1. INTRODUCTION

The European natural gas industry is going through a period of extraordinary change. There is a growing requirement for natural gas across Europe and increasing pressure to address the problems associated with energy efficiency and emissions, set against a background of market liberalisation with its pressing demands to deliver benefits to shareholders in newly privatised companies. It's clear that these requirements conflict in that they imply cost savings and an emphasis on payback in the shorter term. Almost inevitably, this means significant reductions in R&D expenditure at a time when there remains a demand for high quality R&D. Natural gas companies are well aware of the conflicting requirements and wish to contribute to the solutions, but funding is becoming more of a challenge.

In such times, many agree that it is essential to maintain involvement in organisations that allow, even promote, collaboration in R&D. GERG - the European Gas Research Group - is a prime example of such an organisation, set up to ensure that mechanisms exist for shared cost and shared risk R&D activities, in a period when short-term business thinking has become increasingly prevalent.

GERG is strictly a research and development (R&D) organisation and this paper begins with a brief outline of its rôle in the European Gas Industry. It goes on to detail some of the current pressures on R&D activity and argues the case for collaborative R&D as a fairly obvious solution.

The paper will consider the background and the priorities of GERG, examine how it works for the benefit of the European gas sector and point the way for its future success. Examples of successful, ambitious and expensive R&D projects - GERG projects - will be used to illustrate that there are gas companies which consider it essential to be involved in collaborative R&D that will deliver solutions that are important for their business and, crucially, for their future survival.

2. GERG - THE EUROPEAN GAS RESEARCH GROUP

The History

GERG, the European Gas Research Group, was founded in 1961 to strengthen the Gas Industry within the European Community and it achieves this by promoting research and technological innovation in all aspects of the onshore gas chain. Established initially as a network to enable exchange of information between a select group of specialist R&D centres to avoid duplication of effort, it has grown steadily to its current size whilst retaining its original aims.

GERG members have developed a large European reservoir of specialist knowledge, which currently represents a high quality research resource numbering in excess of 2000, many of whom are international leaders in their fields. However, its priorities remain: networking; technical information exchange; and the promotion of collaborative R&D projects carried out by dedicated, multi-disciplinary Project Teams.
Membership currently stands at 16 members from 10 countries, each actively involved in natural gas R&D, and these members serve a European Gas Industry which has the responsibility of supplying in excess of 85 million domestic, commercial, industrial and power station customers. It’s worth noting that despite, or maybe as a result of, the changes in the European natural gas landscape, GERG membership is growing steadily, with seven new members in recent years.

Since its inception, GERG has evolved, from the small, original group of Gas Industry R&D organisations run part-time by one of the members, to a considerably stronger organisation, located in Brussels to benefit from proximity to the institutions of the European Union (EU).

**How does it work?**

GERG operates at several levels, with a Board and Plenary responsible for strategic direction, at the head of a structure designed to maximise high level networking. However, the success of GERG relies principally on the interactions within the Programme Committees, where groups of technical experts, drawn from the member organisations, meet on a regular basis. Their objectives are to exchange ideas, to explore the potential for collaboration and, most important, to establish GERG projects.

The whole activity is supported by a professional, full-time Secretariat based in Brussels, to underpin the activities of GERG and to maintain links with outside bodies, particularly the offices of the EU and Gas Industry organisations world-wide.

GERG has four Programme Committees (PCs), covering the Gas Industry’s main areas of activity:
- PC General/Fundamental Studies;
- PC Transmission and Storage;
- PC Distribution;
- PC Utilisation;
- and a very wide range of projects, some of which will be described later.

GERG operates as a project brokerage, based in the technical Programme Committees, and thrives on a steady flow of new project proposals. Members decide whether new proposals are of interest, whether they wish to support them and, in conjunction with the Secretariat, whether they could be eligible for external funding. Once projects have been initiated, they are run by dedicated Project Teams which can, and often do, include non-GERG members such as universities, manufacturers and even natural gas organisations from outside Europe.

Flexibility is of primary importance in setting up, funding and running GERG projects. Projects can be funded independently by the GERG members alone, by project consortia which include non-members or with support from the European Commission; many permutations are possible.

**What does it do for the Gas Industry?**

Probably the most important feature of GERG membership is that it facilitates participation in collaborative R&D projects with shared cost and shared risk. At times of reducing R&D expenditure and increasing short-term views, this single factor can enable R&D projects to take place when they otherwise may have failed to get off the ground.
3. THE EFFECT OF LIBERALISATION ON R&D

In recent years, liberalisation of the gas market in Europe has fundamentally changed the structure of the Gas Industry leading, in many cases, to the creation of distinct, new companies with specific responsibilities for network management or for gas sales. However, its implementation across Europe is very different and, in some countries, liberalisation has been a tougher exercise than in others. With regard to R&D, the changes have generated a variety of outcomes, ranging from business as usual to virtually no business at all, with several permutations in between… and the evolution continues.

Inevitably, liberalisation of the gas market has had a negative impact on the amount of gas-related R&D being conducted within Europe. This is certainly the case for GERG members, amongst whom there is clear evidence of reduced availability of funds; a concentration on shorter-term projects; reduction in R&D staff levels and a more critical appraisal of cost and benefits.

Is it provocative to suggest that R&D is important, vital even, if the ‘new’ gas companies wish to progress? If they wish to stay ahead of the competition, won’t it be necessary to retain or develop the know-how to comply with the Kyoto requirements or to make optimum use of the latest developments in materials, ICT, sensors, etc? It’s easy to take the short-term view and to rest on one’s laurels but there is a widely shared view that companies without some investment in R&D could be out of business within 10 years. It’s clear then that an absence of R&D capability in the Gas Industry equates to a potential risk.

Of course, you would expect such views from a representative of an R&D organisation, but I would suggest that gas companies need to make a critical assessment of where they would like to be in 10 years - and in 20 years - and to follow this with a rigorous analysis of what needs to be done to achieve those ends.

Most important, they must recognise the key rôle that R&D has played in achieving the position we have today, the status quo, and that continued R&D will be essential in securing the future.

4. GERG PROJECTS

GERG can help to buck the trend, as it provides a viable option that enables R&D to continue in times when individual company funding is scarce. However, it’s not always easy and it’s very clear that there is pressure on members’ budgets, but it is exactly in circumstances such as these when collaborative R&D becomes vitally important. It allows companies to share the risk; it enables leverage of R&D funding, and gives life to projects which otherwise would not have got off the ground. It’s difficult to over-emphasise the importance of these aspects.

It’s important in assessing the value of GERG to consider the breadth and depth of R&D activity in which it is or has been involved, so the following provides a review of some current, or recently completed, GERG projects, all of which have been co-funded by the European Union’s R&D Framework Programmes:

- **PRESENSE** - Pipeline REmote SENSing for Safety and the Environment

  …was an airborne platform/satellite-based remote sensing project for monitoring pipelines which, overall, should improve the safe and secure transmission of gas in Europe’s high pressure system - a network of some 180,000 km - by detecting potential problems caused by 3rd party interference; soil movement (landslip) and even methane leakage.

  Of course, views of earth from satellites are so familiar to us these days and, as we get better access to spin-offs from military developments, with their superior quality and resolution, we can see progressively more and more detail.

  A range of sensors, including Synthetic Aperture Radar, LIDAR, infra-red and optical surveillance technologies, has been assessed, both for their ability to ‘see’ in a variety of atmospheric conditions and for their contribution to a data-fusion approach to image processing and recognition.
- **PIPEMON** – Geo-information services for pipeline operators

  ...is a three-year integrated, remote sensing and pipeline industry project funded by the European Space Agency as a direct follow-up to PRESENSE. Its objective is to introduce earth observation (EO) services to the pipeline industry for:
  - ground and structure motion monitoring;
  - pipeline route planning;

  which could offer great advantages for remote area monitoring particularly where mobilisation and access costs are high.

- **VOGUE: VISUALISATION OF GAS FOR UTILITIES AND THE ENVIRONMENT**

  ...had as its objective the development of sophisticated new tools to aid the processes of detecting and locating leaks from pipeline systems - on the street. Passive infra-red and active, laser-based, technologies have been developed so that dispersing natural gas clouds can be visualised as a means of pinpointing leaks from gas pipelines at a range of up to 15m.

  A first commercial design suitable for use by gas engineers in the field has provided encouragement for its broader application within the gas industry and there is definite potential for these systems to be used for scanning in leak surveys and vehicle patrols.

- **GIGA: GROUND PENETRATING RADAR FOR HIGH PRECISION PIPE LOCATION**

  ...was a research study to inform and enable the design and build of a new, dependable Ground Penetrating Radar (GPR). Its eventual objective, in a subsequent phase of the project, is a system specifically designed to provide the precision and high resolution required to enable no-dig installation of gas pipelines in association with Horizontal Directional Drilling.

- **NATURALHY**

  The European Union, and others, believe that hydrogen can play a major rôle in bringing about clean energy conversion in the longer term, but there are many barriers to be overcome associated with production, storage, distribution and, not least, perceptions of reduced safety.

  So, the European Gas Industry which, unquestionably, is better qualified for the task than most in Europe, is working together with key players in Europe in an EU-funded Integrated Project to examine the barriers that exist to, and the advantages that might accrue from, the addition of hydrogen to the natural gas transmission and distribution system.

  Inspired by Gasunie in the Netherlands and set up within the GERG framework, the project represents a large, integrated body of work that could lead to the widespread delivery of hydrogen in Europe within the next 20-30 years and, therefore, make a significant contribution to an enlarged Europe’s environmental aspirations whilst, at the same time, providing a logical stepping stone to the feasible, but distant, hydrogen future in Europe.

  Naturalhy is a 5 year project, which began in May 2004 with 39 partners spread across Europe; it is valued at €17 million, including European Commission support of €11 million.

5. **THE FUTURE**

There can be no doubt that the decade ahead will be a time of great change for the natural gas industry in Europe. The demand for natural gas is set to grow and the development of safe, well controlled, and reliable natural gas networks will be essential if optimum performance is to be achieved.

Network operators are constantly striving to improve the overall management of their networks and technological progress makes this possible by the introduction of new or improved equipment to enhance
operation and maintenance, as illustrated above in areas such as ground penetrating radar, satellite remote sensing or laser-based leakage detection. In addition, advances in mobile computing, GPS technologies and sensor-fusion could be used to complement the traditional skills associated with important areas such as pipe location and leakage detection.

For projects such as these, where the technology moves very fast and where there are major benefits and few drawbacks from developing systems that can be applied equally outside the developer’s own organisation, several points are obvious:

- they will need significant R&D activity;
- they should be carried out on a collaborative basis because they will be very expensive;
- their implementation could have significant advantages beyond the gas industry, indeed for all those utilities involved in, for example, transmission network monitoring, street works and leakage detection.

Clearly, there are certain projects which can not or should not be taken on by individual companies, because of cost, because of risk, or because there are benefits to be gained from developing systems that can be applied more universally, and three such projects are outlined below.

- **ORFEUS - Optimised Radar to Find Everything Under the Street**
  It is anticipated that, given EU support, this GIGA follow-up project will begin during 2006 to develop what the project team believes will be the next generation of Ground Penetrating Radar by:
  - providing a step change in the depth penetration and spatial resolution capability of GPR systems;
  - by developing an innovative, prototype GPR-based obstacle detection system for real-time guidance of a Horizontal Directional Drilling tool, and;
  - increasing knowledge of the electrical behaviour of the soil and sub-soil electrical environment to enable improved GPR antenna design.

- **EUDEXA - European Utility Data Exchange on Assets**
  Utility companies have to bear the cost of damage to their underground assets as a result of third party construction works. In addition, the duty to provide information to third parties can tie up company resources with considerable cumulative annual costs for documenting, monitoring and providing network information. Despite these efforts and the associated costs, third party damage remains the largest single cause of asset damage.
  EUDEXA is proposing a reliable solution for exchange of information on asset location (telecommunication, gas, electricity etc.) via a web-based service which includes supporting information such as topography, aerial photographs etc. from external data suppliers or from land registers. If approved by the EU, the project will provide an online network information system which will be put into operation and tested on a EU level together with partners from the utility sector.

- **BINGO - Biogas In Natural Gas Operations**
  ...is a Gasunie-led project, aimed at defining quality specifications for biogas access to the gas transport system. This will be done by overall risk assessment, which will fill the gaps in our knowledge related to the addition of large volumes of biogas to the existing natural gas system. It will investigate whether biogas will affect the safety of normal gas operations including, storage, injection, transmission, distribution and end-use. A thorough system analysis will ensure that these activities can take place with acceptable effects on the integrity of the existing natural gas grid, the value of the product as a feedstock and, most important, with acceptable operational, safety, health and technical consequences for the end-user.
It's worth noting that, with European Union support, GERG members have extended, and will continue to extend, the Gas Industry’s technological boundaries in successful R&D Framework Programme projects, such as those described above. Crucially, these projects offer significant benefits with regard to security of supply, safety, emissions reduction and quality of life for citizens.

6. CONCLUSIONS

It's important to look to, and prepare for, the future. It’s recognised that in the current climate this is not an easy task and this is why there is a pressing need for organisations such as GERG to ensure that gas companies can take part in key R&D activities in conjunction with others by making their R&D dollars or euros go further and minimising their risk..

Given the key rôle of natural gas in both primary energy supply and in achieving EU environmental objectives, it is vital to ensure that the Gas Industry’s R&D capability is maintained so that the benefits of gas are fully exploited. The examples I have given, which are ambitious and expensive R&D projects - GERG projects - have illustrated that there are gas companies which consider it essential to be involved in R&D that will deliver solutions that are important for their business and, crucially, for their future survival.

In Europe we are facing significant reductions in R&D funding - amongst other liberalisation-induced pressures. In such times, many agree that it is essential to maintain involvement in organisations and events, such as this, that allow, even promote, collaboration in R&D - to ensure that mechanisms exist for shared cost and shared risk activities - in a period when short-term business thinking has become increasingly prevalent. It’s quite evident that the GERG members, including many major European gas companies, understand clearly the many obvious, and not so obvious, benefits of collaboration in R&D activities.

The members of GERG represent some of the most expert technical performers in the international natural gas R&D community, combining to contribute key skills and experience that would be impossible to resource at the purely national level. The combination makes for a very strong organisation, significantly stronger than its individual parts, which is well-equipped to undertake energy sector research and technological development.

GERG has been fortunate; it has been active in catalysing such activity over the past 40+ years. Recently revitalised, it continues to attract fresh new members who increasingly see the benefits of gearing up their research euros by working with their peers and, whenever possible, by seeking financial support from the European Union.

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