



Metrology for LNG

Introduction and project overview

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Metrology for LNG

The project - background and motivation

- Growing LNG trade worldwide, European growth rate 21%
- LNG trade more liquid, short vs long term, more commercial
- More focus on transparency and accuracy
- Innovations: off-shore LNG, small-scale LNG distribution
- Sound metrological framework not yet fully in place
- 1% uncertainty = 440 M€ per year in 2010
- 1% uncertainty = 900 M€ per year in 2015



Metrology for LNG

Overall objective

To contribute to a significant reduction of uncertainty (by at least a factor two) in the determination of transferred energy in LNG custody transfer processes.

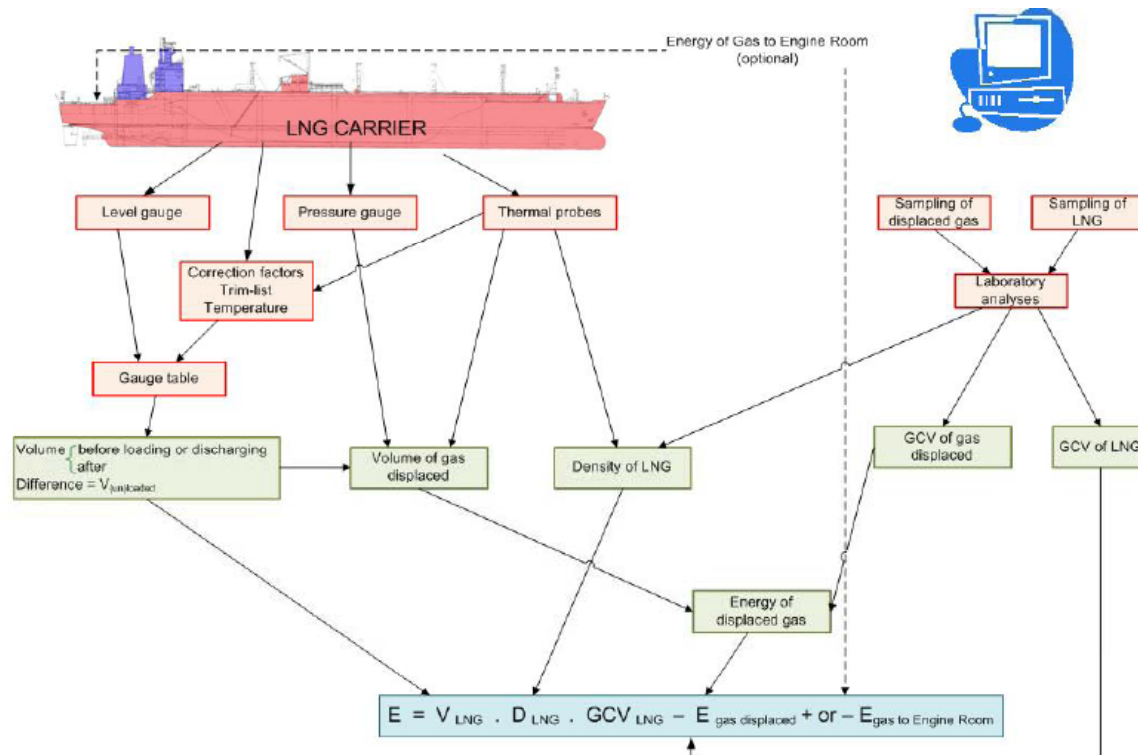
Contribute to:

- Improving existing methods
- Validating new methods
- Creation of new calibration systems with improved uncertainty
- International technical and legal standards and guidelines

LNG custody transfer

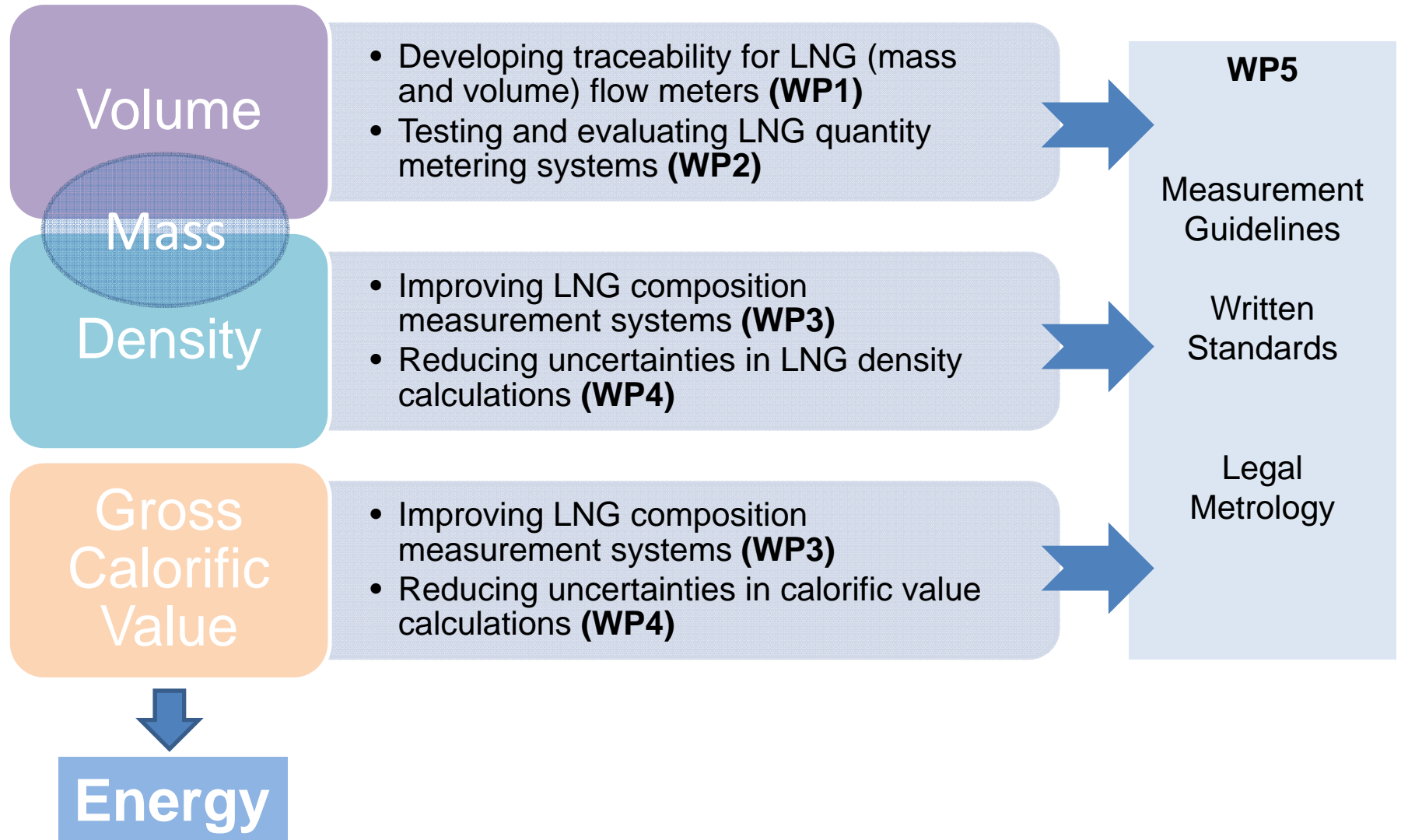
Measurement of energy

Volume x **Density** x **Gross Calorific Value**



Source: GIGNNL Custody transfer handbook, 3rd edition

Project aims and objectives





Workpackage descriptions

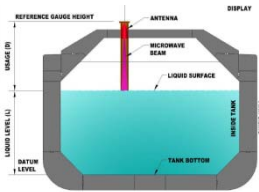
WP1 Developing traceability for LNG flow meters

1. Developing of a primary LNG mass flow standard (25 m³/h, target uncertainty 0,05%)
1. Uncertainty assesment upscaling method
2. Developing simulation upscaling method
3. Developing mid-scale flow standard / 1st stage up-scaling standard (200 m³/h, target uncertainty 0,07%)
4. Comparing water, LN2 and LNG calibrations
5. Defining economic calibration concept
6. Studying technical feasibility and uncertainty of laser doppler velocimetry for LNG flow measurement



Workpackage descriptions

WP2 Testing and evaluating LNG quantity metering systems



1. Evaluating uncertainty of shiptank based measurement systems



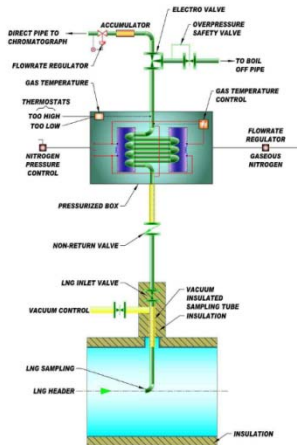
2. Field testing: comparing static (tank level and weighing) and dynamic (flow metering) quantity metering systems



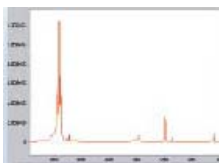
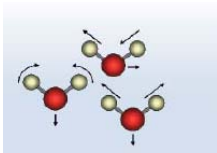
3. Studying (simulation and experiments) effect of cryogenic media on metering system (flow meter, temperature and pressure sensors)
4. Studying (simulation and experiments) of installation effects on LNG flow meters.

Workpackage descriptions

WP3 Testing and evaluating LNG composition measurement systems

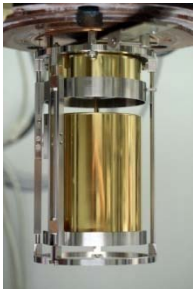


1. Collecting information on sampling methods and uncertainties
2. Collecting data on sample retention during LNG loading and unloading
3. Evaluating the performance of the most suitable sampling technologies based on the provided data
4. Providing recommendations to ISO TC28/SC5
5. Comparing alternative composition method: Raman spectroscopy

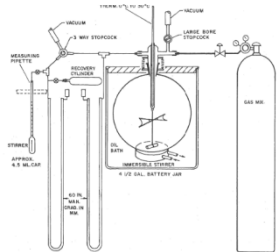


Workpackage descriptions

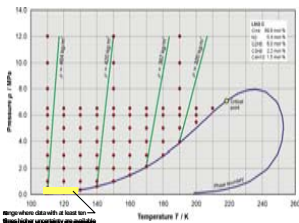
WP 4 Improving LNG density and calorific value calculations



1. Development of a primary LNG densitometer
2. Produce experimental reference data with LNG densitometer for at least four LNG-like mixtures



3. Develop and produce experimental reference data with LNG pycnometer system
4. Validating and comparing equations of state used for density calculation



5. Calculation of LNG calorific value at different reference conditions
6. Assessing the impact of temperature, composition and density gradients in tanks on total measurement uncertainty



Workpackage descriptions

WP5 Contributing to measurement guidelines, written standards and legal metrology



1. Providing input to ISO and CEN standardization (ISO TC28/SC5, ISO10976, ISO8943-2007, ISO TC67/WG10, ISO TC193, ISO 6976, CEN TC282, EN 12838-2000)



2. Providing information/guidelines to EURAMET-TC-flow

3. Providing input to legal metrology (MID / OIML)



4. Providing input to GIIGNL (custody transfer handbook) and LNG industry



Workpackage descriptions

WP6 Creating impact

1. Knowledge transfer (Workshops, conferences, papers, website)
2. Training and dissemination
3. Exploitation (testing and calibration services)
4. Advisory group – link to stakeholders
5. Contribution to standards and guidelines



Metrology for LNG



Project duration: May 2010 – May 2013

Funding: Approx. 3 M€, 46% EU/EMRP, 54% Metrology organisations

Project partners:

VSL (coordinator), SP, TUV NEL, FORCE, JUSTERVESENET, CMI, CESAME, INRiM, PTB

ENAGAS, ELENGY, E.ON RUHRGAS





Metrology for LNG

Collaborators:

Caldon Ultrasonics
Emerson Micro Motion
Krohne
Shell Global Solutions International
Honeywell
Scientific instruments

Other companies involved:

Gasnor
Air Liquide Denmark
And a few more ...



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Members advisory group:

Krohne altometer (chair)

Krohne Ltd

Cameron Caldon

Gasunie transport services

Emerson Process Management Flow

Rasgas

Shell Global Solutions International

Kongsberg Maritime

National Grid Grain LNG

Petronas

Enagas

Elengy

E.On Ruhrgas

Honeywell Enraf

Tokyo Gas

Gate Terminal

Valtronics

More expected soon

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http://www.lngmetrology.info/

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Project news

[Metrology for LNG, July 1st 2010 by VSL](#)

[more](#)

Traceability in LNG measurement

Welcome to the Metrology for LNG website


There is new syndicated content from *LNG news* from Google.

This website is dedicated to the European Research project¹ "Metrology for LNG" and intends to provide information to and bring together stakeholders from the LNG industry.

In the navigation menu we provide you information about the project aims and results obtained, about the partners involved and industrial stakeholders that are contributing to the project.

Visitors can read the discussions on the forums and can vote in the polls.

Registered users are invited to join the discussions on the forums, have access to all summary reports, photograph sections and can subscribe to project newsletters. If you are interested to become even more closely linked to the project please read the [collaborator](#) section and/or the [Advisory group](#) section and contact the project coordinator.



- Whenever there is trade, there are measurements involved to quantify the transfer of goods.
- Whenever there are measurements, there are errors and uncertainties involved.
- Metrology is all about providing standards that are internationally accepted and allow one to quantify the error or uncertainty of any measurement.
- Without a quantification of the associated uncertainty any measured value has no meaning; one would be left in the dark.
- This project aims to improve and develop the metrology for LNG custody transfer measurements leading to smaller measurement uncertainties, reduction of financial risks of transactions and more transparency in the trade of LNG.


Project events

Metering of LNG workshop
[Stockholm - Sweden](#),
 November 9th, 2010

Other events

Conference
Small Scale LNG
 15 & 16 December 2010
 WTC Rotterdam

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Poll

Do you think that the current methods to calculate the density of LNG must be improved?:

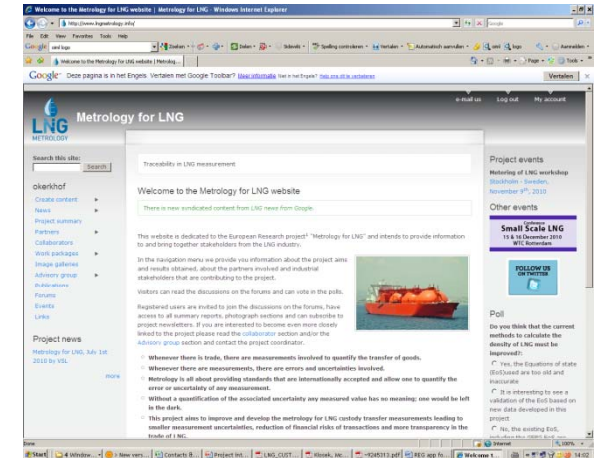
- Yes, the Equations of state (EoS) used are too old and inaccurate
- It is interesting to see a validation of the EoS based on new data developed in this project.
- No, the existing EoS, including the EOSC EoS are



Metrology for LNG

WWW.LNGMETROLOGY.INFO

- Detailed project information
 - Objectives, tasks, activities
 - Progress reports, project results
- Project news
- Photo gallery
- Discussion forum
- Publications and articles
 - Project presentations and articles
 - Other LNG measurement articles
 - Relevant standards and guidelines





Thank you for your attention

&

enjoy the rest of the workshop