flammable atmosphere concerned. All equipment shall be in such a condition and operated in such a manner that its original certification shall not be jeopardized.

Transportation of battery powered equipment such as computers, mobile phones, cameras and equivalent is permitted, provided that the equipment is switched off and is carried in a closed case. All non-approved mobile phones shall be switched off and the battery removed whilst transiting the jetty & the FSRU. The use of non-approved mobile phones on the jetty shall be strictly prohibited.

Use of LNG CARRIER's main communications equipment and radar shall be prohibited during LNG discharge operations; however, the use of the satellite communications equipment may be permitted, subject to the approval of the FSRU Master.

Whilst alongside the berth or the FSRU, no TUG or any other CRAFT shall be allowed closer than 150 m of CARRIER perimeter unless cargo operations have been stopped, valves have been closed and cargo decks have been secured. Exception in an emergency, when shall be permitted tugs or other craft to go alongside, subject to the agreement of the FSRU Master.

#### **FSRU and CARRIER Fire Fighting Equipment**

The FSRU shall be equipped with fire-fighting systems and equipment designed to cover the FSRU only. In addition, the CARRIER shall be equipped likewise. All fire-fighting equipment shall be in good working order. Portable equipment shall be correctly positioned, and ready for immediate use.

#### **Hot Work**

"Hot Work" in non-approved areas and work on open decks or on the jetty, which involves hammering, chipping or the use of power tools not intrinsically safe is prohibited. Use of power tools shall be allowed for maintenance work, provided proper risk analysis has taken place and upon agreement with TRBA.

#### **Emergency Towing Wires (Fire Wire):**

Emergency towing wires shall be deployed forward and aft on the starboard side of the FSRU whilst standing alone alongside the berth. Likewise, emergency towing wires shall be deployed forward and aft on the starboard side of the CARRIER whilst alongside the FSRU.

### **7.6. Incidents onboard of FSRU or LNG CARRIER vessels**

The FSRU and the LNG CARRIER are considered a self-contained unit, fully equipped to deal with major fires and other emergencies on board and capable of providing the initial response to most incidents. The Masters (of FSRU and the LNG Carrier) are responsible to take safety actions on shipboard emergencies.

Incidents on board either the FSRU or LNG CARRIER with the potential to develop into a major event are: Fire/explosion; Pollution through cargo and/or bunker fuel spills; Uncontrolled release of cargo liquid or vapour (LNG) from FSRU vent, arms, tank overflow or leakages; Mechanical failure (affecting cargo operations); Man overboard; Personnel injuries (medical emergencies); Failure of the cable moorings.

If an incident happens, the responsible ship must communicate promptly to Petrobras, Transpetro, Harbor Master, ANP, INEMA and IBAMA, and provide every information and details following the Brazilian Laws.

It is hereby established as the entire area of evolution and maneuver within the evolution basin. The emergency anchorage area, located at the evolution basin, can hold two vessels (FSRU and LNG carrier) simultaneously.

#### **7.6.1. Fire/Explosion on board the FSRU or LNG CARRIER**

##### **Action to be taken by LNG CARRIER:**

- Raise de Alarms and pass on the information to crew, FSRU and TRBA;
- Start Fire Alarm Signal;
- Initiate the own Fire Control Plan and emergency shutdown procedures;
- Liaise with Port Authority, FSRU and TRBA (stop operations, disconnect the arms, prepare the tugs to pull the Carrier; release the mooring hooks) whether to unmoor and go to emergency anchorage position.
- Ask for Tugs to prompt assistance on channel 16;
- Bring engines and crew to standby, ready to unberth;
- Prepare to unmoor if the event escalates;
- Coordinate with TRBA and Harbor Master for marine resources and support;
- Ask for pilot assistance to navigate.

##### **Action to be taken by FSRU:**

- Initiate emergency shut down; stop regasification and CNG send out operations.
- Implement Emergency Response Procedure.
- Ask for Tug prompt and assistance on channel 16.
- Start log of events.
- Contact TRBA, Agent, Maritime Authorities and request assistance.
- Tug (upon arrival) to start fire pumps and assist as directed.
- Establish line of communications with LNG CARRIER and TRBA.
- Prepare to unmoor.
- Liaise with TRBA (stop operations, disconnect the arms, prepare the tugs to pull the FSRU; release the mooring hooks/all of them at the same time) whether to unmoor and go to emergency anchorage position.
- Coordinate with TRBA and Harbor Master for marine resources and support.
- Ask for pilot assistance to navigate.

##### **Action by Tugs & Pilots**

- Tug to start fire pump and assist as directed by FSRU Master.
- Duty Tug's Master to establish communications with Pilot.
- Remaining Tugs to mobilize and assist as directed.
- Prepare to remove the CARRIER from the FSRU under direction of CARRIER Master and Pilot advice.

#### **7.6.2. Oil spill from FSRU or LNG CARRIER**

##### **General**

Specific action to be taken in the event of an oil spill shall depend on the nature, type and amount of the product spilled. The following general rules shall be adhered to, to ensure a fast and efficient response at the same time minimizing the environmental impact.

- For all spills, regardless of the product involved, a total ban on smoking on board shall be imposed on the vessel concerned.
- All other sources of ignition shall be isolated / secured.
- All loading or cargo related operations shall be stopped and cargo tank valves closed.
- All oil spills, regardless of amount involved, shall be reportable events as required by the Port Authorities and Environmental Authorities.

- On no account shall Chemical Dispersants be used (whether approved for use or otherwise) by either CARRIER or the FSRU, without the express permission of the Authority in charge of the incident.
- **The FSRU shall immediately advise the authorities of any oil spill from FSRU or CARRIER's facilities.**
- Communication shall be addressed to PETROBRAS, Port Authority, ANP and Environmental Authority.

**Action by FSRU or CARRIER:**

- Initiate emergency shut-down of cargo operations
- Secure all sources of ignition.
- Verify source/type of pollutant.
- Initiate Oil Spill Response Procedure and Emergency Response
- Inform port authority
- Liaise with appropriate authority to deploy the boom if necessary
- Liaise with appropriate authority to deploy adsorbent materials into the water.
- Commence log of events.
- Communicate the event to TRBA, Port Authority, ANP and Environmental Authority.

**Action by Tugs:**

- Tug prepares to stand by to assist and stands off upwind until nature and type of spill has been established.
- Confirm to FSRU Control Room when standing by.
- Other tugs to prepare for stand-by to assist.

### **7.6.3. Uncontrolled release of LNG from LNG CARRIER or FSRU**

**Action to be taken by LNG CARRIER:**

- Initiate emergency shut-down.
- Secure all sources of ignition and impose a total smoking ban.
- Mobilize ship emergency response plan.
- Establish safety communications with FSRU and TRBA and advise nature, location and direction of the VAPOR CLOUD.

**Action to be taken by FSRU:**

- Initiate emergency shut down on LNG and CNG operations.
- Secure all sources of ignition.
- Operate fire monitors if applicable.
- Initiate Emergency Response Plan).stablish immediately communication with TRBA and advise nature, location and direction of the VAPOR CLOUD.
- Advise Port Authorities.
- Advise ANP and environmental Agency.

**Action to be taken by TRBA:**

- Initiate emergency shut down on CNG (if applicable).
- Stop maintenance work and secure all sources of ignition.
- Establish safe communication with FSRU.
- Identify the direction and extension of vapor cloud.
- Communicate to labor force to go to opposite evacuation point.
- Provide support crafties ant tug boats to attend.
- Initiate Emergency & Evacuation Plan if necessary.
- Communicate to PETROBRAS and Management.

**Action by Tugs (as per drills)**

- Verify extension and direction of the vapor cloud before to approach for assistance.
- Stand-by tug to activate firefighting and deluge systems and stand well clear upwind and await instruction from FSRU.

- Secure all ignition sources and impose total smoking ban.
- Remaining tugs to mobilize and stand offshore as in above and assist evacuation.
- Man overboard Incident
- Action to be taken by the FSRU or LNG CARRIER:
- Deploy lifebuoy into the water.
- Raise the alarm by sounding on the ship's whistle.
- Stop LNG operations if the person in the water is within 100 meters of the vessel.
- Lookout and monitor position of person in the water.
- Request TRBA to assist with small craftier and tug boats.
- Place medical services on standby.
- Communicate to Harbor Master.

**Action to be taken by Tugs (as per drills):**

- Stand-by tug to respond as directed by vessel's Master.
- Communicate with small crafties to assist.

**7.6.4. LNG CARRIER or FSRU Related Incidents**

The response shall depend on the type of incident, the extent, the nature, location and severity of the event. Swift action shall, in the majority of cases, prevent an escalation of these events.

Where marine craft are required to approach alongside the LNG FSRU or CARRIER, they shall only do so after control room has confirmed to that cargo transfer has been stopped and check if there is no vapor cloud on tug direction.

**Action to be taken by CARRIER or FSRU**

- Initiate emergency shut down, if required.
- Advise other LNG vessel and TRBA nature and location of incident and require assistance.
- Mobilize crew to attend emergency response plan.
- Stand-by to disconnect loading arms and prepare to vacate the berth.
- Maintain radio contact with TRBA and other LNG vessel
- Establish communications with stand-by tugs if considered necessary (e.g. mooring failure).
- If medical assistance is required, request Port State Control and Agent assistance.
- Master to request Pilot to stand by if the assistance is required.
- In case of pollution or damage, advise ANP, Harbor Master and Environmental agency after emergency has been finished.

**7.7. Security Incidents**

Any security incidents between CARRIER and FSRU shall be reported the TRBA and the Port Security under the ISPS Code. The Port Security Office shall contact the LNG CARRIER and FSRU Security Officer and shall decide the course of action to take in accordance with Security plans.

**7.8. Escape routes & Rescue**

The CARRIER shall have their own means to escape and rescue personnel. The TRBA gangway can be used by FSRU if considered safe. The rescue of injured personnel from FSRU and CARRIER shall be done by any means available (e.g. vessel's life safe boat, tug or small craft).

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## **7.9. Restarting Operations**

### **LNG Ship to Ship Transfer**

After interruption due to abnormal situations, the operations between FSRU and CARRIER or shall only be restarted after detailed incident analysis and evaluation by the CARRIER, TRBA and the FSRU.

Following the execution of measures for solving the problem, the responsibility for determining the resumption of operation shall be of the party responsible for the interruption.

## **7.10. Operations and Tasks Not Mentioned**

The operations under conditions not provided for in this procedure shall only be made after risk evaluation and definition of additional measures, agreed between the parties involved. If necessary a Preliminary Risk Analysis should be assessed.



## Appendix 1 – OCIMF SHIP/SHORE SAFETY CHECKLIST

### FOR LNG AND CNG OPERATIONS

SHIP'S NAME		VOY	
BERTH		PORT	
DATE OF ARRIVAL		TIME OF ARRIVAL	

#### PART "A" - BULK LIQUID GENERAL – PHYSICAL CHECKS

BULK LIQUID – GENERAL	FSRU	LNG CARRIER	TERMINAL	CODE	REMARKS
1. There is safe access between the ship and shore.				R	
2. Is Are the FSRU and the LNG carrier securely moored?				R	
3. The agreed ship/shore communication system is operative.				A R	System Back up system
4. Emergency towing-off pennants are correctly rigged and positioned.				R	
5. The ship's fire hoses and fire-fighting equipment is positioned and ready for immediate use.				R	
6. The terminal's fire-fighting equipment is positioned and ready for immediate use.				R	
7. The ship's cargo and bunker hoses, pipelines and manifolds are in good condition, properly rigged and appropriate for the service intended.					
8. The terminal's cargo and bunker hoses or arms are in good condition, properly rigged and appropriate for the service intended.					
9. The cargo transfer system is sufficiently isolated and drained to allow safe removal of blank flanges prior to connection.					
10. Scuppers and save alls on board are effectively plugged and drip trays are in position and empty.				R	
11. Temporarily removed scupper plugs will be constantly monitored.				R	
12. Shore spill containment and sumps are correctly monitored.				R	
13. The ship's unused cargo and bunker connections are properly secured with blank flanges fully bolted.					
14. The terminal's unused cargo and bunker connections are properly secured with blank flanges fully bolted.					
15. All cargo, ballast and bunker tank lids are closed.					
16. Sea and overboard discharge valves, when not in use, are closed and visibly secured.					
17. All external doors, ports and windows in the accommodation, stores and machinery spaces are closed. Engine room vents may be open.				R	
18. The ship's emergency fire control plans are located externally.					Location:

#### PART "B" - BULK LIQUID GENERAL – VERBAL VERIFICATION

BULK LIQUID – GENERAL	FSRU	LNG CARRIER	TERMINAL	CODE	REMARKS
19. The ship is ready to move under its own power? How long time required before move under own power?				P R	
20. There is an effective deck watch in attendance on board and adequate supervision of operations on the ship and on the terminal.				R	
21. There are sufficient personnel on the FSRU, LNG carrier and ashore to deal with an emergency.				R	
22. The procedures for cargo, bunker and ballast handling have been agreed.				A R	
23. The emergency signal and shutdown procedure to be used by the FSRU, LNG carrier and shore have been well explained and understood.				A	

24. The hazards associated with toxic substances in the cargo being handled have been identified and understood.					
25. An International Shore Fire Connection has been provided.					
26. The agreed tank venting system will be used.				A R	Method
27. The requirements for shutdown operations have been agreed.				R	
28. The operation of the P/V system has been verified.					
29. Where a vapor return line is connected, operating parameters have been agreed. FSRU and LNG carrier to enter requested tank pressure.				A R	FSRU Tank Pressure: _____mb LNG Carrier Tank Pressure: _____mb
30. Independent high level alarms, if fitted, are operational and have been tested.				A R	
31. Adequate electrical insulating means are in place in the ship/shore connection.				A R	
32. Shore lines are fitted with a non-return valve or procedures to avoid back filling have been discussed.				P R	
33. Smoking rooms have been identified and smoking requirements are being observed.				A R	Nominated smoking rooms:
34. Naked light regulations are being observed.				A R	
35. Ship/shore telephones, mobile phones and pager requirements are being observed.				A R	
36. Hand torches (flashlights) are of an approved type.					
37. Fixed VHF/UHF transceivers and AIS equipment are on the correct power mode or switched off.					
38. Portable VHF/UHF transceivers are of an approved type.					
39. The ship's main radio transmitter aerials are earthed and radars are switched off.					
40. Electric cables to portable electrical equipment within the hazardous area are disconnected from power.					
41. Window type air conditioning units are disconnected.					
42. Positive pressure is being maintained inside the accommodation, and air conditioning intakes, which may permit the entry of cargo vapour, are closed.					
43. There is provision for an emergency escape.					
44. The maximum wind and swell criteria for operations have been agreed.				A	Stop cargo at: Disconnect at Unberth at:
45. Security protocols have been agreed between the Ship Security Officer and the Port Facility Security Officer, if appropriate.				A	
46. Where appropriate, procedures have been agreed for receiving nitrogen supplied from shore, either for inerting or purging ship's tanks, or for line cleaning into the ship.				A P	
47. Are the requirements for use of Galley equipment and cooking appliances being observed?					

**If the ship is fitted, or is required to be fitted, with an Inert Gas System, the following statements should be addressed.**

<i>Inert Gas System</i>	FSRU	LNG CARRIER	TERMINAL	CODE	<i>Remarks</i>
48. The IGS is fully operational and in good working order.				P	
49. The fixed and portable oxygen analyzers have been calibrated and are working properly.				R	

### PART "D" - BULK LIQUIFIED GASES – VERBAL VERIFICATION

Bulk Liquefied Gases	FSRU	LNG CARRIER	TERMINAL	CODE	Remarks
1. Material Safety Data Sheets are available giving the necessary data for the safe handling of the cargo.					
2. The water spray system is ready for immediate use.					
3. There is sufficient protective clothing and equipment (including self-contained breathing apparatus) is ready for immediate use and is suitable for the product being handled.					
4. Hold and inter-barrier spaces are properly inerted or filled with dry air, as required.					
5. All remote control valves are in good working order.					
6. The required cargo pumps and compressors are in good order, and the maximum working pressures have been agreed between ship and shore.				A	
7. Re-liquefaction or boil off control equipment is in good order.					
8. The gas detection equipment has been properly set for the cargo, is calibrated, has been tested and inspected and is in good order.					
9. Cargo system gauges and alarms are correctly set and in good order.					
10. Emergency shutdown systems have been tested and are working properly.					
11. The FSRU, the LNG carrier and Terminal have informed each other of the closing rate of ESD valves, automatics valves or similar devices.				A	FSRU. ____ S LNG Carrier ____ s Terminal ____ s
12. Information has been exchanged between FSRU - LNG carrier and the Terminal on the maximum / minimum Tank & Manifold pressure, cargo transfer rates, Ramp Up/Ramp down?				A	See LNG Cargo Handling Agreement.
13. Cargo tanks are protected against inadvertent overfilling at all times while any cargo operations are in progress.					
14. The compressor room is properly ventilated, the electrical motor room is properly pressurized and the alarm system is working.					
15. Cargo tank relief valves are set correctly and actual relief valve settings are clearly and visibly displayed. (Record settings below.)					

	FSRU	CARRIER		FSRU	CARRIER
TANK NR. 1	700 mb		TANK NR. 4	700 mb	
TANK NR. 2	700 mb		TANK NR. 5	700 mb	
TANK NR. 3	700 mb		TANK NR. 6	NA	

## REMARKS

*Coding of Items: The presence of the letters "A", "P" or "R" in the column entitled "Code" indicates the following:*

**A** ('Agreement'). This indicates an agreement or procedure that should be identified in the "Remarks" column of the Checklist or communicated in some other mutually acceptable form.

*P ('Permission'). In the case of a negative answer to the statements coded "P", operations should not be conducted without the written permission from the appropriate authority.*

**R** ('Re-check'). This indicates items to be re-checked at appropriate intervals, as agreed between both parties, at periods stated in the declaration.

*A crew seaman must stay full time nearby ship's manifold while operating.*

VHF Call's Channel -16                      Conversation's channel-9/14

*Telephones :*

Seals Numbers:

*Oil Water Separator:*

ODME/Oil Discharge Monitoring Equipment:

*Emergency Bilge:*

*Sewage Tank:*

*Sea Chest:*

LNG CARRIER  
NAME/STAMP

**LNG FSRU**  
*NAME/STAMP*

**SAFETY INSPECTOR**  
NAME/STAMP

**LOADING MASTER**  
**NAME/STAMP**

## Appendix 2 – LNG SHIP TO SHIP SAFETY CHECKLIST

### (OCIMF / SIGTTO / ICS / CDI)

#### FSRU – LNG/C Safety Check List

LNG Carrier's Name:		Berth: TRBA Salvador - FSRU LNG/C "Golar Winter"
Date of Arrival:		Time of Arrival:

#### INSTRUCTIONS FOR COMPLETION:

The safety of operations requires that all questions should be answered affirmatively by clearly ticking (✓) the appropriate box. If an affirmative answer is not possible, the reason must be given and agreement reached upon appropriate precautions to be taken between the LNG CARRIER and the FSRU. Where any question is considered to be not applicable, then a note to that effect should be inserted in the remarks column.

A box in the columns 'LNG CARRIER' and 'FSRU' indicates that checks should be carried out by the party concerned.

The presence of the letters **A**, **P** or **R** in the column 'Code' indicates the following:

- **A** - (Agreement). This indicates an agreement or procedure that should be identified in the 'Remarks' column of the checklist or communicated in some other mutually acceptable form.
- **P** - (Permission). In the case of a negative answer to the statements coded 'P' operations should not be conducted without the written permission from the appropriate authority.
- **R** - (Re-check). This indicates items to be rechecked at appropriate intervals, as agreed by both parties, at periods stated in the declaration.

#### PART 'A' – BULK LIQUID GENERAL – Physical Checks

General	LNG Carrier	FSRU	TRBA	Code	Remarks
1. Is there safe access between LNG CARRIER and FSRU?				R	Man Riding Crane & Basket
2. Is the LNG CARRIER securely moored?				R	
3. Is the FSRU securely moored?				R	
4. Is the agreed LNG CARRIER/FSRU communication system operative?				AR	1. HOTLINE 2. UHF CH.1 3. VHF CH. 11
5. Are emergency towing wires correctly rigged and positioned?				R	
6. Are the LNG Carrier's and FSRU fire hoses and fire-fighting equipment positioned and ready for use				R	
7. Are the LNG Carrier's and FSRU's cargo and bunker hoses pipelines and manifolds in good condition, properly rigged and appropriate for the service intended?					
8. Are the FSRU's cargo arms in good condition, properly rigged and appropriate for the service intended?					
9. Are FSRU's and LNG Carrier's cargo transfer system sufficiently isolated and drained to allow safe removal of blank flanges prior to connection					
10. Are scuppers and save-alls on board effectively plugged and drip trays in position and empty?				R	
11. Are FSRU's and LNG Carrier's temporarily removed scupper plugs constantly monitored				R	Deck Watch
12. Are FSRU's and LNG Carrier's spill containment and sumps correctly managed				R	
13. Are the LNG Carrier's unused cargo and bunker connections properly secured with blank flanges fully bolted?					
14. Are the FSRU's unused cargo connections properly secured with blank flanges fully bolted?					
15. Are all cargo, ballast and bunker tank lids closed?					
16. Are sea and overboard discharge valves, when not in use, closed and visibly secured?					

17.	Are all external doors, ports and windows in the accommodation, stores and machinery spaces closed? Engine room vents may be open				R	
18.	Are the LNG Carrier's emergency fire control plans located externally?					Location:

**PART 'B' - BULK LIQUID GENERAL-Verbal Verification**

General	LNG Carrier	FSRU	TRBA	Code	Remarks
1. Is the LNG Carrier ready to move under its own power?				PR	
2. Is there an effective deck watch in attendance on board and adequate supervision in the FSRU and on the LNG Carrier?				R	
3. Are there sufficient personnel on board and to deal with an emergency?				R	
4. Have the procedures for cargo, bunker and ballast handling been agreed?				AR	As per Appendix 7
5. 25. Has the emergency signal to be used by the LNG Carrier and FSRU been explained and understood?				A	FSRU: ..... LNG/C: TRBA:
6. Have Material Safety Data Sheets (MSDS) for the cargo transfer been exchanged where requested?				PR	
7. Have the hazards associated with toxic substances in the cargo being handled been identified and understood					
8. Has an International Shore fire connection been provided				R	Location:
9. Has the tank venting been agreed for use				AR	Venting to atmosphere permitted only in emergency when access to FSRU vapour system not possible.
10. Have the requirements for closed operations been agreed?				R	
11. Has the operation of the P/V system been Verified				R	
12. Have operating parameters been agreed for the vapour return line?				AR	Free flow return to LNG CARRIER. FSRU to control required gas flow.
13. Are independent high level alarms operational and been tested?				AR	
14. Are adequate insulating means in place in the LNG Carrier/FSRU connection?				AR	No bonding cable. Insulated loading arm flanges
15. Are FSRU lines fitted with a non-return valve or procedures to avoid back filling been discussed				AR	NRV's fitted on FSRU
16. Have Smoking rooms been identified and are smoking requirement being observed?				AR	FSRU: Conference Room & Recreation Room LNG/C:
17. Are naked light regulations being observed?				AR	As per procedure
18. Are LNG CARRIER/FSRU telephones, mobile phone and pager requirements being observed?				AR	As per procedure
19. Are hand torches (flashlights) of an approved Type?					
20. Are fixed VHF/UHF transceivers and AIS equipment on the correct power mode or switched off?					
21. Are portable VHF/UHF transceivers of an approved type?					
22. Are the LNG Carrier's main radio transmitter aerials earthed and radars switched off?					
23. Are electric cables to portable electrical equipment within the hazardous area disconnected from power?					
24. Are window-type air conditioning units disconnected?					
25. Is positive pressure being maintained inside the accommodation, and are air conditioning intakes, which may permit the entry of cargo vapours closed?					
26. Have measures been taken to ensure sufficient mechanical ventilation in the pump room?		N/A		R	

27. Is there provision for and emergency escape?					FSRU – P-side Terminal gangway
28. Have the maximum wind and swell criteria been agreed?				A	Stop cargo at: 30 knots wind sp. Disconnect at: > 35kn wind sp. and start undocking procedure
29. Have Security protocols been agreed between the LNG CARRIER Security Officer and the Port Facility Security Officer?				A	MARSEC Level: _____
30. Where appropriate, have procedures been agreed for receiving nitrogen supplied from FSRU, either for inerting or purging LNG Carrier's tanks or for line clearing into the LNG Carrier?				A P	Only for purging loading arms.

**PART 'D' – BULK LIQUEFIED GASES – Verbal Verification**

Bulk Liquefied Gases	LNG Carrier	FSRU	TRBA	Code	Remarks
1. Are Material Safety Data Sheets available giving the necessary data for the safe handling of the cargo					
2. Has a manufacturer's inhibition certificate, where applicable been provided?	N/A	N/A	N/A	P	LNG only
3. Is the water spray system ready for use?					
4. Is sufficient suitable protective equipment (including self-contained breathing apparatus) and protective clothing ready for immediate use?					
5. Are holds and inter-barrier spaces properly inerted or filled with dry air as required?					
6. Are all remote control valves in working order?					
7. Are the required cargo pumps and compressors in good order, and maximum working pressures been agreed between LNG CARRIER and FSRU?				A	18n kpa
8. Is re-liquefaction or boil-off control equipment in good order?					BOG
9. Is gas detection equipment properly set for the cargo, calibrated, been tested and inspected and in good order?					
10. Are cargo system gauges and alarms correctly set and in good order?					
11. Have emergency shutdown systems been tested and are working properly?					
12. Have LNG Carrier and FSRU informed each other of the closing rate of ESD valves, automatic valves or similar devices?				A	LNG Carrier FSRU
13. Has information been exchanged between LNG Carrier and FSRU on the maximum/minimum temperatures/pressures of the cargo to be handled?				A	Temp: -157°C – (160°C) Pressure: 5-18kPa
14. Are cargo tanks protected against inadvertent overfilling at all times while any cargo operations are in progress?					
15. Is the compressor room properly ventilated; the electrical motor room properly pressurized and is the alarm system working?					

16. Are cargo tank relief valves set correctly and actual relief valve settings clearly and visibly displayed? Tank No 1..... Tank No 2..... Tank No 3..... Tank No 4..... Tank No 5..... Tank No 6..... Tank No 7..... Tank No 8.....					FSRU cargo tank valve settings: Tank No.1 - 250 mbars Tank No.2 - 250 mbars Tank No.3 - 250 mbars Tank No.4 - 250 mbars
--	--	--	--	--	---

**PART E - Pre-transfer checklist for in-port STS Cargo Transfer**

In-port STS Cargo Transfer	LNG Carrier	FSRU	TRBA	Code	Remarks
1. A standard pre-transfer checklist, such as the ISGOTT ship/shore safety checklist or equivalent, has been satisfactorily completed and arrangements have been made for repetitive checks during the transfer					
2. Required regional checklists have been completed					
3. Written permissions for cargo operation to take place are available to all Responsible Persons					
4. The formal risk assessment has been communicated by the transfer organizer and reviewed by involved parties					
5. The general contingency plan for the cargo transfer operation has been communicated by the transfer organizer and reviewed by involved parties					
6. Security information has been exchanged and, if required, a Declaration of Security has been completed					
7. Suitable fenders are rigged correctly to prevent contact of the vessels					
8. Fire axes, or suitable cutting equipment, are in place at the fore and aft mooring stations					
9. Present and forecast weather and sea conditions have been considered					
10. A means of access is in place to allow personnel to safely transit between the vessels					
11. Cargo specifications and any requirements for inerting, heating, reactivity and inhibitors have been exchanged					
12. The cargo transfer operation is to be completed under closed conditions					
13. Where applicable, procedures for vapour control/balancing have been agreed					
14. All cargo monitoring systems, including level gauges, high level alarms, pressure gauges and alarms, have been tested and are operational					
15. Access to the cargo deck is restricted and controlled during cargo transfer operations					
16. All personnel engaged in the cargo operation are provided with appropriate PPE including, where necessary, personal gas detectors/monitors					
17. Cargo hoses have been pressure tested within the prescribed period and documentation is available on board					
18. The construction and material of the cargo hoses is suitable for the temperature and nature of the product(s)					
19. Where electrically continuous hoses are used, the hoses are connected to the vessel with the insulated flange before being passed to the other vessel for connection					
20. The cargo hose string is of adequate length and properly supported					
21. The cargo lines are lined up in accordance with the cargo operation plan					
22. Spill response equipment is on station and ready for immediate deployment					
23. Where applicable, fire-fighting provision has been made for unmanned					



barges					
24. Spaces to be routinely monitored for any build-up of flammable and/or toxic vapour have been identified					

**PART F - During Transfer checklist for in-port STS Operations**

During Transfer – In-port STS Operations	LNG Carrier	FSRU	TRBA	Code	Remarks
1. Present weather and sea conditions are within the agreed limits				R	
2. Personnel engaged in the cargo transfer operation are wearing appropriate PPE				R	
3. Cargo hose strings, manifold connections and cargo systems are free of any leakage				R	
4. Cargo hoses are properly supported, taking into account changing freeboards and any movement between the vessels				R	
5. All cargo monitoring systems, including level gauges, high level alarms, pressure gauges and alarms, are functioning correctly				R	
6. The cargo transfer operation is continuing under closed conditions				R	
7. The sea surface around the vessels is periodically visually checked for any sign of pollution				R	
8. All identified spaces are being routinely monitored for any build-up of flammable and/or toxic vapour				R	
9. All mooring lines are correctly tensioned and managed during the cargo transfer operation				R	
10. Where rigged in accordance with local requirements, emergency towing-off pennants are adjusted throughout the cargo transfer operation				R	
11. On completion of cargo transfer to or from a tank, the tank is secured				R	
12. Levels in all cargo and ballast tanks, including those not being worked, are routinely monitored				R	

**DECLARATION:**

We the undersigned have checked, where appropriate jointly, the items on this checklist and have satisfied ourselves that the entries we have made are correct to the best of our knowledge.

We have also made arrangements to carry out repetitive checks as necessary and agreed that those items marked with the letter 'R' in the column 'Code' should be re-checked at intervals not exceeding 6 hours.

If to our knowledge the status of any of any item changes, we will immediately inform the other party

For LNG CARRIER	For FSRU	For TRBA
Name:	Name:	Name:
Rank:	Position:	Position:
Signature:	Signature:	Signature:
Date:	Date:	Date:

Updated: Date/Time/Signature

**Record of repetitive checks:**

*If needed additional pages of repetitive checks should be added.*

Date:							
Time:							
Initials for LNG/C:							
Initials for FSRU:							
Initials for TRBA:							

**Appendix 3 – NATIONAL PETROLEUM AGENCY- REGULATION nº 16**  
(June 17th, 2008)

**Table I: Natural Gas Specification (1)**

CARACTERISTIC	UNIT	LIMIT(2) (3)			Method	
		North	Northeast	South, Southeast, Central West	ASTM	ISO
Higher Heating Value (4)	kJ/M <sup>3</sup> kWh/m <sup>3</sup>	34.000 to 38.400 9,47 to 10,67	35.000 to 43.000 9,72 to 11,94		D 3588	6976
Wobbe Index (5)	kJ/M <sup>3</sup>	40.500 to 45.000	46.500 to 53.500		-	6976
Methane Number(6), min.		(3)	65			15403
Methane, min	% mol.	68,0	85,0		1945	6974
Ethane, max.	% mol.	12,0	12,0		1945	6974
Propane, max.	% mol.	3,0	6,0		1945	1945
Butane and heavier, max.	% mol.	1,5	3,0		1945	1945
Oxygen, max.	% mol.	0,8	0,5		1945	6974
Inert (N <sub>2</sub> + CO <sub>2</sub> ), max.	% mol.	18,0	8,0	6,0	1945	6974
CO <sub>2</sub> ,max	% mol.	3,0			1945	6974
Total Sulphur, max. (8)	mg/m <sup>3</sup>	70			D5504	6326-2 6326-5 19739
Gas hydrogen sulfide (H <sub>2</sub> S), max	mg/m <sup>3</sup>	10,0	13,0	10,0	D5504 6228	6326-3
Dew point of water at 1atm, max.	°C	-39	-39	-45	D5454	6327 10101-2 10101-3 11541
Dew point of hydrocarbons at 4,5 MPa, max (10)	°C	15	15	0		6570
Mercury, max. (11)	µg/m <sup>3</sup>	To be noted				6978-1 6978-2

**Note: See Remarks on the ANP Original document.**

## Appendix 4 - GOLAR WINTER MOORING OPERATION PROCEDURE

(by Golar Wilhelmsen Management)

**INTRODUCTION:** The FSRU will be connected to the mooring arrangement by means of 2 spring lines forward and aft and 7 brest lines forward and aft, a total of 18 mooring lines. Each spring line and brest line consist of a series of shackles, chain, steel wire cable and mooring tail.

### LOCATION OF MOORING CHAIN STOPPER

- FORECASTLE: 7 pcs (Brest Lines forward). Chain stopper for 50 mm chain, 125 SWL
- MAIN DECK, PORT SHOULDER FWD: 2 pcs (Spring Lines forward). Chain stopper for 50 mm chain, 125 SWL
- MAIN DECK, PORT SHOULDER AFT: 2 pcs (Spring Lines aft). Chain stopper for 50 mm chain, 125 SWL
- POOP DECK: 7 pcs (Brest Lines aft). Chain stopper for 50 mm chain, 125 SWL

### MOORING DOLPHINS AND MOORING LINES

Mooring dolphins	Qt	Mooring lines from FSRU
DAM 6 – fwd brest lines	3 pcs	L1, L2, L3
DAM 5 – fwd brest lines	2 pcs	L4, L5
DAM 4 – fwd brest lines	2 pcs	L6, L7
DAT 3 – fwd spring lines	2 pcs	L8, L9
DAT 2 – aft spring lines	2 pcs	L10, L11
DAM 3 – aft brest lines	2 pcs	L12, L13
DAM 2 – aft brest lines	2 pcs	L14, L15
DAM 1 – aft brest lines	3 pcs	L16, L17, L18

### PERMANENT MOORING EQUIPMENT:

Permanent Mooring system is different from a conventional mooring system, hence proper briefing has to be carried out well in advance of the mooring operation.

In regards of the permanent mooring lay out and specific data about the permanent mooring equipment, please consult drawing: No. **3557-100-OD-435-008**. This procedure refers to Typical Arrangement for Brest Lines as for fact that arrangement is identical for all mooring position except for the length of distance wire.

Permanent mooring lines are connected with the following equipment in the following order, starting from the FSRU and toward the Terminal:

- Chain stopper > Mooring chain > Green pin polar shackle > Wire of different length > Green pin polar shackle > Green pin wide mouth shackle > Mooring rope tail.

## Appendix 5 – SAFETY LETTER – LNG CARRIER

Bahia LNG Regasification Terminal – TRBA

### SAFETY LETTER

To the Master o LNGC: \_\_\_\_\_

Dear Sir,

Responsibility for the safe conduct of operations while your ship is at this terminal rests jointly with you, as LNGC Master , and the FSRU Master as well. We wish, therefore, before operations start, to seek your full co-operation and understanding on the safety requirements set out in the Ship/FSRU Safety Check-List, which are based on safe practices that are widely accepted by the oil and tanker industries.

We expect you, and all under your command, to adhere strictly to these requirements throughout your ship's stay alongside this terminal and we, for our part, will ensure that our personnel do likewise, and co-operate fully with you in the mutual interest of safe and efficient operations.

Before the start of operations, and from time to time thereafter, for our mutual safety, a member of the FSRU staff, where appropriate together with a Responsible Officer, will make a routine inspection of your ship to ensure that elements addressed within the scope of the Ship/FSRU Safety Check-List are being managed in an acceptable manner. Where corrective action is needed, we will not agree to operations commencing or, should they have been started, we will require them to be stopped.

Similarly, you consider that safety is being endangered by any action on the part of our staff or by any equipment under our control, you should demand immediate cessation of operations.

As we have signed this letter you recognize full knowledge of The TRBA Port Information,. Safety cannot be compromised.

Please acknowledge receipt of this letter by countersigning and returning the attached copy.

FSRU Representative

Signed: \_\_\_\_\_

FSRU Representative on duty is: \_\_\_\_\_

Position:: \_\_\_\_\_

Contact Details: \_\_\_\_\_

LNG CARRIER Master

Signed : \_\_\_\_\_

SS/MV : \_\_\_\_\_

Date/Time: \_\_\_\_\_

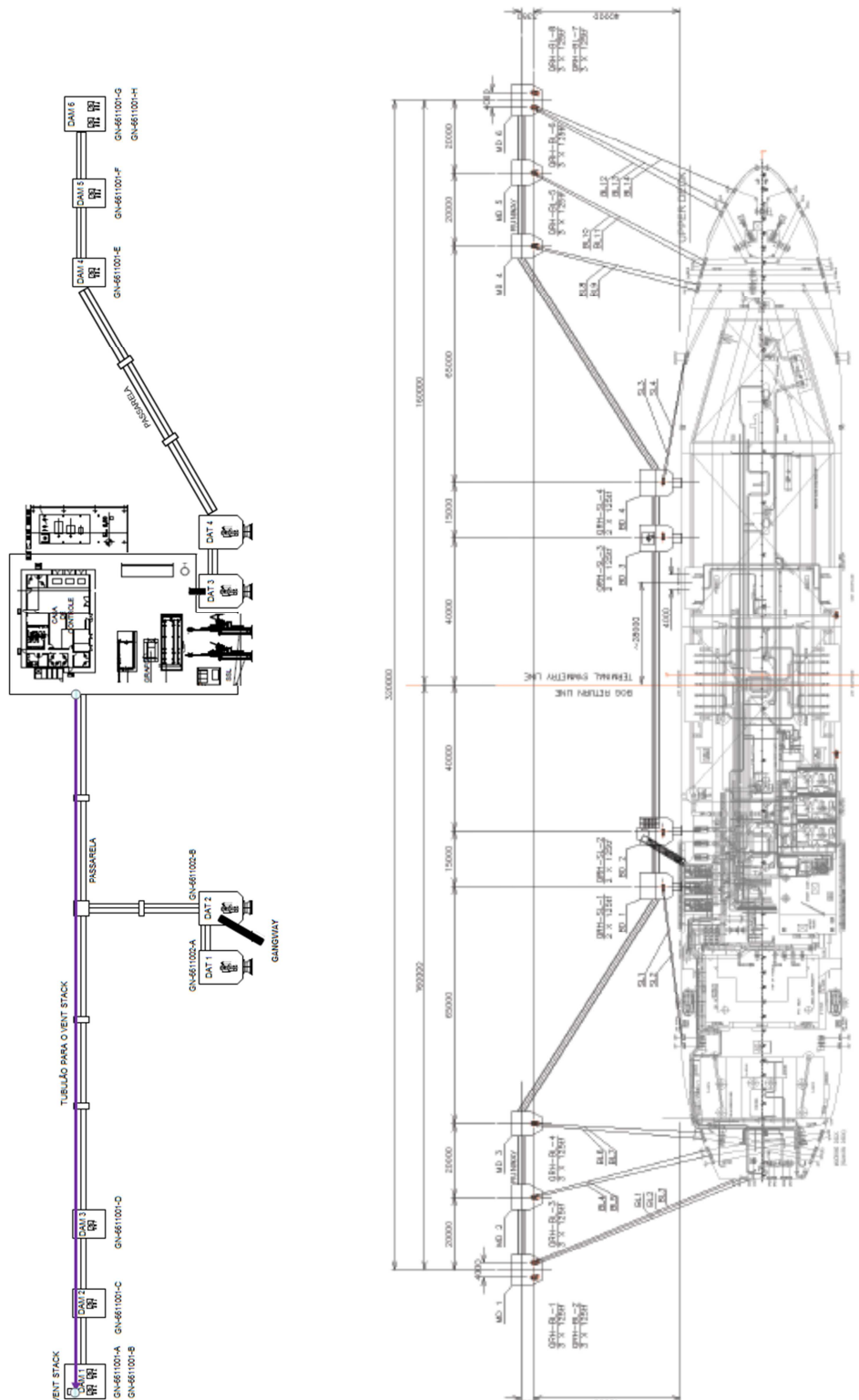
## Appendix 6 - INFORMATION TO BE EXCHANGED BEFORE TRANSFER

- (a) Ship name:
- (b) Voyage Number:
- (c) Berthing date:
- (d) Contractual data:
  - N° of existing pumps on board:
  - Volumetric capacity 98%:
  - Pressure ensured at offload: (When the operation is offload)
  - Capacity of ballasting /unballasting simultaneous with load / offload
- (e) Information about the trip
  - Kind of chartering (VCP, TCP, COA, etc.)
  - Kind of trip (coasting trade / Outbound)
  - Ports or places of origin and destination
- (f) Communication media between ship and terminal
- (g) Information about the cargo
  - Quantity:
  - Temperature:
  - Tank pressure.
- (h) Ballast:
  - (Segregated Ballast) Quantity:
- (i) Information about the operation
  - For offloads:
    - Will the ship make special operation? (Inertization, etc.)
    - Time foreseen for the special operation
    - Time needed to stop the pumps
  - Conditions Carrier / FSRU / Terminal for the operation of product load/offload
    - Carrier – Pressure, Flow Rate, Temperature (Max. and Min.)
    - FSRU/Terminal – Pressure, Flow Rate, Temperature (Max. and Min.)
  - Sequence of operations
  - Quantity to be loaded/offloaded
  - Origin / Destination Tanks
  - Lines from board / shore
  - Loading arms
  - Prevision for operation beginning and finishing
- (j) Complementary information about operation and safety.

### Appendix 7 – EMERGENCY AND CONTACT LIST

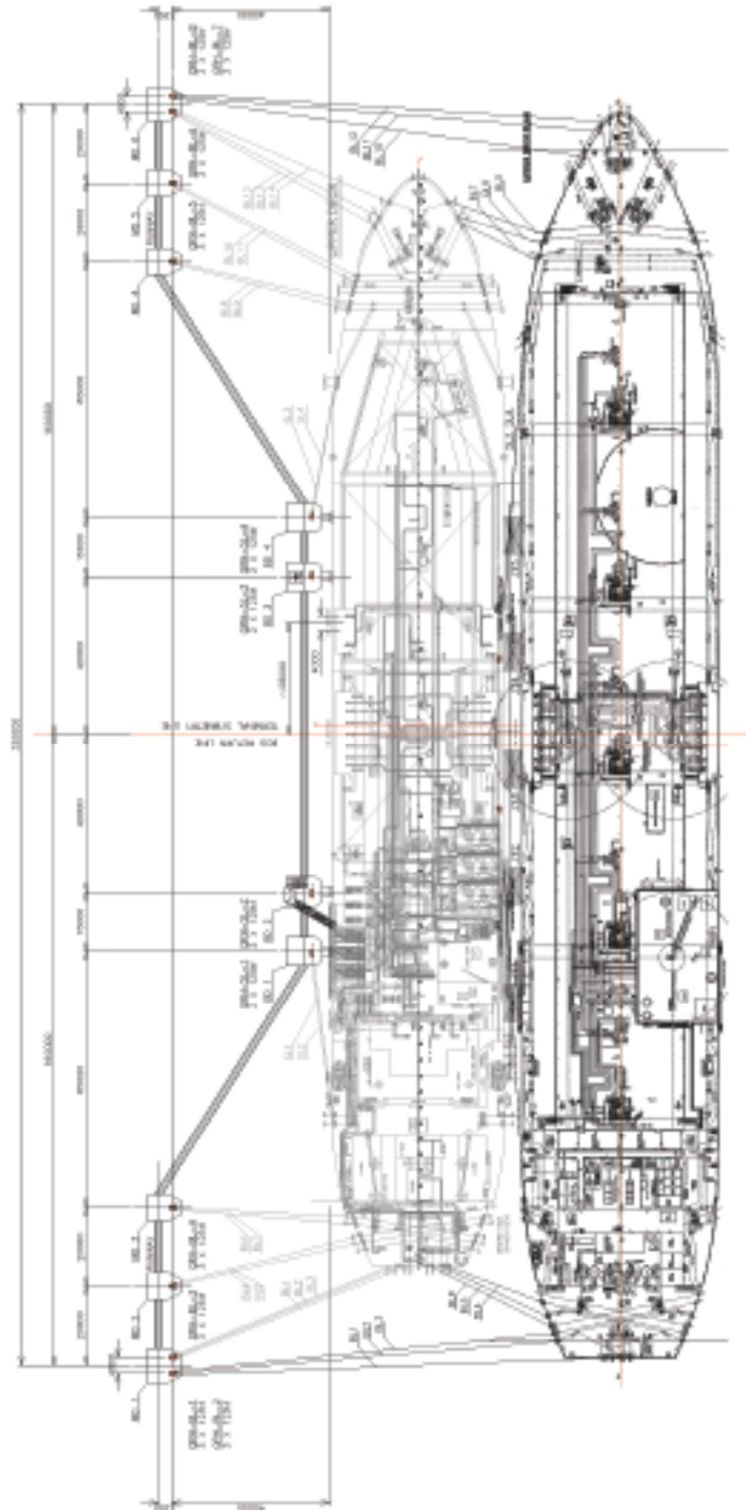
ORGANIZATION	TELEPHONE (+5571)	MOBILE (+5571)	VHF CALL	EMAIL
TRBA - Control Room	Hot Line and 3877-9801/9802	---	16	trba.operations @petrobras.com.br
TRBA - Safety Inspector	3877-9805	9987-7541	16	---
TRBA - Coordinator	3877-9813	9961-9733	---	---
TRBA - Security Team	3877-9810/9811 (PFSO: 3642-3738)	(PFSO: 9944-4659)	16	sspt @petrobras.com.br
GOLAR WINTER - Control Room	HOT LINE	---	16	---
GOLAR WINTER - Captain	---	8169-7966 9684-6570	---	master.golarwinter @ship.golarwilhelmsen.com
PETROBRAS - Asset Manager	(+5521) 2166-8928	(+5521) 98111- 2124	---	---
PETROBRAS - LNG Shipping	(+5521) 2166-5016	(+5521) 99740- 3920	---	Lngshipping @petrobras.com.br
CPBA – Harbor Master	3507-3777 3507-3756	---	---	20@cpba.mar.mil.br
Salvador Pilots	3241 0778	---	---	adm1 @salvadorpilots.com.br
Bahia Pilots	3321-0305 3321-2724	---	---	Diretoria @bahiapilots.com.br
BTS Pilotage	9981-4412	---	---	Linsinacio @uol.com.br
ANP – National Petroleum Agency	08009700267 (+5521) 21128619	---	---	---
INEMA – Environmental Agency of Bahia	0800 711400 3117-1200	---	---	---
ANVISA - Port Health Service Vigilance	3320-1282 3241-0276	---	---	---
IBAMA – Brazilian Institute of Environment	3172-1650/1750 0800 618080	---	---	---
FEDERAL POLICE – Maritime and Boundaries Police	3243-3952 3339-4558	---	---	---
CIVIL POLICE (Madre de Deus)	3604-1309/5750	---	---	---
Ambulance Service	EMERGENCY 192	---	---	---
UMI Hospital (Candeias)	3601-1516 3605-7100	---	---	---
General Hospital (Salvador)	3117-5960	---	---	---
Airport of Salvador	3204-1010	---	---	---

## Appendix 8 - MOORING POINTS AND DOLPHINS LOCATION



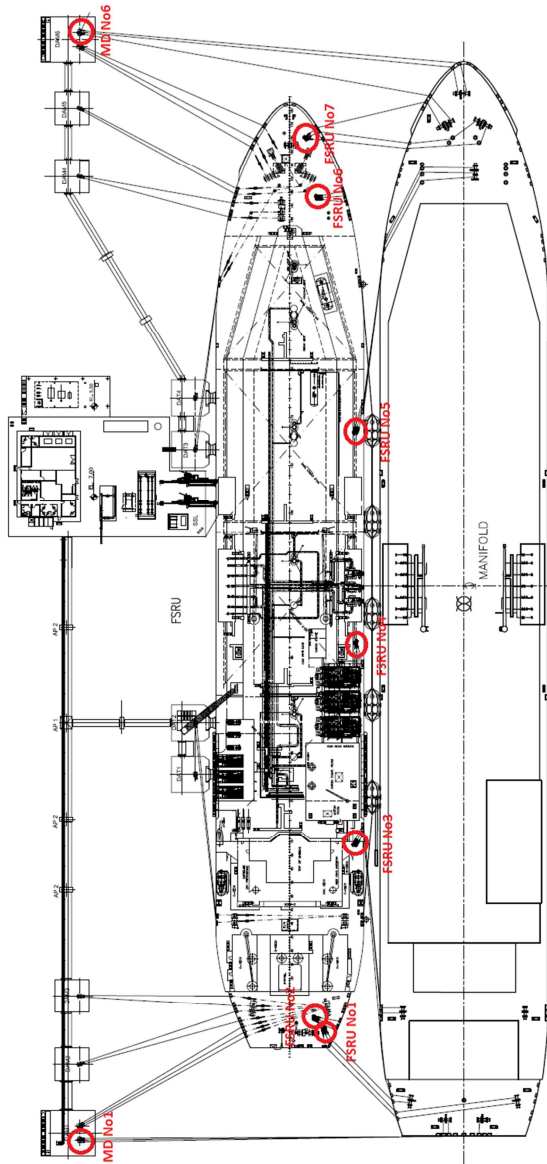
FSRU GOLAR WINTER (138km<sup>3</sup>) and Location of the TRBA Dolphins



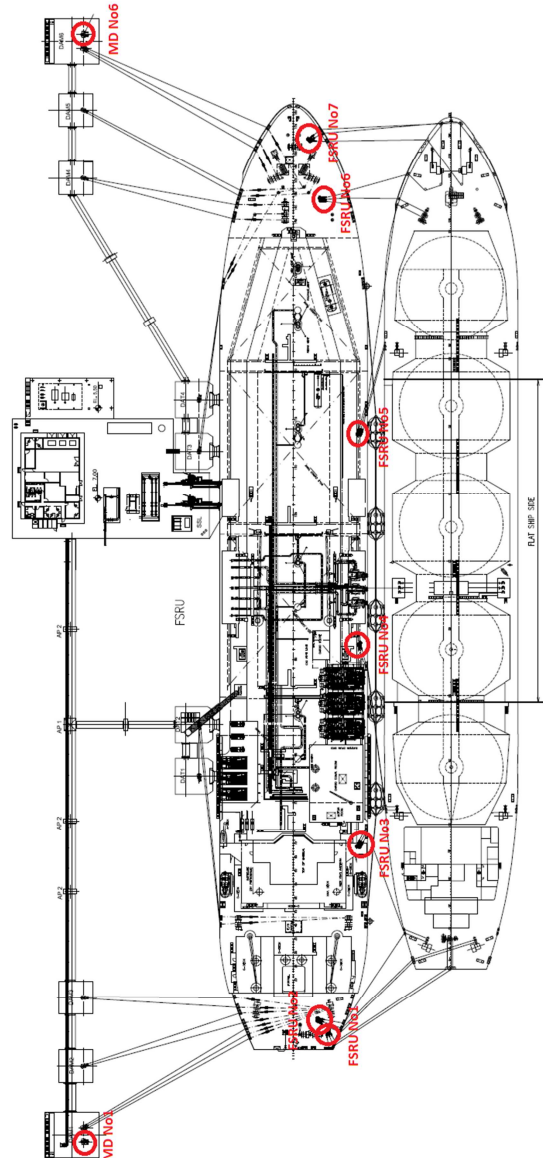


GOLAR WINTER+LNG Supplier- Carrier QFLEX (215km3)

## Appendix 9 – TYPICAL MOORING FOR SBS LAY OUT



LNG Carrier 210 000 m³



LNG Carrier 89 000 m³

LNG Carrier 210 000 m³

## Appendix 10 – PNEUMATIC FENDERS LAYOUT

