

#### Interdisciplinary Needs for Heat Metering

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### Outlook



- TC-F Involvement in R&D
- EMRP and EMPIR Flow Contributions
- TC-F and it's Subgroups
- Measurement of Thermal Energy
- Comparisons within or without the Scope of TC-F?
- Interdisciplinary Needs

2

## TC-F Involvement in R&D



A TC-F task group is directly involved in the organization and development of PRTs and JRPs for the European Metrology Research and Innovation Programme in the field of flow measurements. This task group is chaired by Peter Lucas from VSL since 2013.

This work is manly done via webmeetings but next year a meeting will be held before the TC-F annual meeting to prepare the next EMPIR call, so the work will be done one year in advanced.

A R&D sheet now is under circulation within the NMIs in order to collect ideas for future projects, so far 13 responses were collected.

#### EMRP and EMPIR Flow Contributions



#### Call 2009 – Energy

ENG03 - Metrology for Liquefied Natural Gas - First EURAMET Impact Prize ENG06 -Metrology for Improved Power Plant Efficiency ENG09 – Metrology for Biofuels

#### Call 2011 - Health

HLT07 - Metrology for Drug Delivery

## EMRP and EMPIR Flow Contributions



#### Call 2013 – Energy and Environment

ENG54 – Biogas – Metrology for Biogas ENG58 – MultiFlowMet - Multiphase flow metrology in oil and gas production ENG60 – LNG – Metrology for LNG ENV60 – IMPRESS - Metrology to underpin future regulation of industrial emissions

Also to a lesser extent there is a TC-F members participation in: ENV56 - KEY-VOCs-Metrology for VOC indicators in air pollution and climate change ENG59 - NonNewtonianLiquids-Sensor development and calibration method for inline detection of viscosity and solids content of non-Newtonian fluids

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#### **EMRP and EMPIR Flow Contributions**



#### **2013 (Energy and Environment)**

10 topics 18 NMIs 9 PRTs 8 SRTs 7 JRPs 5 funded JRPs

#### 2014 (Industry)

10 topics 17 NMIs 4 PRTs 2 SRTs 2 JRPs 0 funded JRPs

## Need to analyze the difference between 2013 and 2014 (2015)? Flow can be (very) successful! But how?



- Fluid Speed / Gas Flow / Liquid Flow / Volume
- The primary areas of interest are:
  - Measurement and definition of static volume
  - Measurement of quantities of water
  - Measurement of quantities of hydrocarbon liquids
  - Measurement of quantities of high pressure gas
  - Measurement of quantities of low pressure gas
  - Air (Wind) and water velocity
  - Measurement at Micro and Nano scale
  - Properties of fluids

# Abstract wording but strongly related to domestic metering







## Measurement of Thermal Energy





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## Test Rig at BEV for Thermal Energy





13

### **Common Installation**









## Comparisons within or without the Scope of TC-Flow?



• There are only comparisons for flow but named thermal energy and only 2 CMC entries!

Ref.	Title	Coordinating Institute
1161	Intercomparison on water/heat meter calibration at 50 °C, 6 - 25 L/h	LNE-CETIAT
877	Intercomparison on Water/Heat meters at 50 °C, 6-25 L/h	SP
863	Inter-comparison on Water/heat meters at 50 °C for 50 mm pipe	SP

#### Interdisciplinary Needs



Using water as system heat conveying liquid, then thermodynamic properties must be calculated according to the *Industrial Formulation for the Thermodynamic Properties of Water and Steam* (International Association Property Water Steam -IF 97) using the International Temperature Scale of 1990 (ITS-90)



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kWh Thermal Energy Calculator

M

Calorimeter

## BUT HOW? EURAMET



- Interdisciplinary?
  - Temperture, restistance, chemistry...
- Why?

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- Utility meters, industry needs, power plants,...



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