



25th world gas conference  
"Gas: Sustaining Future Global Growth"

# MISREADING OF CONVENTIONAL DIAPHRAGM DOMESTIC GAS METER

Field study in The Netherlands

By: René Hermkens, Kiwa Technology

Date: June 6 2012

Venue: room 302/3



Patron



Host



Host Sponsor



# Contribution of gas metering to UFG

- Reason for the investigation
- Introduction into domestic gas metering in the Netherlands
- Misreading of diaphragm gas meters due to temperature, gas pressure and atmospheric pressure
  - field study initiated by the Dutch regulator (NMa)
- Conclusions drawn by the Dutch regulator

# Reason for the investigation

- Publication on misreading of domestic gas meters in the Netherlands (Anmar Research laboratories)
- Conclusions of this study:
  - Readings of the gas meter is favourable to DSOs
  - Customers pay too much for their gas
- Dutch regulator (NMa) starts investigation in order to have a better insight into the raised topic

Main research question:

Is the 7-degree Celsius method used in the Netherlands fair for all end users?

Sub-question:

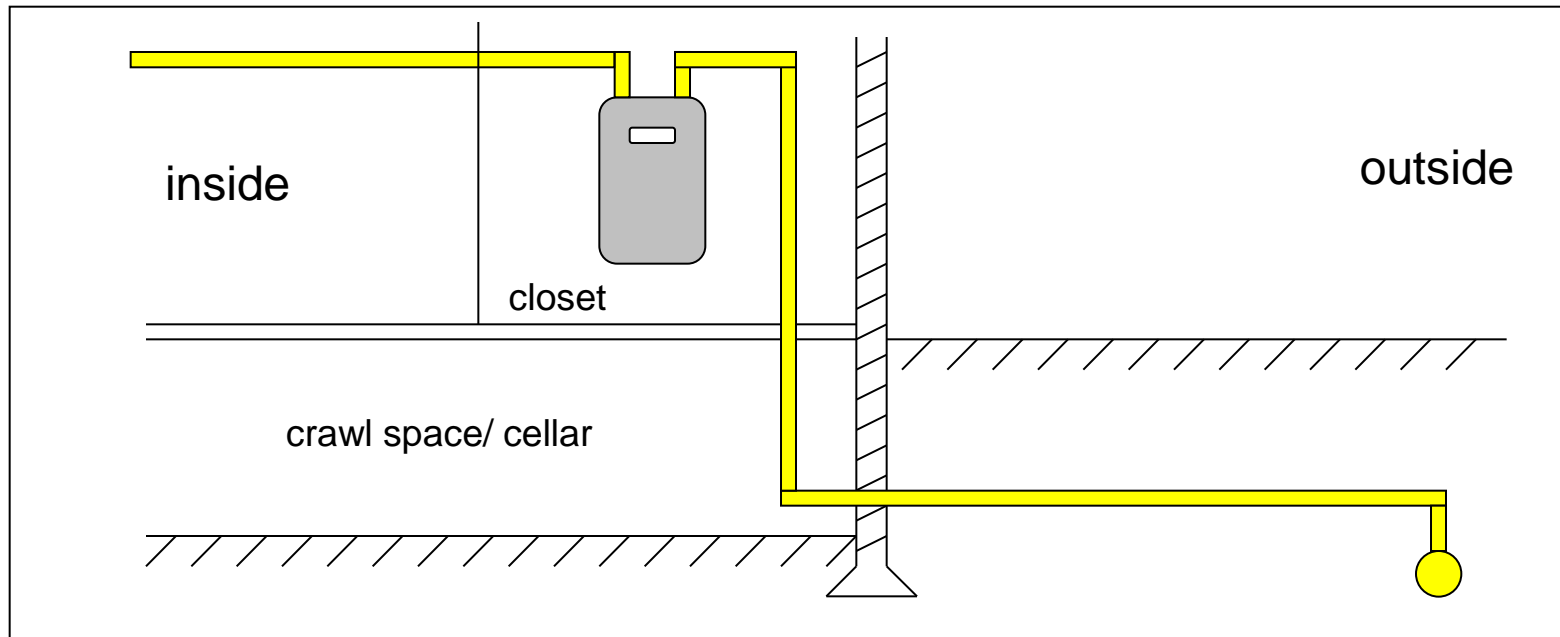
Is misreading of domestic diaphragm gas meters contributing to UFG?

# Domestic gas metering in The Netherlands

- Dutch “meetvoorwaarde Gas-RNB”:
  - Gas consumption is accounted for using volume metering under standard conditions
  - $\text{m}^3$  (0°Celsius, 1013.25 mbar)
  
- Method used: 7 degree Celsius method
- Measurement of gas under the following conditions:
  - Gas temperature: 7°Celsius
  - Nominal pressure: 28 mbar
  - Atmospheric pressure: 1013.25 mbar
  
- The meter reading in  $\text{m}^3$  using the 7°Celsius method is equal to the desired volume under standard condition

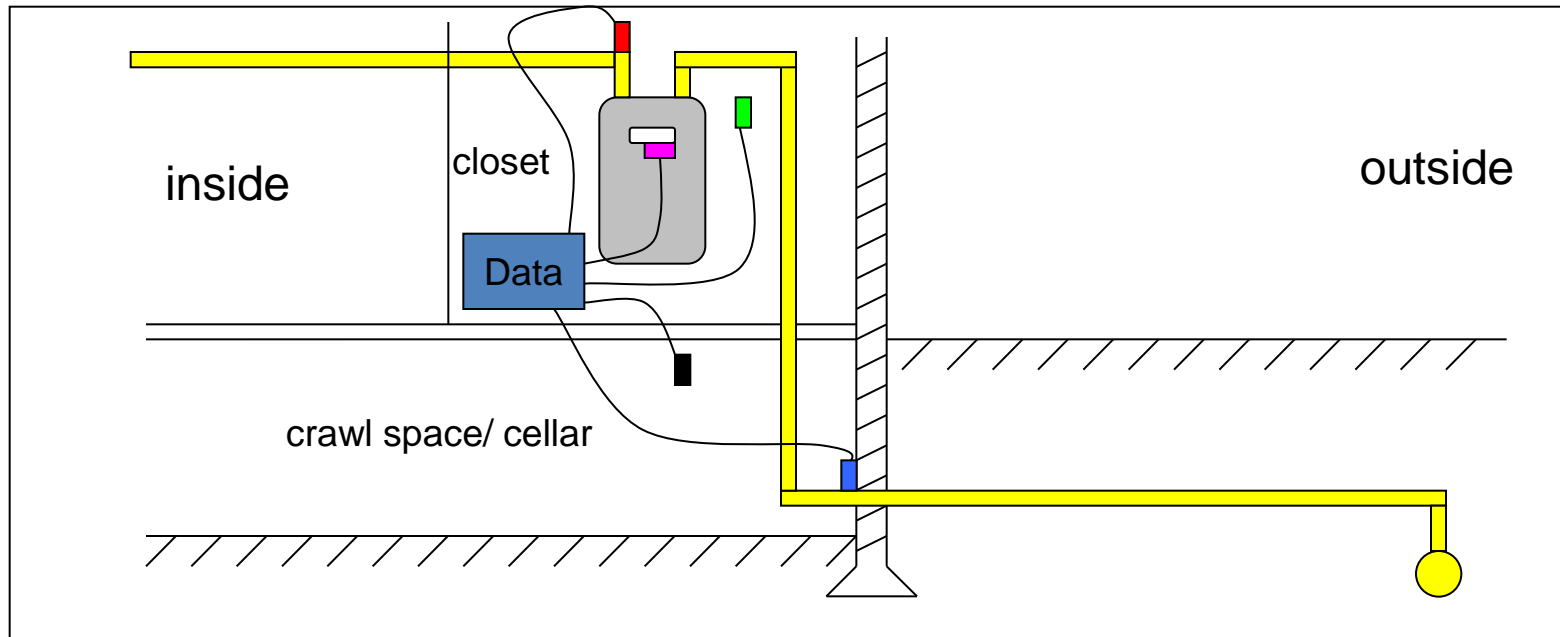
# Domestic gas metering in the Netherlands

- Majority of the meter population: conventional diaphragm meter
- Preferred installation:
  - Inside the building
  - Close to the front door of the residence
  - Inside a special closet



# Experimental set up

- Electronic meter reading device attached to the diaphragm meter ■
- Temperature sensors:
  - at home entry point of the service line ■
  - in the crawl space or cellar ■
  - at the exit of the gas meter ■
  - In the meter closet ■

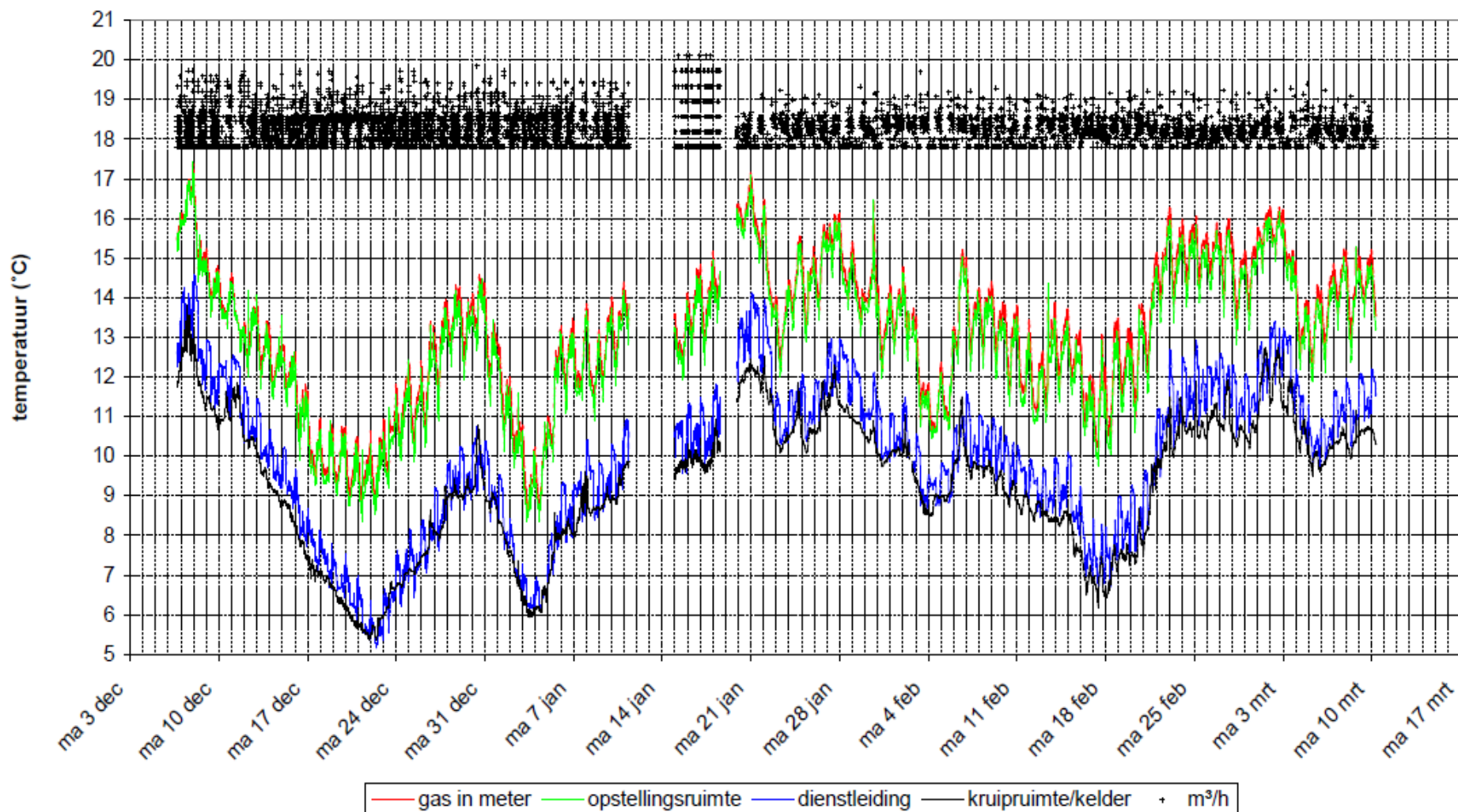


# Field experiment: Chosen locations

- 26 locations, based on:
  - Building type (e.g. high rise, one family house)
  - Type of appliance used (on/off conventional, high efficiency boiler)
  - Items that might influence the gas temperature (e.g. age of the building, family situation)



# Raw results: temperature and consumption





## Results of the individual gas meters

Location	Q <sub>measured</sub> (m <sup>3</sup> )	Q <sub>normal</sub> (m <sup>3</sup> )	Difference	T <sub>gas,average</sub> (K)
1	561.8	555.3	-1.16%	283.4
2	359.4	351.5	-2.21%	286.3
3	850.8	827.9	-2.69%	287.7
4	284.2	271.4	-4.53%	292.8
5	805.2	785.8	-2.41%	286.9
6	113.6	111.5	-1.89%	285.5
7	673.8	667.8	-0.90%	282.7

26	387.5	380.2	-1.87%	285.4
Overall	15664.1	15279.9	-2.45%	287.0

## Re-calculate to “standard” year

- Measuring period December to April
- 40% of the consumption measured during this period
- “Standard” year:  
the average day temperatures of the past three decades for every day

Location	Difference during measurement period	Difference scaled to "standard" year
1	-1.16%	-1.56%
2	-2.21%	-2.73%
3	-2.69%	-3.11%
4	-4.53%	-4.55%
5	-2.41%	-2.88%
6	-1.89%	-2.49%
7	-0.90%	-1.72%

26	-1.87%	-2.47%
----	--------	--------

# Domestic building types In The Netherlands

■ High-rise building	}	29 %	number of gas meters app. 1,780,000		
• Meter closet outside					
• Meter closet inside					
■ One family house	}	54 %	app. 3,320,000		
• Unheated meter closet					
• Heated meter closet					
■ Detached house	}	17 %	app. 1,050,000		
Total				100 %	app. 6,150,000

## Results: standard year and buiding type

<b>House type</b>	<b>Typical measurement error in a "Standard" year compared to the seven-degree method (%)</b>
High-rise building with meter closet outside	2 - 2.5
High-rise building with meter closet inside	4 - 4.5
One family house with unheated meter closet	1.5 - 3
One family house with heated closet	3 - 4.5
Detached house	1.5 - 3

# Conclusions

- Temperature of the surrounding area of the gas meter is dominating the misreading of conventional diaphragm gas meters  
**(gas meter = good heat exchanger)**
- Measured individual errors in this study vary from 1.6 % to 4.6 % unfavourable for the end consumer  
**(negative UFG)**
- The total annual error for the Netherlands, based on the house stock, varies between 2.6 % and 3.9 %
- A 15° Celsius method would reduce the average annual error to almost zero percent

Conclusion by the Dutch regulator:

- The mismatch between the average actual delivered amount of gas and the real amount of gas is already compensated in the tariffs
- **At the introduction of smart meter, a temperature compensation must be present**

Thank you for your attention

Rene.Hermkens@kiwa.nl