



**Minutes of Meeting**  
**74<sup>th</sup> Meeting of the Technical Study Group**  
**Tokyo - September 26<sup>th</sup> - 27<sup>th</sup>, 2023**

**PRESENT**

P.E. Decroës	ENGIE – TSG Chairman
H. Malvos	ENGIE / CRIGEN – TSG Secretary
R. Ellis	BP
S. Planteline	Dunkerque LNG
J. Wu	ENN LNG Trading Company
J. Yang	Equinor ASA
K. Stevens	Fluxys LNG
R. Witteman	Gate Terminal
C. Patricio	N.V. Nederlandse Gasunie
O. Phillips	National Grid (Grain LNG)
M. Hirabayasi	Osaka gas
Y. Mierez	Sempra Infrastructure
R. Alikhanbagi	Shell Global Solutions International B.V.
P.P. Ang	Singapore LNG Corporation
K. Hurley	South Hook LNG
S. Shimizu	Tokyo Gas
G. Petit	TotalEnergies

**INVITED**

S. Dubois-Du-Bellay	TotalEnergies
K. Amano	Mitsui O.S.K. Lines

**APOLOGIES RECEIVED**

J. Lauck	Distrigas/Constellation
P. Bouchy	Elengy
R. Jimenez	Enagas S.A.
R. Vara	Freeport LNG
A. Amorin Torres	GNL Quintero
J. Uibe Diez	Iberdrola Energia Espana
P. Cervera	Naturgy
J. Furuya	Sumitomo Corporation

### Agenda Item 1: INTRODUCTION

TSG Chairman opened the session, thanking Tokyo Gas for kindly hosting the meeting and making the excellent arrangements for this 74<sup>th</sup> meeting, in particular for the technical visit of the Sodegaura LNG Terminal and the e-methane demonstration plant in Yokohama.

He noted the attendance of 19 participants from 17 companies at the TSG meeting, with a good representation of each region and each regas technology.

Distrigas/constellation, Elengy, Enagas, Freeport LNG, GNL Quintero, Iberdrola Energia Espana, Naturgy and Sumitomo Corporation sent apologies for absence.

This meeting covered the TSG ongoing and planned new works as specified in the Meeting Agenda.

TSG Secretary reminded the main rules attached to anti-trust / competition law. He presented as well the principles of the Chatham House Rule for the verbal reports. He also circulated an attendance sheet.

It was also reminded that the minutes of TSG meetings and the related presentations are posted on the following page of GIIGNL website: <https://giignl.org/tsg/>

Home » TSG

## TECHNICAL STUDY GROUP

The TSG provides a forum, within GIIGNL, where leaders from the LNG industry offer their technical expertise to improve efficiencies across the midstream of the LNG value chain.

The purpose of the TSG is to:

- Organize exchanges on safety issues that allows every GIIGNL member to contribute to maintain high level of safety records on LNG import facilities.
- Produce cutting edge studies that improve efficiencies across the midstream of the LNG value chain and that are recognised within the LNG industry.
- Give the opportunity to experts from the LNG importing industry to meet, debate and build strong relationships.

Learn more about the [TSG's mission and goals](#).

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## 74<sup>th</sup> GIIGNL Technical Study Group Meeting - Draft Minutes

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September 2023

MON  
25

September 25 @ 7:00 pm - September 27 @ 7:00 pm CEST  
**GIIGNL 42ND CSG & 74TH TSG JOINT MEETING**  
Tokyo

April 2023

WED  
19

April 19 @ 7:00 pm - April 21 @ 5:00 pm CEST  
**GIIGNL 41ST CSG & 73RD TSG JOINT MEETING**  
Barcelona

October 2022

TUE  
11

October 11, 2022 @ 7:00 pm - October 13, 2022 @ 5:00 pm CEST  
**GIIGNL 40TH CSG & 72ND TSG JOINT MEETING**  
Singapore , Singapore

May 2022

MON

May 16, 2022 @ 5:30 pm - May 18, 2022 @ 4:00 pm CEST  
**71ST GIIGNL TSG MEETING**

### Agenda Item 2: GIIGNL INFORMATION

GIIGNL has a new General Delegate since July 1<sup>st</sup>, 2023 : Mr. Laurent DAVID, who attended part of this TSG meeting. Lucia Mora (in charge of communication/event organisation) left the central Office in August 23.

TSG Chairman reminded that GIIGNL has currently 85 company members and that TSG keeps count of 44 members (about 50% from Europe, 30% from Asia and 20% from Americas).

Since some new members were attending a TSG meeting for the first time, going around the table allowed participants to briefly introduce themselves.

The Japan Gas Association gave a presentation on e-methane contributing to mitigate GHG emission (see PwPt presentation).

### Agenda Item 3: SAFETY ON LNG FACILITIES

#### A3.1. Incident Identification database (Leader Elengy)

##### **Reminder:**

*There is a real necessity to maintain a regular update of the database; Lessons learnt from the past are helpful for all members (designers, operators, maintenance staff, ...) to improve the daily operation and when discussing with the authorities, the local communities...*

*Confidentiality attached to the data collection is ensured through a specific process involving regional coordinators and secure web access (https address).*

*Each GIIGNL member shall make sure to bring all available data into the database. All users were regularly reminded by the regional coordinators to use the database.*

##### **General information about the database**

The administration of the database is carried out by Mr. Bouchy (Elengy) with the support of Central Office.

The database is accessible by PC, laptop, touch pad or smartphone with the following link:  
<https://incidents-giignl.org>

The recommended navigators are Chrome and Firefox. Login and password generation is carried out by the administrators.

TSG Secretary presented on behalf of Mr. Bouchy (who sent apologies for not attending this meeting) the current status of the GIIGNL Incident Identification Data Base web platform, as well as the latest and next developments. He also reminded some general background information (see PwPt presentation).

The scope of the Data Base covers all LNG facilities, including FSRUs and small-scale facilities. Large public incidents but also near misses are considered (HiPo events). It is NOT an exhaustive list of all the incidents but it is representative of what could happen in a LNG Terminal. The database provides a description the accident, its consequences and the measures taken to prevent such accident to happen again. For recent incidents, sketches/pictures are attached. The information is recorded anonymously and is validated by a regional coordinator.

The regional coordinators are:

- Mr. Olagoke Phillips (National Grid) for Europe (30 originators authorized so far),
- Mr. Masayuki Hirabayashi (Osaka Gas) for Asia (36 originators authorized so far),
- Mr. Yovannis Mierez (Semptra Infrastructure) for Americas (16 originators authorized so far).

The role of the coordinators is to liaise with the originators to ensure the completeness of the incident description, and to track the incidents published in the LNG news in their respective region.

A video, accessible through the website menu, explains how to create and search an incident and presents as well guidelines / flowchart.

##### **Status of the Data Base:**

- So far, 479 incidents are registered in the data base.
- The two last incidents registered in the database are the incident 1928, which occurred on June 8, 2022 in Freeport liquefaction plant, and the incident 1929, which is related to a leak of LNG from a blind flange at the end of a truck loading bay.

- Connections to the database in 2023 were counted as follows: 17 for Americas, 19 for Asia and 52 for Europe.
- There is a too limited flow of reported new incidents / near misses / HiPo events.
- The number of incidents reported on small scale and FSRU's seems small compared to the number of facilities in operation.

TSG Chairman insisted on the need to keep an active participation of the GIIGNL members and the HSE managers, pointing out the role of TSG members for contacting HSE managers and inciting them to record the incidents of interest.

#### **Latest developments:**

Following last TSG Meeting, central Office was requested for the different listed below and a contact with the developer (KERNIX) followed to explain the needs:

- Implementation of automatic launching of bi-annual campaigns for collecting the incidents (some members haven't received the mail sent for the campaign for the past 2 years). The receivers should be the TSG members and the originators of the data base (with a link to the tutorial video and guidelines),
- Automatic notification by email to the originators and TSG members of all new incidents registered in the data base (with a link for getting a direct access to the incident on the database),
- In case of update of an incident by the administrators, recording and display of the date of the update in addition to the date of the incident creation,
- Automatic notification by email to the "sleeping" originators, after 3 years without entering any incidents with copy to the TSG company representative.

Kernix informed Mr. Bouchy on September 22<sup>nd</sup> that it was proceeding with the requested modifications of the Data base.

It was reminded that the information in SIGTTO database related to accidents on ships at berth, should be available as well in GIIGNL database. Consistency of both databases on this part was checked in the past and such a comparison could be made again.

A suggestion has been done to define a common password by company (to avoid to share personal password) but a personal password allows to track the connections.

As a reminder, at last TSG meeting in Barcelona Mr. Lauck (Distrigas/Constellation) suggested to work on a new report analyzing the database anonymized information, when more data is entered in a consistent way in the database. The last TSG report on the LNG Incident Identification Study was issued by TSG in 2017. It is available on GIIGNL website, as well as the paper published in 2018 and the presentation at WGC 2018:

[https://giignl.org/wp-content/uploads/pda/2021/08/2017\\_lng\\_incident\\_identification\\_study\\_o.pdf](https://giignl.org/wp-content/uploads/pda/2021/08/2017_lng_incident_identification_study_o.pdf)

[https://giignl.org/wp-content/uploads/pda/2021/08/giignl\\_lng\\_incident\\_identification\\_study\\_-\\_paper\\_march\\_9th\\_2018.pdf](https://giignl.org/wp-content/uploads/pda/2021/08/giignl_lng_incident_identification_study_-_paper_march_9th_2018.pdf)

[https://giignl.org/wp-content/uploads/pda/2021/10/giignl\\_lng\\_incident\\_identification\\_study\\_-\\_wgc\\_abstract.pdf](https://giignl.org/wp-content/uploads/pda/2021/10/giignl_lng_incident_identification_study_-_wgc_abstract.pdf)

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**Decisions were as follows:**

- Mr. Bouchy will follow-up with the following requested implementations:
  - bi-annual campaign mail sent automatically to all TSG members and originators (making sure that the link to the tutorial video and guidelines is provided in the mail),
  - automatic mail (reminder) sent specifically to any originator who didn't enter an incident in the database during the last 3 years (with copy to the TSG company representative),
  - automatic mail sent to TSG members and originators, each time a new incident is entered in the database (with a link for getting a direct access to the incident on the database),
  - recording and display of the date of the update in addition to the date of the incident creation.
- Efforts are required from the data base originators to include also incidents related to FSRUs and truck loading.
- TSG Chairman and Secretary will check consistency of GIIGNL and SIGTTO data bases on incident which occurred on ships at berth.
- GIIGNL central office will review the list of originators to make sure that it is still up to date.

### **A3.2. lessons from incidents**

*To extend safety information sharing and as a mean to promote the use of the database, information on representative incidents which occurred in the last period is included in the Agenda (Lessons from incidents). Such discussions enrich members knowledge on the type of incident which are recorded in the data base.*

-Mr. Vara (Freeport LNG) gave (through visio conference and under Chatham House rule) a presentation on the incident which occurred at Freeport LNG facility on June 8, 2022.

As a reminder, and as explained in the public document posted on internet by Freeport LNG ('Freeport LNG Incident and Regulatory Response - PHMSA / FERC / USCG'), the incident resulted from thermal expansion of trapped LNG within a LNG line, with an isolated 1/4" thermal relief valve, which led to a Boiling Liquid Expanding Vapor Explosion and Loss Of Primary Containment. The flammable vapor (methane) then met an ignition source resulting in a vapor cloud explosion, a fireball, a small secondary pool fire, and a short-term release of vaporizing LNG from a damaged 3-inch LNG piping.

The 18" LNG line running between two tanks, 180 ft long, was vacuum insulated and provided with welded expansion bellows (all piping was welded). Before the incident, it took 5 days for the LNG temperature to slowly raise. Two bellows failed at 270 psi (for a design pressure of 225 psi). When the bellows failed, the insulation failed (loss of vacuum) and the temperature raised much faster (It took 7 hours for the outer jacket to fail at 700 psi). Damages were observed on each end of the line.

The question of the ignition source (damaged electrical cables or friction of broken pipes ?), which was raised at former TSG meeting, has no clear answer. The fact is that it happened 9 seconds after the LNG leak.

No one was injured because it was the lunch time.

Main root causes were lack of TSV test procedure, skin temperature indicators not on DCS screen and lack of isolation procedure.

Contributing elements were the Hazop (thermal expansion not considered), lack of MOC, the operator fatigue and a failure in recognizing the danger.

Actions : More detailed procedures (not more but better procedures) , More training, Test programs, Field audits, alarm management, systematic check for trapped LNG, restore the TI in DCS, soft clamps

on hand valve (to avoid full closure), 80 additional operators to limit over-time, new department for excellence/training, HAZOP revalidation, record of temporary field changes.

-Mr. Petit TotalEnergies reported a significant accident At Pluto LNG (Australia) last May. The accident occurred during maintenance and the flare was damaged. Some public information is available on internet. Mr. Petit will collect some information and feed the database.

-As a reminder, at last TSG meeting in Barcelona, Mr. Spanhove (Fluxys LNG) presented an incident related to truck loading. ESD valves on the LNG truck had their switch on open position when the driver got air supply.as a consequence, the truck driver got some LNG on himself. It was suggested to check if GIIGNL Truck Loading Safety Guidelines shall be updated at the light of this incident.

- At last TSG meeting in Barcelona, Mr. Spanhove (Fluxys LNG) presented one incident related to a tank PSV opening twice in a short period of time at 85% of the set point. Same incident was reported in Hazira (last TSG) and in Revithoussa (more recent info). The real lesson from this incident is that the in-situ testing of a tank PSV with N2 bottles is not accurate as the volume is too small (it is only a functional test). Therefore, it is highly recommended to alternate in-situ testing with bench testing and perform a bench testing each time that there is a small deviation/unstability. The ship tank PSV's are bench tested during each dry dock.

South hook experienced the same problems at the beginning of the terminal. They drilled a new port on the RV body (details to be checked) and modified the in-situ testing procedure with the vendor. Now they bench test each PSV once every 8 years and the in-situ calibration is corresponding to the workshop calibration. Situation is different for the vacuum breakers as the O-ring could be glued.

In US, there is still a debate about LNG transport by Train as REX are outdated (although LPG transport by train is allowed).

**Decision was as follows:**

- Mr. Petit (TotalEnergies) will feed the database with the information collected on Plutot LNG accident.
- Mr. Bouchy (Elengy) will report at next TSG meeting if GIIGNL Truck Loading Safety Guidelines shall be updated at the light of the incident at the LNG truck loading bay of Fluxys LNG facility.
- For each TSG meeting, regional coordinators and the database administrator will select and organize a presentation on an incident recorded in the database. Proposals are welcomed from any member for such safety moments fed with examples.

**Pending:**

- At next TSG meeting, Shell will give a presentation on Prelude incident (failure in the design of the back-up of the power generation system).
- At next TSG meeting, National Grid will give a presentation of the results of the tightness tests made in Isle of Grain with a balloon under cryogenic conditions and 2 to 4 barg for maintenance/repair works in a terminal in service downstream a single block valve.

## Agenda Item 4: OPERATION & MAINTENANCE

### A4.1. COVID experiences and lessons learned (Leader Sempra Infrastructure)

Mr. Mierez (Sempra Infrastructure) gave a feedback on the presentation he gave at LNG 2023 Conference in Vancouver, 10-13 July (see Paper and PwPt presentation).

He reminded as well the timeline of the study, which is now 99% complete (see PwPt presentation). The remaining actions are for Central Office to edit the report in GIIGNL format and to publish it on GIIGNL website.

The study identifies potential lessons learned that could be implemented permanently in the operations.

As a reminder, Task Force members were:

- Mr. Mierez, Task Force leader (Sempra Infrastructure)
- Mr. Decroës (Engie)
- Mr. Patricio (representing then Gate Terminal)
- Mr. Phillips (National Grid / Grain LNG)
- Mr. Koeger (TotalEnergies)
- Mr. Louzerio (REN Atlantico)

The methodology was to get member companies experience through conference calls and surveys on lessons learned.

The report provides a general overview of the main actions and strategies that LNG terminals operators of the GIIGNL member companies implemented to overcome the tremendous multidiscipline crisis generated by the pandemic, keeping a healthy workforce while continuing with a safe operation. The areas of the study included: organization, Health, Safety, Security and Environment (HSSE), including a response plan, Maintenance and Engineering, including disciplines working remotely, Operations, Marine, Technology Support.

#### Decisions were as follows:

- Central Office will format the report on 'Lessons learned from pandemic' and post it on GIIGNL website.

### A4.2. Recent O&M Surveys

TSG Chairman reminded the possibility given to members to raise a question to Central Office. If the interest is confirmed, Central Office may circulates it, as a survey, to all members. After gathering the answers, Central Office analyses the results and produces an anonymous synthesis.

TSG Chairman reminded the last surveys on tank relief valves (PSV), as well as recent issues with LNG compositions (N<sub>2</sub>, C<sub>6</sub>+), which are published on the GIIGNL web site.

- **Heavy Hydrocarbons**

*Reminder : A survey was circulated in Feb 2023 about potential issues with C<sub>6</sub>+ in LNG and it was discussed during the last TSG. Several serious issues were reported on*



- *LNG ships in ballast condition trading with US terminals. The problems were reported during spraying/cooling down before reloading and during BOG reliquefaction. A threshold of 40 ppm of C6+ was mentioned. This issue had serious consequences on ship reliability (reduce ship speed, increase ship heel, ask terminal to perform ship cooldown, regular switch of LD compressors, clean pipes..)*
- *LNG regas terminals (Issues with the suction filters of BOG compressors) and odorant black liquid reported in pump can.*

Equinor founded 0,001% Mol (or 100 ppm) of components even heavier than C12 (from Sabine Pass) on their ships. Their remedy is to load in different places to blend these heavies with fresh LNG from another source (but it has logistic consequences).

ENN LNG mentioned that they got some warmer cargoes than usual and reminded that C6+ is an issue as well for cargo temperature on the ship. Their remedy is to leave a LNG heel in the 4 tanks to limit spraying at arrival (with has an economic consequences)

During a HP pump overhaul after 16000 hours, Gate LNG founded heavies (C20 to C40) in one HP pumps, potentially damaging the HP pump (see PowerPoint presentation). The pump didn't show any bad performances or abnormal vibrations. This is a new problem which didn't occurred in the past and which affects Thrust Equalizing Mechanism (TEM).

TEM works by a fixed orifice (upper wear ring of the TEM impeller) and an adjustable gap between the TEM impeller and the Thrust Plate, in function of flow and discharge pressure. The wear ring clearance and the adjustable gap are calculated for a specific pump model and working conditions. If some pollution or contamination modify these parameters, the mechanism is affected.

A considerable amount of 'oil' (100 ml) was found into the upper chamber of the TEM impeller. Since the oil becomes solid at -10°C (in accordance with recent analysis), it can easily affect the TEM. Additionally, the motor lower bearing can be compromised due to the solid particles.

Gate LNG reported as well heavies on LP pumps (no damages today) and on tank density measurement (more than 10 kg/m3 error), producing wrong measures which could lead to false decision for top filling or bottom filling of the LNG tanks.

TotalEnergies reminded that the problem of heavy hydrocarbons in the feed gas from the U.S. is well known. The origin of these heavy hydrocarbons is not clear (shale gas ? fracking ? compression station ? lubrication oil ?). C6+ (up to C12+) are today reported in the upstream feed pipelines. Normally, these C6+ are not soluble at -70°C and they should be caught by the NGL recovery at -50/-60°C. If some traces are passing through the NGL recovery, they are blocking the plate fin exchanges and the filters. The only remedy actually is to install two equipment (filter/exchanger) in parallel to allow inline cleaning. The issue is reported in almost all the US terminals. If the pipeline gas compressor is oil sealed, it is not an issue to transport gas at ambient temperature but it becomes an issue during the liquefaction process.

It was reminded that some operators suggest to use butane to wash out heavier components.

Singapore LNG mentioned that it could see some black liquid smelling like rotten fish, as this had been also reported by Elengy at last TSG meeting.

South hook reported some problems on the BOG compressor filters but the problem was solved by adjusting the ship pressure to the tank pressure. South hook experienced in the past some TEM issues. Problem was solved by installing more resistant bearings, which are more resilient to C6+.

#### A4.3. HSE

- **Leaks**

Singapore LNG mentioned that they experienced some leaks on SVT loading arms after 7 years of operation. They had to change some parts (CU-Seals) on the top swivel joint.

Gate reported similar experience.

TSG Chairman reported a limited lifetime for the insulating joint at the exit of the terminal (electrical insulation for avoiding interference between cathodic protection of the terminal line and of the transport line). Elengy experienced a leak at this insulating joint after 40 years of operation. Recommendation in Europe for considering its lifetime is 30 years.

South Hook LNG mentioned that they test the quality of this joint by submitting it to high voltage difference between the 2 pipes.

- **N<sub>2</sub>**

*Reminder : Several regas terminals reported that some US liquefaction operators asked to increase the N<sub>2</sub> content at LNG loading above 1%. Contractually it is OK as the limits are for all inerts (CO<sub>2</sub>+N<sub>2</sub>) but the question was raised on the potential operational consequences.*

TotalEnergies explained that the pipeline gas specification from freeport allows up to 3%N<sub>2</sub> (4% inert N<sub>2</sub>+CO<sub>2</sub>). One field feeding freeport becomes more and more N<sub>2</sub> rich. As they don't consume a lot of fuel gas because of the electric driven liquefaction compressors, Freeport has to limit the N<sub>2</sub> content of the feed gas to 1,2% in order to guarantee 1% N<sub>2</sub> at loading. They are studying two technical solutions :

1. Remove the N<sub>2</sub> from LNG (which means additional investment) ;
2. Increase the N<sub>2</sub> limit in the LNG at ship loading from 1% to 1,5% (which was done in sabine pass).

In principle, the nitrogen loaded is released partly during the loaded voyage. However, the following operational consequences are expected :

- Higher ship and onshore tank boil-off rate (leading potentially to sharp pressure increases during (un)loading) ;
- High Nitrogen concentration in both ship and onshore boil-off gas (which might create ship engine knocking and out-off spec regaseified gas conditions at minimum sendout) ;
- Quick LNG ageing in both ship and onshore tanks ;
- Higher risk for onshore tank roll-over :

A discussion was raised on the 3% N<sub>2</sub> limit which may be considered in relation with the risk of auto-stratification leading to roll-over. GIIGNL Roll-over report takes as reference *Chatterjee and Geist \**, who do not precisely define critical nitrogen content but state that only mild effects are expected for nitrogen content between 1% and 3%. Even if stratification occurs, which is not certain, the subsequent vapour-evolution rates at rollover are estimated to be only two or three times normal. For 4% nitrogen or higher, auto stratification is an established cause of rollover.

(see: [https://giignl.org/wp-content/uploads/2021/08/rollover\\_in\\_lng\\_storage\\_tanks\\_public\\_document\\_low-res.pdf](https://giignl.org/wp-content/uploads/2021/08/rollover_in_lng_storage_tanks_public_document_low-res.pdf))

\* *Chatterjee, N. Geist, J.M.* Spontaneous stratification in LNG tanks containing nitrogen. ASME paper 76-WA/PID-6, American Society of Mechanical Engineers, New York, 1976.

Most of the regas terminals have a N<sub>2</sub> limit of 1 % to 1,2%. LNG ships have a N<sub>2</sub> limit at 1,5%.

- **Drop of loading arms parts**

TSG Chairman reported 3 HIPO related to drops of loading arms parts (see PWPt presentation):

- 13 meters drop at South Hook LNG in 2019 (Near Miss)

Whilst connecting to an LNGC, the dropped object (3.7 kg OEM rubber buffer) fell approximatively 13 meters off an outboard arm.

Following this incident, inspection scope and frequency were reviewed, there was full survey across the plant with immediate replacement of damaged rubber buffer, query was sent to OEM to evaluate design, the incident was shared with shareholders and other LNG terminals.

- 15 meters drop in GNL Mejillones terminal in 2023, after 13 years of operation (Near Miss)

At the end of the LNG unloading during arm movement, contact was made with a mechanical stop that serves to limit the displacement of the loading arm. The 20 kg mechanical stop fell to a Terminal platform approximately 15 meters below. Nobody was on the platform. Corrosion wear of the mechanical stop's clamps was identified among the causes.

Following this incident, design was changed to reinforce the arm/counterweight stop connection clamps, conditions and possible removal of the arm stops were verified. verification of the condition of the mechanical stops were included in the pre-unloading check.

A correction was to replace the mechanical stop of the old arms L121A/B-L122-L131-L132 and reinforce the design by copying the FMC improved design of the new arm 121C.

It could be noted that despite the fact that FMC changed the design of its loading arms, it didn't issued alert to its customers.

- 20 meters drop at Dragon LNG in 2023 (Near Miss)

During unloading arm connection, a 27.4 kg outboard arm parking stop fell from approximately 12m on the ship deck, where three operators were busy with arm connection. The stop was not in use at the time of the incident. Initial investigations indicated that corrosion led to a failure of the retaining clamp. Vendor refused to consider it as a design mistake.

**Decisions were as follows:**

- It is recommended to include a visual inspection of the FMC arms mechanical stop in the yearly maintenance plan
- As a follow-up of last TSG meeting, TSG Chairman and Secretary will ask SIGTTO if they have information to share about the NORMs issue.

**A4.4. Reduce LNG leaks from control valves / flanges (South Hook LNG)**

Mr. Hurley (South Hook LNG) gave a concise overview of the key points related to managing fugitive emissions and presented solutions to fugitive emissions and for Effective Sealing.

For the gas leak detection :

- the laser technology is used to detect gas leaks at ppm level (used by Sth hook since 8 years )
- The gas detectors (fixed and portable) are used to see a trend

As a result, the frequency of LDAR campaign with NPL extended from 3 years to 5 to 8 years.

One frequent source of leak are the valve gland packing experiencing wears due to trim movement. He presented the benefits of Live Loaded Packing :

- Elimination of torque checks and adjustments.
- Reduced fugitive emissions.
- Enhanced operational reliability / process safety in cryogenic cyclic duty.
- Packing fulfils its design life, cost savings in maintenance and equipment uptime.

Aspect	Live-Loaded Valve Packing	Normal Valve Packing
<b>Excellent Leakage Control</b>	✓ Provides consistent and reliable sealing even under dynamic conditions.	X require frequent correct torque adjustments and maintenance to prevent leakage.
<b>Reduced Maintenance</b>	✓ Requires no adjustment due to constant force.	X May need frequent maintenance to ensure proper sealing especially in vibration sensitive systems.
<b>Longer Service Life</b>	✓ Typically has a longer service life as it compensates for packing wear according to us over time.	X May wear out faster due to incorrect torque, leading to more frequent replacement.
<b>Enhanced Safety</b>	✓ Reduces the risk of hazardous leaks in critical applications.	X Higher risk of leaks, potentially posing safety hazards.
<b>Better Temperature and Pressure Tolerance</b>	✓ More suitable for extreme operating conditions due to constant sealing force.	X Correct use of torque tables and understanding of dynamic conditions cyclic-temperature-fatigue
<b>Initial Cost</b>	X Usually more expensive to purchase and install due to the added components.	✓ Lower upfront cost compared to live-loaded packing.
<b>Complex Installation</b>	X Requires more intricate setup with OEM or specialist supplier.	✓ Simpler installation with fewer components involved.
<b>Potential for Spring Failure</b>	X There is a possibility of spring failure beyond OEM recommendations, requiring replacement.	✓ Fewer components to fail, reducing the likelihood of parts replacement.
<b>Limited Use in Low-Pressure Systems</b>	X May not be necessary for valves in low-pressure applications, adding unnecessary cost.	✓ Suitable for various pressure ranges, making it cost-effective in lower-pressure systems.

**Pros and Cons**

These spring loaded packings have been identified by South hook in 2016. Terminal replaced 30 valves gland packing on a 2,5 years period. Now terminal has more than 5 years return of experience and the technology is highly recommended.

There is a special red mark to warn the maintenance people that the packing must be replaced. In case of spring failure, the valve goes in fail safe position. The glands are checked by maintenance every 6 months.

## Agenda Item 5: GHG EMISSIONS

### A5.1. Ways to reduce the CO<sub>2</sub> footprint of the LNG terminals (Leader Dunkerque LNG)

Due to the tight schedule of this 74<sup>th</sup> TSG meeting, Mr. Planteline (Dunkerque LNG) kindly accepted to postpone to next TSG meeting his presentation of the work carried out by the Task Force related to CO<sub>2</sub> emissions. A questionnaire will be circulated to feed the reflections of the Task Force on CO<sub>2</sub> emissions reduction.

As a reminder, a first study linked to this topic was led by Mr. Witteman (Gate LNG) on Methane Emissions. Other GIIGNL sources are also available, listing more or less directly CO<sub>2</sub> reduction examples, but none with a direct focus on CO<sub>2</sub> reductions. To avoid repeats, the study focuses on recent solutions (eg: no specific benefit for members to highlight cases of pipeline compressor installation).

The Task Force members are: Dunkerque LNG (Task Force Leader), Enagas, Engie, Sempra Infrastructure, Shell and TotalEnergies.

The study focuses on the CO<sub>2</sub> impact of each main equipment of a terminal (a global benchmark would be difficult because the operating conditions of each terminal are too different).

The report will be divided in three main parts:

- Introduction (General content, Source of main CO<sub>2</sub> emissions inside a regasification terminal, Extent of CO<sub>2</sub> emissions per main equipment and scope)
- Ways to reduce CO<sub>2</sub> emissions (Scope 1, Scope 2 and Scope 3)
- LNG terminal concrete examples (Case studies)

At last TSG meeting in Barcelona, there was a discussion on the boundaries between scope 2 and scope 3. Shell suggested to discuss and explain at next TSG meeting how to use the GIIGNL MRV method. TSG Chairman agreed and proposed to ask LNG Quintero to give a presentation at next TSG meeting, as one of the company taking part of the pilot phase of GIIGNL MRV.

In relation with case studies, Enagas proposed to give a presentation at next TSG meeting on the way cold recovery is performed with a Rankine cycle at Huelva LNG terminal. Enagas suggested as well to include in the case studies, the use by Enagas at Cartagena LNG terminal of H<sub>2</sub> flare (pilot fed by green H<sub>2</sub> produced through electrolysis, with fuel gas back-up).

When commenting the draft questionnaire, Distrigas/Constellation suggested that each member of the Task Force fills in the draft questionnaire first, for adjusting it if needed.

It was suggested as well to align the questionnaire with GIIGNL MRV and to focus more on scope 1 and scope 2 than on scope 3. TSG Chairman proposed that the Task Force leader takes these suggestions into account and gets feed-back from Task force members by July 2023, before circulating the questionnaire to all members.

The results (gathering all answers) are expected to be presented at next TSG meeting. The intended content of the report could be adjusted according to the discussion that would follow the presentation.

TSG Chairman and TSG Secretary asked Mr. Shimizu (Tokyo Gas) if he could try to get some Japanese Company Member in the Task Force, since there is so far no member from Asia in the Task Force.

**Decisions were as follows:**

- TSG Chairman will ask LNG Quintero to give a presentation at next TSG meeting on how they used GIIGNL MRV method in the pilot phase.
- Mr. Jiménez (Enagas) will give a presentation at next TSG meeting on the way cold recovery is performed with a Rankine cycle at Huelva LNG terminal.
- Mr. Planteline (Task force Leader) will include in the case studies, the use by Enagas at Cartagena LNG terminal of H<sub>2</sub> flare.
- Mr. Planteline (Task force Leader) will revise the questionnaire, aligning it with GIIGNL MRV and focusing more on scope & and scope 2 than on scope 3. He will get feed-back from Task force members after they fill in the questionnaire.
- Mr. Planteline (Task force Leader) will timely circulate the questionnaire to all members in order to presents the results (gathering all answers) at next TSG meeting.

### A5.2. GIIGNL MRV and CHG Neutral Framework

Shell gave feed-back on its own practical experience in using the framework for LNG cargo carbon compensation in the pilot phase (see PwPt presentation).

The main takeaways of the presentation are as follows:



Focus to avoid, reduce and then compensate with **sustainable NBS**



The GIIGNL carbon neutral framework **enables emission quantification** when using a standard. This is the premise to delivering carbon neutral cargos.



Shell advocates for a **singular industry wide framework** for reporting LNG cargo emissions and calculating the offset required for neutrality.



Along with GIIGNL, Shell advocates for **primary data usage for cargo emission reporting**, LNG import terminals can support here with submissions to GIIGNL.



Currently, only 6% of LNG import terminals are represented with primary data in GIIGNL

It was reminded that, in Europe, the law changes from 01/01/2024 and that after this date, any LNG cargo coming to Europe will have to quantify and report its methane intensity.

Shell insisted on the need for the LNG industry to continue to collect primary data as it allows to have a better picture of the real carbon footprint of the industry. For instance, primary data for US upstream are widely available. Shell recommends to create a database of primary data for the MRV.

### A5.3. LCO<sub>2</sub> terminalling

Mr. Petit (TotalEnergies) presented the proposed work to be carried out in the Task Force which was created at last TSG meeting on combining LNG receiving and CO<sub>2</sub> liquefaction terminals (see PwPt presentation).

The objectives of the study are:

- to evaluate the challenges and synergies brought by combining onshore LNG receiving and CO<sub>2</sub> liquefaction terminals,
- to define design principles considering the overall CO<sub>2</sub> chain from capture to re-injection,
- to focus on Onshore LNG Terminals (FSRU specificities will be studied in a second phase if interest is confirmed).

During the meeting, National Grid and BP volunteered to join the Task Force.

Task force Members are:

- TotalEnergies, Task Force Leader (Mr. Ginès Petit, Mr. Olivier Pasteau / Mr. Stéphane Dubois du Bellay)
- BP (Mr. Richard Ellis)
- Dunkerque LNG (Mr. Sylvain Planteline)
- Elengy (Mr. Philippe Bouchy, Mr. Benjamin Poirson)
- Engie (Ms. Audrey Hubert, Mr. Paul-Emmanuel Decroes, Mr. Hugues Malvos)
- Equinor (Ms. Jingshi Yang)
- Fluxys LNG (Mr. Kim Stevens, Mr. Siegfried Spanhove)
- National Grid (Mr. Olagoke Phillips)
- Osaka Gas (Mr. Masayuki Hirabayash)
- Sempra Infrastructure (Mr. Yovannis Mierez)
- Shell (Ms. Raha Alikhanbagi, Mr. Pablo Vega Perez)
- Singapore LNG (Ms. Pei Pei Ang)

Before opening the discussion for gathering the subjects of interest to be integrated into the scope of work, Mr. Petit presented some items proposed ahead of the meeting by Engie, Elengy and TotalEnergies, linked to CO<sub>2</sub> supply conditions and impact on the facilities design, CO<sub>2</sub> specifications and needs for purification, CO<sub>2</sub> Purification / Liquefaction / Storage / Transfer / Loading / Shipping, operation and HSE.

As a reminder, Sempra Infrastructure has a project on carbon capture and utilization of CO<sub>2</sub>, and Gate Terminal is involved in a project using cold energy from Gate LNG terminal and LCO<sub>2</sub> transported on barges.

Mr. Mierez (Sempra Infrastructure) suggested to add in the study, CO<sub>2</sub> specifications for e-methane production.

Ms. Alikhanbagi (Shell) suggested to include as well brown field terminals (new LNG terminals). She suggested as well, in link with HSE, to tackle subjects such as safety distances.

Mr. Ellis (BP) suggested to add specifications for shipping (notably pressure).

Mr. Planteline (Dunkerque LNG) proposed to consider the custody transfer aspects.

**Decisions were as follows:**

- Task Force members are: TotalEnergies (Task Force Leader), BP, Dunkerque LNG, Elengy, Engie, Equinor, Fluxys LNG, National Grid, Osaka Gas, Sempra Infrastructure, Shell and Singapore LNG.
- Mr. Petit (Task Force Leader) will organize a kick-off meeting at the soonest and will present at next TSG meeting the work carried out.

**Agenda Item 6: GIIGNL PUBLICATIONS**

**A6.1. Update of the Custody Transfer Handbook (Leader Fluxys LNG)**

*As a reminder, the purpose of the custody handbook is to serve as a reference manual to assist readers in understanding the procedures and equipment available to be used by GIIGNL members. It helps to determine the energy quantity of LNG transferred between LNG ships and LNG terminals (ship to shore or shore to ship).*

*It is neither a standard nor a specification, but it sets out the practical issues and requirements to work out a suitable procedure for a specific LNG custody transfer application.*

*Last Update of GIIGNL Custody Transfer Handbook was finalized at the end of 2021 (6<sup>th</sup> edition).*

*Future subjects under consideration for a next update of GIIGNL Custody Transfer handbook include:*

- *some small-scale LNG transfer operations (such as ship bunkering, STS transfer, fueling of ships and trucks, filling of LNG trucks or containers)*
- *Transshipments*
  - *Considerations about the change in composition due to flash gas*
  - *Gas quality determination*
- *Use of the RAMAN analyzer (sole a reference is made in the current edition)*
- *Use of flow meter for custody transfer measurements*
- *Use of portable vaporizer/chromatograph (which could be useful for counter expertise)*
- *Rules for ship level meter filtering (as the modification of the filtering could make a 200-300 m3 difference)*

Mr. Stevens (Fluxys LNG) replaced, as Task Force Leader, Mr. Verhelle, who recently changed position within Fluxys.

Some suggestions were made at last TSG meeting by Enagas, Equinor and Singapore LNG for updating GIIGNL Custody Transfer Handbook (CTHB), notably:

- to address partial loading/unloading by adding a paragraph dealing notably with temperature issues,
- to ensure that §2.3.5. on periodic instruments recalibration is clear enough, notably by making some recommendation on duration (3 or 5 year periods, for instance),

It was proposed as well at last TSG meeting that CTHB Task Force leader (Fluxys LNG) checks with Enagas (Mr. Jiménez) if they wish to draft a paragraph for integrating some small-scale LNG transfer operations (such as bunkering, STS transfer, fueling of ships and trucks, filling of LNG trucks or containers). Since then, the subject has been discussed internally within Enagas between Mr. Jimenez



and Mrs. Rabinal. Mr. Jimenez will send comments to Task Force Leader (Fluxys LNG) and give a presentation at next TSG Meeting.

Mr. Stevens will contact Enagas, Equinor and Singapore LNG, for taking into account their comments and suggestions. He will report at next TSG meeting on the proposals for updating the CTHB.

The link for downloading the 6<sup>th</sup> edition of GIIGNL Custody Transfer Handbook is:

<https://giignl.org/document/custody-transfer-handbook-6th-edition-2021/>

**Decisions were as follows:**

- Mr. Jiménez (Enagas) will send comments to CTHB Task Force leader (Fluxys LNG), notably for drafting a paragraph integrating some small-scale LNG transfer operations (such as bunkering, STS transfer, fueling of ships and trucks, filling of LNG trucks or containers).
- Mr. Jiménez (Enagas) will give a presentation at next TSG meeting on his updating proposal.
- CTHB Task Force leader (Fluxys LNG) will discuss with Enagas, Equinor and Singapore LNG, the subjects to be considered for next revision of CHTB.
- CTHB Task Force leader (Fluxys LNG) will consider addressing partial loading/unloading, as well as transshipment, in next revision of CTHB.
- Next revision of CTHB will ensure that §2.3.5. on periodic instruments recalibration is clear enough.
- CTHB Task Force leader (Fluxys LNG) will report at next TSG meeting on the proposals for updating the CTHB.

## **A6.2. Rollover in LNG Storage Tanks**

A roll-over on ships/FSU/SFSRU is credible (some case were reported in Klaipeda, Mejillones, Moss ship after partial unloading/reloading). Shell proposed to launch a study on rollover onboard FSRUs or FSUs, completing the rollover report issued in 2015 for on-land LNG tanks.

See: [https://giignl.org/wp-content/uploads/2021/08/rollover\\_in\\_lng\\_storage\\_tanks\\_public\\_document\\_low-res.pdf](https://giignl.org/wp-content/uploads/2021/08/rollover_in_lng_storage_tanks_public_document_low-res.pdf)

Ms. Alikhanbagi (Shell) volunteered as Task Force Leader of such a study.

Engie and N.V. Nederlandse Gasunie volunteered to join the Task Force.

Ms. Alikhanbagi will prepare a proposal of work to be sent by Central-Office to ask for volunteers to join the Task Force.

**Decisions were as follows:**

- A Task Force is constituted for a study on rollover onboard FSRUs or FSUs, completing the rollover report for on-land LNG tanks.
- The members of the Task Force at this stage are: Shell (Task Force Leader), Engie and N.V. Nederlandse Gasunie.
- Task Force Leader will prepare a proposal of work to be carried out, and will submit it to Central-Office, TSG Chairman and TSG Secretary.
- Central-Office will circulate the proposal, asking for more volunteers to join the Task Force.
- Task Force Leader will present the scope of work at next TSG meeting.

### A6.3. LNG quality & compatibility

Last update of the composition table which used to be published in GIIGNL annual report on the LNG industry was issued more than 10 years ago (2012):

[https://giignl.org/wp-content/uploads/2021/07/giignl\\_the\\_lng\\_industry\\_2012.pdf](https://giignl.org/wp-content/uploads/2021/07/giignl_the_lng_industry_2012.pdf)

The composition table appeared in later reports but without being updated. Finally it was deleted from the annual report as it was not representative anymore of the LNG international market (for instance, US and Australian LNG were not in).

TSG Chairman proposed to launch a joint Task Force with GIIGNL Commercial Study group, trying to overcome the confidentiality issue which prevented the update of this composition table.

Equinor and Engie volunteered from joining such a Task Force.

**Decisions were as follows:**

- TSG Chairman will liaise with CSG Chairman and Equinor for launching a Task Force on LNG quality and compatibility. He will report on the progress at next TSG meeting.

### Agenda Item 7: OTHER MATTERS

#### A7.1. New study subjects

It is reminded that this creative part of the meeting is of highest importance, since it allows to bring added value to the TSG in order to help the LNG industry in today's activities and preparing for the future.

Ms. Alikhanbagi (Shell) suggested to launch a Task Force for creating a database on primary data to be used with GIIGNL MRV and CHG Neutral Framework.

TSG Chairman proposed to discuss this topic at next TSG meeting and asked Ms. Alikhanbagi to prepare a presentation.

Due to the tight schedule of this 74<sup>th</sup> TSG meeting, the subject of Standardization for truck loading facilities, which was raised at former TSG meeting, couldn't be discussed and is still pending:

- Mrs. Ang (Singapore LNG) formerly proposed to give a presentation on truck loading connection and dry coupling.  
Standardization for truck loading facilities (including connections) is a subject of interest for several TSG members (such as Dunkerque LNG, Fluxys LNG or Gate LNG).

As a reminder, all TSG members are asked to think about new study ideas to be discussed at next TSG meeting. To date, several ideas have been proposed, such as:

- Developing a technical paper on green gases (Bio-LNG, Liquefied Synthetic Methane and LH<sub>2</sub>)
- Infrastructure synergies for LNG and LH<sub>2</sub>, LNG and ammonia.
- New O&M philosophy in an environment where more flexibility is required (zero send-out to peak send-out, additional services such as truck loading, transshipment, ship reloading..).
- Benchmarking of maintenance of the main LNG equipment.

- Providing design, operational or safety recommendations for the operation of floating or small-scale facilities.
- Standardizing the design of LNG trucks (connections, overfill detection systems..), in order to develop unmanned truck loading stations.

Also, some existing studies could be slightly updated such as:

- Cold recovery: the Rankine cycle in Barcelona has been upgraded.
- Roll-over: Appendix A is to be deleted from the text as the public document is referring to it but the appendix, on purpose, is not attached.
- Technical manual on emissions: GWP of CH<sub>4</sub> is now 32 instead of 20 in the documents. Some new technologies to be added, such as flexibles.
- Updating previous publications (earthquake guidelines, environment impacts of LNG facilities, cold recovery, update the 2005 TSG report on LNG Maintenance Strategy Benchmarking).

**Decisions were as follows :**

- Ms. Alikhanbagi (Shell) will give a presentation at next TSG meeting on her proposal to create a database on primary data to be used with GIIGNL MRV and CHG Neutral Framework.
- Each member is encouraged to propose new subjects to be developed by the Technical Study Group.

Pending:

- Mrs. Ang (Singapore LNG) will give a presentation at next TSG meeting on truck loading connection and dry coupling.

#### **A7.2. Communication plan (LNG 2023 Conference)**

Mr. Mierez (Semptra Infrastructure) gave under Item 4 (O&M) a feedback on his presentation at LNG 2023 Conference in Vancouver, 10-13 July.

#### **A7.3. Coordination with other LNG bodies (IGU, ISO, SIGTTO, GLE, GERG, Marcogaz, ...)**

TSG Secretary reported that new Chairman of Marcogaz WG LNG (Mr. Zero Andrzej from PSG) proposed on September 20, 2023, to his WG members, to launch a study on LNG quality in cooperation with Marcogaz WG Gas quality.

Mr. Lana (Enagas), who used to work on this subject within GIIGNL/TSG, as former representative of Enagas, would be involved in the work proposed by Marcogaz.

This topic will be discuss at next meeting of Marcogaz WG LNG, which will be held through visio-conference on October 20, 2023.

**Agenda Item 8. DATE AND VENUE OF NEXT TSG MEETING**

Mr. Patricio (N.V. Nederlandse Gasunie) kindly offered to host next TSG meeting (75<sup>th</sup>), with a technical visit of Eems Energy terminal (FSRU).

**Agenda Item 9. VERBAL REPORTS BY MEMBERS ON TOPICAL LNG MATTERS**

The round table (All members) of recent LNG development in existing FSRU/terminals had to be postponed to next TSG meeting, due to the tight schedule of this 74<sup>th</sup> TSG meeting.