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development and safety training for contractors
in the oil and gas industry**

**Issues paper for discussion at the Global Dialogue Forum on Future Needs
for Skills and Training in the Oil and Gas Industry**
(Geneva, 12–13 December 2012)

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Executive summary

While technological advances in the oil and gas industry have improved the recovery of hydrocarbons in general, the surging demand for crude oil and natural gas has attracted sizeable investment to increase recovery of unconventional hydrocarbons, and such investments are expected to continue to grow. Unconventional hydrocarbons are often located in geographically and geopolitically challenging areas, so that innovation and differentiation in technology are becoming increasingly essential for the industry to maintain safe and reliable operations. The industry is also expected to generate millions of direct, indirect and induced jobs. Investment in human capital is critical for the industry to operate progressive technologies and to remain productive and competitive.

However, a wide range of skills is substantially lacking, including technical, soft and managerial skills, with particularly acute shortages in technical occupations such as petrochemical engineers, petroleum engineers and geologists. These shortages are imposing challenges to the maintaining of scheduled daily operations in the industry; national oil companies (NOCs), international oil companies (IOCs) and services companies (contractors) are all affected.

A primary cause of the skills shortage is demographic: large numbers of experienced workers are retiring and fewer young skilled workers are entering the industry. Unless the industry begins to address these challenges today, it may face a crisis of skills in the next decade as more than half the employee base leaves the workforce. It needs to take a proactive role, adjusting to these labour market transitions to support its future workforce demands. Coherent human resources development policies need to be developed to ensure sustainable expansion, taking into account the skills sets required. By matching training to labour market demand, providing opportunities for lifelong learning and using skills development to drive innovation and future growth, a virtuous circle can be created.

To this end, governments, employers and workers need to collaborate to formulate a global training strategy for the sector. Such a strategy must include respect for rights at work, non-discrimination, equal opportunities and treatment for women and men (including youth), good governance, transparency and accountability. It can also contribute to job-rich growth in other sectors through transferable skills, and work towards a green economy. The successful implementation of such a strategy will depend on the good will and commitment of all stakeholders – governments, employers, workers and others. Tripartite social dialogue will therefore play an important role.

Enhanced and coherent recruitment policies need to be developed in order to attract young workers. Several factors influence applicant attraction; among these, understanding the needs of the next generation is key. Individual characteristics affect applicants' perceived fit with the organization or job, which in turn has an impact on organizational and job attractiveness. Perceptions of fairness also influence applicant attraction; social dialogue, competitive wages, benefits and safe conditions of work and environment will enhance the business case and promote the Decent Work Agenda within the industry. A focus on promoting issues that are congruent with applicants' values will be beneficial.

The industry also needs to draw on talented workers from diverse labour supply pools that have previously not been sufficiently utilized. These groups include women. There has been little success in increasing the numbers of skilled women workers, except in limited cases. Many women workers in the industry face challenges in advancing their careers and unfavourable treatment in the workplace from their male counterparts. A climate of diversity needs to be developed, by promoting family friendly policies for both women and men, equal pay for work of equal value, equal opportunities and equal treatment for

promotion, and non-discrimination. There is also a need to increase the number of women in managerial positions, particularly senior managers.

In the past, worker retention strategies have tended to be planned internally and independently by the companies concerned. Coordination at the global level and an exchange of best practices on innovative retention policies within the industry can help. It is important for young workers of both sexes that companies have gender-differentiated career development plans in place, including mentoring to meet their need for guidance on their career path, advice on day-to-day issues in the workplace and personal development. Coordination and cooperation are also required for skills migration policies.

Many workers in the oil and gas industry are employed through specialized services companies, and accidents are more prevalent for contract workers than for regular company employees. Although there are no ILO instruments that specifically address contractors' and subcontractors' safety and health at work (or for training in the industry), those concerning occupational safety and health (OSH) in general emphasize the importance of OSH training for all workers. Safety training should focus on supporting preventive action and finding practical solutions. Many accident reports emphasize that training in the oil and gas industry must contribute to improving the safety culture, that safety training needs to be supported and that all workers should be involved. Safety training in the industry includes soft skills such as communication among workers and between employers and contractors; and industry-specific safety requirements such as risk assessment, risk management, chemical safety, emergency preparedness, safety reporting, mitigation, emergency response and evacuation. It is crucial to incorporate respect for tripartite social dialogue in safety training in order to continuously improve the safety culture. To this end, the ILO *Guidelines on occupational safety and health management systems* (ILO-OSH 2001) is an important instrument.

Abbreviations

BOEMRE	United States Bureau of Ocean Energy Management, Regulation and Enforcement
BP	BP p.l.c.
CEPETRO	Center for Petroleum Studies
CERA	Cambridge Energy Research Associates
CONCAWE	oil companies' European association for environmental, health and safety in refining and distribution
E&P	exploration and production
ECITB	Engineering Construction Industry Training Board
ExxonMobil	Exxon Mobil Corporation
FARs	fatality accident rates
FPRW	fundamental principles and rights at work
G20	Group of Twenty Finance Ministers and Central Bank Governors
GCC	Gulf Cooperation Council
GDP	gross domestic product
GFA	global framework agreement
Global KPS	Global public-private knowledge-sharing platform on skills for employment
GNPC	Ghana National Petroleum Corporation
IADC	International Association of Drilling Contractors
IEA	International Energy Agency
IFA	international framework agreement
ILO	International Labour Organization/International Labour Office
ILO-OSH 2001	<i>ILO Guidelines on occupational safety and health management systems</i>
IndustriAll	IndustriAll Global Union
IOCs	international oil companies
IOE	International Organisation of Employers
IPIECA	global oil and gas industry association for environmental and social issues

ITUC	International Trade Union Confederation
Lukoil	ОАО Лукойл
NOCs	national oil companies
OECD	Organisation for Economic Co-operation and Development
OGP	International Association of Oil and Gas Producers
OMS	operating management system
OPITO	Offshore Petroleum Industry Training Organisation
OSH	occupational safety and health
Petrobras	Petróleo Brasileiro SA
POP	professional onboarding programme
PPP	public–private partnership
PTPs	petrochemical professionals and petroleum engineers
SASOL	Sasol Limited
Saudi Aramco	Saudi Arabia Oil Company
SECTOR	Sectoral Activities Department
Shell Nigeria	Shell Petroleum Development Company of Nigeria Limited
SPE	Society of Petroleum Engineers
Statoil	Statoil ASA
Total	Total SA
VET	vocational education and training

Introduction

1. This issues paper has been prepared by the Sectoral Activities Department (SECTOR)¹ for the Global Dialogue Forum on Future Needs for Skills and Training in the Oil and Gas Industry, to be held in Geneva on 12–13 December 2012. SECTOR’s mandate is to promote decent work by addressing social and labour issues in specific economic sectors, at both international and national levels. By tackling challenges and development issues of great importance for specific sectors, SECTOR assists governments, employers and workers to develop policies and programmes aimed at enhancing economic opportunities and improving working conditions.
2. At the 310th Session of the Governing Body (March 2011), it was proposed to hold a Global Dialogue Forum to assess “the current skills and workforce structure and future needs for skills and vocational education and training (VET), as well as effective safety training for contractors and subcontractors in order to create more decent employment across the industry”.² At the 315th Session of the Governing Body (June 2012), it was decided to invite eight Employer and eight Worker representatives, after consultation with their respective groups in the Governing Body, to attend the Forum, as well as representatives from the government of any ILO member State that indicated its wish to attend.³
3. This paper is comprised of an executive summary and three chapters. Chapter 1 focuses on the roles played by technology in the oil and gas industry and illustrates employment trends. Chapter 2 analyses current skills shortages and discusses how to meet future skills development needs for the industry to remain competitive and productive. Chapter 3 discusses the role of training in occupational safety and health (OSH) and its implementation, particularly for contract and subcontract workers.
4. The paper was prepared by Yasuhiko Kamakura, Senior Technical Specialist, SECTOR, and is published under the authority of the International Labour Office (ILO). The Office wishes to thank the International Organisation of Employers (IOE), the IndustriAll Global Union (IndustriAll), and the International Trade Union Confederation (ITUC) for providing valuable data and information. Several ILO colleagues also provided useful comments.

¹ ILO Sectoral Activities Department, <http://www.ilo.org/sector> (accessed 12 June 2012).

² GB.310/STM/1 and GB.310/14(Rev.).

³ GB.315/INS/8.

1. Technology and employment trends

1.1. Technological advancement

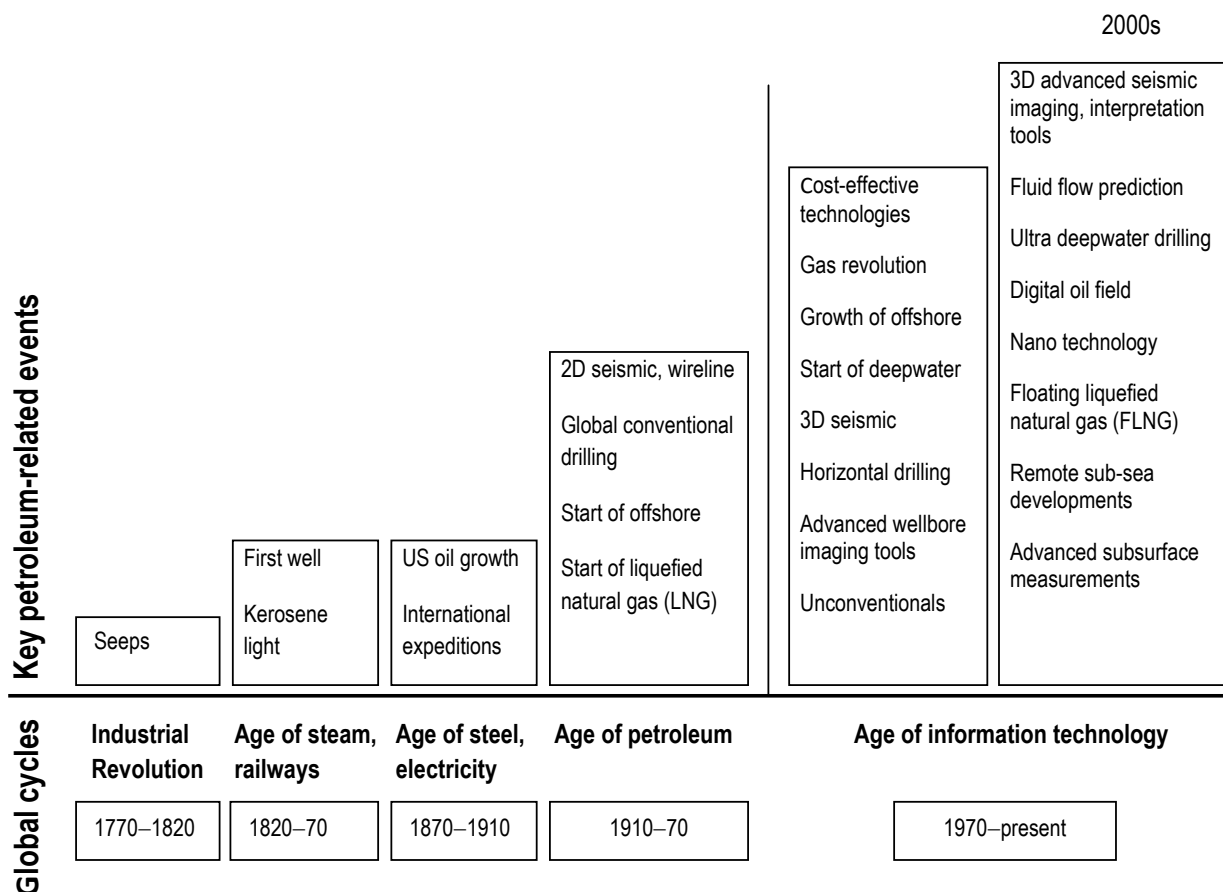
5. Three key areas have contributed to much of the growth in the oil and gas industry in the past few years: deepwater oil and gas, heavy oils, and unconventional oil and gas. Such development requires drilling rigs, trucks and other equipment, crews to drill and complete wells, facilities to process oil and gas before transportation, and pipelines to move products to markets or refineries.
6. An increasing number of hydrocarbons are being found in unconventional resources and this trend is likely to continue in the long term. ExxonMobil's 2012 energy outlook forecasts that natural gas from unconventional resources will account for 30 per cent of worldwide gas production by 2040.¹
7. A key phrase in the oil and gas industry is "technically recoverable". The significant developments in the industry through the diffusion of technology over time have proved its resilience and ability to respond to change. For several decades in oil and gas exploration, activities were dominated by oil seeps, surface structures and shallow onshore vertical drilling. All this changed with the advent of seismic wireline logs, improved earth modelling and the development of offshore drilling. The information technology revolution provided the industry with new tools: modelling and measurements. In the modern oil and gas industry, the application of two critical technological advances – horizontal drilling and hydraulic fracturing – has revolutionized the recovery of unconventional hydrocarbons (figure 1).
8. The International Energy Agency (IEA) reports that unconventional gas resources have not only doubled the amount of estimated recoverable gas, they have also shown that gas resources are more evenly spread between regions than previously acknowledged. The unconventional gas revolution in North America is now driving many countries into an "unconventional gas race". Beyond North America, Asia is the most advanced region in this development, with Australia and China taking the lead.² Shale gas exploration is also under way in Europe, including Austria, Germany, Hungary, Ireland, Poland, Sweden and the United Kingdom. Over half of all estimated European shale gas reserves, which accounts for almost 10 per cent of the global total, is concentrated in two countries: France and Poland.³

¹ N. Snow: "ExxonMobil energy outlook expects growing unconventional gas role", in *Oil & Gas Journal* (Houston, TX), 9 Dec. 2011.

² International Energy Agency (IEA): *Medium-term oil & gas markets 2011* (Paris), p. 196.

³ Ernst & Young: "Shale gas in Europe: Revolution or evolution?" (Doha), 5 Dec. 2011.

Figure 1. Key technological developments in the oil and gas industry



Source: I. Sandrea: "Technological developments and challenges", in *Oxford Energy Forum* (Oxford, Oxford Institute for Energy Studies), No. 86, Nov. 2011, p. 3.

9. The IEA forecasts that global energy demand will increase by 40 per cent by 2035. Demand will grow for all energy sources. Oil demand will increase by 18 per cent and will be driven by transport. Coal demand will increase for around the next ten years but will then stabilize at around 25 per cent higher than it was in 2009. Modern renewables will grow faster than any other energy form in relative terms, but in absolute terms total demand will still not be close to the level of any single fossil fuel in 2035. Global investment in the energy supply infrastructure of US\$35 trillion will be required between 2011 and 2035. Two-thirds of this will be needed in non-OECD countries. Oil and gas combined will require nearly US\$20 trillion in investment, increasing to reflect higher costs and a need for upstream investment to rise in the medium and long terms. Coal and biofuels will require about US\$1 trillion.⁴
10. Increasingly, new sources of future oil and gas reserves and production will come from technologically challenging reservoirs. As traditional oil-producing areas become depleted, alternative methods of oil drilling will become progressively more important as new sites of available oil are to be found in more remote locations. To meet the demand for future growth, it is necessary to find and produce oil using highly complex technology, which in turn increases the types and degrees of professional skills and expertise to manage such advanced technology in the oil and gas industry.

⁴ International Energy Agency (IEA): *World Energy Outlook 2011: Energy for all – financing access for the poor* (Paris, 2011), p. 69.

1.2. Employment trends

11. The oil and gas industry plays an important role in the economy: it creates jobs for both women and men and value by extracting, transforming and distributing hydrocarbons, and it also creates the energy resources that underpin the economy.
12. A study by Wood Mackenzie shows that the oil and gas industry will create over 1.4 million jobs by 2020 in the United States.⁵ For example, shale gas has the potential to create many jobs because it is available in geographically wide areas of the globe. A study by IHS Global Insight shows that by 2010 shale gas represented 27 per cent of total United States natural gas production. It is expected that this share will grow to 43 per cent by 2015, and will reach 60 per cent by 2035. In 2010, the shale gas industry supported over 600,000 jobs, which included 148,000 direct jobs in the United States, nearly 194,000 indirect jobs in supplying industries, and more than 259,000 induced jobs. By 2035, the shale gas industry will support over 1.6 million jobs across the United States, comprising more than 360,000 direct jobs, over 547,000 indirect jobs, and over 752,000 induced jobs.⁶
13. One example of how the oil and gas industry can create direct, indirect and induced jobs by 2015 is given by an assessment study of the shale gas development of the Utica Shale reserves across the State of Ohio (table 1).

1.2.1. Employment trends for contractors

14. Global employment data for contract labour levels in the oil and gas industry seem not to exist; however, it is estimated that a considerable number of contract and subcontract workers are employed in the industry. A study by IHS Global Insight reports that in the United States there are about 18,000 independent oil and gas companies, many of which are contractors that work for the major oil and gas companies. These companies created 399,508 jobs in 2010 in the United States exploration and production (E&P) onshore sector alone.⁷
15. Flexibility is one of the economic advantages of contracting. It also makes contractors more prone to cutbacks when there is a downturn; as a result, contract workers' employment is relatively unstable. Employment turnover trends among Australian oil and gas workers "have been cyclical connected to the price of a barrel of oil and the offshore activity at the time". In general terms, "we have had close to full employment for both permanent and contract workers, with shorter periods of low activity and unemployment amongst the contract labour who are first to be stood down in quieter times".⁸ In Ecuador, there is high job rotation among contract workers in the oil and gas industry, but it is

⁵ TransCanada: "TransCanada releases detailed Keystone XL job creation data", Media Advisory, 10 Jan. 2012, <http://www.transcanada.com/5921.html> (accessed 12 June 2012).

⁶ IHS Global Insight (USA) Inc.: *The economic and employment contributions of shale gas in the United States* (Washington, DC, 2011).

⁷ IHS Global Insight (USA) Inc.: *The economic contribution of the onshore independent oil and natural gas producers to the U.S. Economy: Final report* (Washington, DC, 2011), p. 5.

⁸ Information provided to the ILO by the Maritime Union of Australia (MUA), 2009.

accepted that this is the nature of the business. Given the high demand in the industry, contract workers are generally able to remain in employment.⁹

16. Seasonality is another reason for fluctuations in the use of contractors. Refinery turnarounds are a good case in point. These are planned, periodic shutdowns of all or part of a refinery for maintenance and inspection, plus the repair of equipment and replacement of process materials where necessary. In continuous operations such as refining, turnarounds are also often the only opportunities to improve equipment or processes. Refinery turnarounds entail an intensive but seasonal use of contract workers.¹⁰

Table 1. Utica formation employment analysis: Industries in Ohio with at least ten employees

Category	2011	2012	2013	2014	2015
Support activities for mining	2 473	13 521	63 118	105 709	117 204
Retail trade	166	1 007	4 948	8 990	10 743
Professional and technical services	149	885	4 299	7 675	8 988
Administrative and support services	107	625	3 023	5 365	6 236
Ambulatory health care services	106	634	3 215	5 911	7 060
Construction	98	660	3 235	6 673	9 077
Food services and drinking places	71	434	2 156	3 994	4 940
Wholesale trade	54	321	1 539	2 722	3 162
Real estate	43	259	1 287	2 307	2 670
Personal and laundry services	33	201	1 010	1 834	2 158
Private households	24	148	737	1 349	1 606
Monetary authorities – central bank	23	133	647	1 551	1 348
Repair and maintenance	22	128	616	1 084	1 247
Rental and leasing services	21	117	550	948	1 078
Hospitals	21	125	634	1 168	1 420
Membership associations and organizations	18	109	537	967	1 144
Nursing and residential care facilities	15	93	470	873	1 075
Fabricated metal product manufacturing	13	75	351	588	633
Securities, commodity contracts, investments	12	69	334	598	699
Management of companies and enterprises	11	65	309	526	575
Educational services	10	63	324	619	786
Performing arts and spectator sports	10	61	297	543	658
Total	3 500	19 733	93 636	161 994	184 507

Source: Kleinhenz & Associates: *Ohio's natural gas and crude oil exploration and production industry and the emerging Utica gas formation: Economic impact study*, prepared for the Ohio Oil and Gas Energy Education Program, Sep. 2011, p. 84.

⁹ Information provided to the ILO by the National Federation of Chambers of Industry of Ecuador, 2009.

¹⁰ United States Department of Energy: *Refinery outages: Description and potential impact on petroleum product prices* (Washington, DC, Office of Oil and Gas, Energy Information Administration, 2007), http://www.eia.doe.gov/oiaf/servicerpt/refinery_outages/SROOG200701.pdf (accessed 12 June 2012).

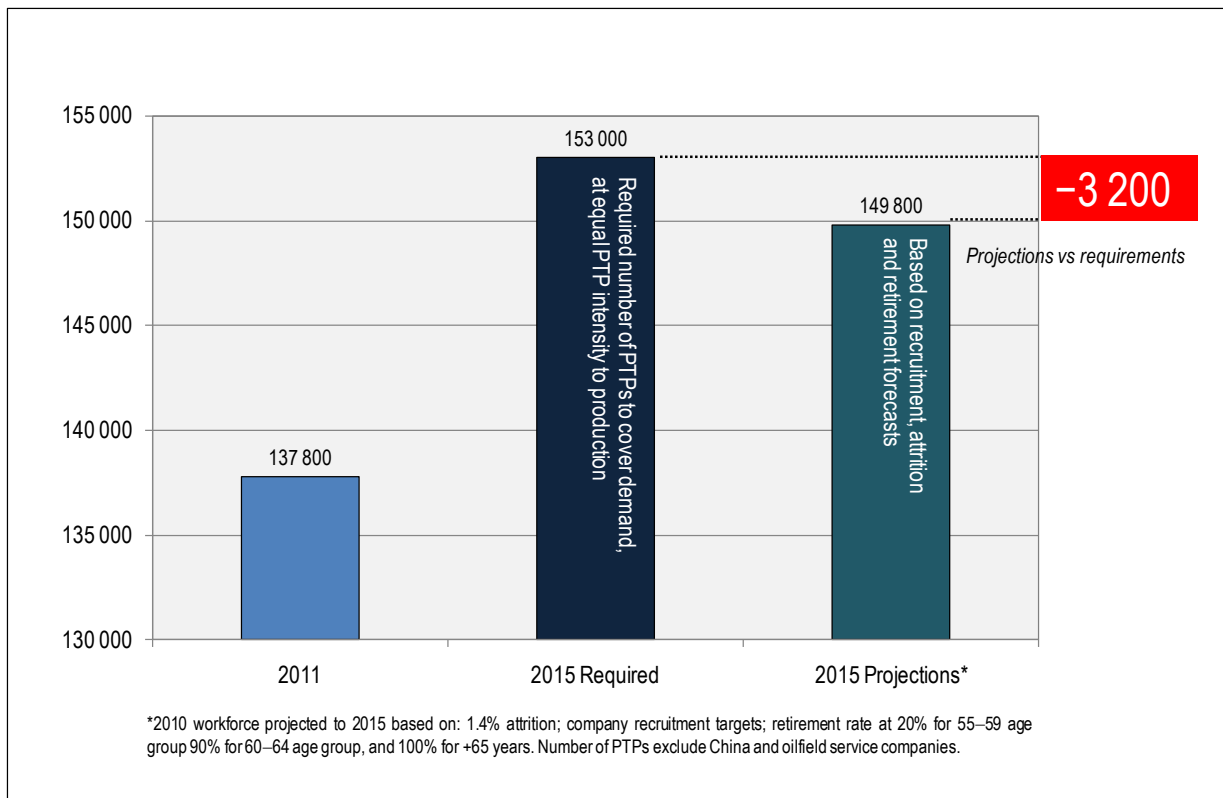
2. Current skills gaps and future skills development strategies

17. The oil and gas industry has undergone radical changes in recent years. Geopolitics are rapidly changing; environmental concerns are rising; global demand for crude oil and natural gas is escalating. The prices of crude oil and natural gas have remained high, and investment in the oil and gas industry has surged. Consequently, the industry is increasingly facing a shortage of qualified workers.

2.1. Skills shortage – A global issue

18. The skills shortage is a global problem. For example, based on data from 37 global exploration and production (E&P) companies covering nearly 40 per cent of world oil and gas production, it is estimated that there could be a global shortage of over 3,200 petrochemical professionals and petroleum engineers (PTPs) in the E&P sector in 2015 (figure 2).

Figure 2. Estimate of the potential talent gap of petrochemical professionals and petroleum engineers (PTPs) in the exploration and production sector in 2015



Source: Schlumberger Business Consulting: 2011 SBC oil and gas HR benchmark survey (Paris).

19. The oil and gas industry is currently showing shortages in a wide range of skilled occupations, including technical, management, financial, marketing and leadership. Almost four out of five oil and gas companies reported that technical skills were a key shortage area, and half stated that management skills were in short supply. Specific skills shortages in each area are shown in box 1.

Box 1
Serious skills shortages in the oil and gas industry, by occupation

Technical

Engineers

Chemical, electrical power, drilling, operations, petroleum, reservoir, production, mechanical, pipeline, structure – especially those with practice expertise, report-writing and consultancy skills.

General technical

Alternative/renewable energies, fire safety, drilling and well-site supervisors, IT, “hands on” skills, pressure vessel designers, metallurgists, industrial energy efficiency – especially problem-solving and research and development (R&D) skills.

Scientific

Geologists/geophysicists, microbiologists, chemists.

Management

Project management

Experienced project managers for large- and small-scale projects, risk management, technical management skills, additional practical as opposed to theoretical skills, contract skills, MBAs, enhanced industry awareness of grass roots problems, experienced engineers with additional management skills, integration work in a global environment.

People skills

Line management skills, “managing managers”, department managers. A common theme here was that these management skills in short supply were often best resourced internally.

Financial/commercial/business skills

Energy training, international finance, overseas finance management, economists, reporting skills.

Marketing

Sales and marketing managers, selling the “added value” of the company, marketing profile skills, closing sales, understanding of world markets, dealing with clients, marketing of technical skills, managers with wider experience of commercial technology, commercial skills to develop new markets.

Leadership

People that can “lead, not follow”, ability to work individually and head up a team, industry engagement in key initiatives, ability to develop technologists as leaders, greater all-round rather than specific skills, understanding the interactions across a business, engineering plus MBA degree, project managers, more positive “can do” attitude, self-confident and able to work with all levels.

Source: Energy Institute, Deloitte and Norman Broadbent: *Skills needs in the energy industry: A report on the initial findings of three surveys* (Jan. 2008), <http://www.energyinst.org/documents/5> (accessed 12 June 2012).

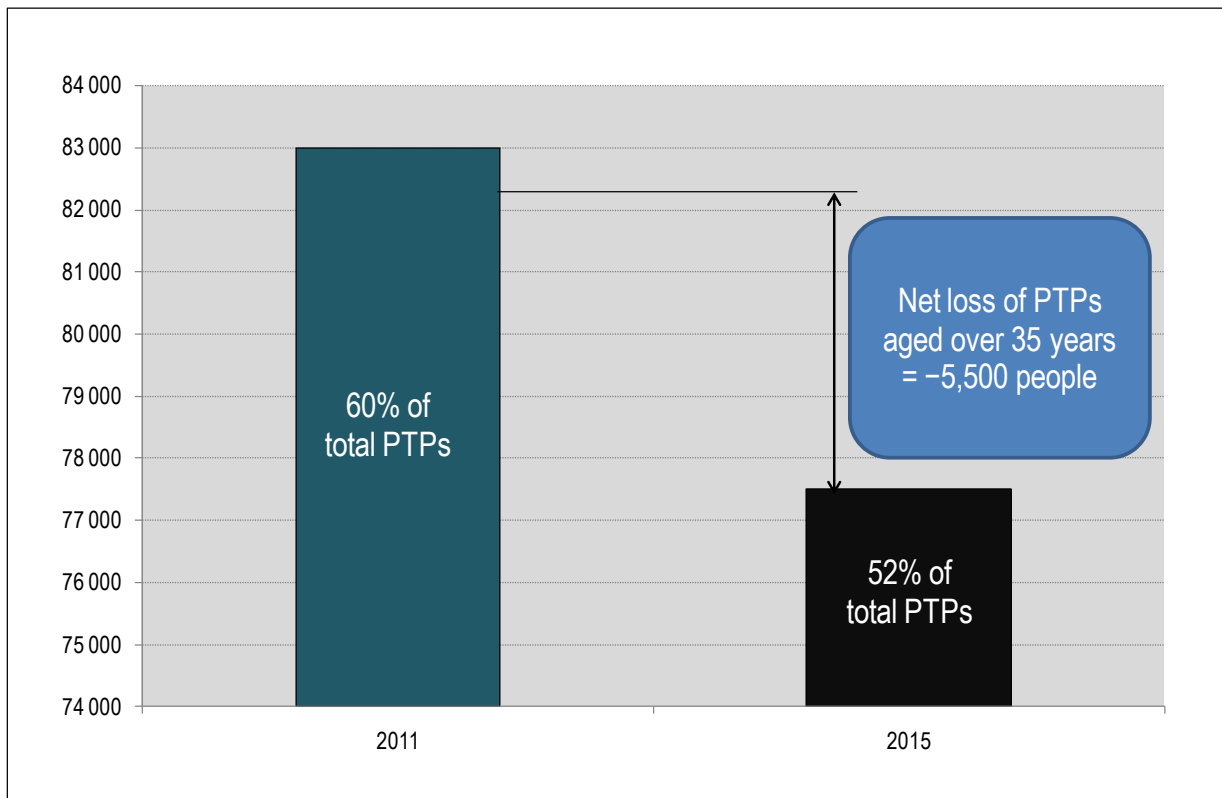
2.1.1. Demographic challenges

20. The Schlumberger Business Consulting study cited in figure 2 estimates that the E&P sector may face a net loss of approximately 5,500 experienced PTPs aged over 35 years. The ratio of these experienced workers will decrease from 60 per cent in 2011 to 52 per cent of total PTPs in 2015 (figure 3).¹¹
21. With the number of United States oil rigs hitting a new record in April 2012 and deepwater exploration activities increasing in all regions, particularly Africa, the skills shortage has

¹¹ *ibid.*

become more serious.¹² A survey on skills in the North Sea conducted by the Offshore Petroleum Industry Training Organisation (OPITO) and the Engineering Construction Industry Training Board (ECITB) reveals a skills shortage in operators and contractors. In particular, the need for contractors is expected to grow in the coming years, with short-term growth most likely in companies employing fewer than 500 people and medium-term growth in those employing more than 500 people.¹³ OPITO and ECITB research shows that over 50 per cent of oil and gas companies consider the skills shortage their number one challenge.¹⁴

Figure 3. Estimate of potential talent gap of experienced petrochemical professionals and petroleum engineers (PTPs) in the exploration and production sector in 2015



Source: Schlumberger Business Consulting: 2011 SBC oil and gas HR benchmark survey (Paris).

22. These shortages are mainly the result of demographic challenges. According to a Boston Consulting Group study, *Turning the challenge of an older workforce into a managed opportunity*, by 2050 the global population aged 60 and over will exceed the number of people aged 15 and under for the first time in history. Most countries will be faced with

¹² N.J. Watson: “Serving the oil boom”, in *Petroleum Economist* (London), May 2012, pp. 18–19.

¹³ Skills shortages could halt North Sea oil & gas boom”, in *Process Engineering* (Berkhamsted), 17 Mar. 2011, <http://processengineering.theengineer.co.uk/skills-shortages-could-halt-north-sea-oil-and-gas-boom/1007892.article> (accessed 12 June 2012).

¹⁴ “Filling the engineering skills gap: Jee reveals secret to recruitment success” (London and Aberdeen), Nov. 2011, <http://www.jee.co.uk/news/nid-0016/filling-the-engineering-skills-gap-jee-reveals-secret-to-recruitment-success-/> (accessed 12 June 2012).

labour shortage issues. Countries with large numbers of young people are not immune, as their workforce might migrate.¹⁵

- 23.** For the oil and gas industry specifically, there are two major business challenges: (i) reduction in production caused by supply shortages of workers; and (ii) a reduction in productivity due to an ageing workforce as well as replacement of experienced workers with less experienced workers.¹⁶ These challenges are very real. Two-thirds of the Society of Petroleum Engineers (SPE) membership is now over 40 years old; and according to Cambridge Energy Research Associates (CERA), more than half of all oilfield professionals will reach retirement age in the next decade. In Saudi Arabia, more than 60 per cent of engineers will have less than ten years' experience in the next few years.¹⁷ In the Middle East, daily operations in the industry are threatened as a result of unprecedented growth.¹⁸ Overall, the skills shortage has resulted in the use of contract labour on a regular basis in almost all occupations, including senior positions.¹⁹
- 24.** The oil and gas industry offers VET to workers as part of its employee training programmes. For example, effective industry-supported training for Nigerians is available at the Mobil Technical School. Shell Nigeria also offers training, as do all other oil companies to a greater or lesser degree. In addition, the industry offers training curricula to improve non-technical competencies. For example, the Saudi Aramco professional onboarding programme (POP), designed to accelerate the development of new graduates and their integration into the workforce, teaches young engineers both technical and non-technical skills, such as interpersonal effectiveness and an understanding of Saudi Aramco's business.²⁰
- 25.** Some programmes are supported by the industry in the form of scholarships and financial contributions to teachers' and professors' positions at technical schools and universities. In one such example, BP is currently implementing a US\$50 million five-year programme with a range of technology, education and culture projects, designed to bolster research and skills in the oil and gas industry in the Russian Federation. The programme focuses on supporting eminent professors in energy studies at leading Russian universities, as well as talented students interested in pursuing energy and economy-related studies.²¹ The Government of Ghana is taking a similar initiative: in collaboration with Tullow Ghana

¹⁵ International Gas Union: "Progress reports from the task forces", in *International Gas* (London, International Systems and Communications Limited, and Oslo, International Gas Union), Apr.–Sep. 2012 issues.

¹⁶ International Gas Union: "Progress reports from the task forces", op. cit.

¹⁷ "The big crew change: Turnover in the oil workforce", in *The Oil Drum: Europe*, 17 Mar. 2007, <http://europe.theoil Drum.com/node/2369> (accessed 12 June 2012).

¹⁸ "Fight the talent war", in *Business Management* (Cardiff), No. 4, Oct. 2008.

¹⁹ G. Thomson: "Tackling the skills gap in the oil and gas sector", in *Holyrood* (Edinburgh), 28 Mar. 2011.

²⁰ T. Aggour: *A multidisciplinary professional onboarding program for E&P new hires*. Paper presented at the International Petroleum Technology Conference 2009, Doha, Qatar, 7–9 Dec. 2009.

²¹ "BP Russia launches five year investment in technology, education and cultural programmes", BP Press Release, 20 Dec. 2011.

Limited, the Exploration and Engineering Department of the Ghana National Petroleum Corporation (GNPC) is implementing an upskilling programme in the industry.²²

2.2. Meeting the skills challenge

26. In order to avoid a chronic skills shortage in the medium- and long-term and to enable growth, the industry will need to develop coherent human resources development policies. Such policies may require a combination of strategies, including a global training strategy for the industry; drawing talent from diverse labour supply pools that may not have been previously tapped sufficiently (such as women and workers with disabilities); and increasing collaboration between industry employers, workers' organizations and other stakeholders to improve retention schemes and develop technologies for the future.

2.2.1. Developing a global training strategy

27. Endeavours on the part of oil and gas companies, working independently to create a large skilled workforce, have had only limited success. A coherent global training strategy needs to be developed, aligned with ILO international standards and policies.

28. The ILO framework for skills development is laid down in the Human Resources Development Recommendation, 2004 (No. 195). The framework advises countries to sustain a virtuous circle by matching training to labour market demands, providing opportunities for lifelong learning, and using skills development to drive innovation and thus future job growth. In addition, the 97th Session of the International Labour Conference, in 2008, adopted the Conclusions on skills for improved productivity, employment growth and development,²³ which provides practical guidance on how Recommendation No. 195 can support the development of policies to improve productivity, employment growth and development. The conclusions are tripartite agreement between workers, employers and governments. The conclusions provide a forward-looking framework for strengthening linkages between skills, productivity, employment, development and decent work. The conclusions underscore the principle that effective skills development policies need to be integral components of national development strategies in order to prepare the workforce and enterprises for new opportunities and adopt a forward-looking approach to dealing with change. In order to successfully link skills to productivity, employment creation and development, skills development policies should target three objectives: matching supply to current demand for skills; helping workers and enterprises adjust to change; and anticipating and delivering the new and different skills that will be needed in the future.

29. Subsequently, the ILO developed the G20 Training Strategy: "A skilled workforce for strong, sustainable and balanced growth",²⁴ which focuses on building bridges between the world of education and training and the world of work. It explains why a skills strategy is needed, outlines a conceptual framework and assembles the essential building blocks of a robust training strategy – including the roles of the social partners (table 2).

²² "14 Ghanaians graduate from training in oil and gas sector", in *The Ghanaian Journal* (Accra), 5 Mar. 2011.

²³ http://www.ilo.org/wcmsp5/groups/public/---ed_emp/---ifp_skills/documents/publication/wcms_103457.pdf (accessed 24 July 2012).

²⁴ http://www.ilo.org/wcmsp5/groups/public/@dgreports/@integration/documents/publication/wcms_151966.pdf (accessed 24 July 2012).

Table 2. Summary of the ILO skills development framework and the G20 Training Strategy

	ILC 2008 framework for skills for improved productivity, employment growth and development	G20 Training Strategy: A skilled workforce for strong, sustainable and balanced growth, 2010
Conceptual framework	<ul style="list-style-type: none"> ■ Match supply to current demand for skills ■ Help workers and enterprises adjust to change ■ Anticipate and deliver skills needed in the future; sustain a dynamic development process 	<ul style="list-style-type: none"> ■ Broad-based good quality general education ■ Matching training to the labour market ■ Continuous learning to enable adjustment to change ■ Anticipating and preparing for the skills needs of the future
Features of the virtuous circle	<ul style="list-style-type: none"> ■ Continuous and seamless pathways of learning ■ Development of core skills ■ Development of higher skills ■ Portability of skills ■ Employability 	<ul style="list-style-type: none"> ■ Continuous and seamless pathways of learning ■ Development of core skills ■ Development of higher skills ■ Portability of skills ■ Employability
Success factors	<ul style="list-style-type: none"> ■ Full involvement of social partners ■ Policy coherence by linking education research and skills development to labour markets, social policy, technology, public services, trade, investment and macroeconomic policies ■ Attention to gender equality 	<ul style="list-style-type: none"> ■ Lifecycle perspective of skills development for children, young people and older workers ■ Policy convergence so that skills and employment policies are viewed together ■ Coordination mechanisms to connect basic education to technical training, labour market entry and lifelong learning; communication between employers and training providers; and integrating skills development policies with labour market, social protection, and industrial, investment, trade and technology policies
Recommendations	<p>Recommended areas of action:</p> <ul style="list-style-type: none"> ■ Skills development at the workplace and along value chains ■ Skills development to help manage global drivers of change ■ Early identification of current and future skills needs to feed into sectoral development strategies ■ Link education, skills development, labour market entry and lifelong learning ■ Skills development for social inclusion of target groups 	<p>Building blocks for effective implementation of national skills policies:</p> <ul style="list-style-type: none"> ■ Anticipating skills needs ■ Participation of social partners ■ Sectoral approaches ■ Labour market information and employment services ■ Training quality and relevance ■ Gender equality ■ Broad access to training and skills utilization ■ Financing training ■ Assessing policy performance

Source: ILO: *Follow-up on the implementation of the ILO–G20 training strategy*, Governing Body document GB.313/POL/3, 313th Session, March 2012 (Geneva), p. 3.

30. As part of the implementation of the G20 Training Strategy, the ILO will launch a web-based “global public–private knowledge-sharing platform on skills for employment (Global KSP)”. The Global KSP is aimed at turning information into actionable knowledge with a focus on pragmatic problem solving through analysis of what governments, workers and employers, as well as other organizations, have found that works; facilitating active exchange of experience among constituents and stakeholders; collecting and disseminating case studies and other knowledge products directly from enterprises and from trade unions; broadening the range of experience made available to ILO constituents through partnerships with other international organizations under the G20 partnership; and maximizing open, public access by choosing platform technologies that maximize

accessibility in less industrialized countries.²⁵ The oil and gas industry's training strategy would contribute not only to creating more decent jobs within the industry, but also to job-rich growth in the country concerned. The industry might also consider contributing to the ILO's Global KSP.

2.2.2. Moving to greater reliance on local skilled workforces

- 31.** Oil and gas companies are expanding operations into new and ever more remote geographic locations; as a result, companies are looking to build local skilled workforces so that they can rely less on expatriate services. However, efforts to decrease reliance on expatriate workers are difficult to implement in some situations, and nearly impossible in others where local skilled workers are simply not available. Without expatriate specialists to provide the necessary skills and services, many oil and gas companies may be unable to sustain current levels of technical expertise.
- 32.** Heavy reliance on expatriates has several consequences for nationals, including unemployment. Young people are particularly affected: globally, in 2011 four out of ten unemployed people were young women or men, and youth were three times as likely as adults to be unemployed.²⁶ In 2011, youth unemployment rates in the Arab region were on average more than 27.3 per cent, with the average unemployment of young women at 41.1 per cent.²⁷ In addition, there is large population of migrant workers in the region. Towards the end of 2004, the year of the latest relatively reliable statistics, the Gulf Cooperation Council (GCC) States were inhabited by 12.5 million foreigners, who constituted 37 per cent of the total population. In Qatar, the United Arab Emirates (UAE), and Kuwait, foreigners constituted a majority; in the UAE they accounted for over 80 per cent of the population. Only Oman and Saudi Arabia managed to maintain a relatively low proportion of foreigners: about 20 and 27 per cent, respectively.²⁸
- 33.** Many companies are grappling with the challenge of reducing the high cost of maintaining an international workforce. They recognize the increasing importance of recruiting local talent with local knowledge and experience to join their workforce and to move into business leadership roles. This change in emphasis is important, not just for cost reduction reasons, but for companies to benefit from the best local talent, culture and knowledge. Transfer of skills required for the oil and gas industry must be made from countries that have the skills to countries that have not. Local content policies and practices are among the means for such skills transfer.
- 34.** Employers are meeting local content policies. In Angola, Total has a training centre in Luanda, the Pazflor Centre, as part of its commitment to investing in the development of local staff. The Centre trains Angolans to work in the oil and gas industry; courses on offer

²⁵ ILO: *Follow-up on the implementation of the ILO–G20 training strategy*, Governing Body document GB.313/POL/3, 313th Session, March 2012 (Geneva).

²⁶ ILO: *Global employment trends for youth: 2011 update* (Geneva, 2011).

²⁷ ILO: "Arab youth aspiring to social justice and decent work", in *World of Work Magazine* (Geneva), No. 74, May 2012.

²⁸ UN: A. Kapiszewski: "Arab versus Asian migrant workers in the GCC countries", in *United Nations Expert Group Meeting on International Migration and Development in the Arab Region* (Beirut, 2006), p. 9.

include risk analysis, geological systems and structures, industrial drawing, rotation equipment, an introduction to drilling, and valves and tubing.²⁹

35. Some governments have established policy frameworks on implementing local content in staffing. In Ghana, since the discovery of major oil reserves at the Jubilee Oilfield in 2007, the active involvement and participation of locals in the oil and gas industry has become a major policy issue. After a nationwide consultation process, in 2010 Ghana's Ministry of Energy formulated a policy framework which set a number of key policy objectives, including:

- maximizing the use of local expertise, goods and services, and financing in all aspects of the oil and gas industry value chain;
- developing local capability through education, skills and expertise development, transfer of technology, and active research and development;
- achieving at least 90 per cent local content and local participation in all oil and gas activities by 2020; and
- creating oil and gas and related supportive industries to sustain economic development.³⁰

36. The ILO's public-private partnership (PPP) approach can assist its constituents to improve the implementation of local content through skills development.³¹ However, the creation of a quality skilled workforce can be challenging. In Nigeria, for example, there has been only limited success, because science and technology teaching at the national universities is not yet meeting the quality demands of international oil and gas business.³² The Government of Nigeria emphasizes that the success of any organization to a very large extent rests on its people. Nigeria's oil and gas industry is considering evolving a new strategy to create a system that will ensure that Nigerian professionals in the appropriate areas are groomed and integrated to sustain the nation's ambitions for transforming its oil and gas industry.³³

37. Increasing skills transferability across countries would contribute to redressing the skill shortages in the industry globally. However, differences in national VET systems make this difficult at present. This is caused by a skills mismatch between internationally widely accepted qualifications systems and national qualifications systems. For example, when some oil and gas industries invest in skills training in accordance with one national system, which are not necessarily equivalent to the internationally widely accepted qualifications,

²⁹ "Future city: Why Luanda is the new Dubai", in *Universo Sonangol* (London, Impact Media Custom Publishing), Winter 2008, p. 39.

³⁰ Ghana Ministry of Energy: Local content and local participation in petroleum activities: Policy framework (2010).

³¹ "ILO and BP sign a public-private partnership agreement in Indonesia", ILO Press Release, 1 June 2011, http://www.ilo.org/global/about-the-ilo/press-and-media-centre/news/WCMS_156224/lang-en/index.htm (accessed 12 June 2012).

³² "Nigeria's oil industry: Between nationalism and skills gap", 1 Sep. 2009, <http://neftgaz.ru/en/news/view/89926> (accessed 12 June 2012).

³³ A. Akpe: "Alison-Madueke wants enhanced local skill in industry", in www.businessdayonline.com, 24 Feb. 2011.

it would result in restricting the opportunities of skilled workers to move from one country to another.³⁴

2.2.3. Attracting entry-level talented young people

38. All industries compete to recruit talented workers. Young people have many career opportunities other than the oil and gas industry. The harsh living and working conditions of those working in the E&P sector and a perception that the oil and gas industry is dirty and dangerous have damaged its ability to attract young talent.
39. The industry needs to understand the work ethic of younger people. In general, the millennial generation has been characterized as adept at multitasking, and technologically savvy, but also as having a sense of entitlement, less loyalty towards organizations, and preferences for immediate benefits over long-term rewards.³⁵ However, a recent study points out that they also have higher motivation to transfer what they learn during training back to their jobs, and higher learning-goal orientation – a concept defined as a person’s focus on acquiring knowledge for the sake of learning itself rather than just performing. Though in general these younger workers are reluctant to persist through difficult times in pursuit of long-term goals, they appear to be more motivated to utilize what they learn in training on the job.³⁶ These findings suggest that the oil and gas industry can leverage the preferences and motivational patterns among young people of this generation through training courses designed to quickly advance the necessary skills.

2.2.4. Attracting talented women workers

40. The oil and gas industry has not succeeded in hiring a large number of qualified women workers. Figures 4(a)–(c) shows the evolution in employment of women engineers in independent oil companies, NOCs and IOCs for 2006, 2010 and 2011 in the E&P sector. Overall, the ratio of women workers appears to have remained the same in the past six years; however, high-growth companies have more women in their technical talent pool. In the geosciences, 27 per cent of PTPs in high-growth companies were female, compared to 18 per cent in lower-growth companies. Among petroleum engineers, the female ratio was 19 per cent for high-growth companies to 11 per cent for lower-growth companies.

³⁴ P. Elias and A. McKnight: “Skill measurement in official statistics: Recent developments in the UK and the rest of Europe”, in *Oxford Economic Papers: Special Issue on Skills Measurement and Economic Analysis* (Oxford, Oxford University Press), Vol. 53, No. 3, 1 July 2001, pp. 508–540.

³⁵ D. Beard, D. Schwieger and K. Surendran: “Bridging the academic/industrial chasm for the millennial generation”, in *Information Systems Education Journal (ISEDJ)* (Chicago, IL, Association of Information Technology Professionals, Education Special Interest Group), Vol. 5, No. 33, 2007, pp. 1–16.

³⁶ K. Tyler: “May 2007 HR Magazine: The tethered generation”, in *HR Magazine* (Alexandria, VA, Society for Human Resource Management), Vol. 52, No. 5, May 2007.

Figure 4(a). Percentage of female workers in independent oil companies (including contractors), 2006, 2010 and 2011

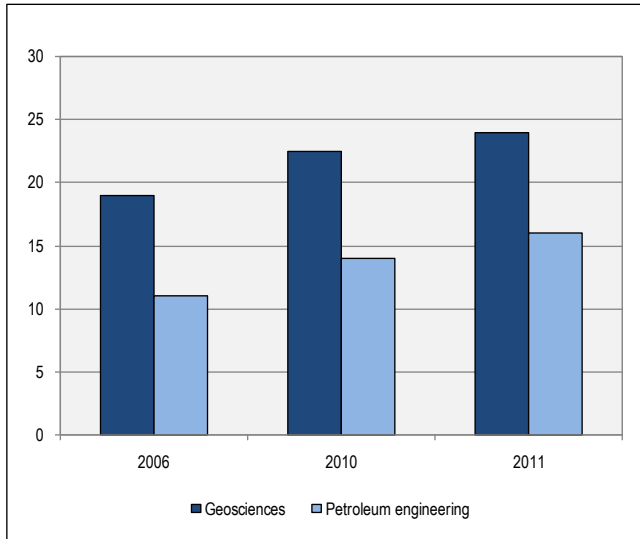


Figure 4(b). Percentage of female workers in international oil companies (IOCs), 2006, 2010 and 2011

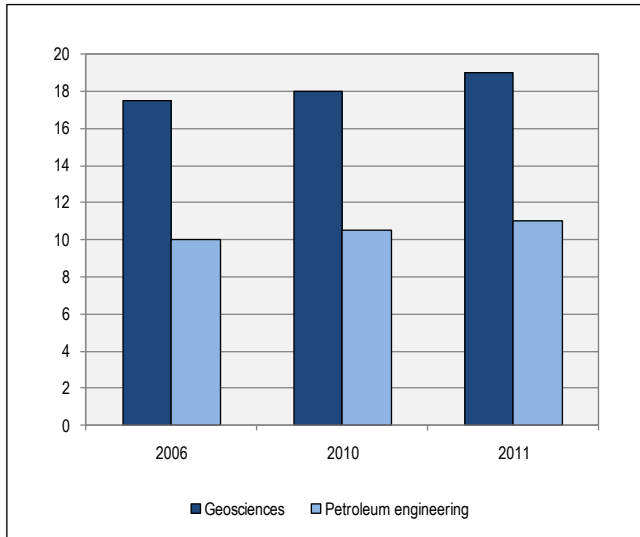
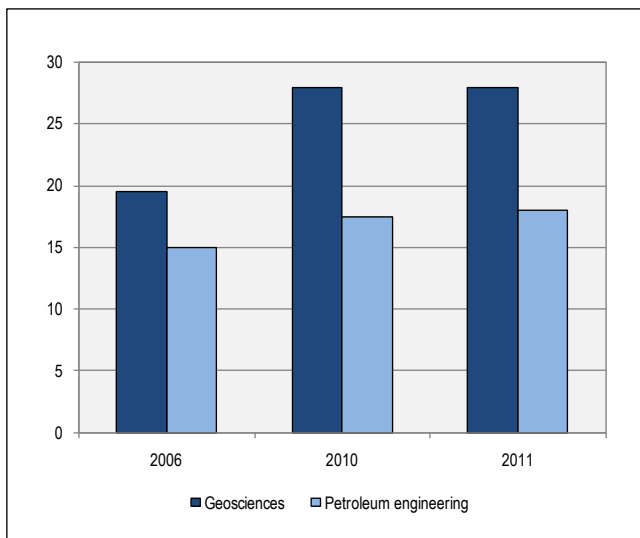


Figure 4(c). Percentage of female workers in national oil companies (NOCs), 2006, 2010 and 2011



Source: Schlumberger Business Consulting; 2012 SBC oil and gas HR benchmark survey (Paris).

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41. There are still challenges to recruiting more women workers in the oil and gas industry. Despite the increased visibility of women in the industry, many face various work-related challenges from their male counterparts. These stem predominantly from the male-focused culture and practices that permeate many aspects of organizational life in the industry, including demographic composition, assumptions, values and every day practices.³⁷ As a result, women are often reported as discriminated against at work. Sex ratios, organizational norms and opportunity structures have been identified as factors conducive to sexual harassment. The sex imbalance creates an organizational culture that is hostile or resistant to women.³⁸
42. The oil and gas industry could direct more effort towards preventing harassment and discrimination by creating a climate for diversity in accordance with ILO instruments such as the Equal Remuneration Convention, 1951 (No. 100), the Discrimination (Employment and Occupation) Convention, 1958 (No. 111), and the Maternity Protection Convention, 2000 (No. 183), and their accompanying Recommendations. Awareness training for all workers, both male and female, and effective complaint and grievance procedures on a confidential basis need to be implemented and enforced in order to reduce the potential negative effects of harassment and discrimination. Corporate culture should be aligned with formal corporate non-discriminatory practices.³⁹
43. Fair and equal gender representation in the workplace is an important factor in determining career development for women. Women in the oil and gas industry occupy less senior positions and are more likely to experience career barriers because of the male-dominated nature of such high ranks. When women are well integrated at all levels of the organization, they are likely to feel very much at ease within and positive about their organization and experience a good organizational fit.⁴⁰ This idea resonates with role modelling for women and its role in promoting more women into upper management positions. In particular, role modelling may increase women's representation in upper management. When women see other women being promoted, it is likely to encourage them to seek similar positions.⁴¹

³⁷ R.J. Ely and D. Meyerson: "Unmasking manly men: The organizational reconstruction of men's identity", in *Academy of Management Annual Meeting Proceedings* (Atlanta, GA), Aug. 2006.

³⁸ J. Kiely and A. Henbest: "Sexual harassment at work: Experiences from an oil refinery", in *Women in Management Review* (Bingley, Emerald Group Publishing Limited), Vol. 15, No. 2, 2000, pp. 65–77.

³⁹ S. Osborn and B.H. Kleiner: "Discrimination in the oil industry", in *Equal Opportunities International* (Bingley, Emerald Group Publishing Limited), Vol. 24, No. 3/4, 2005, pp. 17–26.

⁴⁰ R. Simpson: "Gender mix and organizational fit: How gender imbalance at different levels of the organization impacts on women managers", in *Women in Management Review* (Bingley, Emerald Group Publishing Limited), Vol. 15, No. 1, 2000, pp. 5–19.

⁴¹ P.F. McKay, D.R. Avery and M.A. Morris: "Mean racial–ethnic differences in employee sales performance: The moderating role of diversity climate", in *Personnel Psychology* (Malden, MA, Wiley Online), Vol. 61, No. 2, Summer 2008, pp. 349–374.

2.2.4.1. Family friendly policies

44. Family responsibilities are perceived as the biggest challenge for women's career advancement in the oil and gas industry.⁴² But the issue is of concern to both sexes; many people working in the oil and gas industry are concerned that the responsibilities of family and children may interrupt or even end their careers.⁴³ Work–life balance can refer not only to caring for dependent relatives, but also to extra-curricular responsibilities or important life priorities. Working arrangements should be sufficiently flexible to enable workers of both sexes to undertake lifelong learning activities, and further professional and personal development that is not necessarily directly related to their jobs. Work–life balance should be considered in the context of the Workers with Family Responsibilities Convention, 1981 (No. 156).

2.2.4.2. Coaching and mentoring

45. A recent study in Australia's oil and gas industry shows that a successful mentoring programme requires the following features, regardless of the target groups:

- a statement of purpose endorsed and approved by senior staff;
- the public commitment and support of senior staff;
- a programme plan and a nominated programme coordinator;
- a recruitment and selection process that selects those staff who volunteer to participate;
- structured mentor and mentee preparation;
- a rigorous mentor/mentee matching strategy;
- coordinated support mechanisms for mentors and mentees;
- a closure policy to ensure the formal ending of mentoring relationships; and
- appropriate evaluation and assessment processes.⁴⁴

46. The basis of the mentoring relationship is that one person has more knowledge, expertise and experience relative to the mentoring theme. Mentoring is an ideal process to assist young people or those commencing employment in the oil and gas industry for the first time. When selecting mentors, it is imperative that they be sensitive to the issues faced by a young person or new entrant in the industry workplace. Mentors need to have an understanding of the issues at lower levels of the organization that may have an impact on young and new entrants.

⁴² I. Maimunah and I. Mariani: "Barriers to career progression faced by women: Evidence from a Malaysian multinational oil company", in *Gender in Management: An International Journal* (Bingley, Emerald Group Publishing Limited), Vol. 23, No. 1, 2008, pp. 51–66.

⁴³ E. Sprunt: "Not just women's issues", in *World Oil* (Houston, TX, Gulf Publishing Company), Vol. 229, No. 11, Nov. 2008.

⁴⁴ Australian Petroleum and Production Exploration Association (APPEA): *A mentoring model for the Australian upstream oil and gas industry* (Canberra, 2008).

47. Ideally, mentors selected to participate in a mentoring programme designed for women in non-traditional occupations would be women with the same or similar profile. Given the low numbers of women working in the oil and gas industry, it may be necessary to find women outside the company who are prepared to provide mentoring support for female workers. Where there are not enough women to take on mentoring roles, group mentoring arrangements should be considered, or men may also be considered as mentors. Any potential male mentors must have a thorough understanding of the issues women face in the workplace.⁴⁵

2.2.5. Attracting more people with disabilities

48. The ILO's Disability Programme promotes equality of opportunity and treatment for people with disabilities in vocational rehabilitation, training and employment, as reflected in the Vocational Rehabilitation and Employment (Disabled Persons) Convention, 1983 (No. 159), and the ILO code of practice on managing disability in the workplace, adopted in 2001. Under the Programme, the ILO has established the Global Business and Disability Network, which is a voluntary group of representatives from multinational enterprises, employers' organizations and business networks, and selected non-governmental and disabled persons' organizations interested in including disability diversity in the workplace and in their strategic business plans.⁴⁶ At the time of writing only one oil and gas company, Sasol, is a member of the network. Sasol strives to apply affirmative action measures to ensure that people with disabilities are afforded reasonable accommodation, if and where appropriate.⁴⁷ Greater participation by oil and gas companies in this network would demonstrate the industry's determination to make progress in their commitment to workplace diversity.

2.2.6. Coordinating retention schemes

49. Oil and gas companies have planned internally and independently for their retention schemes. In order to meet the longer-term needs of the industry, retention policies should focus on catering to employees' individual preferences, offering more comprehensive career development support, and decent wages and working conditions.

50. Improving working conditions by fostering the Decent Work Agenda in the oil and gas industry can contribute to better retention. Recent research in the Australian natural resources sector shows that companies implementing a range of good employment practices, such as competitive wages and workplace benefits with flexible, non-standard work arrangements, have improved retention of young workers. The research also notes that companies are moving towards increasing social dialogue engagements, but not

⁴⁵ *ibid.*

⁴⁶ ILO Global Business and Disability Network, <http://www.businessanddisability.org> (accessed 12 June 2012).

⁴⁷ http://docsearch.derrickpetroleum.com/files/04756/Sasol%20-%202010%20Facts_0042.pdf (accessed 12 June 2012).

rapidly enough. Companies also need to ensure that workers feel challenged in their work.⁴⁸

51. An oil and gas industry that attracts skilled young workers and women must have coherent policies and initiatives focused on advancing their careers.⁴⁹ Companies should carefully examine what types of careers they offer their workers, in order to ensure that career development policies and plans are tailored to their needs.⁵⁰ Over 85 per cent of industry workers who participated in a survey cited providing “opportunities for career progression and personal development” as a high-/critical priority issue.⁵¹
52. Global talent has never been more mobile or sought after. Not all countries focus their primary policy on attracting skilled non-nationals: a few have developed policies to encourage the return of their educated nationals and with some success. Global talent flows will expand for economic reasons, but may be slowed by politics.⁵² Visa systems for skilled workers may need to be addressed.⁵³ In addition, dual-career concerns are a challenge: mobility strategies for accompanying spouses in the industry must be considered. Collaboration at regional and international levels can help to ensure a coherent global and cost-effective international migration policy on skilled workers.

2.2.7. Towards the development of future technologies

53. Because oil and gas companies and service companies are focused primarily on technology applications that will lead to relatively short-term profits, much of the basic research behind important technological innovations has been carried out at universities and research institutes. These institutions can benefit the oil and gas industry by providing a number of alternative relationships that facilitate the advance of knowledge and the penetration of new technologies. A case study in Brazil shows that a strategic partnership based on strong interaction between the oil and gas industry and academia has created favourable conditions for the development of new technologies at CEPETRO (Center for Petroleum Studies) – a multidisciplinary petroleum research centre established at a university. The main strategies are based not only on the traditional mechanisms of industry–university cooperation, but on strong interaction between industry and university

⁴⁸ K. Hutchings et al.: “Employee attraction and retention in the Australian resources sector”, in *Journal of Industrial Relations* (Thousand Oaks, CA, and London, Sage Publications), Vol. 53, No. 1, 2011, pp. 83–101.

⁴⁹ B. Orr and B. McVerry: “Talent management challenge in the oil and gas industry”, in *Workforce Issues* (Hoboken, NJ, Wiley Periodicals Inc.), Dec. 2007, pp. 18–23.

⁵⁰ B. Williams: “Offshore oil and gas seen as ideal opportunity for young people, industry veterans”, in *Offshore* (Houston, TX), PennEnergy Jobs, Vol. 67, Sep. 2007, pp. 16–23.

⁵¹ B. Orr and B. McVerry: “Talent management challenge in the oil and gas industry”, op. cit., pp. 18–23.

⁵² C. Kuptsch and E.F. Pang (eds): *Competing for global talent* (Geneva, ILO, International Institute for Labour Studies, 2006).

⁵³ P. Ranscombe: “Warning over skills shortage in oil and gas”, in *Scotland on Sunday* (Edinburgh, Scotsman Publications Limited), 11 Dec. 2011.

in a multidisciplinary collaborative structure that facilitates the development of research products and outputs from the perspective of the oil and gas industry.⁵⁴

- 54.** Investment in R&D needs to focus on future-oriented, next-generation technologies to meet the broad demand of the oil and gas industry. Technological management in Brazil's Petrobras involves all its operating bodies, universities and research institutes in Brazil, international research institutions, and global oil companies and suppliers. Petrobras' *2011–15 Business Plan* calls for some US\$1.3 billion in investments in technology per year. The company has hundreds of research groups working in Brazil to address key issues, not only in all oil, gas, biofuel and energy industry activities, but also in environmental protection. There are 50 thematic networks involving 80 institutions and average annual investments of US\$270 billion. These networks have enabled the implementation of world-class laboratories and the training of researchers.⁵⁵
- 55.** There is ongoing debate about “peak oil”. Peak oil describes the point in time when the maximum rate of oil and gas extraction is reached, after which the rate of production is expected to enter terminal decline. The notion of peak oil raises deep concerns about the future of the oil and gas industry in the event that crude oil and natural gas reservoirs will one day be depleted. The industry needs to invest more in emerging technologies and training in these, and in alternative energy sources for the future. It can take a leading role in promoting a “green economy”, reducing the environmental impact of enterprises and economic sectors to sustainable levels. For example, the ILO's Green Jobs Initiative will help reduce negative environmental impacts, ultimately leading to environmentally, economically and socially sustainable enterprises and economies. More precisely green jobs will reduce consumption of energy and raw materials, limit greenhouse gas emissions, minimize waste and pollution, and protect and restore ecosystems.⁵⁶ A research study in 12 countries by the Millennium Institute shows that investing 2 per cent of GDP in the green economy could create up to 9.6 million new jobs per year in the countries and industries studied.⁵⁷
- 56.** Transition to a greener economy as part of broader long-term structural change may incur severe economic and social adjustment costs if efficient and socially responsible restructuring measures are not in place. People who get the new jobs may not necessarily be the people who have lost their old jobs. Disadvantaged groups in the labour market will need targeted assistance and preferential treatment to ensure their access to new and good-quality green jobs. Retaining and skills upgrading are crucial to a successful, smooth and equitable transition to the green economy. Low-skilled people are especially vulnerable as it will be difficult for them to compete for many of the new jobs. Successful restructuring with efficient retaining measures can prevent workers being displaced and/or successfully retain displaced workers for employment in new, greener, industries and occupations. The key to success is the assumption of shared responsibility by governments, employers and workers, achieved through social dialogue. Public employment services and active labour

⁵⁴ S.B. Suslick: “Strategic university–industry partnership in petroleum: The case of CEPETRO/UNICAMP as a Brazilian innovative experience”, in *Brazilian Journal of Petroleum and Gas* (Natal), Vol. 1, No. 2, 2007, pp. 59–66.

⁵⁵ P.H. Wertheim: “Innovation and investment propel Petrobras toward deeper waters”, op. cit.

⁵⁶ On the Green Jobs Programme of the ILO see: <http://www.ilo.org/empent/units/green-jobs-programme/lang--en/index.htm> (accessed on 2 July 2012).

⁵⁷ *Growing green and decent jobs*, ITUC, Apr. 2012.

market policies are effective delivery mechanisms for training and for matching skills with jobs.⁵⁸

3. Occupational safety and health (OSH) training for contract and subcontract workers

- 57.** Over the past three decades, the growing sophistication of production systems and the increased flexibility of labour markets and legislation have led to the development of a multiplicity of contractual arrangements for workers. The common feature of so-called non-standard forms of employment⁵⁹ is that they differ, in one way or another, from permanent full-time employment with a single and clearly defined employer, considered by most national legislations as the “standard” or “regular” form of employment. “Non-standard” employment is normally used to refer to: employment relationships in which workers are not employed directly by the user company, but by a subcontractor or private employment agency; various types of short-term contracts; and, finally, part-time work and home work. There are legitimate reasons for these arrangements and they are recognized in several ILO standards.⁶⁰ Non-standard forms of employment and the precariousness that often accompanies them give rise to concerns over their impact on the enjoyment of fundamental principles and rights at work (FPRW) and other work-related rights, particularly OSH.
- 58.** Freedom of association ensures that workers and employers can associate to efficiently negotiate work relations. Combined with strong freedom of association, sound collective bargaining practices ensure that employers and workers have an equal voice in negotiations and that the outcome will be fair and equitable. Collective bargaining allows both sides to negotiate a fair employment relationship and prevents costly labour disputes. Indeed, some research has indicated that countries with highly coordinated collective bargaining tend to have less inequality in wages, lower and less persistent unemployment, and fewer and shorter strikes than countries where collective bargaining is less established. ILO standards promote collective bargaining and help to ensure that good labour relations benefit everyone.⁶¹ The IndustriAll Global Union⁶² has advocated the need to take pre-emptive action in dealing with contract labour issues at the workplace. It has promoted to include a clause in the collective agreement which states that trade unions must be consulted prior to any changes that could affect the employment status of employees.⁶³
- 59.** Governments, employers and workers have a mutual interest in maximizing OSH and environmental protection. Advancement of safety technologies and human factors are

⁵⁸ ILO: *Skills for green jobs – a global view* (Geneva, 2011), pp. 55–93.

⁵⁹ Other terms, such as “non-regular” or “atypical” forms of employment, are also frequently used to describe the same type of contractual arrangements.

⁶⁰ The Part-Time Work Convention, 1994 (No. 175), the Home Work Convention, 1996 (No. 177), and the Private Employment Agencies Convention, 1997 (No. 181).

⁶¹ <http://www.ilo.org/global/standards/subjects-covered-by-international-labour-standardscollective-bargaining/lang--en/index.htm> (accessed on 13 July 2012).

⁶² Formerly the International Federation of Chemical, Energy, Mine and General Workers’ Unions (ICEM), see www.industriall-union.org (accessed 12 June 2012).

⁶³ ICEM: *ICEM Mini Guide to Dealing with Contract and Agency Labour* (Geneva), p. 12.

equally important. Multinational companies and the IndustriAll have concluded several global framework agreements (GFAs) or international framework agreements (IFAs). For example, the GFA at Lukoil and Statoil includes provisions for safety and health protection of contract and subcontract workers working for these multinational enterprises to better understand human factors in OSH.⁶⁴

3.1. Comparison of fatality accident rates (FARs)⁶⁵ for operators and contractors

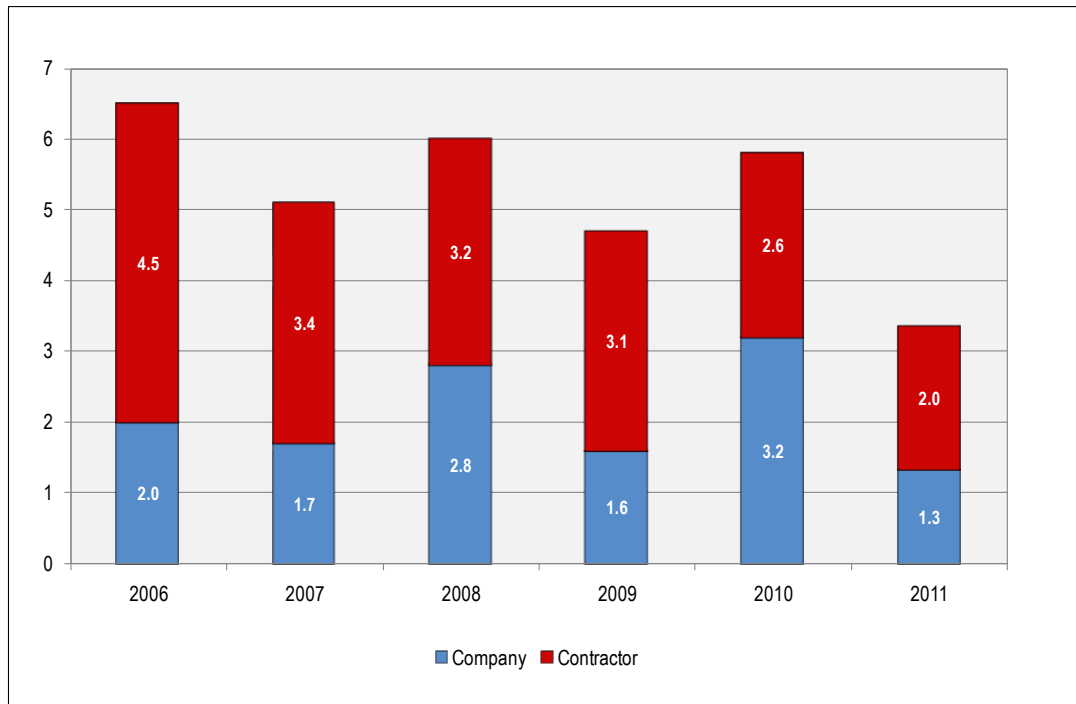
60. Measuring and assessing safety and environmental performance requires a clear understanding of human factors. Accident and incident statistics are commonly used indicators; however, the statistics for these in the oil and gas industry are incomplete. It is essential that the industry develop a comprehensive and systematic global safety reporting system.
61. In the E&P sector, worldwide safety performance data is collected each year by the International Association of Oil and Gas Producers (OGP). To date, the OGP's safety statistics have been derived from data provided by a total of 45 IOCs, NOCs and service companies. There does not seem to be any corresponding worldwide OSH survey in the downstream sector; however, safety performance data for the downstream oil and gas industry in Europe are compiled by the oil companies' European association for environmental, health and safety in refining and distribution (CONCAWE). CONCAWE's safety statistics for 2010 were derived from data provided by 34 refineries in the 27 European Union member countries, plus Croatia, Norway and Switzerland.⁶⁶
62. Contract workers in both upstream and downstream sectors are more likely to face fatal accidents than company employees (figures 5 and 6). In the upstream sector in 2010, company employees' FARs were higher than those of contract workers; however, this was a one-time event; between 2006 and 2009 the opposite was the case. On average, contract workers are about twice as likely to die at work as company employees, with more contract worker FARs in the downstream sector and higher rates offshore than onshore.

Figure 5. Fatality accident rates in the oil and gas exploration and production sector (per 100 million hours worked), 2006–11

⁶⁴ <http://www.icem.org/en/69-Global-Framework-Agreements> (accessed 12 June 2012).

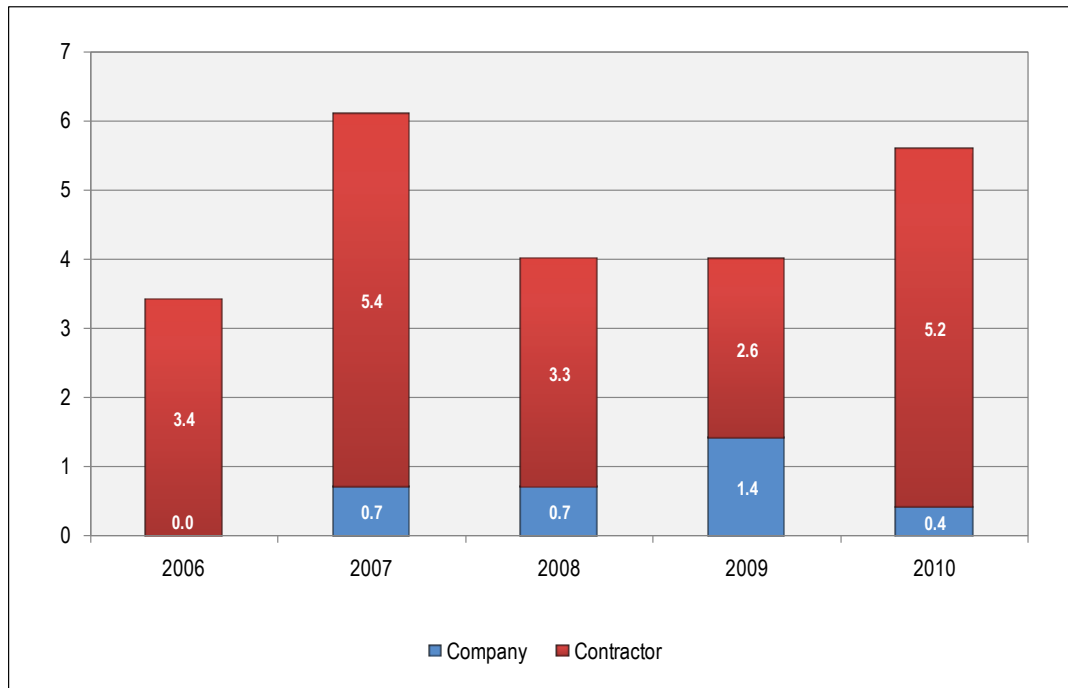
⁶⁵ Fatality accident rates per 100 million hours worked.

⁶⁶ A. Burton and K.H. den Haan: *European downstream oil industry safety performance: Statistical summary of reported incidents – 2010*, Report No. 5/11 (Brussels, CONCAWE, 2011).



Source: International Association of Oil and Gas Producers (OGP): *Safety performance indicators – 2011 data*, Report No. 2011s, May 2012 (London), pp. 1–3.

Figure 6. Fatality accident rates in the European downstream oil and gas industry (per 100 million hours worked), 2006–10



Source: CONCAWE: *European downstream oil industry safety performance: Statistical summary of reported incidents, yearly issue 2006–10* (Brussels).

3.2. Occupational safety and health training provisions in ILO instruments

63. The ILO Conventions and/or Recommendations concerning OSH include training provisions. The main instruments are the Occupational Safety and Health Convention,

1981 (No. 155), the Occupational Health Services Convention, 1985 (No. 161), the Chemicals Convention, 1990 (No. 170), the Prevention of Major Industrial Accidents Convention, 1993 (No. 174), and the Promotional Framework for Occupational Safety and Health Convention, 2006 (No. 187), and their accompanying Recommendations.

- 64.** Convention No. 155 calls for each Member to “formulate, implement and periodically review a coherent national policy on occupational safety and health, occupational health and the working environment (Article 4)”. The policy shall take into account “training, including necessary further training, qualifications and motivations of persons involved, in one capacity or another, in the achievement of adequate levels of safety and health (Article 5)”. Under Convention No. 170, employers are requested to “train the workers on a continuing basis in the practices and procedures to be followed for safety in the use of chemicals at work (Article 15)”. Convention No. 187 calls for signatories to formulate national policy to develop “a national preventative safety and health culture that includes information, consultation and training (Article 3)”.
- 65.** There is no ILO instrument exclusively covering contract and subcontract workers in the oil and gas industry with regard to OSH. Only Convention No. 174 states that the Convention applies to major hazard installations, including oil and gas facilities, and pipelines (Article 1). With regard to employers’ responsibilities, the Convention lays down that employers shall provide “organizational measures, including training and instruction of personnel, the provision of equipment in order to ensure their safety, staffing levels, hours of work, definition of responsibilities, and controls on outside contractors and temporary workers on the site of the installation (Article 9)”.

3.3. Effective occupational safety and health training for contract and subcontract workers

- 66.** BP’s Deepwater Horizon disaster in 2010 has eerie similarities to the BP Texas City refinery explosion in 2005. These similarities include:
- (a) multiple system operator malfunctions during a critical period in operations;
 - (b) not following required or accepted operations guidelines;
 - (c) neglected maintenance;
 - (d) instrumentation that either did not work properly or whose data interpretation gave false positives;
 - (e) inappropriate assessment and management of operations risks;
 - (f) multiple operations conducted at critical times with unanticipated interactions;
 - (g) inadequate communications between members of the operations groups;
 - (h) unawareness of risks;
 - (i) diversion of attention at critical times;
 - (j) a culture with incentives that provided increases in productivity without commensurate increases in protection;
 - (k) inappropriate cost and corner cutting;

-
- (l) lack of appropriate selection and training of personnel; and
- (m) improper management of change.⁶⁷
- 67.** In 2011, the Norwegian energy trade union, Industri Energi, established a task force to review reports and data on the BP Deepwater Horizon disaster. The Industri Energi report stressed that it was crucial for “safety pays” policies and practices to be in place.⁶⁸
- 68.** With respect to safety and emergency preparedness, the report states that Norway’s decades of experience on the Norwegian continental shelf highlight what cannot be emphasized often enough – that proper maintenance of equipment, training, knowledge and operational participation by crew members concerning well control and evaluation is crucial. The principal cause of BP’s Deepwater Horizon disaster was poor safety culture. The ILO global strategy on occupational safety and health, adopted at the 91st Session of the International Labour Conference in 2003, states that: “[OSH] training should focus on supporting preventative action and on finding practical solutions”.⁶⁹ OSH training must serve to create and promote a safety and a preventative culture in the oil and gas industry, too.
- 69.** The concept of safety culture has received increased attention, particularly in the offshore sector of the industry, triggered by the findings of the inquiry into the Piper Alpha oil rig disaster. In 1998, Lord Cullen, who chaired the inquiry, stressed that: “It is essential to create a corporate atmosphere or culture in which safety is understood to be, and accepted as, the number one priority.”⁷⁰ ILO Convention No. 187 defines the term “preventative safety and health culture” as “a culture in which the right to a safe and healthy working environment is respected at all levels, where government, employers and workers actively participate in securing a safe and healthy working environment through a system of defined rights, responsibilities and duties, and where the principle of prevention is accorded the highest priority (Article 1)”.
- 70.** The Industri Energi report stresses the importance of cooperation between employers and workers on safety and openness, enabling any worker to report any risk to the authorities. The report states that “All major accidents are a result of many factors, which in a given situation can pull in one direction and trigger a catastrophe. The importance of reporting small and major non-compliances, without any consequence for the person reporting or the companies they work for, is of the greatest importance for enhanced safety for individuals and the environment in the broadest sense.”⁷¹
- 71.** Training must be supported by all the stakeholders, and all workers must participate fully. Worker participation at all stages is particularly important for training programme

⁶⁷ Deepwater Horizon Study Group: *Final report on the investigation of the Macondo well blowout*, Mar. 2011, p. 10, http://ccrm.berkeley.edu/pdfs_papers/bea_pdfs/DHSGFinalReport-March2011-tag.pdf (accessed 12 June 2012).

⁶⁸ Industri Energi: *Deepwater Horizon and Macondo*, a report by the Norwegian trade union, Industri Energi, on the oil disaster in the Gulf of Mexico in April 2010 (Stavanger and Oslo, 2011).

⁶⁹ ILO: *Global strategy on occupational safety and health: Conclusions adopted by the International Labour Conference at its 91st Session, 2003* (Geneva, 2004), para. 20.

⁷⁰ K. Mearns et al.: “Measuring safety climate on offshore installations”, in *Work and Stress* (London), Vol. 12, No. 3, 1998, p. 238.

⁷¹ Industri Energi: *Deepwater Horizon and Macondo*, op. cit.

development and implementation. Training programmes must be proactive and there is a need for reliance on on-the-job training. A substantial amount of practice and dialogue is generally more effective than other methods of OSH training.⁷²

- 72.** It is also crucial to respect the principles of social dialogue if continuous improvements are to be made. In this context, tripartite social dialogue should be one of the pillars in OSH and environmental protection in the industry; it is a vital factor in reinforcing continuous improvement in putting into practice the regulations agreed by authorities.⁷³
- 73.** In addition to promoting a safety and preventative culture,⁷⁴ the oil and gas industry needs to ensure that workers are trained to acquire and maintain their competency requirements in all areas concerning safe operations, including soft skills such as communication among workers and between employers and workers (both contract and subcontract workers), and OSH-related technical skills such as risk assessment, risk management, chemical safety, safety reporting, mitigation, emergency response, emergency preparedness and evacuation.
- 74.** Evacuation training is particularly important in the industry. Eleven people died in the Deepwater Horizon disaster: four on the drill floor; four in the mud-pump room; two in the shaker room; and one on the crane deck. Evacuation was reportedly chaotic. There was no systematic search for survivors, and survivors were only counted after coming on board the standby vessel. Life rafts and standby vessels must be in good condition at all times. And workers must be trained so that they can respond to any contingency to evacuate in a systematic, orderly and safe manner.⁷⁵
- 75.** Training for inspectors requires special attention. In addition to general knowledge and expertise, they need to understand the specificities of the highly technical matters in the oil and gas industry. After the Deepwater Horizon disaster, the United States Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE) adopted multiple-person inspection teams for offshore oil and gas operations and established the National Offshore Training Center. It is also developing special courses covering specific areas of offshore inspections.⁷⁶
- 76.** Following the Deepwater Horizon disaster, the oil and gas industry has been updating its safety standards. The OGP has put more emphasis on areas such as collaboration with the International Association of Drilling Contractors (IADC) in areas such as training and revising guidelines on OSH and environmental protection management systems. A joint OGP–IPIECA (the global oil and gas industry association for environmental and social issues) task force is developing updated and expanded guidance to help steer the creation and maintenance of an over-arching methodology for organizing and implementing controls – the Operating Management System (OMS), which will replace the existing OGP guidelines for the development and application of health, safety and environmental

⁷² M.J. Burke et al.: “Relative effectiveness of worker safety and health training methods”, in *American Journal of Public Health* (Washington, DC, American Public Health Association), Vol. 96, No. 2, Feb. 2006, pp. 315–324.

⁷³ Position paper from the Norwegian trade unions and industry associations, 30 Jan. 2012.

⁷⁴ ILO: *Global strategy on occupational safety and health*, op. cit., para. 4.

⁷⁵ Industri Energi: *Deepwater Horizon and Macondo*, op. cit.

⁷⁶ “BOEMRE changes offshore inspection process, adds training center”, in *Offshore* (Houston, TX), 21 June 2011.

management systems, published in 1994.⁷⁷ The oil and gas industry would align its new OSH management systems and other OSH instruments in the industry with the principles of the ILO instruments concerning OSH, particularly with the ILO *Guidelines on occupational safety and health management systems* (ILO-OSH 2001) described below.

3.4. **Guidelines on occupational safety and health management systems (ILO-OSH 2001)**

77. ILO-OSH 2001 promotes a systems approach to the management of OSH at both national and enterprise levels. It is a voluntary instrument, but fits well with the management systems approach on OSH widely adopted with the oil and gas industry. ILO-OSH 2001 reflects core ILO values such as tripartism and social dialogue. It provides guidance on the systematic management of OSH at the national and organization levels and encourages the integration of OSH management systems with other management systems. At the national level, it provides for the establishment of a national framework for OSH management systems, preferably supported by national laws and regulations. At the organization level, ILO-OSH 2001 encourages the integration of OSH management systems elements into overall policy and management arrangements, as well as stressing the importance that, at the organization level, OSH should be the responsibility of senior management and should not be seen as a task for OSH departments and/or specialists. It states that “the employer should have overall responsibility for the protection of workers’ safety and health, and provide leadership for OSH activities in the organization”.⁷⁸

78. A distinctive aspect of ILO-OSH 2001 is that it promotes worker participation as an essential element of OSH management systems in the organization, and in all aspects of OSH (box 2).⁷⁹

<p style="text-align: center;">Box 2 Excerpts from the ILO <i>Guidelines on occupational safety and health management systems</i> (ILO-OSH 2001)</p> <p>3.4. Competence and training</p> <p>3.4.1. The necessary OSH competence requirements should be defined by the employer, and arrangements established and maintained to ensure that all persons are competent to carry out the safety and health aspects of their duties and responsibilities.</p> <p>3.4.2. The employer should have, or should have access to, sufficient OSH competence to identify and eliminate or control work-related hazards and risks, and to implement the OSH management system.</p> <p>3.4.3. Under the arrangements referred to in paragraph 3.4.1, training programmes should:</p> <ul style="list-style-type: none">(a) cover all members of the <i>organization</i>, as appropriate;(b) be conducted by competent persons;(c) provide effective and timely initial and refresher training at appropriate intervals;(d) include participants’ evaluation of their comprehension and retention of the training;(e) be reviewed periodically. The review should include the safety and health committee, where it exists, and the training programmes, modified as necessary to ensure their relevance and effectiveness; and

⁷⁷ International Association of Oil and Gas Producers (OGP): *OGP Highlights*, Apr. 2012, pp. 1–2.

⁷⁸ ILO: *Guidelines on occupational safety and health management systems* (ILO-OSH 2001) (Geneva, 2001), p. 7.

⁷⁹ *ibid.*

(f) be documented, as appropriate and according to the size and nature of activity of the *organization*.

3.4.4. Training should be provided to all participants at no cost and should take place during working hours, if possible.

3.10.3. Emergency prevention, preparedness and response

3.10.3.1. Emergency prevention, preparedness and response arrangements should be established and maintained. These arrangements should identify the potential for accidents and emergency situations, and address the prevention of OSH risks associated with them. The arrangements should be made according to the size and nature of activity of the *organization*. They should:

- (a) ensure that the necessary information, internal communication and coordination are provided to protect all people in the event of an emergency at the worksite;
- (b) provide information to, and communication with, the relevant competent authorities, and the neighbourhood and emergency response services;
- (c) address first-aid and medical assistance, firefighting and evacuation of all people at the worksite; and
- (d) provide relevant information and training to all members of the *organization*, at all levels, including regular exercises in emergency prevention, preparedness and response procedures.

3.10.3.2. Emergency prevention, preparedness and response arrangements should be established in cooperation with external emergency services and other bodies where applicable.

Source: ILO: *Guidelines on occupational safety and health management systems* (ILO-OSH 2001) (Geneva, 2001), pp. 8 and 12.