

Collaborative R&D in the European Gas Industry

David Pinchbeck
Secretary General
GERG – The European Gas Research Group

April 21, 2009



EC-funded Projects

§ DEO • CONRAD • DIGBUILD • VOGUE • MICROMAP • PRESENSE • LABNET • GIGA • COMBO • NATURALHY • ORFEUS • INTEG-RISK • GASQUAL



The European Gas Research Group

- 45+ years of collaborative R&D on natural gas topics
- Effective Gas Industry network for R&D information exchange
- 20 members from 11 countries, active in natural gas R&D
- Large European reservoir of specialist knowledge
- High quality research resource



Natural Gas has an important role in Europe

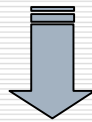
- 25% of EU25's primary energy consumption (434.3 MTOE)
- probably ~30% by 2030
- 240 million people using natural gas (EU15)
- ~ 210,000 employees
- ~ 150,000 km h. p. transmission pipeline (EU25)
- ~ 120 LNG storage facilities (EU25)
- security of gas supply is an increasingly important issue
- growing dependency on external sources
- roughly half of the gas consumed in Europe (EU25) comes from only 3 countries:
 - n Russia (24%)
 - n Norway (15%)
 - n Algeria (11%)

April 21, 2009

Source: Eurogas "EU25 : Natural Gas Trends 2004-2005 & Statistical Data", 2006

The GERG Research Roadmap

- Gather gas researchers on strategic European gas research issues
- Address gas companies' top management on strategic issues
- Promote gas research among European and international gas organisations



Towards the 2030 European gas industry vision

Major European Gas industry challenges

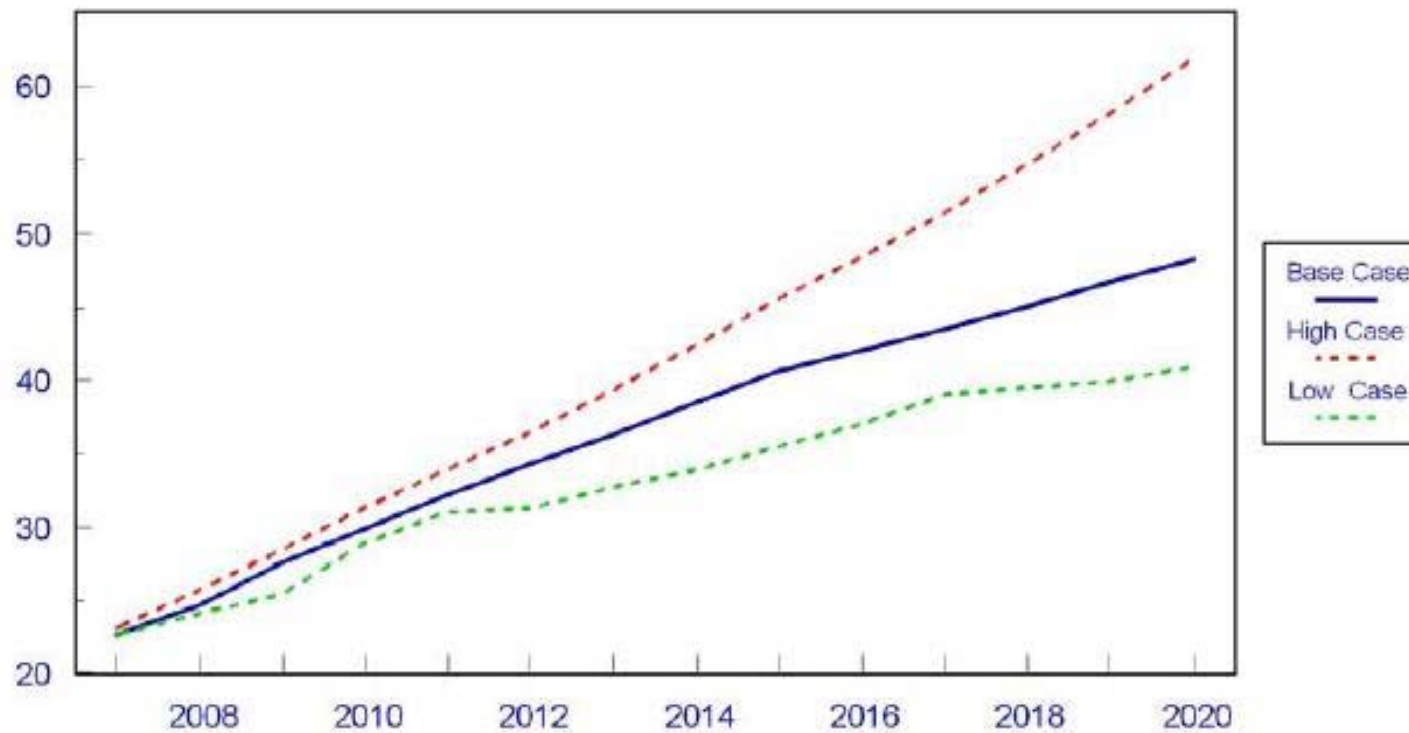
- Energy and gas market globalisation
- Fossil fuels price evolution
- Secure matching of gas supply and demand
- Gas demand evolution
- Impact of the internal energy market/liberalisation on R&D investments
- Environment

Four strategic orientations

1. Securing the European gas supply
2. Improving the safety and integrity of gas networks
3. Developing smart gas uses / managing energy demand
4. Improving the sustainability of natural gas supply and use & future energy schemes

LNG Trading Forecast

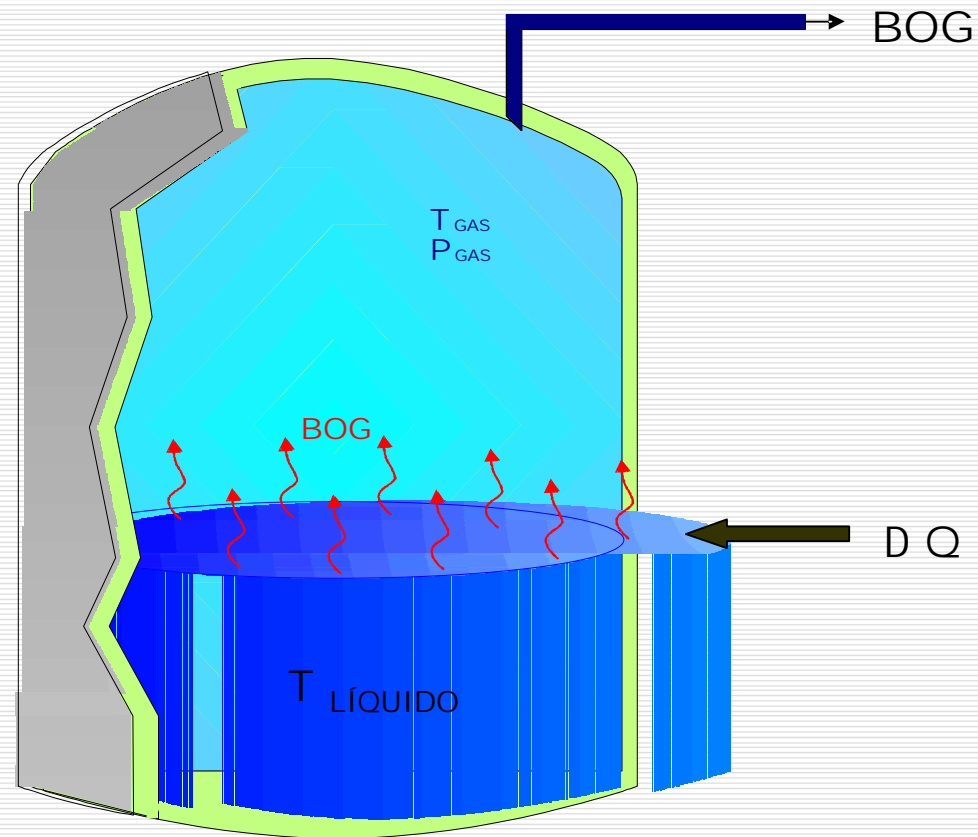
LNG SUPPLY - BCFD



Source: Jensen Associates

MOLAS

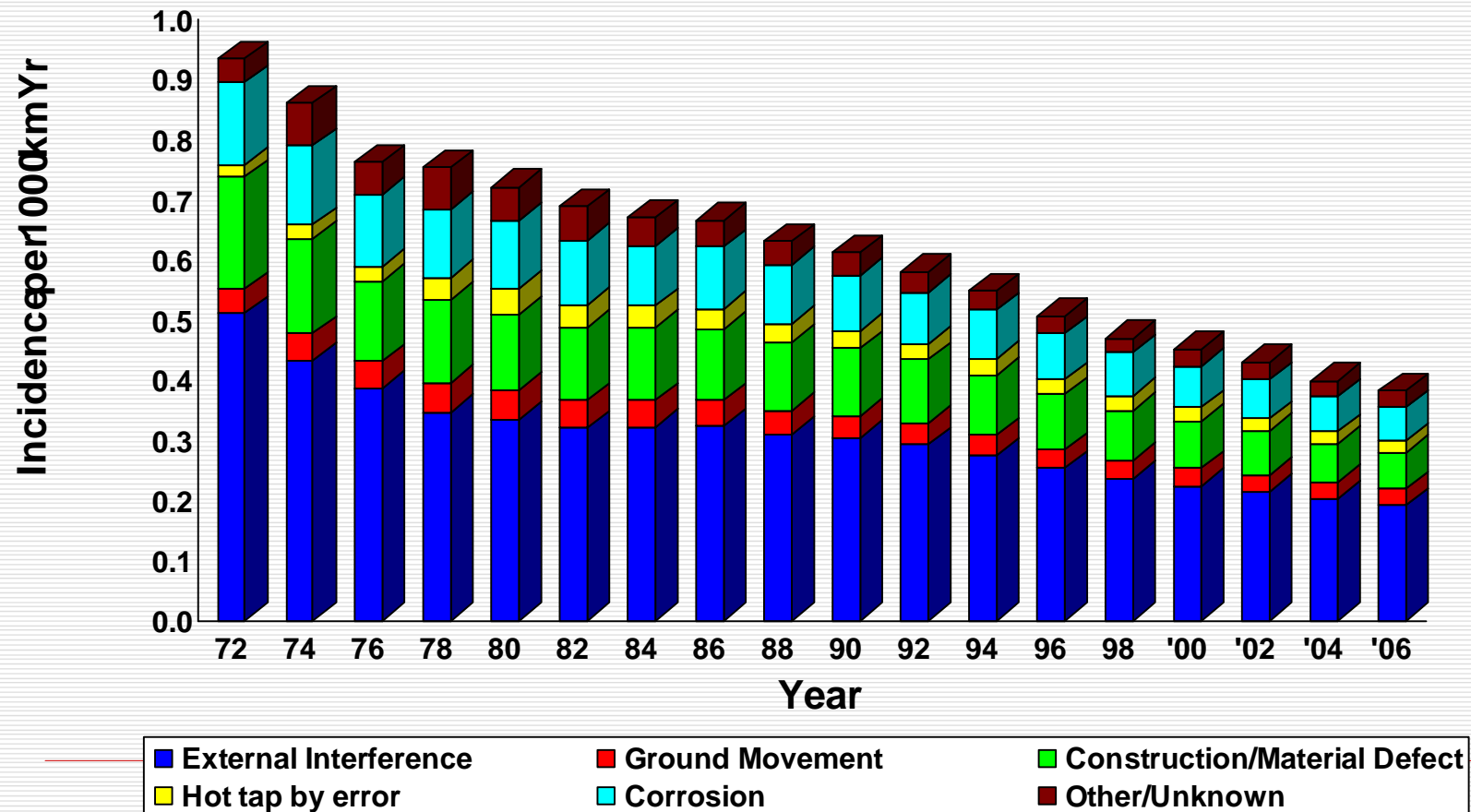
Calculation Models Of LNG Ageing During Ship Transportation



MOLAS

- ... a user friendly, powerful and reliable tool that let's us know LNG composition to be unloaded and, therefore, the most essential LNG properties, with errors that are within uncertainty accepted in LNG industry.
- ... can help Terminal Operators manage regasification in a safer and more efficient manner;
- ... can help engineers and technicians take necessary actions on natural gas to be sent out so that it can comply with quality specifications.

Average Pipeline Incident Frequency



Source: EGIG

New technology for pipeline monitoring

- Satellite/airborne surveillance and image processing;
- Encroachment & impact detection via distributed optical fibres;
- Data fusion and integration with SCADA.

TPI Examples



Trans-Alaska oil pipeline – with hole from gunshot, 2001

Ghislenghien, 30 July 2004



High pressure transit pipeline, Belgium: Zeebrugge-Blaregnies:

- 143 km, 1000 mm dia.
- 80 bar operating pressure
- 1.6 million m³/hour

Example of external aggression
on torn off section - Ghislenghien



The outcome - Ghislenghien

The Human Impact

155 victims:

- 24 deceased
- 131 injured

PRESENSE

GERG

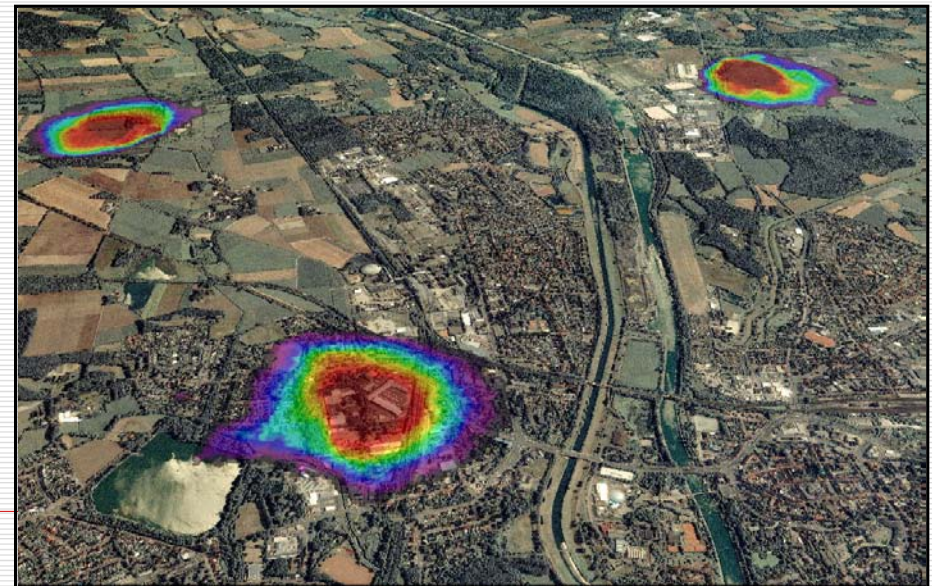
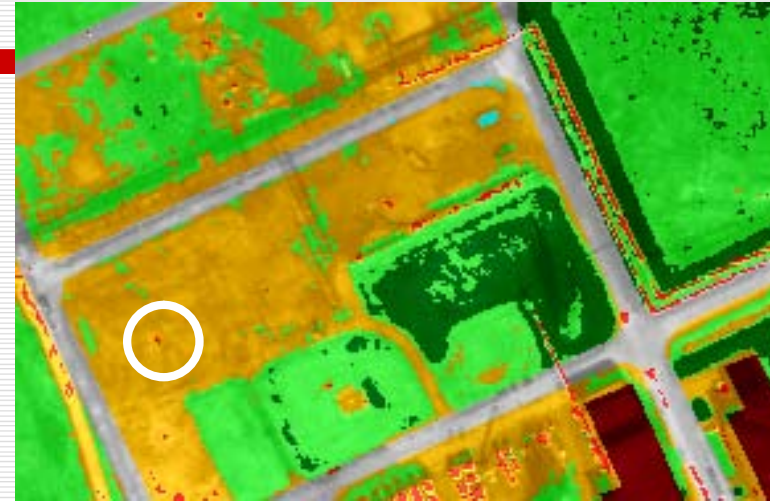
Satellite imagery for pipeline monitoring



Source: ESA

PRESENSE

- Gas pipeline operators & remote sensing specialists
- Satellite surveillance of the European h. p. pipeline grid
- Priorities:
 - n third party interference (TPI)
 - n subsidence & landslip
 - n methane leakage



April 21, 2009

(Images courtesy of E.ON-Ruhrgas & PRESENSE consortium)

"INTEG-RISK"

EC-funded
UAV ROW Surveillance Project

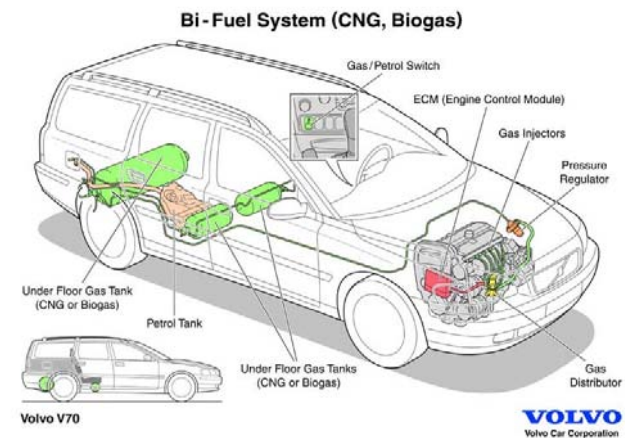




The European Commission's objective

“...to demonstrate more intelligent and efficient processes and systems for gas transport and distribution, including the effective integration of renewable energy sources”

BONGO - Biogas & Others in H.P. Natural Gas Operations



April 21, 2009

21

GERG



ORFEUS

Optimised Radar to Find Every Utility in the Street



ORFEUS

Next Generation GPR Technology



OSYS
technology limited

IDS
INGEGNERIA DEI SISTEMI



TU Delft

Delft University of Technology

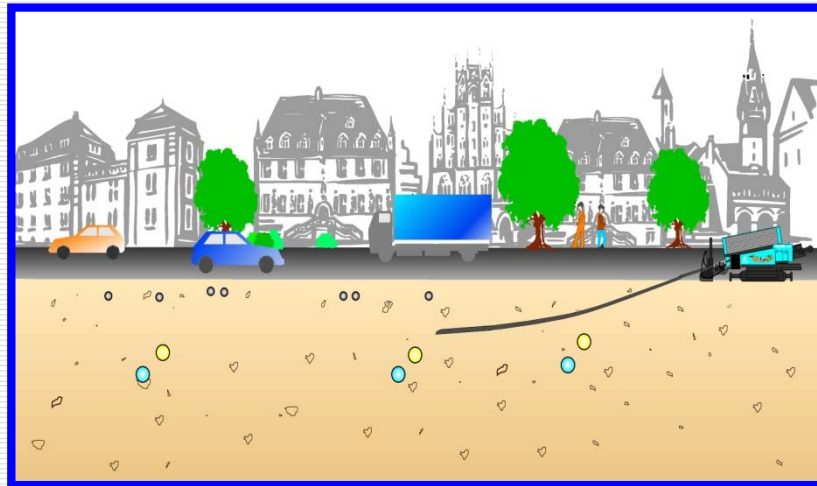
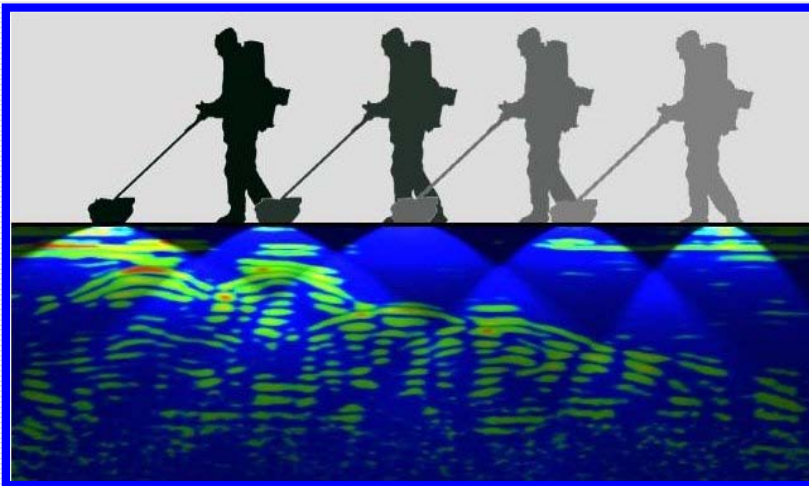


GERG



ORFEUS objectives

- A step change in ground penetrating radar performance
- Safer deployment of HDD equipment



Fundamental Studies

- Development of a Reference Calorimeter:
 - n for determining the superior calorific value of flammable gases (natural gases). On target for an uncertainty of $<0.05\%$ at 298.15 K;
- Hydrocarbon dewpoint:
 - n comparison of different methods used to determine the hydrocarbon dew point on transmission networks.
- Field tests of Coriolis gas meters:
 - n investigating, via field-tests, the long-term stability of Coriolis meters in natural gas custody transfer applications;
- LNG ageing:
 - n developing physical and statistical models to predict LNG ageing during transportation by ship.

H.P. Transmission & Storage

- Gas camera - 'GASCAM' prototype completed, field trial performed early 2008 and more planned.
 - Crack detection by acoustic emission – All tests recently completed and final report now available.
 - Dust particles and aerosol mist content detection - Warsaw University of Technology acting as a contractor, is developing a test facility.
 - Cathodic protection under AC/DC interference conditions - in final stages of Phase 1.
 - Validation of ECDA (External Corrosion Direct Assessment) – Objective is to validate ECDA for assessing external corrosion threat by sharing data with collaborating companies.
 - INSPECTION of non-piggable pipelines – Exchange and collation of information from collaborating companies. 2nd phase will prepare state-of-the-art of applicable systems on the market.
 - Long Range Guided Waves (LRGW) - Investigating performance and applicability on small/medium diameter pipes and on existing 48"OD pipeline test sections.
 - Secure Pipe Phase 3 (cable in conduit); Evaluation of an optical fibre TPI/intruder detection system.
 - Inventory of natural gas emissions measurement methods - Objectives are to identify and assess known methods for natural gas emissions measurement
 - Regulatory pre-feasibility study for high pressure intercontinental gas mains - A study to investigate the likely reaction of local regulators to very high pressure gas transmission pipelines across Europe.
 - INTEG-RISK - Objective is to provide a pipeline route aerial surveillance via drones integrated with an off-line automatic image processing. (EC Funded.)
-

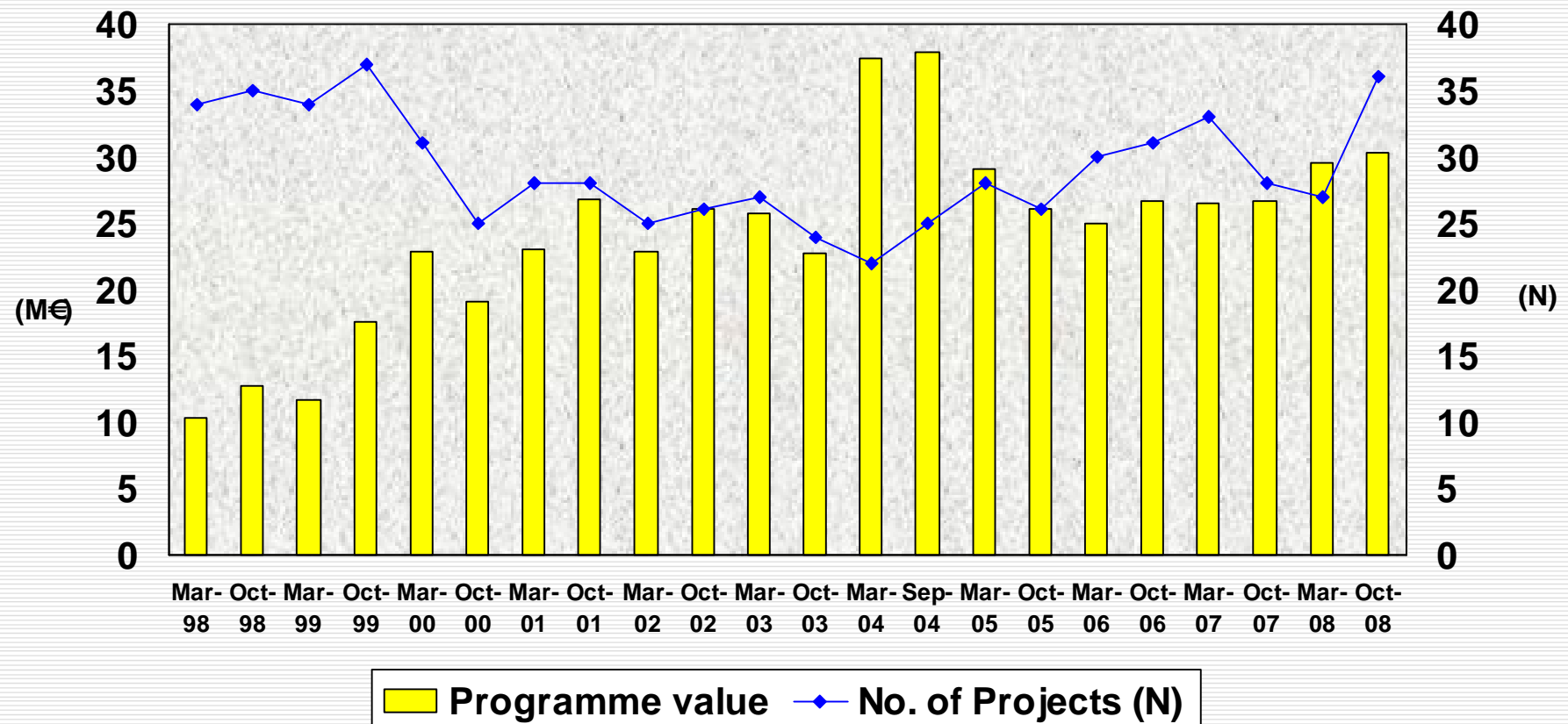
L.P. Distribution

- Permeation of methane and hydrogen through plastic pipes used for higher pressures
- Evaluation of the suitability of PA pipeline systems for gas distribution at pressures between 10 and 20 bars
- ALTMETER – development of a new endurance test to predict the behaviour of domestic gas meters in real life conditions
- Shallow trenches with conventional material and conventional depths
- Influence of non-conventional pipe laying on the service life of PE Pipes
- NATURALHY – investigation of the European gas network's ability to distribute hydrogen
- ORFEUS – development of a new generation GPR:
 - n Improved penetration;
 - n HDD bore-head integrated radar

Utilisation

- q NATURALHY - A project supported by the European Commission (EC) for an assessment of the capability of the European natural gas network to deliver hydrogen mixed with natural gas.
 - q LABNET – an expert forum to promote good practice and exchange new test techniques;
 - q ASUE (Association for the Efficient and Environmentally Friendly Use of Energy) – There is an agreement to publish ASUE technical documents on the GERG website as a way of raising awareness and understanding of the technologies and associated issues.
 - q METHANE /OCTANE NO. OF NG – Project on development of a standard engine knock-resistance evaluation method for gases has been completed and a short report provided. Comparisons will be made with ADL VIN approach for Methane Number.
 - q CLEAN ENGINE TECHNOLOGY – Government funded project with VW and Bosch automotive, aimed at v. low emissions (90g/km)
 - q GASQUAL - GAS INTERCHANGEABILITY - Proposal to EU Commission on gas quality harmonisation. Successful but waiting for Commission to agree budget. (Survey of appliance classification and population, installation and approvals practice, followed by appliance testing required to measure efficiency and emissions performance of a range of European appliances against the proposed EASEE-gas Wobbe limits.
 - q BONGO – A proposal to the EU Commission for an assessment of the problems caused by large-scale introduction of biogas into the European high pressure natural gas system.
-

GERG Programme Evolution



CONCLUSIONS

- R&D is important to meet our commitments:
 - n to customers
 - n to the environment
- Collaborative R&D is vital, as it enables:
 - n financial leverage (FP7)
 - n shared risk
 - n access to external expertise
- Beyond Europe
 - n EU28 plus...
 - n information exchange
 - n joint R&D projects
 - n a stronger gas industry

