



**EMRP**

European Metrology Research Programme  
• Programme of EURAMET



The EMRP is jointly funded by the EMRP participating countries within EURAMET and the European Union

# Metrology for LNG

## Project introduction

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# Metrology for LNG

## **The project - background and motivation**

- LNG strongly growing business worldwide
- LNG market changes: more commercial, increased liquidity, short vs long term,
- More focus on transparency and accuracy
- New application areas/new metering challenges: off-shore LNG, small & mid-scale LNG
- 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.

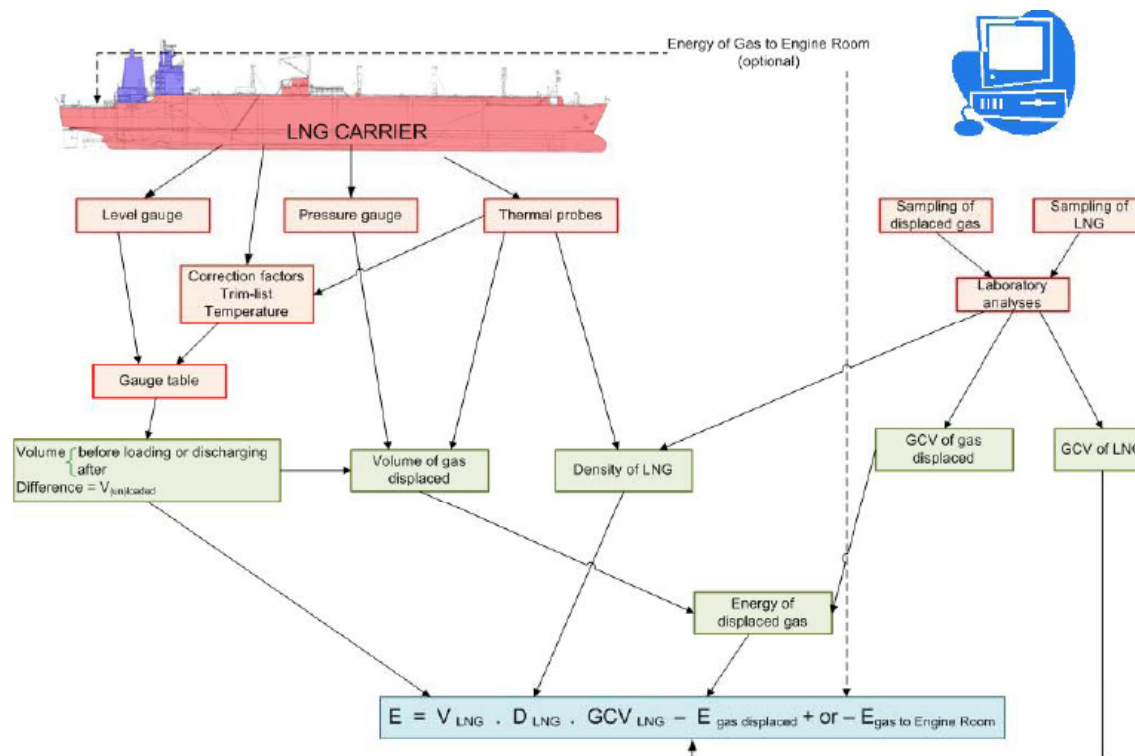
Contribute to:

- 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

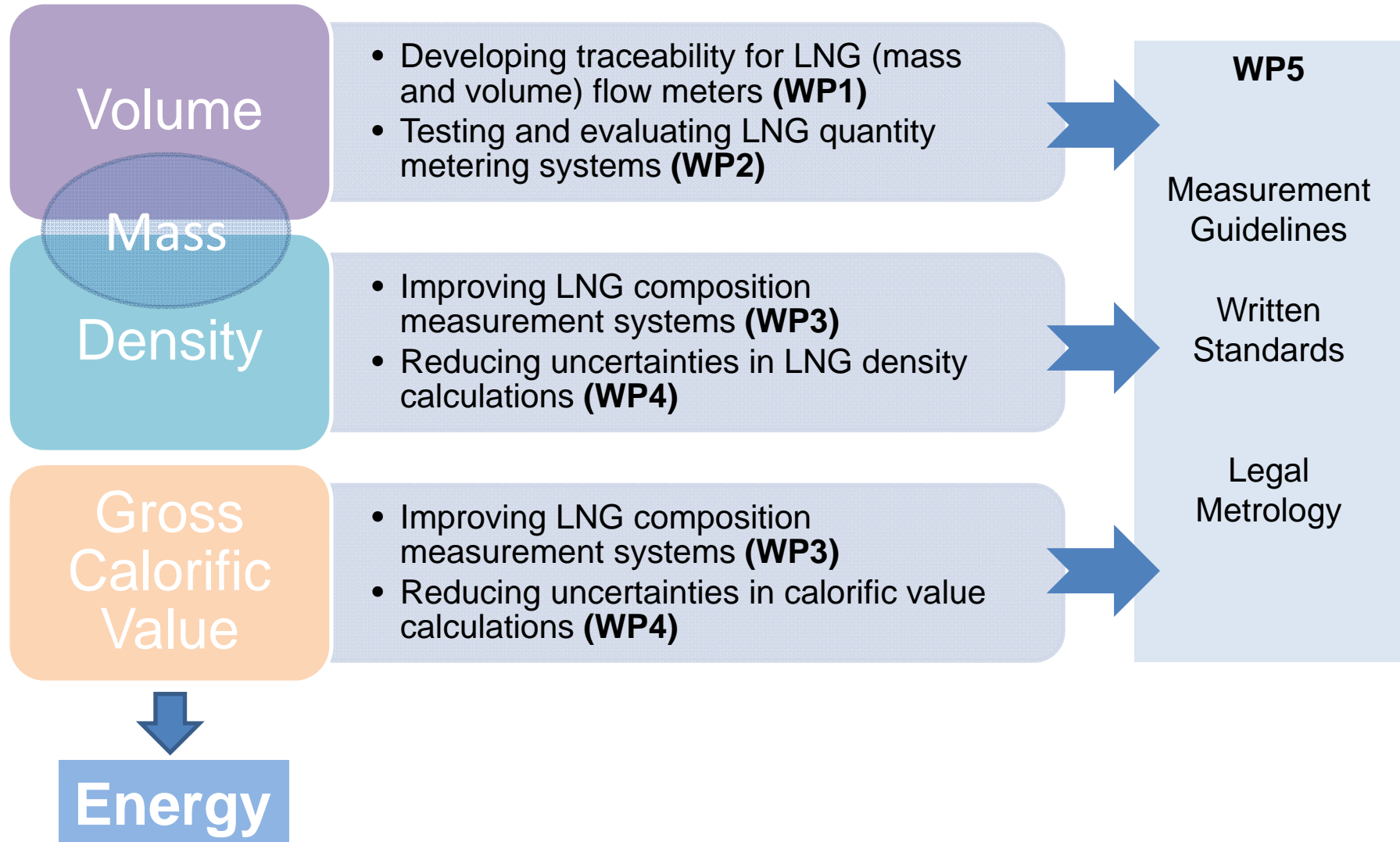
**Volume** x **Density** x **Gross Calorific Value**



Source: GIGGNL Custody transfer handbook, 3<sup>rd</sup> edition



# Project aims and objectives



# Workpackage descriptions

## WP1 Developing traceability for LNG flow meters

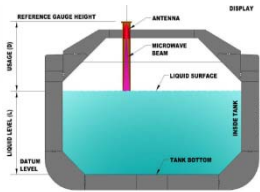
1. Developing of a **primary LNG mass flow standard** (25 m<sup>3</sup>/h, target uncertainty **0,05%** )
2. Developing **Small/Mid-scale flow standard** / 1<sup>st</sup> stage up-scaling standard (200 m<sup>3</sup>/h, target uncertainty **0,07%**)
3. Comparing water, LIN and LNG calibrations
4. Defining economic calibration concept
5. Feasibility study Cryogenic Laser Doppler Velocity system





# 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

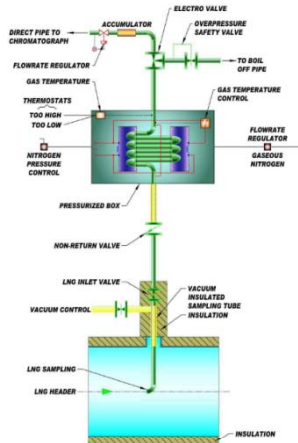
3. Studying (simulation and experiments) **effect of cryogenic media** on flow metering systems



4. Studying (simulation and experiments) of **installation effects** on LNG flow meters.

# Workpackage descriptions

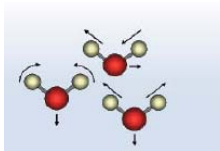
## WP3 Testing and evaluating LNG composition measurement systems



1. Collecting information on **sampling methods and uncertainties**

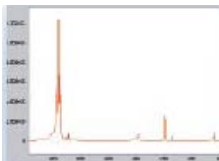
2. Collecting **data on sample retention** during LNG loading and unloading

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**



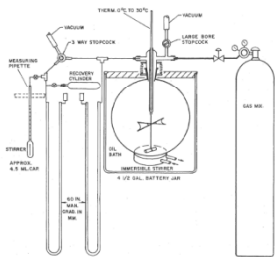


# Workpackage descriptions

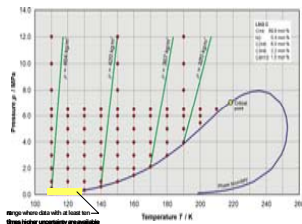
## WP 4 Improving LNG density and calorific value calculations



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



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The EMRP is jointly funded by the EMRP participating countries within EURAMET and the European Union

**Project duration:** May 2010 – May 2013

**Funding:** 3 Million Euro, 46% EU/EMRP, 54% Metrology organisations  
Co-funding from GERG project on LNG density  
Additional investment budget from NMI's  
Additional in-kind contribution from industry

**Project partners:**

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

**ENAGAS, ELENGY, E.ON RUHRGAS**





# Metrology for LNG – advisory group

## **Members**

Krohne altometer (chair)  
Krohne Ltd  
Cameron Caldon  
Elster Instromet  
Emerson Process Management Flow  
Gasunie transport services  
National Grid Grain LNG  
Rasgas  
Shell Global Solutions International  
Kongsberg Maritime  
Petronas  
Enagas  
Elengy  
E.On Ruhrgas  
Honeywell Enraf  
Tokyo Gas  
Gate Terminal  
Valtronics  
Endress + Hauser  
GdFSuez



# Project website

**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

