

BACKGROUND

At the 11th IEF Ministerial (Rome, April 2008) Ministers and industry leaders identified a shortage of skilled human resources as a critical bottleneck and a major, causal factor in the delay and uncertainty regarding capacity expansion decisions. The issue has been further complicated by myriad uncertainties introduced by the recent economic downturn.

To advance the understanding of this key topic and to provide input for a productive 12th IEF Ministerial in Mexico, 29-31 March 2010, the IEF Secretariat and the Government of Qatar convened representatives from oil and field services companies from producing and consuming nations, as well as representatives from educational institutions, to discuss and debate the issue of human resource deficiency in the energy sector. The symposium presented a timely opportunity to address the shared concerns of petroleum industry stakeholders on the issues of recruitment and the retention of skilled employees. Participants discussed the main reasons behind these structural skill shortages and exchanged views on potential long-term solutions.

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IEF SYMPOSIUM TACKLING THE HUMAN RESOURCES CRUNCH IN THE PETROLEUM SECTOR

DOHA, 13-14 APRIL 2009

AN IEF EVENT IN COOPERATION WITH THE GOVERNMENT OF QATAR



The International Energy Forum (IEF) is the world's largest gathering of Energy Ministers. IEF Countries account for more than 90% of global oil and gas supply and demand.

In addition to IEA and OPEC countries, transit states and key energy players, including Brazil, China, India, Mexico, Russia and South Africa, participate in the Forum. The magnitude and diversity of this engagement is a testament to the IEF's position as a neutral facilitator. Through the Forum and its associated events, IEF Ministers, their officials, energy industry executives, and other experts engage in a dialogue of increasing importance to global energy security.

The IEF and the global energy dialogue are promoted by a permanent Secretariat of international staff based in the Diplomatic Quarter of Riyadh, Saudi Arabia.

IEF Symposium

Tackling the Human Resources Crunch in the Petroleum Industry

OBJECTIVE

The International Energy Forum and the Government of Qatar are holding a Symposium on “Tackling the human resources crunch in the petroleum industry”. In response to a call from IEF Ministers reflected in the Host and co-Host’s closing statement at the 11th IEF Ministerial, the symposium will revisit human resources problems facing the energy sector, with specific emphasis on the petroleum industry. Participants will review established and existing modalities adopted by a range of companies and seek to identify innovative approaches to address short-term imbalances and build strong foundations for long-term prospects.

The symposium will gather representatives from a broad spectrum of educators, trainers and employers to debate and propose action on one of the most critical challenges facing the petroleum industry.

CONTEXT

The 11th International Energy Forum (IEF), held in Rome, 20-22 April 2008, noted that, “fossil fuels will dominate the energy mix for decades to come in all realistic scenarios”. According to Ministers, a sustainable energy future implies efficiency improvements, technological advances in both production and consumption of fossil fuels, and development of alternative low-carbon energy sources. Against this backdrop, Ministers discussed the need to broaden co-operation and exchanges in the fields of human capital and technology advancement. They addressed the urgency to work together with the oil and gas industry, universities and research centres to promote a world-wide campaign to improve the image and rewards of technicians and skilled staff working in the oil and gas industry.

IEF Symposium

Tackling the Human Resources Crunch in the Petroleum Industry

Final Agenda

Monday 13 April 2009

08.30 - 09.30: Registration

09.30 - 09.45: Welcome Address

- H.E. Abdallah Al-Attiyah, Deputy Premier and Minister of Energy and Industry, Qatar

09.45 – 10.00: Opening Statement

- Noé van Hulst, Secretary General, IEF

10.00 – 10.30: Coffee & Networking Break

10.30 – 12.00: Session One: Root causes and nature of problems facing the industry: What, where and why?

Moderator: Dr. Ramzi Salman, Advisor to the Deputy Premier, Minister of Energy & Industry, Qatar

Panelists:

- Fabrice Bouchaud, Head of HR, Reservoir Characterization Group, Schlumberger
- Fouzi Bubshait, President, Arab Society for Human Resources Management
- Larry Brown, Professor and Chair Department, Cornell University
- Carl Atalah, President, Chevron Qatar
- Abdullah Al-Dewachi, Head Training Technologies, Corporate Training Department, QP
- Ho Sook Wah, Petronas, Malaysian Gas Association, Vice Chair Coordination Committee, IGU

- Which are the areas or disciplines posing most challenges to the oil industry? What are the causes?
- How the current economic slowdown is affecting the industry?
- How different are the challenges facing NOCs, IOCs and service companies?
- Mind the gap. Alignment of graduate/industry needs and expectations, where and why?
- Is technology having an impact on human resources requirements?
- Government policies: what impact on recruitment and retention?

Roundtable discussion

12.00 – 14.00: Lunch Break

**14.00 – 15.30: Session Two: Identifying solutions: What is being done?
What more should be done?**

Moderator: Jean Luc Karnik, Dean, IFP School

Panelists:

- Ms. Mariangela Santos Mundim, HR manager Petrobras
- Volko de Jong, Vice President, Energy Delta Institute
- Robert Bell, Director, New View Group
- Khaled El-Miniawi, Shell Regional Recruitment Manager, Middle East & Russia
- Øystein Noreng, Department of Leadership & Organizational Management Norwegian School of Management
- Jerome Kearns, Head Training Needs Analysis, Evaluation & Marketing, Corporate Training Department, QP
- Dealing with human resources shortage in the short term: what has been the industry response?
- Managing human resources in a boom-bust environment
- What measures are necessary/possible to ensure long-term sustainability (image improvement, female recruitment and promotion policies, remuneration packages, career building, re-skilling ...)? What role for the different players?
- As the current workforce ages, what can be done to defend against the loss of expertise as senior professionals approach retirement age? What role for the different players?

Roundtable discussion

20.00: Dinner hosted by the Ministry of Energy and Industry, Qatar

Tuesday 14 April 2009

09.00 – 10.30: Session Three: Cooperation between industry, government and academia

Moderator: Dr. Pierce Riemer, Director General, World Petroleum Council

Panelists:

- Aziz Chowdhury, Director Global Talent Acquisition, Baker Hughes
- Clive Eckersley, CEO, NExT
- Nabeel Al-Salem, Associate Director, Qatar National Research Foundation
- Anqi Qian, Director of Strategic Initiatives, Carnegie Mellon University
- Mohamed Moradi, Human Resources Manager, BAPCO
- Jim Holste, Dean for Research and Graduate Studies, Texas A & M
- To what extent is it possible to draw up a comprehensive strategy for human resources development in the petroleum industry? What do we expect from the different stakeholders?
- What are the most promising avenues for cooperation between governments, energy companies and academic institutions to address skills shortage in a dynamic industry?

Roundtable discussion

10.30 – 11.00: Coffee & Networking Break

11.00 – 12.30: Session Four: Wrap up session: Conclusions and recommendations

Moderator: Noé van Hulst, Secretary General, IEF

- Dr. Ramzi Salman
- Jean Luc Karnik
- Dr. Pierce Riemer

12.30 – 14.00: Lunch

15.00: Visit to Ras Laffan Facility

IEF Symposium

Tackling the Human Resources Crunch in the Petroleum Sector

Background Paper

1 – Introduction

At the 11th IEF Ministerial in Rome, Italy (20-22 April 2008) Ministers and industry leaders acknowledged the role of skilled human resource shortage as a major causal factor in delay and uncertainty regarding capacity expansion decisions. They discussed the need to broaden co-operation and exchange in the field of human capital and called for measures to facilitate overcoming this serious challenge. Ministers addressed the “urgency for the oil and gas industry to work together with universities and research centres to promote a world-wide campaign in consuming and producing countries aimed at improving the image and rewards of technicians and skilled staff in the oil and gas industry”.

The ad hoc Jeddah Energy Meeting (22 June 2008) encouraged international, national and service companies from all producing and consuming countries to enhance their cooperation in investment, technology and human resource development.

At the London Energy Meeting (19 December 2008) ministers and industry leaders discussed the impact of the world financial crisis and economic slowdown on the oil industry and agreed that further work should be taken forward to identify ways to promote optimal levels of investment and more transparent markets. In this regard, they welcomed the forthcoming symposium of the IEF in cooperation with the Ministry of Energy and Industry in Qatar to revisit human resources requirements of the oil and gas industry and review established modalities by various players to find and to promote most promising proposals in order to address short-term imbalances and build up solid foundations for the long-term.

At the first NOC-IOC Forum held in Kuwait, 30-31 March 2009, participants noted that the considerable cost increase observed during the last few years was due in part to the previous boom in commodity prices, the shortage of industrial capacity and a lack of skilled personnel. If companies respond to economic pressure to implement large cuts in jobs, training and capital spending, there is a risk that it may sow the seeds of the next cost escalation. Participants declared that the high average age of personnel in the industry and how to attract young graduates is a source of concern and stressed that long-term considerations should prevail as more skilled staff will be needed to meet future global oil and gas requirements.

Responding to Ministers and industry leaders call, the IEF Secretariat is holding a Symposium on “tackling the human resources crunch in the petroleum industry”, on 13-14 April 2009 hosted by the Government of Qatar and sponsored by Qatar Petroleum. The symposium offers a timely opportunity to address shared concerns of petroleum industry stakeholders, since the shortage of skilled personnel is not company, country or even sector-specific.

The objective of the symposium is to review the human resources challenge facing the energy sector, with specific emphasis on the petroleum industry. Participants will assess established and existing modalities adopted by a range of companies and seek to identify innovative approaches which address not only short-term imbalances but also lay the foundations for long-term sustainability.

Participants, representative of all stakeholders, will debate and propose action on one of the most critical challenges facing the petroleum industry. The findings and recommendations of the symposium will be developed and brought to the attention of the Ministers, as well as the CEOs which will gather at the 12th International Energy Forum and 4th International Energy Business Forum in Mexico, 29-31 March 2010.

The oil and gas industry has been engaged in a “war of talent”, for years. The combination of severe cutbacks in petro-technical graduate programmes in the 1990s coupled with an ageing workforce has left NOCs, IOCs and service companies, in producing and consuming countries, with a severe shortage of skilled personnel.

Talent scarcity and difficulty in attracting and retaining skills has been a pressing issue on the industry's agenda for several years. This situation worsened during the last few years until the middle of 2008 in the face of rising oil prices and increasing capital expenditures. As the industry faces the considerable challenges posed by rising demand and requirements to "pushing boundaries" in the exploration for and production of more "technical oil", the skills required for overcoming those challenges are becoming a scarce resource.

Moreover the current economic slowdown and financial crisis, weakening demand and low oil prices, may negatively affect the near-term perceptions and impact Human Resource Management decisions which will have long-term structural consequences for the industry. The uncertainties related to such a volatile environment add to the urgency to address this critical challenge.

This paper sets out some of the background considerations related to the key topics for discussion and seeks to identify issues for which participants are challenged to propose practical action and avenues of investigation.

2 - Root causes and nature of problems facing the industry

The reasons behind the human resource shortages in the oil and gas industry are well-documented and familiar to HR managers, industry leaders and academia.

A recent survey made by the Society of Petroleum Engineers showed that nearly 90% of senior human resources executives at top international oil and gas companies consider that their industry faces a major talent shortage and the workforce issue is one of the most critical challenges facing their companies.

Two reasons are generally identified as the main causes of the skilled shortage; the ageing existing workforce and a lack of interested qualified young graduates.

In recent years the supply-demand equation for talent has become unbalanced.

On the demand-side:

- The age profile of the workforce in oil and service companies is moving into retirement creating an experience gap, the so called "great crew change".
- Expanding E&P budgets and the move of petroleum industry towards more "technical oil" intensify its needs for skilled staff.

On the supply-side:

- A negative image of the oil industry as it is perceived by public opinion in general, in particular in the US and Europe.
- Limited number of students graduated from education institutions and insufficient personnel trained by vocational training centres.

The industry image is one of the causes preventing sufficient numbers of graduates from joining oil industry.

2.1 – A “greying workforce” leading to a “great crew change”

An ageing workforce coupled with severe cutbacks in technical programmes over the past two decades has left the industry with a spike in demand for talented graduates.

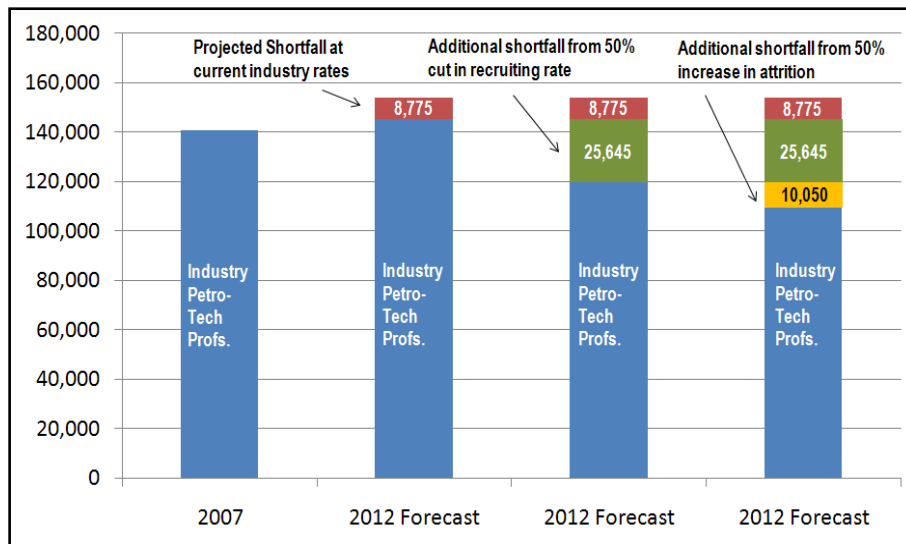
A recent survey carried out on behalf of the European Union showed that the average age of professionals in the oil industry is around 50; with barely 15 % of the workforce being junior recruits. A “brain-drain” is in progress with half of the current workforce likely to retire within the next ten years, while on the other hand it takes up to three years for a new recruit to develop basic industry operating competences and up to 10 years for many professional disciplines. An estimated 40 % of industry employers worldwide report difficulties in filling skilled-worker positions.

Faced with this critical issue, a top executive of a major oil company announced that by 2012 around 40% of his staff in core activities will have less than 5 years experience in the group.

The nature of the industry has changed with more “technical oil” to extract requiring adapted advanced technology and specific project management expertise. The industry is also facing increased competition for skills from other sectors leading to increased turnovers (workers are quick to resign for a position with greater remuneration).

In reviewing the overall picture in a recent survey, the American Petroleum Institute declared that, “human resources offer a potentially more binding threat to industry expansion than physical resources”.

Fig.1: Projected shortfall in petro-technical professionals



Source: Schlumberger

2.2 – Reduced supply of talent

The pool of technological talent needed to sustain the industry's ability to meet global energy demand is shrinking at an alarming rate.

The flow of talent produced by education institutions around the world is in a downward spiral. During the 1980s and 1990s, universities cut back their petro-technical programmes as industry was faced with over-capacities both upstream and downstream. Lower oil prices witnessed in the eighties and the nineties have also favored an unprecedented technological development throughout the petroleum chain. As an example, although the size of the average refinery has been increased significantly as a way to benefit from economies of scale, the manning of such refineries has not increased proportionally. Over the same period the industry itself further compounded the problem by laying off a huge number of skilled workers, in response to low oil prices, reduced capital expenditure and a wave of mergers and acquisitions.

Accordingly, the recruitment of new employees dropped drastically and fewer university students entered petroleum engineering programmes.

The number of petro-technical people graduating from universities in the US and Europe has fallen significantly during the last two decades. To give an idea of the scale of the issue, a recent survey by NASA estimated that US colleges produced fewer than 200,000 technical graduates to replace the two million experienced professionals who retired between 1998 and 2008.

2.3 – A negative industry image and a lack of attractiveness

Job security is a major concern among students and the oil and gas industry's reputation for vulnerability to "boom and bust" cycles is not a positive factor.

Graduates are keenly aware of the sector's periodic shortcomings and the industry has been ineffective in counteracting this perception. Student enrolment in petro-technical courses has been on the decline for many years. Although enrolment has picked up somewhat in the last 2-3 years, the level is still well below that of the early 1980s.

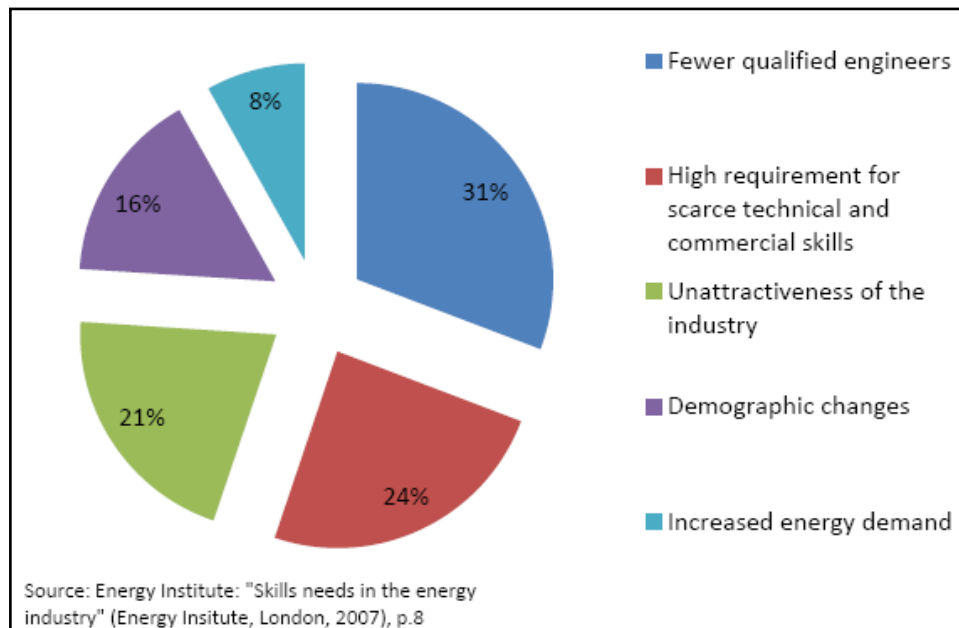
It is reported that in the United States during 2007, only 430 geologists and 279 petroleum engineers graduated, compared to 43,000 law students that graduated in the same period.

On another front, students (and their parents) continue to perceive the oil and gas industry as one with a heavy environmental footprint. In addition, young engineers that join the industry often hit a "grey ceiling" as the average age is relatively high. Young engineers are less likely to be given responsibility for running projects, while in other businesses young graduates are managing projects and divisions in their late 20s to early 30s.

Some even see in the debate around "peak oil" that took place over the past ten years or so another factor behind the disenchantment of young talents with the petroleum industry. At a time when world energy demand is growing and when potential worldwide reserves are increasing, favoured by development taking place in new areas and new technologies being successfully implemented, both for conventional and unconventional oil, it is ironic to see that many of the bright young minds are turning away from the petroleum industry.

The lack of graduates entering the industry is the primary cause of the crew change phenomenon. The oil industry must redouble efforts to reverse its poor image among young people.

Fig.2: **Reasons for Skills Shortages in the Oil and Gas Industry**



3- What is the industry response and are there potential long-term solutions?

Although the root causes of human resource shortages in the oil and gas industry are well-known, little progress has been made in implementing long-term solutions. Individual efforts are made to resolve immediate problems, but these are far short of the mark from a global long-term perspective.

De-bottlenecking this crucial problem requires cooperation and innovative approaches involving companies, education institutes and policy makers.

3.1 – Short term solutions

Poaching talent from other companies through financial incentives was (and still seems to be) the easiest and quickest way to fill specific needs. But globally this solution has proven to be a "zero-sum" game and contributing to wage inflation and cost escalation in E & P activities.

To rejuvenate their workforce and improve the future labour pool, some companies (oil and gas and service companies) are partnering with local universities and technical institutes.

Some producing countries and oil companies, in association with internationally renowned education institutions, have implemented specific training programs that accommodate their particular needs.

However, there is a lack of a coherent long-term strategy for most companies. Industry is starting to recognize the need to focus on the underlying structural problems and to move beyond the vicious cycle of laying off workers each time the price of oil drops or poaching existing talent. Clear long-term and reliable recruitment and retention policies must be developed if the industry is to regain the trust of labour markets.

Human Resource Management is now better recognized as a strategic issue and companies are creating specialized positions such as manager of capabilities, manager of university relation, corporate campus management director, director global talent acquisition, head graduate resourcing, university partnership manager, director university affairs, director university liaison, etc...

3.2- More sustainable solutions

Internally proactive measures could include mentoring programmes to attract, motivate and retain talent as well as facilitating succession planning and knowledge transfer.

Externally the pipeline needs to be strengthened to increase the flow of students into the relevant educational programmes. The adequacy between industry needs and academic curricula is one possible avenue to improve talent management and development. Senior experts or retirees could contribute to matching curricula with industry needs and even in implementing the programmes. Bilateral relations involving financial backing and staff support already exist between host governments and companies and particular education institutions. Some universities and educational institutions invite representatives from NOCs and IOCs to seat in their programmes advisory board and participate in defining programme content and number of graduates for each programme, thus matching curricula with industry needs and facilitating recruitment.

But to be efficient, the industry should multiply and expand such isolated initiatives and work on a larger scale with governments and education systems. Industry-wide collaboration with government and education is needed to rebuild the attraction of the oil and gas sector to young graduates. Making the industry more attractive to young graduates will require coordinated efforts within the industry and in collaboration with the academia and governments.

Changing the image of the industry is a key element in providing more sustainable solutions. The industry must be more proficient in projecting a positive public image especially with regard to the environment and communicate more openly, engaging and educating the public from an early age.

Being a cyclical business the oil and gas industry needs to show more consistency in human resources management and “walk away” from the layoff-recruit and shortfall-excess vicious circle.

4 – From boom to bust, has the industry learned the lessons?

In a boom period companies have traditionally boosted their capital expenditure and recruited more staff. In a bust period the situation is normally reversed. The recent slowdown in demand and the fall of oil prices is therefore a real cause of concern to NOCs and IOCs as well as services companies and a major challenge to their human resource management skills.

How does the industry react in times of lower demand and greater uncertainty? How should companies adapt their strategies in the face of slowing growth and lower investment? As demand is dropping is the industry moving from a skill shortage to a skill surplus? Some major IOCs and large service companies recently announced job cutback programmes. Is the industry reverting to its old practices, thus ignoring structural HR issues? Is the history repeating itself or has the industry learned any lessons from the past? Can the industry avoid repeating past mistakes?

The most effective approach is to take the long-term view, i.e. that fossil fuels will maintain their prominent share in the world energy-mix in the coming decades. Demand will eventually bounce back and huge investment will be needed to meet future demand. The human resource challenge will certainly return when the global economy recovers and oil demand picks up again.

The industry must find new approaches to manage and retain its workforce, maintain skill levels and attract new talent. To attract talents the industry needs to assess internal attitudes and its external reputation; identify long-term solution to attract and retain talents.

On a positive note, recently in an international conference, industry leaders cautioned the industry against cutting back on recruiting in reaction to current economic downturn. According to a recent survey, 92% of the participating companies said they will prevent loss of skilled technical staff. Most majors said they have learned the HR lessons from the 80s and 90s and that they will maintain the talent pipeline and continue to develop staff and manage workforce demographics, in this bust time.

5 - Cooperation between industry, government and academia

The success of any attempt to address the challenge of human resource bottlenecks relies on a coordinated and harmonized cooperation between government, academic and industry on various issues related to curricula, employment and social policies and programme financing.

Collective collaboration between industry, academia and government will achieve more in the long-term than isolated initiatives by individual companies or individual educational institutions.

The stakeholders need to think on different approaches, poaching people through enhanced financial offers is a zero-sum game. Only long-term collaboration can contribute to address the challenge.

Collaboration between the industry, academia and government to develop a new curriculum for future energy professionals is a key element to tackle the human resource issue. Industry-wide collaboration with government and education is vital to rebuild the attraction of careers in the oil and gas sector.

6 – Conclusion

The industry is facing a real challenge that will undoubtedly have an impact on expansion and growth plans. Tackling the challenge requires commitment from top management and new approaches which focus on actively managing the recruitment, development and retention of talent.

The lack of attractiveness of petrotechnical studies is one of the main reasons behind this situation. The industry together with educational institutions must redouble efforts to reverse its poor image among young people.

Internally, proactive measures could include recruitment and mentoring programmes, attracting and retaining talent and facilitating knowledge transfer and succession planning.

Externally, the pipeline needs to be strengthened to increase the flow of students into the relevant educational programmes.

Industry-wide collaboration between industry, government and education is vital to rebuild trust in the sector and improve the attraction of careers in the oil and gas industry.

Now is the time for new models based on collaboration on a wider scale and between all stakeholders, the industry, academia and governments.

Notes...

An IEF Symposium

Tackling the Human Resources Crunch in the Petroleum Sector

Concluding Statement

The International Energy Forum Secretariat held a symposium on “Tackling the human resources crunch in the petroleum industry” in Doha, 13-14 April 2009. Hosted by the Government of Qatar the event brought together representatives from oil and services companies from producing and consuming countries, as well as representatives of educational institutions.

The symposium presented a timely opportunity to address the shared concerns of petroleum industry stakeholders regarding recruitment and retention of skilled employees.

IEF Ministers and participants in the International Energy Business Forum (IEBF), the two ad hoc energy Ministerial meetings in Jeddah (June 2008) and London (December 2008) and the first IEF NOC-IOC Forum (March 2009), have identified the human resource crunch as a critical bottleneck and long-term challenge to the petroleum sector. The issue has been further complicated by myriad uncertainties introduced by negative revisions to the near-term global economic outlook.

With HR deficits ranking amongst the causal factors of delay and uncertainty in capacity expansion and other project plans, participants discussed the main reasons behind these structural skill shortages and exchanged views on potential long-term solutions.

1 - Root causes and nature of problems facing the industry

- Recruitment and retention of key personnel with the petrotechnical qualifications and experience necessary to excel in the increasingly complex technical disciplines practiced in this high-tech sector has been a contributory factor to cost escalation in the oil and gas industry since 2005.
- A recent survey places the average age of professionals in the oil industry at around 50. If current business practices remain unchanged it is likely that 50% of the industry's current skilled workforce will be lost to natural attrition through retirement within the next ten years as junior recruits comprise barely 15% of the resource base.
- Perceptions of the industry as a "sunset" sector, misconceptions about its approach to environmental concerns and competition from other high-tech industries have combined with cutbacks in technical and earth science programmes in Universities to reduce the in-flow of skilled staff to the working population. The result is an ageing workforce and a scramble for talent.
- Job security is a major concern among students, now perhaps more than ever, and the industry's reputation for vulnerability to "boom and bust" cycles presents a major obstacle to recruitment from an increasingly limited pool of resources.
- Prospective employees and the general public must be convinced of the industry's long-term prospects. Commonly held negative perceptions of the industry should be challenged by better communicating the reality of the modern oil and gas sector as a high-tech, diverse, and environmentally conscious entity, integral to the long-term future of the global economy. The industry must persuade its detractors that it is part of the solution rather than the cause of the problem.

2 – What is the industry response and are there potential long-term solutions?

- The sustainable solutions necessary to correct global structural skills imbalances are not fully provided by existing efforts which typically target individual near-term problems. Nevertheless, there is a growing understanding within the industry of the need to establish, promote and sustain long-term recruitment and retention policies in order to regain trust and build the foundations necessary to support future requirements.
- Simple proactive measures already practiced by many in the industry hold great potential if applied more widely across the sector. Key amongst these best-practices to attract, motivate and retain talent is the implementation of mentoring programmes which facilitate succession planning and knowledge transfer.
- Wider provision of Scholarships targeted at key disciplines, the sponsoring of academic chairs in the essential Earth Sciences (which are currently losing ground to Atmospheric Sciences) and support for internship schemes were cited as examples of proactive initiatives with the potential to attract, develop and retain interest in the sector as career path of choice.
- Co-operation between industry and academia on the development and delivery of targeted programmes exists, but widespread adoption and application of this best practice is essential if the talent pipeline is to deliver skill-sets commensurate with the rapidly evolving needs of the energy sector at the right place and time.
- Acceptance and understanding of the long-term nature of industry project cycles is necessary. Companies must resist short-term economic pressures to implement cuts in workforce. To maintain skills development in line with its increasingly sophisticated operations the sector is urged to establish training budgets as a fixed percentage of earnings. Potential recruits would interpret this step as a message of long-term commitment necessary to reverse the insecurity bred by historical response to downturns.

3 - Cooperation between industry, government and academia

- Participants stressed that de-bottlenecking the sector's human resource challenges requires collective, targeted and innovative cooperation between government, educational institutions and industry.
- Positive reinforcement of the image of the sector must be widely practiced and supported by co-ordinated development of curricula, employment and social policies.