

PERFORMANCE REPORT ON THE ADAPTATION OF A LARGE-SCALE JETTY IN BILBAO FOR SMALL-SCALE LNG SUPPLY

D5.1

Ente Vasco de la Energía (EVE)



CORE LNGas
hive



Core Network Corridors and Liquefied Natural Gas

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More Information

Public CORE LNGas HIVE reports and additional information related to the project execution and results are available through the CORE LNGas Hive public website at www.corelngashive.eu

Table of contents

1.	Introduction.....	7
2.	Monitoring of sub-activity EPA1	8
2.1.	Description of the sub-activity.....	8
2.1.	Monitoring operations	8
2.1.1	Operation #1: Loading of MV Oizmedi.....	9
2.1.1	Operation #2: Load of MV Coral Fraseri	12
3.	Conclusions	18
4.	Appendices	19
5.	List of Acronyms and Abbreviations	20

List of tables

Table 1	List of operations
Table 2	OP. #1 KPI and indicators
Table 3	OP. #2 KPI and indicators

List of figures

Figure 1	Location of OP. #1 in the port of Bilbao
Figure 2	Location of OP. #2 in the port of Bilbao

List of pictures

Picture 1	Interconnection pipeline works for LNG supply
Picture 2	MV Oizmendi at BBG jetty: view from seaside
Picture 3	MV Oizmendi at BBG jetty: view from ship
Picture 4	MV Oizmendi at BBG jetty: hoses
Picture 5	Hose arrangement on the MV Coral Fraseri
Picture 6	Detail of the mooring of the MV Coral Fraseri
Picture 7	Gangway between the vessel and the terminal
Picture 8	Connection manoeuvre
Picture 9	Detail of connections
Picture 10	Detail of connections
Picture 11	Hose arrangement
Picture 12	Hose cooling process

1. Introduction

The purpose of the report is to document the performance of LNG reception and supply trials and operations carried out during the operational monitoring period of the BBG regasification plant facilities, which, within the framework of the EPA1 sub-activity of the CORE LNGas hive project, have been adapted for small-scale supply.

2. Monitoring of sub-activity EPA1

2.1. Description of the sub-activity

Modification of the existing mooring jetty and pipeline in Bahía de Bizkaia Gas (BBG) regasification plant, located in the port of Bilbao, currently used for unloading LNG tankers between 70,000 m³ and 200,000 m³. The BBG regasification plant has been adapted to enable it to offer small-scale services as well as LNG bunkering. Two complementary actions have been carried out within the project:

- Jetty adaptation works. Carried out by ITSAS GAS. Adaptation of the BBG terminal jetty for the mooring of vessels smaller than the usual LNG Carriers, in particular for the mooring of the 100 m long MV Oizmendi (previously known as MV Monte Arucas) (EPA 2).
- Interconnection pipeline works for LNG supply. Carried out by EVE. Among other things, this work has involved modifications to existing pipelines and the definition of an appropriate manifold for the supply of LNG to the barge.



Picture 1. Interconnection pipeline works for LNG supply.

2.1. Monitoring operations

Two operations were carried out during the monitoring period of the BBG regasification terminal adaptation project. Firstly, on 31 January 2018 (OP. #1) the MV Oizmendi was loaded to subsequently service the MV Ireland. Later, between 23 and 24 September 2019, the MV Coral Fraseri was loaded. This vessel passed through

Bilbao on its way to the area of the Strait of Gibraltar, where it was to carry out a supply operation.

OP. #	DESCRIPTION	DATE
1	Loading of MV Oizmedi	31 January, 2018
2	Loading of MV Coral Fraseri	23/24 Sept., 2019

Table 1. List of operations

2.1.1 Operation #1: Loading of MV Oizmedi

MV Oizmedi loading operation of 85 m³ of LNG. The loading took place at the jetty specially adapted for this purpose at the BBG regasification plant (Figure 1).

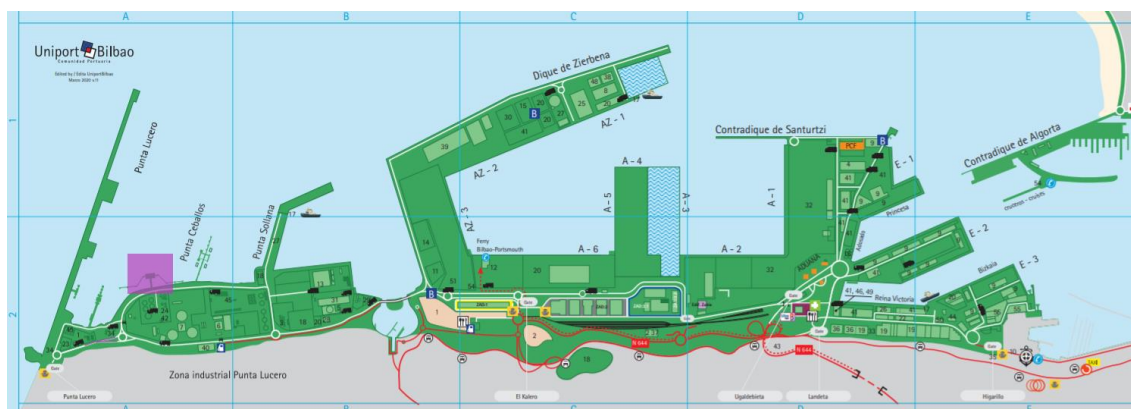


Figure 2. Location of OP. #1 in the port of Bilbao.

The entry and berthing manoeuvre took place on 29 January 2018 without incident and in good sea and wind conditions. Certain issues were noted in the reports (OP-IF-0008-18) regarding the gangway to connect vessel and terminal, due to the variation in tidal height.

Communications between vessel and terminal were established (ESD, walkie-talkie and mobile phone) and the BOG and liquid hoses were connected without incident. Pressure tests were then carried out.

A meeting was held prior to the start of operations, the ESD system was tested and the vessel was cooled down.

On the mornings of 29, 30 and 31 January, various loading and unloading tests were successfully carried out between the vessel and the terminal, without incident (OP-IF-0008-18).

The loading operation took place on the afternoon of 31 January and lasted 36 minutes. The maximum flow rate reached was 235 m³/h.

Subsequently, the hoses were drained and disconnected, the post-operation meeting was held and the vessel was unmoored.

In short, the loading operation was carried out satisfactorily, with no incidents of any kind and in the appropriate safety conditions. Sea and wind conditions were very favourable, and the loading was performed quickly and efficiently (OP-IF-0027-18).

LNG SUPPLY OPERATION			
GENERAL INFORMATION			
OPERATION	Short description.	Loading of MV Oizmendi at the BBG LNG terminal (Bilbao) for subsequent STS bunkering for the MV Ireland.	
Type of operation		Terminal-to-Ship	
Facilities/Supplier vessel		BBG Terminal	
Receiving vessel		MV Oizmendi	
Supply site		BBG Terminal Port of Bilbao	
Location		MV OIZMENDI moored at BBG jetty	
Delivery date		31 January 2018	
Docked	h	8:18 (29 January)	
Connected	h	10:30 (29 January)	
Started	h	16:42	
Completed	h	17:18	
Disconnected	h	18:12 (disconnection began at 18:00)	
Total time	h	N/A	
Actual loading time	h	36 mins. (0.6 h)	
Quantity supplied	m ³ kWh	86.097	568.796
High heating value	kWh/Nm ³	11,753	
Initial tank pressure	bar	0.3	
Final tank pressure	bar	0.3	
KPIs			
Ratio actual loading time/total time	h/h	N/A	
Ratio quantity supplied/total time	m ³ /h	N/A	
Pumping rate	m ³ /h	85/0.6 = 142 m ³ /h Max 235 m ³ /h	
Ramp-Up	h	N/A	
Ramp-Down	h	N/A	
QUALITATIVE ASPECTS			
Cooling	Incidents	No comment	
Mooring	Incidents	No observations to be made	
Berthing	Incidents	No incidents. Manoeuvre in 48 mins.	
Hoses and/or arms	Incidents Manoeuvrability	5 bar pressure drop at 250 m ³ /h	
BOG/LNG Management	Incidents	No observations to be made	
Communications		ESD, walkie-talkie, mobile phone	
OTHERS			
Attached documentation	OP-IF-0008-18 Oizmendi trials OP-IF-0027-18 Partial loading of MV Oizmendi OP-IF-0031-18 Inerting of MV Oizmendi TESTS at BBG Checklist		

Table 2. OP. #1 KPI and indicators



Picture 2. MV Oizmendi at BBG jetty: view from seaside.



Picture 3. MV Oizmendi at BBG jetty: view from vessel.



Picture 4. MV Oizmendi at BBG jetty: hoses.

2.1.1 Operation #2: Load of MV Coral Fraseri

MV Coral Fraseri loading operation of 2,859 m³ of LNG. The loading took place at the jetty specially adapted for this purpose at the BBG regasification plant facilities (Figure 1).

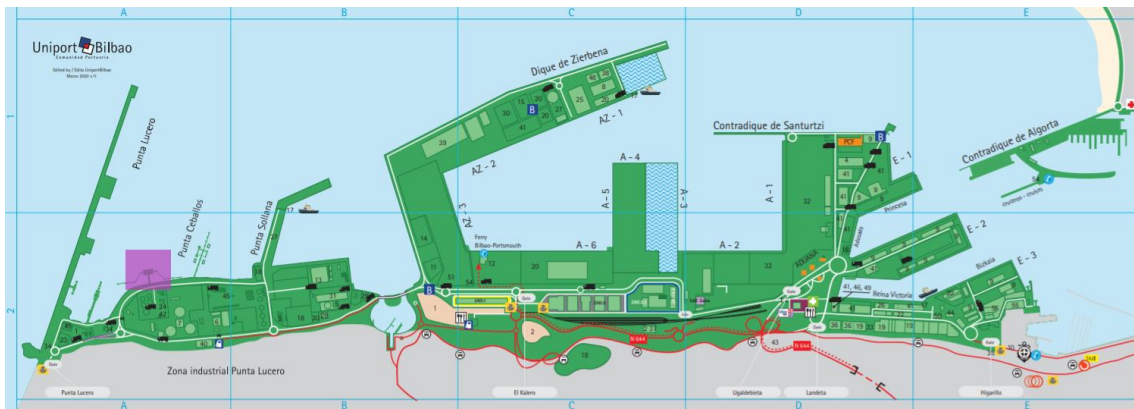


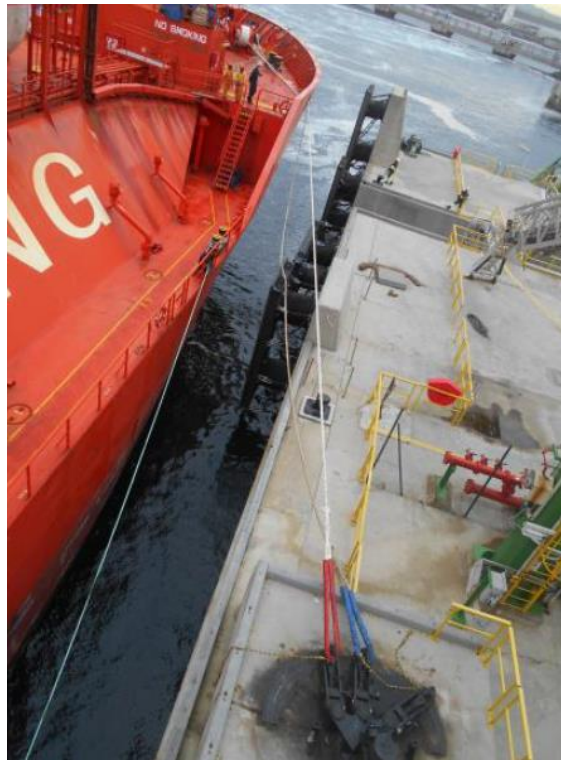
Figure 2. Location of OP. #2 in the port of Bilbao.

Several incidents occurred during the entry manoeuvre. On the one hand, a broken Yokohama fender fastening had to be repaired. On the other hand, some adjustments had to be made to connect the hoses, as they were connected to the ship's high manifold and not to the low manifold, which would have been more convenient for connection to the terminal.



Picture 5. Hose arrangement on the MV Coral Fraseri.

These adjustments caused some problems when mooring the vessel, which were solved by changing the arrangement of the mooring lines. It should be noted that the MV Coral Fraseri was the first vessel to moor starboard side to the jetty at BBG, due to the position of the bunkering station.



Picture 6. Detail of the mooring of the MV Coral Fraseri.

In turn, adjustments to the mooring led to some problems with the positioning of the gangway connecting the vessel to the terminal.



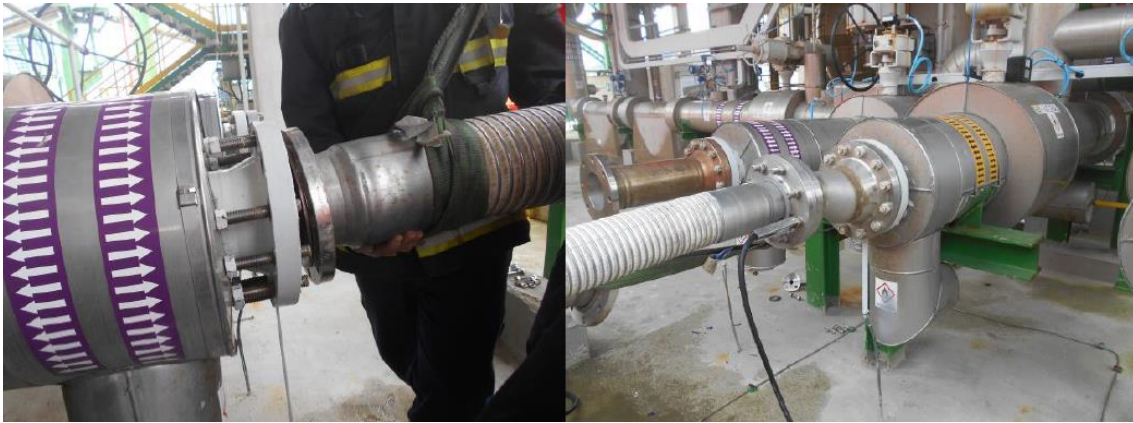
Picture 7. Gangway between the vessel and the terminal.

Communications between the vessel and the terminal were mostly by walkie-talkie. Cable communication could not be established due to incompatible connections.

Hose connections to the terminal were made after solving some flange compatibility problems.



Picture 8. Connection manoeuvre.



Picture 9. Detail of connections.



Picture 10. Detail of connections.



Picture 11. Hose arrangement.

After the hoses had been connected, a meeting was held prior to unloading between the BBG terminal staff and the ship's crew. In this meeting, all points of the operation were thoroughly reviewed and agreement was reached on how to proceed in those areas where there were doubts.

After the meeting, the emergency shutdown systems (ESD) were activated and the vessel's hoses, which were at ambient temperature, were cooled.



Picture 12. Hose cooling process.

The loading of the vessel began at 16:45h on 23 September, and the full pumping rate was reached an hour and a quarter later, at which time the ramp-up process was completed. The loading process was performed without incident, with an average flow rate of 320 m³/h.

After loading, the hoses were drained using nitrogen and were disconnected, the gangways were removed and the vessel unmoored, all of which was performed without incident.

LNG BUNKERING OPERATION			
GENERAL INFORMATION			
OPERATION	Brief description	Loading of MV CORAL FRASERI at the BBG LNG terminal (Bilbao)	
Type of operation		Terminal-to-Ship	
Facilities/Supplier vessel		BBG Terminal	
Receiving vessel		MV CORAL FRASERI	
Supply site		BBG Terminal Port of Bilbao	
Location		MV CORAL FRASERI moored at BBG jetty	
Delivery date		23 and 24/09/2019	
Docked	h	11:55 (23)	
Connected	h	13:50 (23)	
Started	h	16:45 (23)	
Completed	h		
Disconnected	h	4:50 (24)	
Total time	h	16.75 h	
Actual loading time	h		
Quantity supplied	m³ kWh	2,859	
High Low heating value	kWh/Nm³		
Initial tank pressure	bar	N/A	
Final tank pressure	bar	N/A	
KPIs			
Ratio actual loading time/total time	h/h		
Ratio quantity supplied/total time	m³/h	2,859/16.75 = 170,7	
Pumping rate	m³/h	Max. 340 Nm³/h Average 320 Nm³/h (excluding ramp-up)	
Ramp-up	h	(16:45-18:00) = 1:15 h	
Ramp-down	h	(2:30-(<u><3:40</u>)) = <u>< 2:10</u> H	
QUALITATIVE ASPECTS			
Cooling	Incidents	1 h. No incidents. Performed using LNG from the cooling line.	
Mooring	Incidents	Changes to planned mooring set-up due to the position of the upper manifold.	
Berthing	Incidents	- 22 September: Yokohama fenders are attached to vessel at anchor. - Previous incident: Yokohama fender fasteners broke. - Starboard berth (first time at BBG jetty).	
Hoses and/or arms	Incidents Manoeuvrability	Provided by vessel. 6" LNG and 4" steam return.	
BOG/NG management	Incidents	No incidents	
Communications		Walkie-talkie. Standby mobile in case of communications failure.	
OTHERS			
Attached documentation	C1901-OP-IF-0107-19 loading of CORAL FRASERI		

Table 3. OP. #2 KPI and indicators

3. Conclusions

At the time of writing this report, two LNG small-scale supply operations had been performed at the BBG regasification plant facilities.

On both occasions, the mooring, berthing, connection, disconnection and unmooring manoeuvres of the vessels receiving the load have been performed without incident and with all required safety measures in place. In any case, it should be noted that the facility has been sufficiently versatile to adapt to unforeseen events such as the use of manifolds from the ship's bunkering station at an unexpected height, as occurred during the loading of the MV CORAL FRASERI.

The specific loading operations have been performed in reasonable times, effectively and with no incidents. No difficulties in terms of compatibility with the vessels' bunkering stations have arisen in relation with the BBG small-scale regasification facility.

As the ramp-up and ramp-down processes are not fully documented, no quantitative conclusions can be drawn. However, from the data available and the comments provided in the attached reports, it can be concluded that all operations were carried out as planned. One process lasted 1:15 h and the other around 2:00 h, reasonable periods considering that the full rate supply ran for just over 16 hours.

The pumping rates achieved were those agreed with the vessel managers. In no case were the pumping rates close to the maximum values permitted by BBG, nor to the maximum values that can be accommodated by the supplied vessels.

Finally, despite the small number of operations carried out during the monitoring period, it can be concluded that the BBG regasification plant facilities are perfectly suitable for small-scale supply to vessels of over 60 m in length, depending on their specific compatibility.

4. Appendices

OP-IF-0008-18 Oizmendi trials
OP-IF-0027-18 Partial loading of MV Oizmendi
OP-IF-0031-18 Inerting of MV Oizmendi
TESTS at BBG Checklist

C1901-OP-IF-0107-19 Carga CORAL FRASERI

5. List of Acronyms and Abbreviations

LNG	Liquefied natural gas
MV	Motor vessel
ESD	Emergency shut-down
BOG	Boil-off gas