



DNV GL

The technical advisor to the global oil and gas industry

A new company with 150 years of experience

DNV and GL Noble Denton joined forces in September 2013. We've drawn upon our proud heritages to create:

- Greater technical expertise
- Enhanced innovation capabilities
- Extended global reach
- An integrated service portfolio



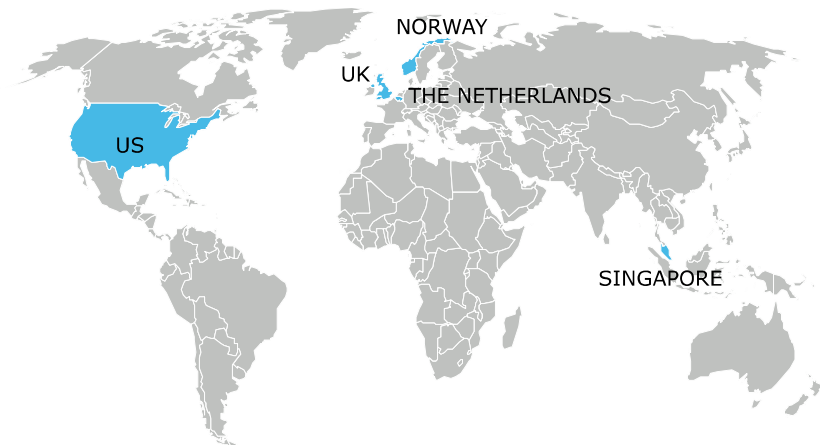
An innovation powerhouse

5% of annual revenue reinvested into research and development every year

70 internal technology projects annually

170 industry standards and recommended practices

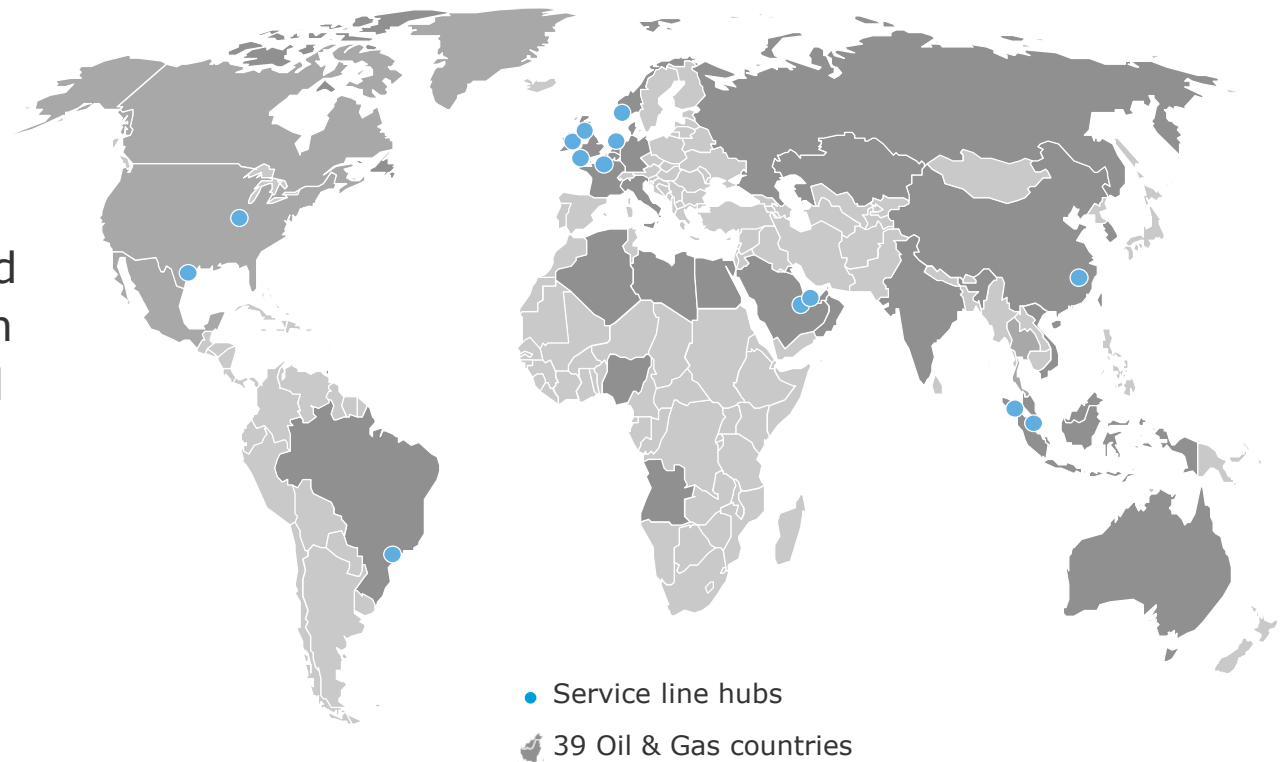
100 joint industry projects each year



Dedicated R&D centres in the Netherlands, Norway, Singapore, the UK and the US.

Exceptional people with a global presence

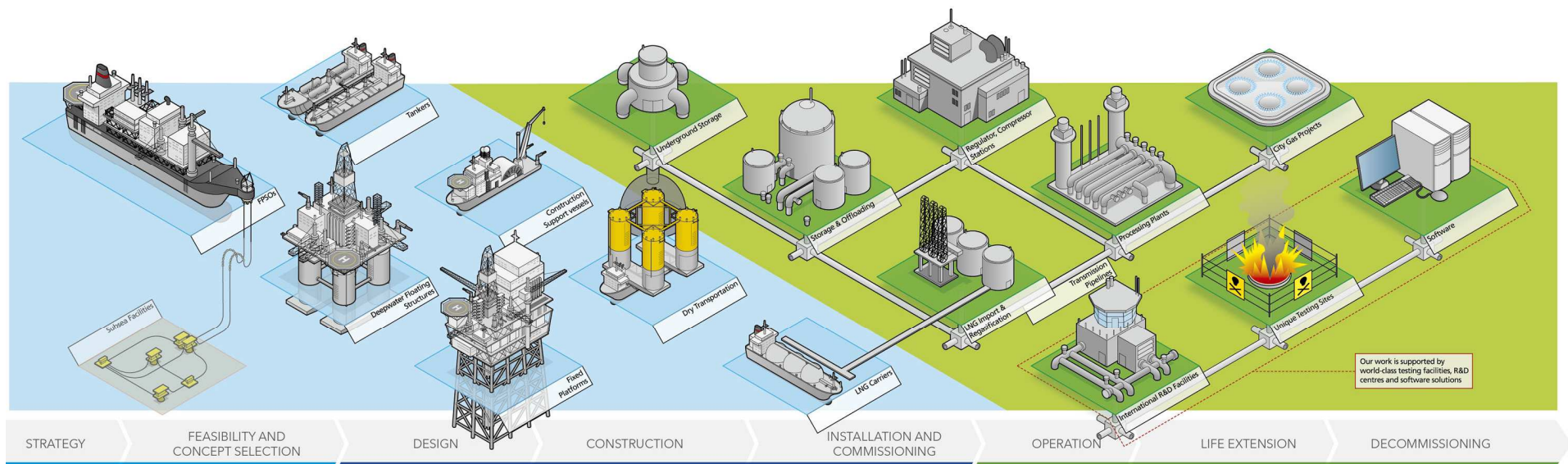
- 5,500 exceptional people who care about making the industry safer, smarter and greener
- Combining industry and domain knowledge with project and operational expertise
- A global network of experts, working together to solve local customer challenges.



An integrated approach across the asset lifecycle

Our common way of working and global sales model delivers industry best practice across the asset lifecycle. Core service areas include:

- Risk management advisory
- Technical advisory
- Noble Denton marine assurance & advisory
- Technical assurance
 - *Certification and verification*
 - *Inspection and quality assurance*
- Offshore classification



Pipeline Safety in the UK

Ian Fordyce

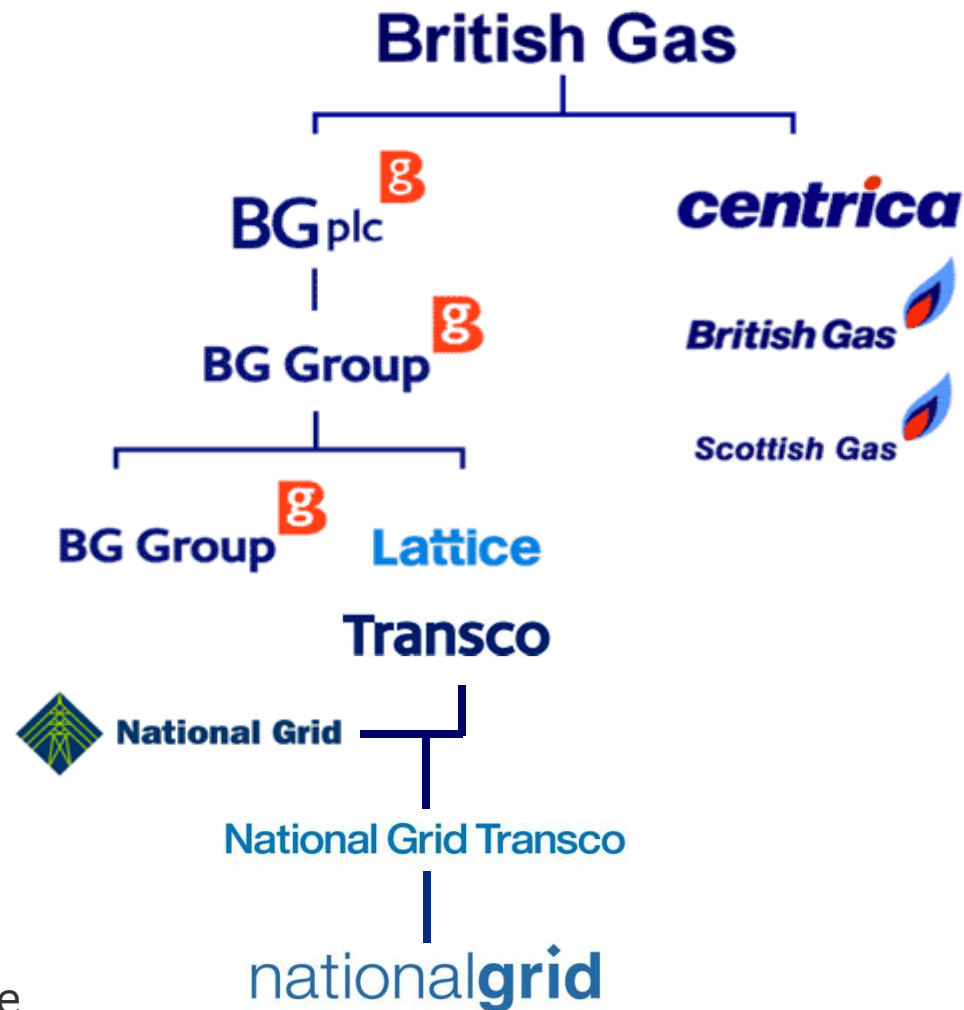
Principal Consultant

DNV GL

WOC3 meeting Turin 12th March 2014

Origins of National Grid

- 1986 Privitised
- 1997 de-merger
- 2000 de-merger
- 2002 merger
- 2005 Network sale



National Grid is an International Electricity and Gas Company

- Based in the UK and north eastern USA
- They play a vital role in delivering gas and electricity to millions of people safely, reliably and efficiently
- One of the world's largest investor-owned utilities
- Approximately 19 million industrial, commercial and domestic customers
- Almost 28,000 employees
- 63% work in the US; 37% work in the UK



UK Transmission Business



UK Electricity
Transmission System



UK HP Gas Pipeline
System

NG own the gas transmission network in the UK and own and operate the high voltage electricity transmission network in England and Wales, as well as storage facilities for LNG

They also operate, but do not own, the electricity transmission networks in Scotland

Changing supply pattern (up to 2014/15)

Demand:

increasing from 100 to 120 bcm

UKCS:

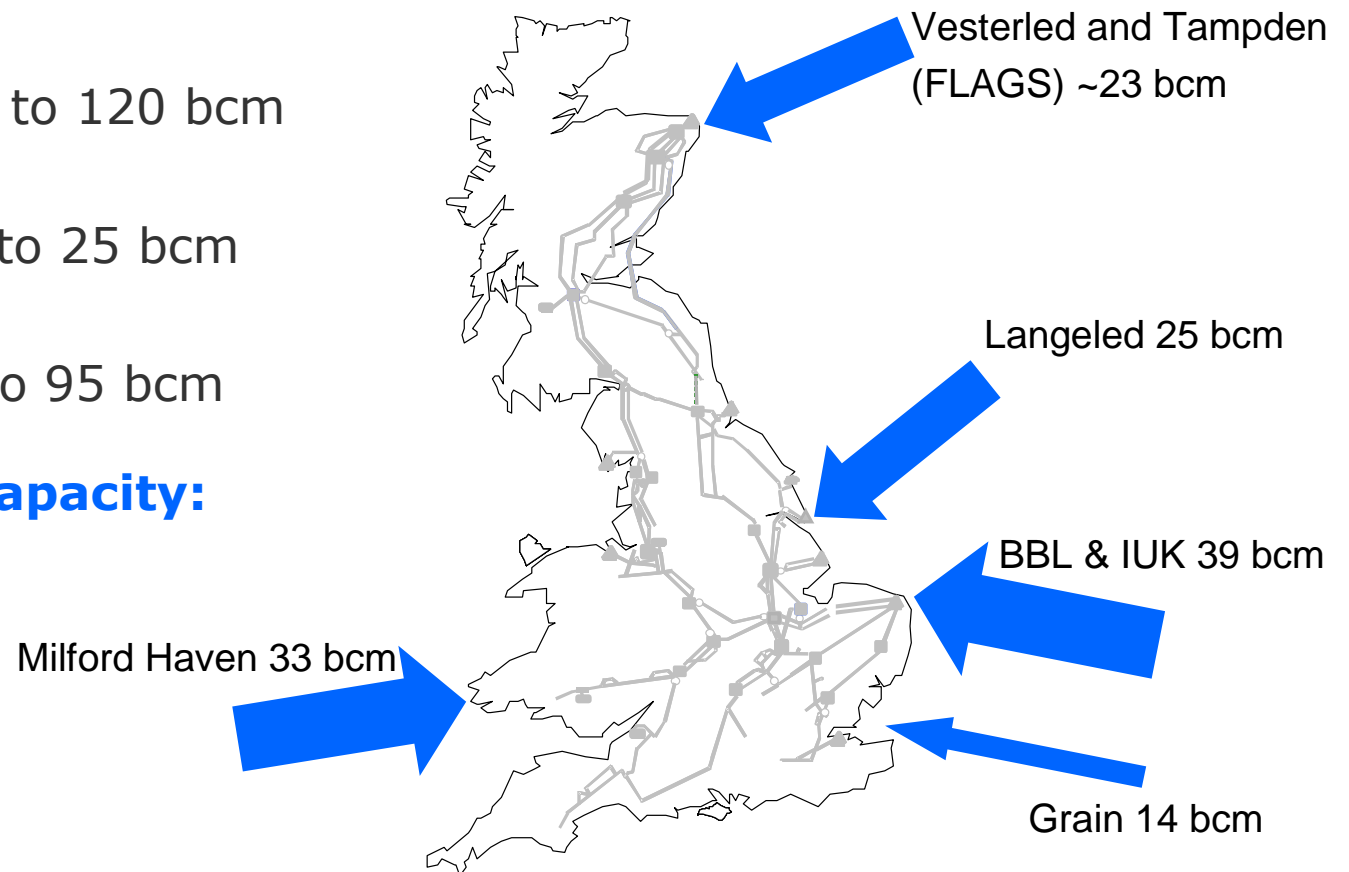
decreasing from 80 to 25 bcm

Imports required:

increasing from 20 to 95 bcm

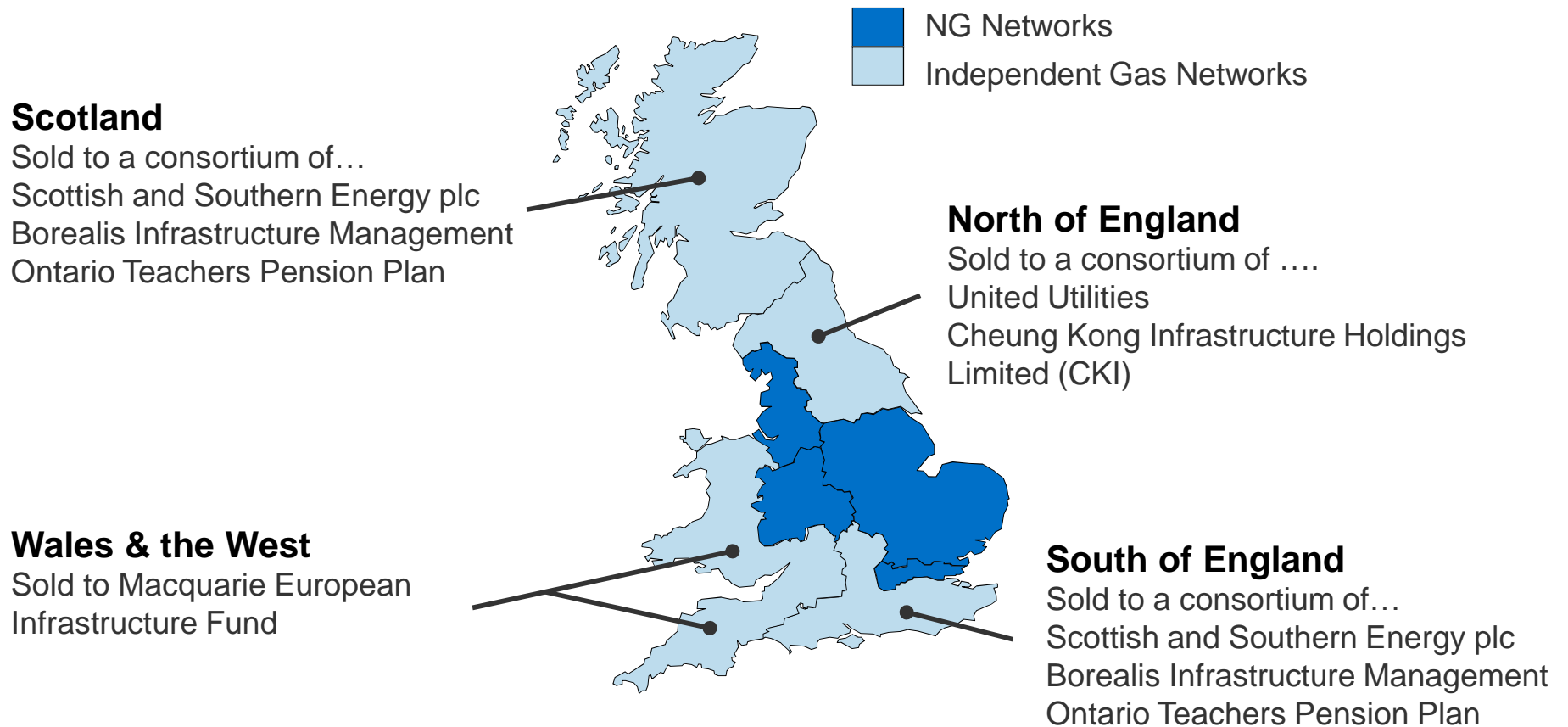
Potential import capacity:

> 130 bcm



Increasingly difficult to forecast supply

Distribution Networks in the UK



National Grid Gas Distribution business - USA

■ Gas Distribution US – operating area



- In the US, NG's Gas Distribution business consists of gas networks in upstate New York, New York City, Long Island, Massachusetts, New Hampshire and Rhode Island
- Delivers gas to 3.5 million consumers

Gas Transmission Pipeline Failures in the UK

- The safety record in the UK has been very good
- There have been no worker or public fatalities as a result of a high pressure gas pipeline failure
- However there have been a number of significant failures that did not result in injury

Palaceknowe 1993



Bushey Heath 1984



Yarm 1971

Worldwide Pipeline Failures

- There have been a number of failures that have occurred worldwide
- These highlight the potential catastrophic consequences that can occur should a high pressure pipeline fail



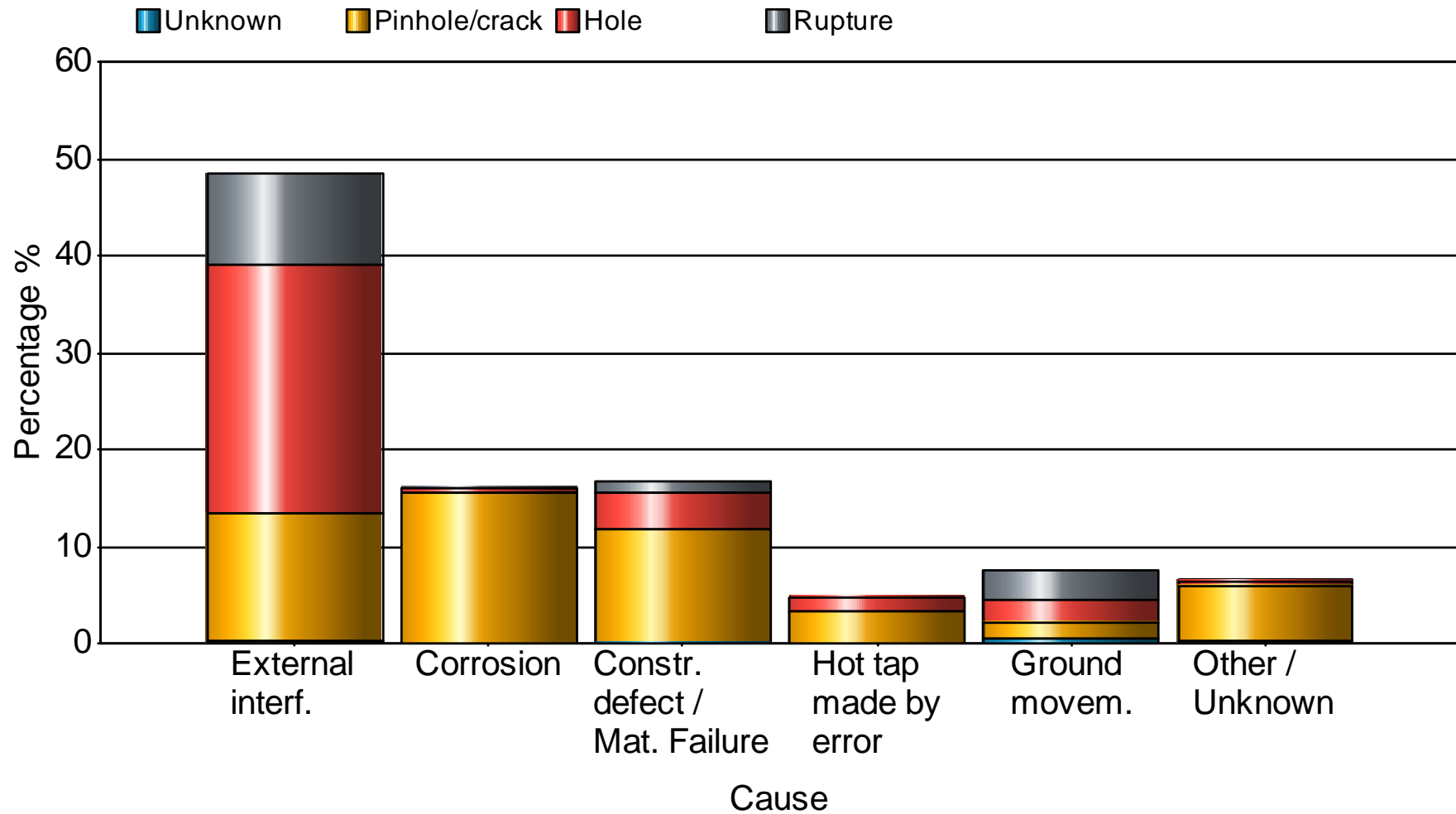
Venezuela 1993



San Bruno, California, 2010



Causes of Pipeline Failures in Europe (EGIG 1970-2010)



Example of 3rd Party Damage to >7bar Pipeline



- Ambergate to Papplewick 24", 37 bar High Pressure Pipeline.
- Damage reported by ground works contractor on during construction works
- Damaged coating and weld seam – damaged was classified as 'Severe' and repaired with an epoxy shell.

Avoidance of External Interference

- Most likely cause of a transmission pipeline rupture is external interference
- National Grid has a number of measures to reduce the risk
 - Land owner/occupier and key stakeholder liaison
 - Aerial / Vantage Surveillance
 - Plant Protection Team - free advice to people who want to work near a pipeline
 - LineSearch - internet based search enquiry system
 - Pipeline markers
 - Safe control of operations near to our pipelines (T/PM/SSW/2 & T/SP/SSW/22)
 - Wall thickness/depth of cover/protective measures
 - Line walking

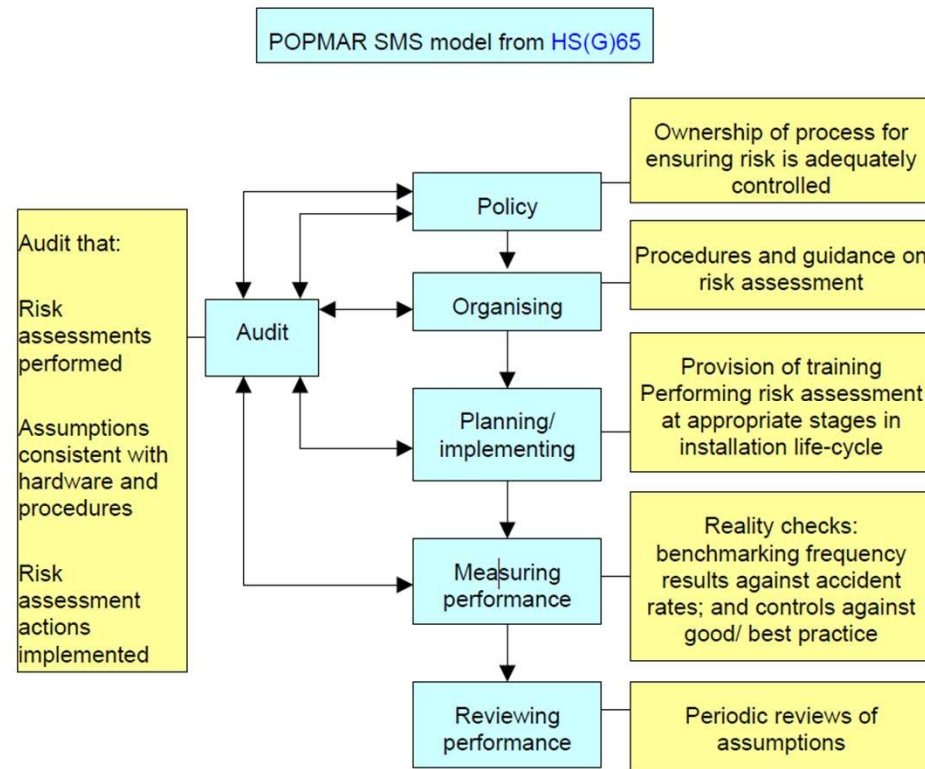
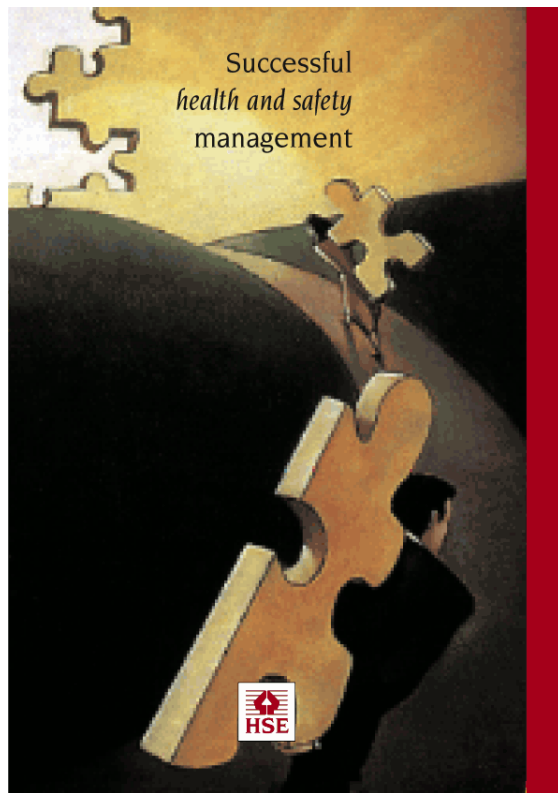
Enforcement of Pipeline Safety

- The Health and Safety Commission (HSC) is appointed by the government to ensure regulation of health and safety in the UK.
- The Health and Safety Executive (HSE) supports the HSC and is responsible for enforcing the legislation.
- HSE has some 1200 Inspectors with legal powers which include:
 - visit companies and enter premises,
 - serve Improvement Notices requiring improvements to be made
 - serve Prohibition Notices stopping a dangerous activity
 - Prosecute companies for breaking legislation
- HSE has a Memorandum of Understanding with the economic regulator, Ofgem



National Grid Safety Management System

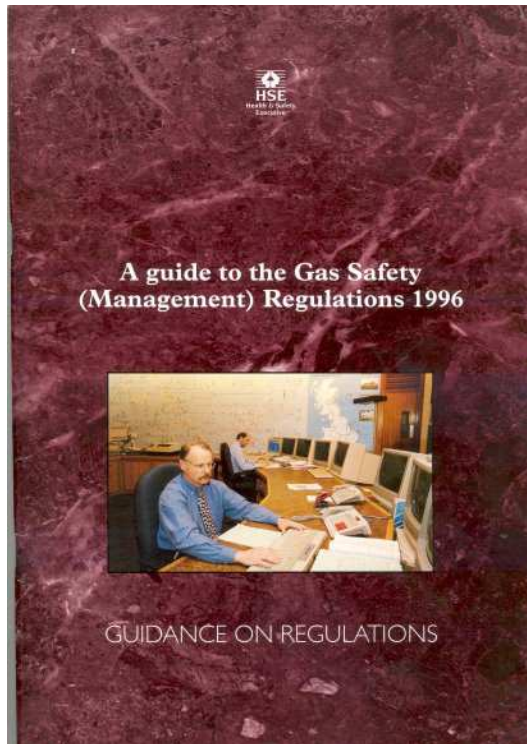
- Follows HSE guidance on successful health and safety management HSG65



Gas Safety Legislation

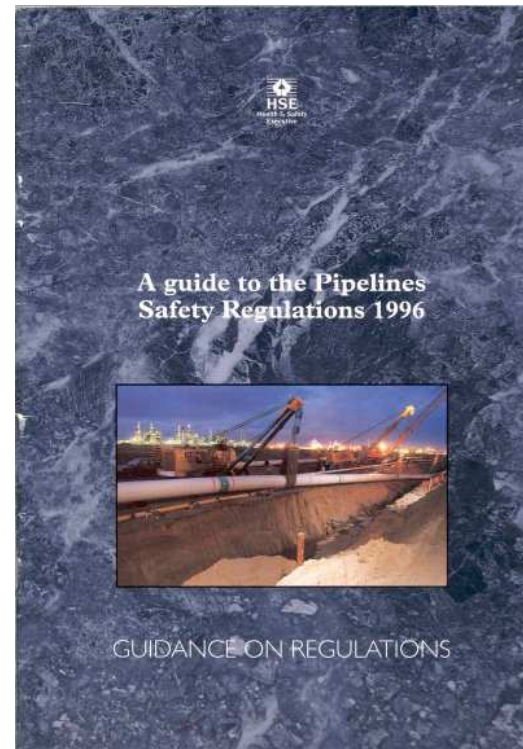
- Prior to 1996 the gas industry in the UK comprised mostly of British Gas
- Industry was regulated through a series of Gas Acts
 - 1965, 1972 and 1986
 - plus the general provisions of the Health and Safety at Work Act
- 1994 the Government announced its intention to introduce legislation to facilitate competition in the gas industry
- The government introduced a set of new legislation to ensure that new entrants worked to the same high standards that British Gas were already working to

Gas Safety Legislation



Gas Safety Management Regulations

Continuity of gas supplies to gas consumers



Pipeline Safety Regulations

Integrity of the gas supply network

Gas Safety (Management) Regulations 1996

- Regulations cover:
 - The management of the safe flow of gas
 - Responding to gas escapes from the pipeline network and consumers premises
 - Investigations of gas escapes
 - Gas quality
 - Appointment of a Network Emergency Co-ordinator (NEC)
- Most of the duties are placed on conveyors (transporters) but requirement to cooperate placed on producers, shippers, suppliers, storage operators etc.

Gas Safety (Management) Regulations 1996

Safety Case

- Requirement on conveyors to have a Safety Case which is accepted by HSE before operation.
- Safety Case covers 21 particulars describing or demonstrating the safety management system
- HSE require the Safety Case to be resubmitted if there is a material change and take three months to assess and accept it.
- The National Grid Safety Case comprises:
 - A description of the NG system and how it is maintained and operated
 - How gas supplies are planned and controlled
 - A risk assessment covering gas supply emergencies and escapes
 - How gas composition and pressure are managed
 - How gas supply emergencies, escapes are managed and investigated

Pipelines Safety Regulations 1996

- Set a single, goal setting approach for both onshore and offshore pipelines
- Two tier approach. General duties applicable to all pipelines carrying hazardous fluids
- Additional specific requirements that apply to Major Accident Hazard Pipelines (MAHPs)
 - For gas pipelines, pipelines > 7 bar
- Specific duties for MAHPs include:
 - Major Accident Prevention Document (MAPD)
 - Emergency Procedures (Pipeline Operators)
 - Emergency Plan (Local Authorities)
 - Notifications

Process Safety - Baker report

BP accepts blame for US disasters and agrees to pay \$373m in fines

Company pleads guilty to Texas explosion felony
Penalties for Alaskan oil leaks and market rigging

Andrew Clark New York

The oil company BP yesterday accepted blame for failures to protect employees, the environment and consumers as it agreed to hand over a total of \$373m to settle a string of criminal investigations into its conduct across America.

In an apparent effort to put lipases under the leadership of Lord Browne behind it, BP struck a broad deal with the US Department of Justice to address the catastrophic 2005 explosion at its Texas City refinery, last year's oil leaks from an Alaskan pipeline and a pattern of manipulation of propane prices by BP's commodity traders.

In Washington, officials from six US law enforcement bodies gathered to announce the company's guilty pleas.

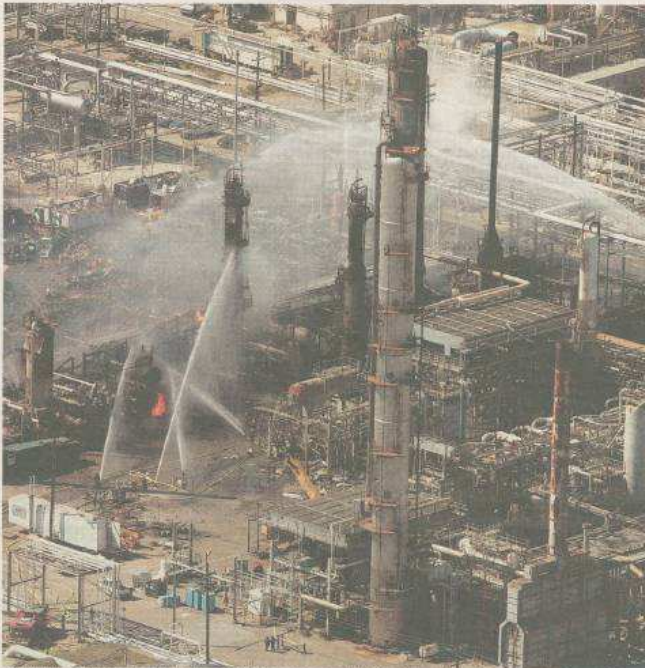
The acting attorney general, Peter Keisler, said the deal demonstrated the US government's commitment to enforce laws to protect the integrity of both financial markets and the environment.

"Businesses that ignore these laws and endanger their workers and communities or corrupt our markets must be held accountable," said Mr Keisler.

The most serious issue facing BP was an explosion at its Texas City refinery which killed 15 people and left more than 170 injured when a container was overfilled with volatile chemicals, sending a geyser of burning liquid over nearby trailers.

The company is pleading guilty to a felony charge of failing to have adequate maintenance procedures. It is paying a fine of \$50m - the largest ever levied under the US Clean Air Act, which was passed in response to the Bhopal chemical disaster in India in 1984.

BP is also pleading guilty to violating regulations over monitoring corrosion in its Alaskan pipelines which caused a 4,800-barrel oil spill. It is paying \$20m in



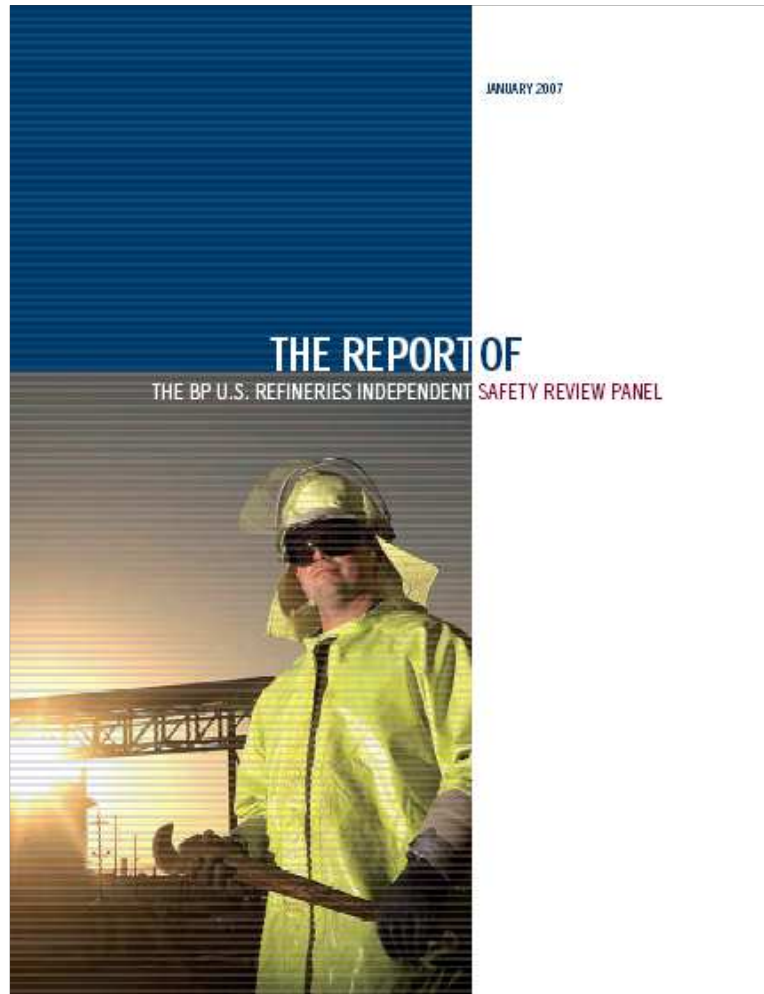
Firefighters in Texas tackle an explosion at a BP refinery in 2005 which left 15 people dead Photograph: Brett Coomer/AP

Focused on deficiencies relating to corporate safety culture, process safety management systems and performance evaluation, corrective action and corporate oversight.

'...the panel is under no illusion that the deficiencies in process safety culture, management or corporate oversight ...are limited to BP'.

Recommended that all companies in other process industries should give serious consideration to its recommendations.

Baker Report Key Findings



- Process Safety Leadership and Culture
- Process Safety Management System
- Performance Evaluation, Corrective Action
- Corporate Oversight
- National Grid now manage this via a series of leading & lagging Process Safety KPIs which are reported right up to Board level

Conclusions

- The UK Safety record for high pressure gas pipelines has been very good
- Although a number of serious accidents have occurred worldwide the data indicates that gas pipeline safety continues to improve
- Although the trend is downward pipeline operators must remain ever vigilant in managing high pressure gas pipelines
- Industry co-operation is a key element in ensuring that we all learn from each other and that as an industry we continue to make further safety improvements

Thank you for your attention !

Ian Fordyce

ian.fordyce@dnvgl.com

+44(0)7785 718775

www.dnvgl.com

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