bp

THE INTERNATIONAL MAGAZINE OF THE BP GROUP ISSUE 1 2012

BP MAGAZINE

LOOKING TO THE FUTURE

BP Magazine talks to the company's head of technology to find out how techniques such as enhanced oil recovery are helping to tackle the energy challenges of the future.

Welcome. At the heart of any successful business you'll find dedicated people working as one team towards the same goal. This is certainly true at BP's Cooper River plant in the US, where a clear vision and a simple approach to safety and risk management has turned the petrochemicals facility into a role model for the rest of the company. On page 12, we visit the site to talk to plant manager Mark Fitts and some of his team about the importance of personal responsibility when it comes to keeping each other safe. And there are plenty of other examples of teamwork elsewhere in the magazine. On page 60, we find out about a new network that brings surface scientists from different disciplines together to tackle similar challenges, and on page 22, human resources director Helmut Schuster talks about why BP's recruitment strategy is moving from a 'buy' to 'build' model, with a focus on long-term investment in people's capabilities. We also visit the North Sea (page 36), to find out how new investment is set to bring growth and value to BP and the region, and on page 6 we review the 2011 financial results, and take a look at the company's strategy for the next two years.

Lisa Davison> Editor

BP MAGAZINE
The international magazine of the BP Group – ISSUE 1 2012

BP Magazine is published quarterly for external readers around the world, as well as past and present BP employees. Its content does not necessarily reflect official company views.

managing editor
David Vigar
david.vigar@bp.com

editor
Lisa Davison
lisa.davison@uk.bp.com

distribution
Carolyn Copland
+44 (0) 20 7496 4340

design
Phil Steed – Steed Design
phil@steeddesign.com
www.steeddesign.com

print management
Williams Lea

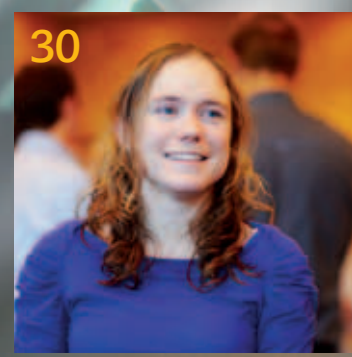
image contributors
BP Imageshop
Action Images
Getty Images
Heart Agency
Debut Art

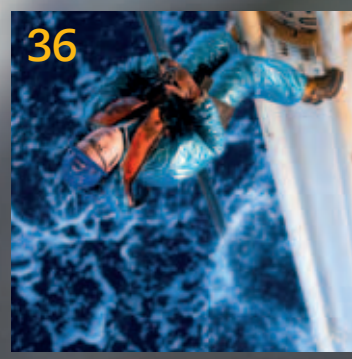
Cover image: BP's upstream laboratories at its International Centre for Business and Technology, Sunbury, UK. Technician studies enhanced oil recovery technology under a microscope. **Photograph by Simon Kreitem**

contents / issue 1 2012

+ Features

+ Regulars





For the record

the quarter in numbers

3

The number of years that Australian cricket captain Michael Clarke has agreed to work with BP to help educate drivers about BP Ultimate premium fuel.

5

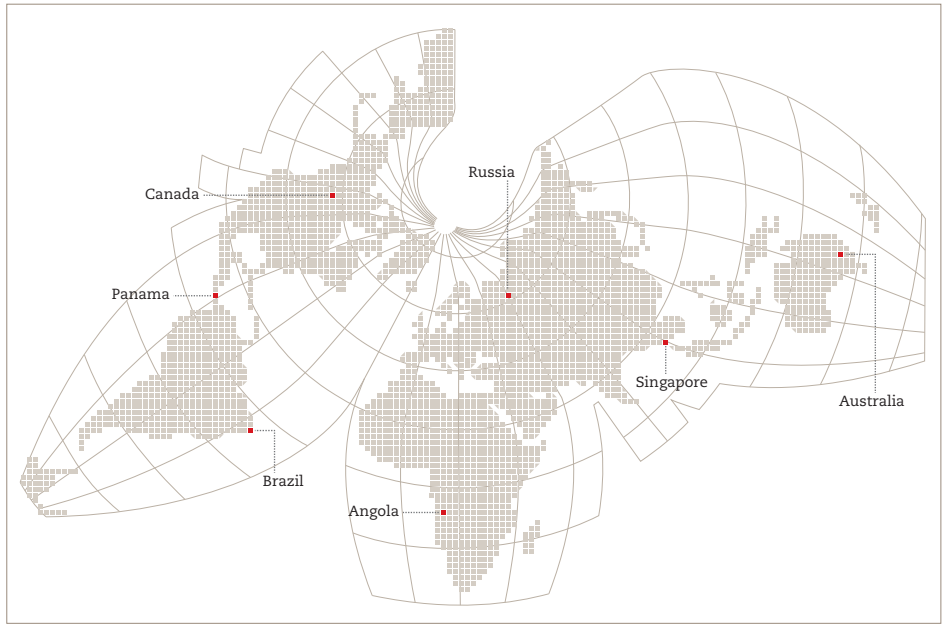
The number of years on Air BP's new supply contract with the world's largest commercial airline – United Airlines.

12

The number of companies who have formed an alliance to accelerate the pace of environmental performance in producing Canada's oil sands.

45

The number of days it took BP's new floating production, storage and offloading vessel to travel from Singapore to its new home, offshore Angola in Block 31.



Heading out: Vessels of Opportunity leave port in Louisiana, July 2010.

US: GoM settlement

BP has reached a settlement with the Plaintiffs' Steering Committee (PSC), subject to final written agreement, to resolve the substantial majority of legitimate economic loss and medical claims stemming from the Deepwater Horizon accident and oil spill.

The PSC acts on behalf of individual and business plaintiffs in the Multi-District Litigation (MDL) proceedings pending in New Orleans (MDL 2179). BP estimates that the cost of the proposed settlement, expected to be paid from the $20-billion Trust, would be approximately $7.8 billion. This includes a BP commitment of $2.3 billion to help resolve economic loss claims related to the Gulf seafood industry. Prior to the proposed settlement, BP had spent more than $22 billion towards meeting its commitments in the Gulf.

Global

Dividend rise

BP has raised its quarterly dividend by 14% – to eight cents a share in the fourth quarter of 2011. It is the first rise since the company resumed paying the dividend at the end of 2010. BP group chief executive Bob Dudley (above centre) said that returning operational momentum and strong cash flow generation in 2011 gave the company increasing confidence in its plans to grow value for shareholders.

Russia

Refining efficiency

A $14.6-million international consortium to make oil refining in Russia more efficient and environmentally sustainable has been given the green light. The Skolkovo Foundation has given official approval for the establishment of a centre of applied research on energy efficient heat exchange and catalysis (Project UNIHEAT), involving Imperial College London, the Boreskov Institute of Catalysis and BP. The project will focus on increasing energy efficiency and reducing heat loss in oil refining by up to 15% by improving refining operations, enhancing oil production processes, and reducing CO_2 emissions.

Brazil

Deepwater expansion

The Brazilian National Petroleum Agency (ANP) has approved BP's 'farm-in' to four deepwater exploration and production concessions operated by Petrobras, located in the Brazilian equatorial margin. BP is taking a 40% interest in each of the blocks, located in the Barreirinhas and Ceará basins. Together, the blocks cover a total area of 2,113 square kilometres (815 square miles).

Global

Board changes

Professor Dame Ann Dowling (below) has joined the BP board as a non-executive director. She is the head of the department of engineering at the University of Cambridge, where she is professor of mechanical engineering. Meanwhile, Sir William Castell has decided not to stand for re-election at the 2012 annual general meeting, after six years on the board.

Panama

Oil shipments

BP has begun shipping crude oil bound for the US west coast via Petroterminal de Panama's (PTP) trans-Panama pipeline, marking the start of a seven-year transportation and storage agreement between the two companies. Under the terms of the agreement, BP has leased a total of 5.4 million barrels of PTP's storage located on the Caribbean and Pacific coasts of Panama and committed to east-to-west crude oil shipments averaging 100,000 barrels per day through the trans-Panama pipeline.

Canada

NGLs sale

BP has agreed to sell its Canadian natural gas liquids (NGL) business to Plains Midstream Canada ULC for a total of $1.67 billion in cash. BP's Canadian NGLs business owns, operates and has contractual rights to assets involved in the extraction, gathering, fractionation, storage, distribution and wholesale marketing of NGLs across Canada and in the Midwest US. Subject to the satisfaction of other customary closing conditions, the acquisition is anticipated to close in the second quarter of 2012.

Global

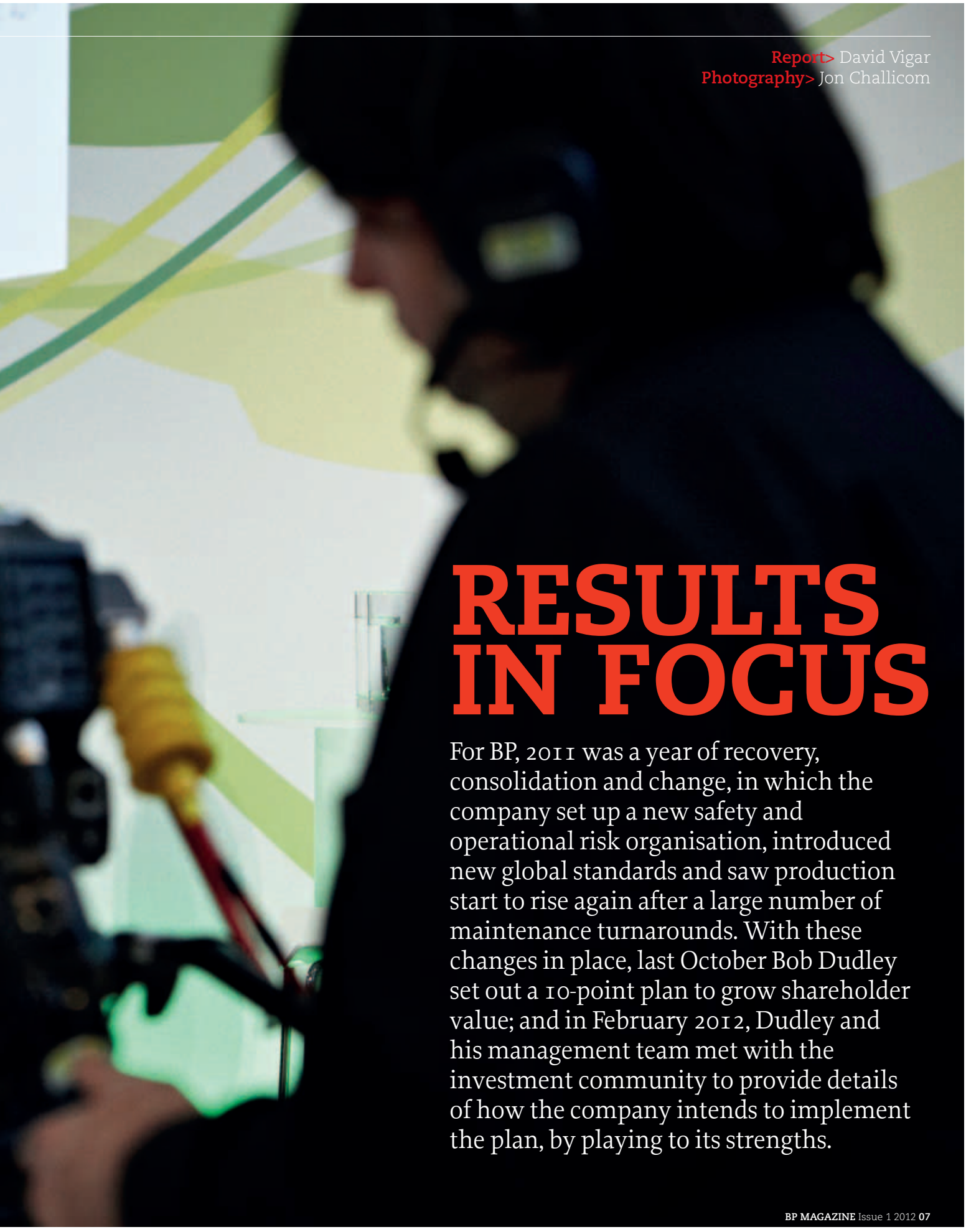
LPG sale

BP is to sell its liquefied petroleum gas (LPG) bottles and tank-filling operations in Portugal, UK, Austria, Poland, Netherlands, Belgium, Turkey, China and South Africa, as well as its non-refinery-integrated wholesale business. Also included in the sale are LPG storage terminals, bottle-filling plants, customer lists, operating licences and logistics assets. BP is, however, keeping its auto gas business.

Year end> *Behind the numbers*

In numbers: BP's chief financial officer Brian Gilvary, takes to the platform in February 2012 to outline BP's fourth-quarter and year-end results to investors.

Report> David Vigar
Photography> Jon Challicom



RESULTS IN FOCUS

For BP, 2011 was a year of recovery, consolidation and change, in which the company set up a new safety and operational risk organisation, introduced new global standards and saw production start to rise again after a large number of maintenance turnarounds. With these changes in place, last October Bob Dudley set out a 10-point plan to grow shareholder value; and in February 2012, Dudley and his management team met with the investment community to provide details of how the company intends to implement the plan, by playing to its strengths.

Large, international oil companies, such as BP, ExxonMobil, Shell, Chevron, Total and ConocoPhillips, are often described as 'supermajors'. The term dates back to the mega-mergers of the late 1990s and denotes firms that have grown to a massive scale. Their global operations stretch from finding oil and gas deep beneath oceans and deserts, to selling hydrocarbon products to consumers around the world.

The conventional wisdom has been that such companies are, by definition, integrated enterprises – operating in every part of the supply chain – working oilfields from discovery to depletion, running refining and marketing operations across major consumer markets and working in all areas of the downstream, from gasoline and diesel to the full suite of lubricants and chemicals derived from hydrocarbons.

Today, however, as the energy industry becomes more complex and competitive, many companies are beginning to vary the model. ConocoPhillips, for example, has chosen to operate its upstream and downstream as two separate, standalone businesses. In BP's case, the question has been how to create long-term value in a way that builds on and complements a rigorous and continually improving approach to risk management.

The answer for BP's group chief executive, Bob Dudley, lies in doing what BP does best – and, therefore, not trying to do everything. In a speech in Oslo this February, he said: "A supermajor can't be super at everything," before highlighting the areas in which he believes BP has built distinctive skills and technology – exploration, deepwater activity, giant fields, gas value chains, a world-class downstream business, technology and relationships.

The plan is that by investing in these areas, where it has most competitive advantage, and divesting businesses that are less competitive, or less well-positioned, BP will focus its dollars on the assets that create the most value.

So, for example, BP is increasing its spending on exploration, and focusing on upstream projects that have high cash margins – the net cash provided by operations divided by the number of barrels produced.

In the US, where demand for gasoline and diesel is declining, it is investing in refineries at Whiting, Cherry Point and Toledo, which can process many different types of crude oil and are well placed to serve large consumer markets. Meanwhile, it is divesting the Texas City and Carson

"Our period of consolidation is over. Now, it's time to deliver investment, growth and value – achieved by playing to our strengths. That means making choices."

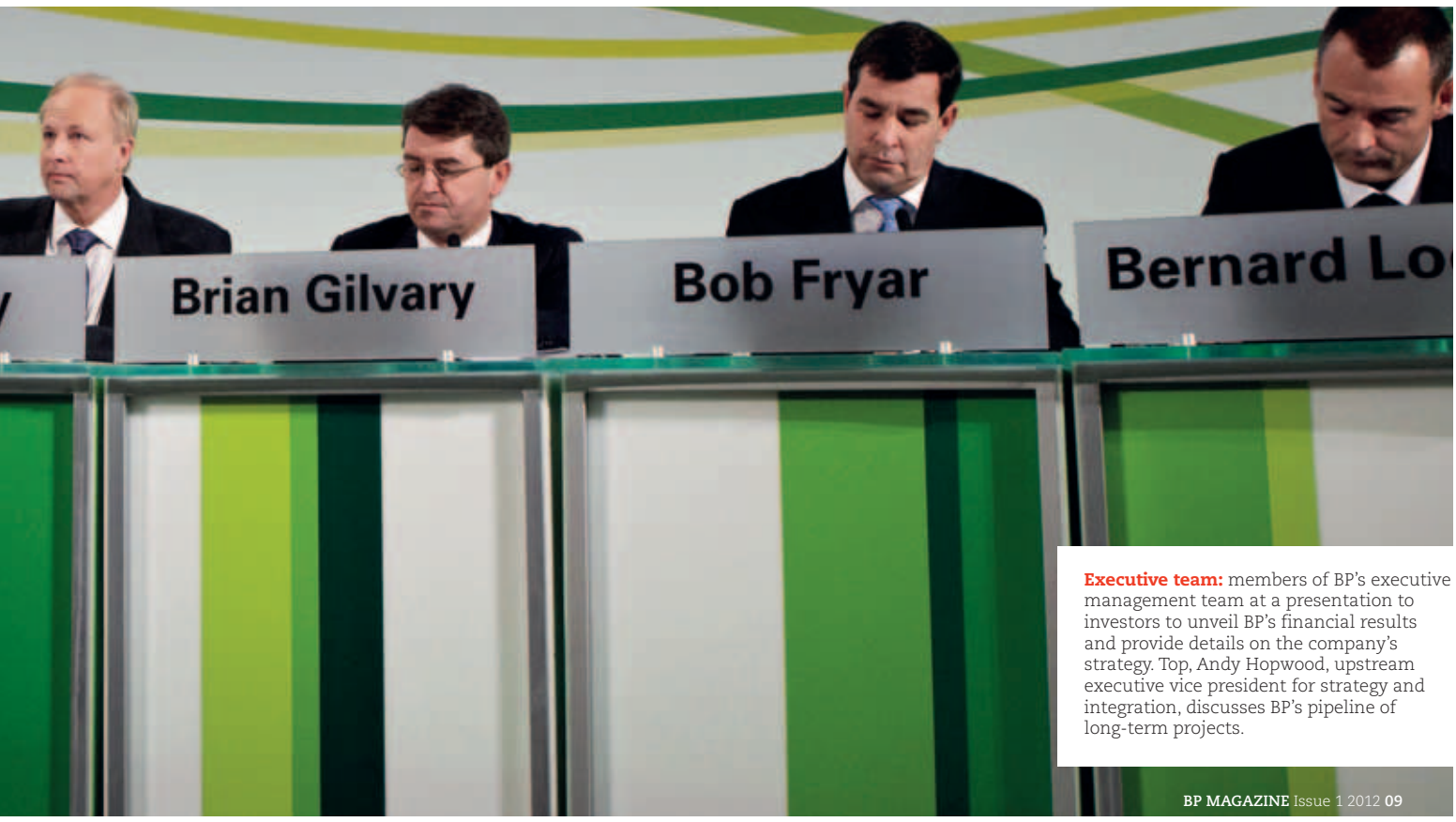
Bob Dudley

refineries, which are less strategically positioned and well configured.

It's increasing the proportion of premium lubricants it sells, but selling off part of its liquefied petroleum gas (LPG) business, including bottling and tank filling. BP has also divested a number of mature oilfields, which it believes other companies are better placed to operate, as well as smaller upstream businesses, such as those in Vietnam and Pakistan.

One of the biggest changes of emphasis is that BP is asking investors to measure its progress by how much operating cash it generates rather than simply how much oil it produces. The logic is that long-term value depends not only on volume, but on the margins derived from each barrel – quality as well as quantity.

Outlining the strategy to investors in February 2012, Dudley said: "Our period of »



Executive team: members of BP's executive management team at a presentation to investors to unveil BP's financial results and provide details on the company's strategy. Top, Andy Hopwood, upstream executive vice president for strategy and integration, discusses BP's pipeline of long-term projects.

"Our vision is to build an ever-stronger portfolio, upstream and downstream, generating sufficient cash, both to invest in our pipeline and reward those who invest in us as the circumstances of the firm improve."

Bob Dudley

YEAR BY YEAR – HOW THE PLAN IS UNFOLDING

2011 – 'SOLID' RESULTS

BP described 2011 as a 'year of consolidation' with a major emphasis on safety and a large number of maintenance 'turnarounds'. Nonetheless, the company turned in what Dudley called a 'solid' set of results, with profits rising 6%. Highlights include:

- $21.7 billion of underlying replacement cost profit compared with $20.5 billion in 2010.
- BP's first dividend increase in a year – a 14% increase to 8 cents per share for the fourth quarter of 2011.
- A turning point in October, when production began to rise again after maintenance turnarounds – production was 170,000 barrels a day higher in the fourth quarter than the third.
- Average production for the year was 3.45 million barrels a day, ahead of the expected 3.4 million.
- The highest-ever earnings for BP's refining and marketing business, with underlying replacement cost profit for 2011, before interest and tax of $6 billion – a 23% increase on 2010.
- Continuing to meet commitments in the Gulf of Mexico region – by the end of 2011, more than $7.8 billion had been paid to meet claims and government payments.

2012 – 'A YEAR OF MILESTONES'

In 2012, BP expects to pass several milestones as it implements its 10-point plan. These include increases in exploration, new projects and capital investment:

- High margin production back onstream, following turnarounds in Angola, the North Sea and elsewhere.
- Drilling 12 exploration wells, double the 2011 total.
- Starting up six major upstream projects.
- Operating with eight rigs in the Gulf of Mexico by the end of the year.
- Increasing organic capital investment to around $22 billion.
- $2 billion of financial performance improvement in refining and marketing since 2009.
- Completing payments into the Deepwater Horizon oil spill trust.

2013-2014 – FINANCIAL MOMENTUM

In 2013 and 2014, as investment continues, BP expects to see greater financial momentum. Main developments are planned to include:

- Increasing exploration activity – up to 25 exploration wells per year.
- A further nine major upstream projects – making 15 between 2012 and 2014.
- Unit operating cash margins from new upstream projects in 2014 expected to be double the 2011 average (assuming a constant $100 per barrel oil price and excluding TNK-BP).
- Whiting refinery upgrade expected onstream in second half of 2013.
- Completion of $38 billion divestment programme by the end of 2013.
- High value, focused portfolio that plays to BP's strengths.
- Around 50% more annual operating cash flow by 2014 compared with 2011.*
- BP expects to use around half of this extra cash for increased investment and around half for other purposes, including increased distributions to shareholders.

consolidation is over. Now, it's time to deliver investment, growth and value – achieved by playing to our strengths. That means making choices. We are choosing value over volume – measured in cash flow not barrels. We are choosing strategic assets over non-core ones. We're investing more in the front-end of exploration, and divesting mature assets that others can derive more value from. So, we are choosing not to try to be the biggest – but over time, to aspire to be the best: a safer, stronger and simpler BP."

All of this is encapsulated in BP's 10-point plan, in which point one is a 'relentless focus on safety and risk management' and point two is 'playing to BP's strengths'. The plan also outlines BP's intentions to strengthen its portfolio through 'active portfolio management' – acquisitions and divestments; making the business simpler through standardisation; and providing investors with more detail on individual businesses.

Measures of progress include bringing higher margin operations onstream and maintaining a strong balance sheet. The expectation for operating cash flow is to generate around 50% more annual operating cash flow by 2014, compared with 2011.* The extra cash will be shared around equally between investment in the company's pipeline of growth projects and other purposes, including dividends to shareholders.

Dudley told investors: "Our vision is to build an ever-stronger portfolio, upstream and downstream, generating sufficient cash, both to invest in our pipeline and reward those who invest in us as the circumstances of the firm improve." ■

Leading the way: BP's group chief executive, Bob Dudley, opens a session with investors to present the company's financial results and discuss plans for the next two years.

*This is based on certain assumptions, including an oil price of $100 per barrel. Full statement of assumptions available at www.bp.com/strategypresentation4Q2011

COOPER RIVER
MAKING IT PERSONAL

A chemical plant in South Carolina has become a role model within BP for the way it has made safety and risk management relevant and real for the frontline. *BP Magazine* visited the Cooper River facility to find out how a simple, personal approach to implementing a global set of standards and practices has inspired a workforce.

Site inspection: Cooper River operations personnel carry out a visual survey of a vessel at the facility.

Report> Amanda Breen
Photography> Joshua Drake / Marc Morrison

The concept of 'good housekeeping' might conjure up an image of a well-kept home in suburbia. The world of industrial manufacturing, often depicted as a grimy, faceless process, is less likely to spring to mind. But for BP's Cooper River plant in South Carolina, US, good housekeeping is an approach that lies at the heart of safe and systematic operations.

Looking around the chemical plant, which produces up to 1.3 billion kilograms (2.8 billion pounds) of purified terephthalic acid (PTA) each year, observant visitors will spot some unexpected details.

Bright labels on pumps in the three operating units bear individuals' names, declaring who is responsible for monitoring the good condition of that equipment. With the plant manager's name on one as well, the standard is set from the top.

Elsewhere, neatly-painted pipes are colour-coded to signify the materials held within and orderly tool sheds hold the necessary instruments for the plant's operating technicians to carry out minor repairs. By paying close attention to keeping a tidy 'house', the team at Cooper River believes it is easier to identify and manage risk in the plant where potentially hazardous chemicals, such as acetic acid, are processed at high temperatures and under pressure.

"Upholding a high standard of housekeeping means a better detection of potential defects," says plant manager Mark Fitts, who has spent his entire career at Cooper River, working his way up from mechanical engineer to today's leadership role. "If manufacturing operations look messy with soiled equipment, people get discouraged; they stop seeing potential risks and the abnormal becomes normal."

It is, after all, people who hold the plant's safety, and consequent success, in their hands. Although industrial processes may seem impersonal, it's clear that putting the emphasis on people power is what works at Cooper River, located within 30 kilometres (20 miles) of Charleston and one of the three US sites in BP's petrochemicals portfolio.

Taking its name from the waterway on which it sits, Cooper River made its first shipment of PTA in 1978. But the site has another definition for the acronym PTA that has nothing to do with the white, crystallised powder that emerges, warm, as the finished product from the maze of pipes and reactors. It also stands for *People Taking Action*. The slogan greets visitors before they even reach the security gates, displayed on the forest-lined roadside, next to an announcement on this month's safety focus. However, signs at an entrance mean nothing if they're not supported by what's happening behind the scenes.

Inside the gates, you don't have to look far before you spot an object or a surface with somebody's name or photograph on it. Names and faces of staff and their families appear on posters stuck to office doors, as a reminder of why people are working safely. For those who have notched up 30 years of employment at the former Amoco site, their names are engraved in bricks forming the steps up to the main entrance.

These roll-calls create a sense of community, highlighting that everyone »

Close eye: maintenance coordinator Moses Frost inspects Cooper River's eye wash system.

COOPER RIVER: MORE THAN MANUFACTURING

There is an array of natural specimens – from lifeless skeletons to moving snakes – inside a white-washed wooden building, within Cooper River's 10-acre recreation area. This is the plant's teaching centre, a blend of mini-natural history museum with small-scale reptile house.

BP's land management and security specialist, James 'Ernie' Nelson, points out a red ratsnake, native to South Carolina, inside a glass tank. The centre, he explains, has become a sanctuary for a few former pets, when locals need to find them a new home.

They now form part of an education programme, as local schools, scout groups and college students visit for experience of an outdoor laboratory. There is plenty to see: set on the grounds of two former plantations, the 6,000-acre Cooper River site consists of upland habitat, marsh and wetland, close to the Francis Marion National Forest.

With 500 acres set aside for the operating site, the whole area is carefully managed to preserve its natural resources. Looking after the expanse of pine trees and waterways requires dedicated staff, whose efforts are split between forest and wildlife management.

Tasks include monitoring nest boxes, as part of a number of avian habitat programmes; maintaining roads, fences and drainage; and undertaking prescribed burns to create fire breaks and stimulate growth of native plants.

Nelson, who also runs the community outreach and environmental education activities, says: "Our main focus is on the health of the forest and the wildlife within it, followed by recreational activities. We have remains of kilns here since brick manufacturing took place on the site in the 1800s; this is a great place to have another industry today and it's our responsibility to manage the area for the future."

Certified since 1990 by the US non-profit organisation Wildlife Habitat Council as part of its Wildlife at Work programme, Cooper River was among three runners-up for the council's corporate habitat of the year award in 2011.

While the land remains private property, the plant joined the council's Corporate Lands for Learning programme in 1993, as one of seven pilot sites. Today, through scheduled visits, it continues to host children from the local school in Cainhoy, as well as Master's students from the College of Charleston's environmental studies programme on field trips to develop research methods and practise resource management.

"Through our employees' links in the area, we also offer scout groups the opportunity to come here to pursue merit badge work and Eagle scouts have completed projects, such as building tables and benches for visitors, as well as a deck for the teaching centre," says Nelson, who joined the Cooper River team in 1980, originally as a maintenance mechanic.

"Last year, we established an employee biodiversity team, with 15 people who now help to coordinate activities in their area of interest. There are options for fishing, hiking, kayaking, overnight camping and it's great to share that with the local community."

The plant also supports the local area through funding of maths, science and technology programmes in schools, while employees volunteer as mentors and teach in Junior Achievement sessions, a nationwide programme that helps to prepare young people for the workplace.

Fine specimens: the Cooper River teaching centre is located in a small wooden building within the plant's 10-acre recreation area. The centre houses an array of natural specimens, both live and skeletal.

Core product: Cooper River is one of the world's largest producers of purified terephthalic acid (PTA), a chemical feedstock used to make polyester products.

WHAT IS PTA?

Purified terephthalic acid is the key raw material for the manufacture of polyester fibre, resin and film. It is used to produce polyethylene terephtalate (PET), one of the most versatile man-made products found in everyday materials, such as plastic bottles, home textiles, clothing and photographic film.

A by-product of crude oil, paraxylene is the raw material for PTA; shipped from BP's Texas City refinery by two double-hulled ocean barges, the first step in its conversion to PTA takes place in the oxidation unit. Air reacts with paraxylene under high temperatures and pressures, in the presence of acetic acid and a catalyst, to produce a terephthalic acid that is cooled into crystal form.

Then comes purification, when the terephthalic acid is cleaned up, removing the acetic acid and other impurities, to result in the pure product required by customers. Onsite laboratories analyze product quality, while utilities such as steam, power and water are captured and reused in the production cycle.

Once ready for shipment, one-tonne bags of PTA are either transported domestically by rail from the site, or delivered to the nearby port of Charleston by vessel for onward international export.

» has a part to play, whether they are on the frontline of operations, in the laboratory or in the office building. "What good looks like for Cooper River is, first and foremost, having engaged and involved people who are doing, what I call, 'the basics' in an excellent way," says Fitts.

Those 'basics' are the fundamentals of operations that the plant has identified as the most critical process safety and operational skills required to deliver BP's operating management system (OMS), which sets out common global standards, principles and practices in the four areas of plant, people, performance and processes. Of 200 BP staff onsite, some 110 are frontline operators and technicians. Defining priority skills, such as housekeeping, shift handover and emergency drills, has been the way to bring OMS to life for the teams and individuals working in, and supporting, the frontline.

But these critical safety and operational skills – which encompass the common causes of catastrophic industrial failures – are not just for operators to focus their attention on; according to Fitts, they touch everyone onsite. "Each person can connect with many of our fundamentals and is able to recognise their piece in the whole – whether that comes under developing effective training and procedures or maintaining the safe design and permit limits of plant equipment, what we call the operating envelopes.

"Our office administrators play a significant role in supporting OMS and the fundamentals, through maintaining written procedures, supporting training and the core systems in our systematic processes. They are extremely valuable to the quality and integrity of these systems and they can see where they fit in to what we're doing. People can be very innovative when they can plug into a vision and that's when you can achieve extraordinary things."

By involving staff and contractors at every level, from every corner and shift on the plant, with a vision of excellence in manufacturing and safety, the results are tangible. Cooper River has a strong record in safety and compliance; the site had no reportable process safety events in 2011. It also has a clean record on environmental performance, with no permit excursions last year, and in personal safety, the plant »

Family affair: Norva Myles (right) holds a poster featuring photographs of her grandchildren. Below, Irwin Lewis checks and maintains a pump that bears his name. Both the posters and the name tags are part of the site's efforts to make safety a personal responsibility.

"What good looks like for Cooper River is, first and foremost, having engaged and involved people who are doing, what I call, 'the basics' in an excellent way."

Mark Fitts

has passed the four million hours milestone without a case requiring a day away from work.

Spreading a clear, consistent safety message through individuals talking to one another and regular training is making such achievements possible. Every three months, all staff attend a full day's safety workshop to focus on the fundamentals and core technical skills. "We have operations and maintenance teams in the same room together for training so they can talk about what works for them.

"Each person takes a day off from their shift to train – and we don't consider our engineering or support staff to be any different, so they come along too," says Fitts, who teaches some sessions himself due to his technical background. "It's a tremendous benefit as it gives me the opportunity to speak to every member of the team to reinforce our vision and strategy."

Training on a three-monthly basis would not, in itself, be enough to keep safety and systematic operating at the forefront of people's minds. That's why the plant has an individual in every team, 35 in total, who holds monthly conversations with their peers about that month's safety topic. These HSSE champions pass on the messages face-to-face, avoiding the use of email when not everyone has or needs a computer for their job.

"Our champions are our communicators, that's the best name I can give to them," says Norva Myles, behaviour safety specialist, who coordinates Cooper River's employee safety team. "The theme of the month might be personal protective equipment, or hazard communication, and the champions go out to their groups to have that discussion, then bring back any questions or feedback every two weeks.

"By making this a personal process, face-to-face, people feel like they have a part to play and it gives them an opportunity to share their experiences with one another."

Norva Myles

"We also go out into the plant for an audit every month, that's how we know if everyone gets it. By making this a personal process, face-to-face, people feel like they have a part to play and it gives them an opportunity to share their experiences with one another."

Speaking up about what's working – and what's not – does not always come as second nature, though. That's why everyone, including contractors, is required to attend an 'intervention training' programme to help them speak up and step in if they notice anything of concern. It sounds rather dramatic to an outsider, but it's aimed at making people feel comfortable to speak what's on their mind.

"This is about teaching that 'it's the way we do things because we care'," says Myles. "There's a way to say things, so another person receives it and doesn't feel harassed. In role play scenarios, we make it clear that our mantra should be 'it's okay for you to stop me if something isn't right, and I can do the same for you'."

The plant's Good Find card programme, introduced in 2005, gives employees the opportunity to put this 'speak-up' philosophy into action. It is a tool encouraging colleagues to record any safety issues observed around the site. Staff then fill out the card – either by hand or online – and detail the actions they have taken.

There is an incentive behind the initiative, as the employee safety team monitors the issues raised and picks the 'best' entries each month. Individuals are presented with gift certificates, while teams where all members participate by submitting at least one card in a month are invited to lunch with the plant manager. In the meantime, the cards' details are entered into a database to share across the plant and identify any emerging trends.

In the production units, safety messages are reiterated on a daily basis. Process safety management coordinator Irwin Lewis is among the team who compiles, researches and conducts training around the critical safety and operational skills in unit 2. "We're getting a lot of positive feedback as the guys are seeing the results of their efforts," says the former technician, who has 29 years' experience at the plant.

"As an example, we run tag or emergency drills on Fridays, where we simulate an abnormal event, such as loss of power. I feel passionate about these drills because I know how much they can help to prepare people to respond."

When operators feel a sense of ownership for certain areas of the plant,

such as the pumps that bear their names, that brings a sense of responsibility, too, according to Lewis. "It works really well because everyone has a degree of pride and nobody wants their area to look poor in comparison to others. It also translates into leadership and everybody here can display some degree of ownership and responsibility for their equipment."

Developing leadership skills, at all levels of Cooper River, is high on the plant manager's agenda. The 20 members of the site's extended leadership team are taking part in monthly workshops to hone their skills, based on the Massachusetts Institute of Technology's (MIT) Leadership Framework. Later in 2012, the same training will be offered across the site to all leaders.

Sessions focus on everything from 'sense making' – how leaders translate a complex idea into straight-forward terms that everyone can understand – to 'emotional intelligence' – the attributes such as self-awareness, motivation and empathy that will separate an ordinary leader from an extraordinary one.

"The importance of simplifying things has been proven again and again," Fitts says. "If a system or process is complicated, people can't see where they fit in. Once the organisation understands the vision, there's a path to follow and it's vital to hear what people think when making changes to the way they work. As leaders, we sometimes forget that other people do these jobs, so let's find out what their roadblocks are and have them tell us what needs to be fixed."

The 'vision' for Cooper River and its team is clear: to become a Centre of Excellence for manufacturing and safety. They are also sharing their methods across the company, through BP's Operations Academy at MIT and the Managing Operations programme. There, other site leaders from the refining and marketing segment, as well as upstream divisions, learn about successful practices at Cooper River that they could apply to their own businesses.

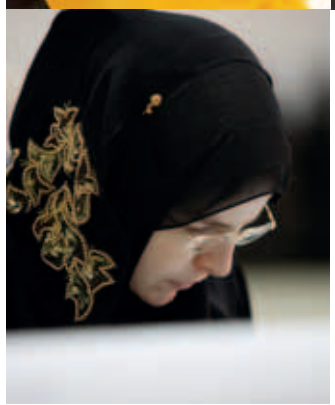
As for the South Carolina petrochemicals manufacturer, although process details and audit methods may be refined, the big picture remains consistent. "The causes of major industrial accidents do not change, only new evidence is added on how they occur and how to prevent them," Fitts concludes. "So, we stay the course, identifying any gaps and applying continuous improvement, but our message and strategy remain the same." ■

Towering example: from left, Cooper River's dehydration tower; BP operators discuss safety amid a 'clean house'; tidal wetlands border the Cooper River facility; and employees who have worked at the site for more than 30 years have their names etched into the bricks that make up the steps to the front entrance.

Clear vision: Helmut Schuster was appointed BP's group human resources director in January 2011.

PEOPLE POWER

As BP announces increases in its graduate intake for 2012, the company's human resources director, Helmut Schuster, talks to *BP Magazine* about building a career in BP and why it's important that the company's reward system reflects the long-term nature of the business.



Diverse workforce: BP has staff working all over the world and in a range of businesses. From top, biofuels in the US; petrochemicals at Hull, UK; onboard the *British Ruby*; a firefighter onboard the Atlantis platform in the Gulf of Mexico, US; and at BP's offices in Muscat, Oman. Main image, offshore Angola.

Interview> **Lisa Davison**
Photography> **Graham Trott / BP Imageshop**

"As a company, we had been heavily relying on hiring from the external job market, much more than any of our competitors."

Helmut Schuster

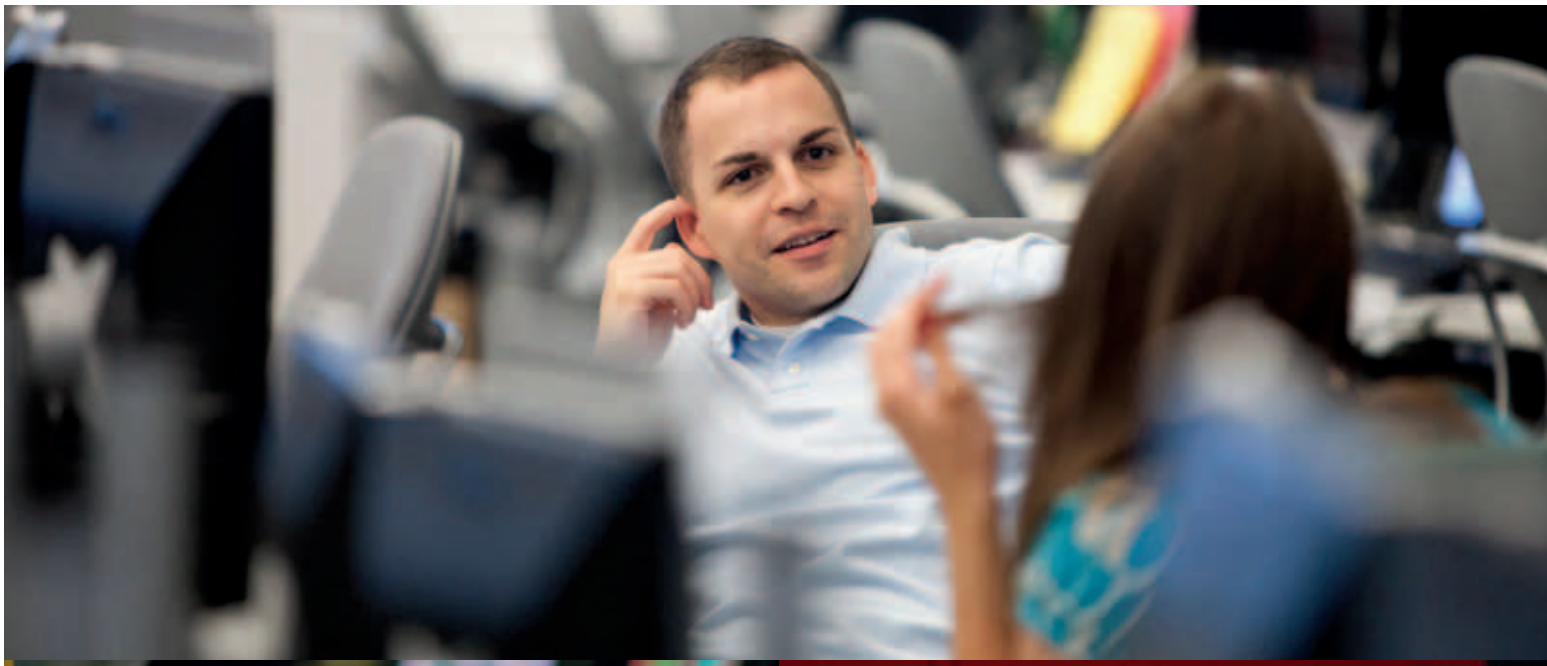
Growing up is never easy, especially when you're doing it in some of the worst global economic conditions seen for at least a generation. Data indicates that more than a quarter of those who graduated in the UK in 2007 were still without full-time work in 2010 and a fifth of teenagers in the US are out of work. One trend often blamed for youth unemployment is the decline of heavy and manufacturing industry – or 'deindustrialisation' – in more established economies. Against this background, then, BP's drive to increase graduate recruitment is encouraging news, both for young people and for the industrial sector – whether in the emerging or more mature economies.

Hands-on experience: a researcher analyses simultaneous saccharification and fermentation in a small scale fermenter at the Biofuels Global Technology Centre, San Diego,US.

In February 2012, BP announced that it plans to increase its annual UK graduate recruitment by 50%, to almost 250 graduates. It's all part of what Helmut Schuster, BP's group human resources (HR) director, describes as moving from a 'buy' to a 'build' model.

Schuster was appointed as head of HR in January 2011, and has spent much of the past 12 months working with BP's executive team to review the organisation's approach to people management. "It was a time for a pause, really," he says, "and one of the key things I learned was that as a company, we had been heavily relying on hiring from the external job market, much more than any of our competitors."

By external market, Schuster is referring to what are known as 'experienced hires', people often with many years of work experience and deep expertise. With their skills and knowledge of working in a corporate environment, this group will continue to play a vital role in the company's recruitment plans. However, says Schuster, it became clear "that we were not taking on as many graduates or early career hires, the so-called 'second jobbers' [those with three to five years of work experience], and helping them develop skills that would support us in the long term." »




OPERATOR

Global reach: clockwise from top, traders discuss their work, Chicago, US; Helmut Schuster meets BP staff; an operator at Kwinana refinery, Australia; and operators in the control room at the Atlantic LNG facility, Trinidad.

Defying the idea that having a career with one company is a thing of the past, he adds: "Over the next 10 years, we want to grow a much stronger talent development pipeline. I believe hiring from university or early in a person's career helps to build loyalty – we want people to come to BP and see the opportunity to build a whole career in one place."

It's a subtle, yet important shift in an age where global markets look set to continue wobbling. Suddenly, a solid career in an industrial business that produces tangible goods has a lot to offer. But while the traditional focus has often been on UK and US markets, Schuster is keen to ensure that BP hires from universities across the globe. "There is a bit more work to be done here," he says, "but if you look at where the big pieces of our portfolio are, where our new acquisitions are occurring, we need to ensure we have a supply of talented individuals who understand different cultures, speak the relevant languages."

As an Austrian who joined what was regarded as a quintessentially British company more than 20 years ago, Schuster says this focus on growing a more diverse workforce is close to his heart. He is quick to point out that BP was nothing but 'welcoming' when he first joined in 1989, working in Vienna to help grow the organisation's brand in central Europe. And he cites his experiences of working on BP's joint venture with Mobil in the 1990s as teaching him invaluable lessons about the importance of creating an inclusive environment.

"I think this has always been a company that prides itself on being inclusive," says Schuster, "but there is still some work we can do." Some of that work will include a review of BP's diversity and inclusion policies, along with setting some clear milestones so that, as its graduate intake builds, the organisation can measure its progress more effectively.

The other area on which Schuster and his team are focused is one that many people tend to be most interested in, whether they work for a large corporate or not – performance and reward. "Since the collapse of Lehman Brothers in 2008, I think we have seen the unintended consequences of businesses focusing on purely short-term reward systems," says Schuster. "We operate in a very long-term business and, so, the time felt right to review how we reward our employees and ensure it reflects the nature of the job."

Many people who join BP go on to work for the company for years and rightly expect their organisation to support them, both in terms of professional development and financial reward. But, says Schuster, it's also important that employees see themselves as long-term stewards of the company and its assets.

"We want people to work for BP for a long time and we've always acknowledged that for the first couple of years, your job is really to learn how things work. But after that, we didn't really have the reward mechanisms in place that made people think about how they could continuously improve over time. So, we spent a lot of time thinking about what we stand for as a company and discussing the right way to reward our people. We all agreed that it should be about much more than yearly performance."

So, from 2012, employee reward will no longer be based purely on individual performance, but, instead, calculated on an assessment of the performance of the employee, their team and the entire company. The idea is to build a system that reflects the importance of teamwork and long-term thinking, as well as annual performance.

"We have thought about this very carefully and have created a system that rewards our people for the right behaviours," says Schuster. "This is a long-term industry and it's important to represent that. I believe our new model is very balanced and acknowledges an individual's short-term performance, while making sure long-term issues, such as safety and risk management are properly reflected in the way we do business."

After a 23-year career with BP, many of those years with some form of responsibility for people, Schuster is well-placed to support BP in establishing a more sustainable future in terms of its most valuable resource – people. But with modern society so focused on the next big trend, why should today's graduates be interested in the possibility of employment with the same company for all or most of their working lives?

"I think BP brings the right balance between direction and rigour, while still allowing space for an individual to develop and bring their personality to a role. I also think we operate in an industry that is vital to the progression of all societies across the globe. Energy is something that is always on people's minds and I find that fascinating. The other thing I would say is that I believe BP people try to help make their colleagues successful, they care about and try to support different ways of thinking. I think what we offer is a unique combination of opportunity, community and excitement, and we should be proud of that." ■

BP IN THE US

$4 BILLION

The amount investedin the US arm of BP's Alternative Energy business since 2005.

15

The number of oilfields that BP operates on Alaska's North Slope. This accounts for around two thirds of all North Slope production.

$8.8 BILLION

BP's US capital investment in 2011. This represents 28% of the company's global capital expenditure.

+11,000

The number of US retail sites operating under the BP and ARCO brands. This represents more than 50% of BP's global retail presence.

The number of people BP employs in the US, making it the country's second largest oil and gas employer.

23,000 EMPLOYEES

17 BILLION

The number of gallons of gasoline sold at BP's branded retail sites in 2010 – enough to fuel 31 million US vehicles annually.

8,500

The approximate number of miles of pipeline that BP's North America Gas business operates. This is the equivalent of driving across the US 3.5 times.

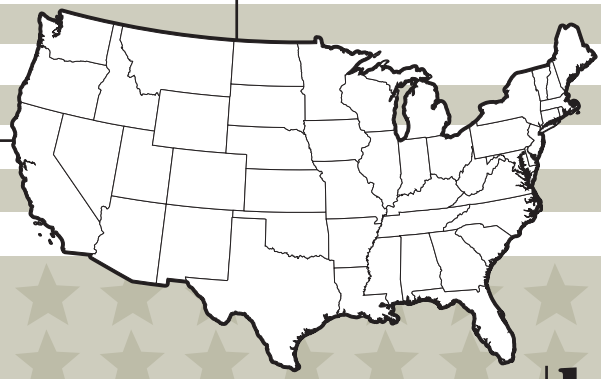
ILLUSTRATION: **INFOMEN**

38%

The percentage of BP shareholders located in the US.

+$52 BILLION

BP's capital investment between 2007 and 2011, making it the largest energy investor in the US. This excludes $14 billion spent on the Gulf response between 2010 and 2011.



$180 MILLION

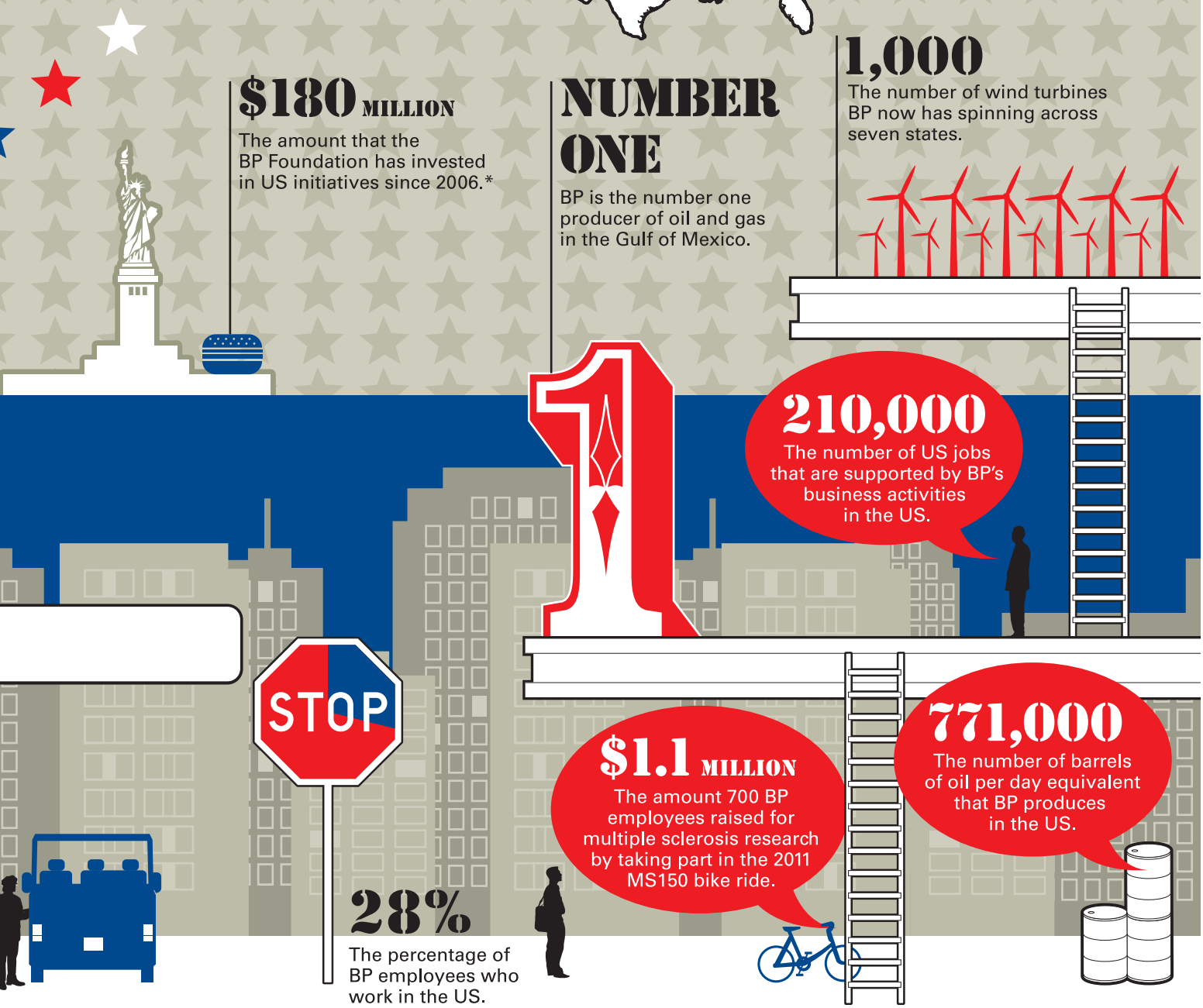
The amount that the BP Foundation has invested in US initiatives since 2006.*

NUMBER ONE

BP is the number one producer of oil and gas in the Gulf of Mexico.

1,000

The number of wind turbines BP now has spinning across seven states.



210,000

The number of US jobs that are supported by BP's business activities in the US.

$1.1 MILLION

The amount 700 BP employees raised for multiple sclerosis research by taking part in the 2011 MS150 bike ride.

771,000

The number of barrels of oil per day equivalent that BP produces in the US.

28%

The percentage of BP employees who work in the US.

*The BP Foundation is a separate legal entity from BP and accounts independently for its operations, assets, liabilities and expenses.

NEW FACES

BP is on a global search for a new generation of bright young talent. But joining the company is only the start of the journey. With its range of development programmes, BP hopes many new starters will choose to build their careers within the organisation.

Future leaders: BP holds regular networking events for its new starters, helping them to build their contacts and learn from the experiences of other new recruits. The photographs over the next few pages show events in London and Azerbaijan for both upstream and downstream Challengers and those on the Future Leaders programme. Among them are Jerome Milongo (opposite) and Elida Cavic (second down) and Jian Zhu (page 33).

Report> Hester Thomas
Photography> Mehmet Binay / Graham Trott

BP is set to increase the number of graduates it recruits in the next few years, boosting its capability to take on new challenges in meeting energy demand.

The offer to new recruits is a career that involves working at the frontiers of the industry – the deep water, heavy oil, unconventional gas production, state-of-the-art refining and petrochemical plants. And in BP, new joiners are carefully integrated into the business, with support from mentors who are willing to share their experiences to help the next generation make new advances.

It is exactly this prospect that BP is hoping will attract ever greater numbers of graduates around the world, as it looks to build the skills required to provide the world's future energy needs in a sustainable manner.

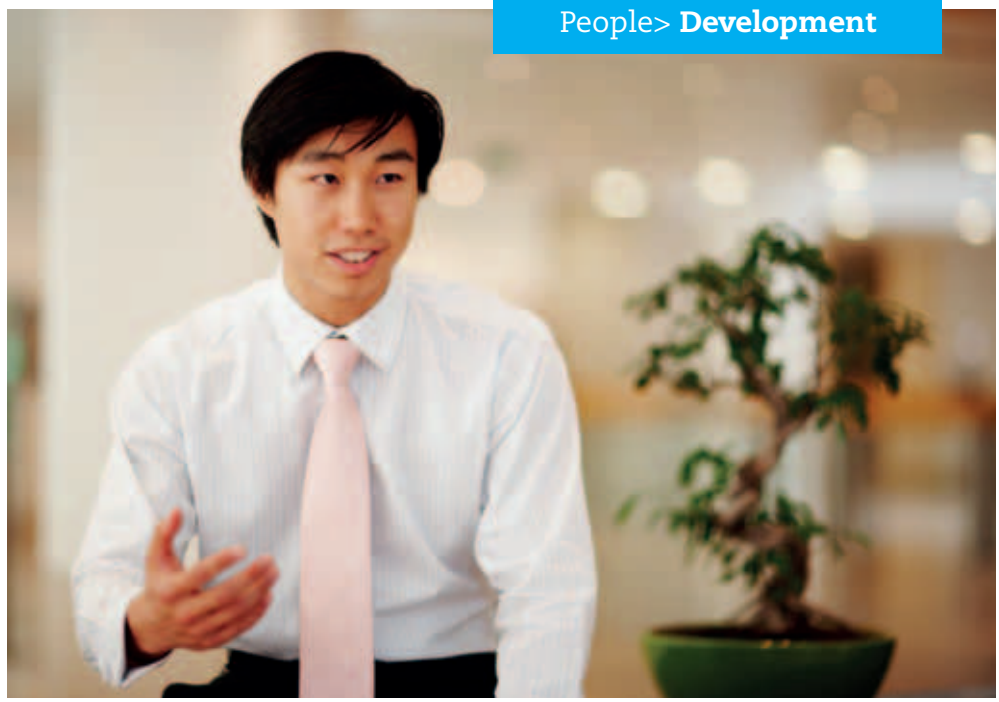
The numbers tell the story. In 2009, BP's upstream business recruited just under 300 graduates around the world. Last year, that number rose to almost 500. By 2014, it will be looking for some 700-800 new people every year. It's a similar story in refining and marketing, where global graduate recruitment is set to triple between 2010 and 2014, rising from 110 to 350 new joiners every year. The aim, in both segments, is to then maintain those levels of recruitment.

And it's not just graduates that BP is hoping to recruit. In September 2011, it launched its Future Leaders programme (FLP), designed to attract high-potential postgraduates, with a minimum of three years' experience, to take up roles in both refining and marketing and BP's information technology and services (IT&S) function. This year, it is looking for 40 candidates, with numbers rising in the future.

So, what has prompted all this activity? Global demand for energy is growing, with estimates suggesting an increase of as

THE NUMBERS

- BP employs just over 80,000 people worldwide. By 2014, the upstream and downstream segments will be recruiting 1,150 Challengers every year. Assuming that hiring targets stay the same, by 2017, the Challenge programme will account for 4.3% of employees, with many more Challenger alumnae populating the company globally.
- In 2011, some 37% of new Challengers joining the upstream segment were based in the US, while 25% were in the UK and 38% in the rest of the world. The split for downstream last year was 42% in the USA, 18% in the UK and 40% in the rest of the world. These percentages will change as BP's businesses grow in other parts of the world, including large emerging economies, such as India and China.
- Candidates face tough competition to gain a place on the three development programmes – more than 5,000 people have applied for 40 positions in the Future Leaders programme (FLP). "This number reflects the appeal of well-structured development programmes and BP's attraction as a company," says Paul Lawrenson, FLP global programme manager in refining and marketing. "We're offering great programmes in which people can do valuable, rewarding work. There's never been a better time to join BP."



much as 40% over the next 20 years. At the same time, the energy industry is facing a growing skills gap, as large numbers of experienced workers retire.

As a result, BP needs to prepare a new generation with the skills, knowledge, values and behaviours to take the company into the future. BP has developed several graduate programmes that help support new starters in their initial years with the company.

The longest running of its graduate development plans is its upstream Challenge programme – an early development initiative for technical and professional disciplines – which has been running since 1993. Aimed at undergraduates and postgraduates with up to three years' work experience, Challenge has evolved into a highly-structured, competency-based programme. It provides graduates with practical experience and formal training to build strengths in particular disciplines, including engineering, finance, subsurface and wells.

Greta Uranich, global operations manager for the programme, explains how Challenge works: "Each of our 'Challengers' will go through two job rotations, over a period of three years, with each rotation providing appropriate field or operational experience. This is complemented by on-the-job experience, along with up to 25 days of formal training every year. In addition, our Challengers receive support and coaching, regular assessments and feedback."

BP invests both time and money in its development programmes, with each Challenger receiving extensive support from a network of managers, mentors and buddies. As Uranich puts it: "It takes a village to raise a Challenger."

For Kirsty Dawkes, a geophysicist for BP Angola, it was this commitment to training and support that attracted her in the first place. Based in Sunbury, Dawkes is a third-year upstream Challenger who found out about the programme while on a summer internship with the company. "It was the training aspects – both formal courses and on-the-job training – that I found particularly attractive," she says. So far, she has attended technical courses related to her discipline, software, offshore safety survival and, most recently, influencing and presentation skills.

The Challenge programme may be attractive, but it also lives up to its name. Alex Townsend, a start-up support engineer in the Angola global projects organisation in Singapore and Sunbury, and now in his first post-Challenge role, says: "It is a challenge. I got a phenomenal amount out of being on the programme, but to get through it all, you must plan, apply yourself and grab the opportunities available."

For Townsend, the high point was during his third role as a process engineer aboard the Greater Plutonio floating production, storage and offloading (FPSO) vessel in Block 18, Angola. "I joined the turnaround team to replace and repair a number of defects on the platform [a 'turnaround' is a planned, periodic shutdown of a facility in order to perform maintenance]. We managed all the changes successfully and the FPSO started up on time, without any injuries or leaks. Also, because it worked more efficiently, you could see the outcome of your work and its positive effect on people."

One of the key elements about the programme is that it is designed to throw new recruits into real projects, right from the outset. Sometimes, that can mean moving country, getting to grips with a new career, new colleagues and a new culture – all at the same time. Joseph Payton knows this well, having moved from the UK to Germany after just nine months of working with BP, to take up a role as quality assurance technical support manager with the global fuels technology team.

"The company gives you great responsibility, backed up with supportive managers," he says. "It's been great coming to a new country and liaising with colleagues in other surrounding countries. You're working with high-calibre people and pushing ahead with technology."

Scott Lepley, a PhD graduate based in »

"This is the only programme in our country that gives such a great opportunity for graduates. You work and learn at the same time."

Leyla Safarova

Houston, meanwhile, has found himself working as a geologist with the Brazil team as part of his second upstream Challenge rotation.

"I'm working with world-renowned experts," he says. "Not many people get [these experiences] in a lifetime's career and here I am in my third year working with the best."

However, it isn't only the upstream business that is looking to develop its new recruits in this way. In September 2011, BP's refining and marketing business launched its own Challenge programme. Simone Tillmann, global head of the downstream programme, explains why: "Although other programmes exist in downstream, the ultimate aim is for them all to migrate to Challenge, so that we can offer a globally consistent framework."

Downstream Challenge is similar to its upstream partner, in that it offers a number of job rotations over a period of around four years, support from mentors, plus training in core skills and behaviours. Unlike the upstream programme, some business areas allow Challengers to experience roles across different segments.

Challengers graduate from each of the programmes when they have met all their competency and training goals, moving into a standalone role within their chosen discipline.

Meanwhile, the FLP aims to develop mature graduates for early leadership roles. Applicants must meet strict criteria – that they hold a postgraduate degree, have professional experience related to their discipline, have lived or studied outside their home country and have demonstrable leadership potential. Fluent English is mandatory and they must be able to speak a second language.

An extensive recruitment campaign has been carried out in nine countries, including the UK, US, China and the United Arab Emirates. New recruits began joining BP in March 2012.

"There are three main elements to the FLP development offer: education, experience and exposure," says Tessa Arnold, head of the IT&S Academy. "New joiners will go through a series of structured learning modules. They will undertake two distinct roles, one of which may be outside the home country, gain experience in a major business project and have exposure to the global business and senior leaders."

All these global development programmes have great appeal, as they offer a clear structure, goals and associated training. Leyla Safarova, an environmental advisor in Azerbaijan and a final-year upstream Challenger, says she was attracted to BP because of the development programme. "This is the only programme in our country that gives such a great opportunity for graduates," she says. "You work and learn at the same time. There's very good training and, for me, the chance to gain formal certification in environmental management from the UK's Institute of Environmental Management and Assessment."

All three graduate development programmes place their emphasis on what it takes to develop a career, along with the value of knowing who to turn to for

support and advice. Among other things, great importance is attached to networking, and formal opportunities are provided.

One new opportunity took place in 2011, when the upstream Challenge team organised a global poster competition called Global TechnoFest. The competition ran in 10 of BP's regional hubs, including Norway and Alaska, and was designed to give Challengers the opportunity to share their projects and ideas with the wider BP community. All the teams were encouraged to demonstrate how their work supports safety and risk management, business impact and technical excellence.

More than 300 individuals took part in the competition and six teams were later selected to display their work at a final showcase in BP's London headquarters, attracting interest from staff and senior executives

"The exhibition helped Challengers gain far greater exposure for themselves and their work," says Uranich, "while also enabling them to become better connected."

Currently, BP has around 1,650 Challengers worldwide. However, there are thousands more who have since 'graduated' from the programme and are now in significant roles around the globe. Al Vickers, vice president for safety and operational risk in BP's global wells organisation, based in Houston, joined the company 15 years ago as a Challenge graduate. Since then, he has enjoyed a diverse career that has spanned upstream and downstream segments in operational, engineering and managerial roles, across the UK, South Korea, Angola and the US.

Carl Orsbourn, meanwhile, a performance and planning manager for UK Retail has also experienced a remarkably wide-ranging career. "I've had a range of jobs since joining BP," he says, "working, among other things, as a project manager, a pricing manager and in a variety of operational roles in California."

Both men are committed to helping new Challengers find their feet. Orsbourn is the refining and marketing commercial Challenge programme coordinator, finding roles for new recruits, allocating mentors, running assessment panels and helping support Challengers find their next role, following their graduation from the programme.

Vickers, who recently gave a speech at a US Challengers' induction event, is impressed by the quality of the young entrants he meets. "I see outstanding people," he says, "They're dynamic, mobile, energetic, refreshing and want to learn. It's also clear that they know how to access and network information at a phenomenal speed. As a leader, you can learn a lot from them, as they're learning from you."

With competition so fierce in the industry, BP's commitment doesn't end when these programmes are completed. Across the company, career road-maps are being designed to support employees as they continue to develop. And in 2011, the upstream business announced the launch of its *eXcellence* programme, into which Challengers move after they graduate. This new initiative provides an accelerated development career programme through to an individual's 10th anniversary of joining BP.

Clearly, BP is making a long-term commitment. The hope is that this will be returned by its employees. "This is a business in which technical knowledge and the value that can be derived from it in the right hands, is paramount," says Vickers. "We need people who are at the forefront of their disciplines, and we must retain their talent in order to discover new and better ways of operating. If we can create a stimulating environment where people can learn and grow, then we're a big enough company for people to have hugely diverse careers without moving elsewhere."

So, what do Challengers think of the programme? Would they recommend it to others? "Definitely," says Leyla Safarova. "I'm working, learning, gaining professional skills and being paid well, too. BP's planning for the future with Challengers. BP cares about us and we care about BP, too." ■

"I see outstanding people. They're dynamic, mobile, energetic, refreshing and want to learn. As a leader, you can learn a lot from them, as they're learning from you."

Al Vickers

Report> Helen Campbell
Photography> Stuart Conway / Richard Davies

ON THE UP

For BP's North Sea business, life really did begin at Forties, with the discovery of the giant field that proved to be the backbone of regional oil production. More than four decades later, there's no sign of the North Sea business having a mid-life crisis, as BP and its partners get set to invest $16 billion over the next five years.

Cable guy: offshore worker suspended underneath the Byford Dolphin drilling rig.

Anyone with even half an eye on the UK oil and gas sector would be hard pressed to miss the fact that production in this region has been in decline for some time. The past decade has seen domestic oil output almost halve, from 2.7 million barrels in 2002 to 1.4 million barrels in 2010, while the challenge to extract commercial amounts of oil and gas has grown.*

But, while the continued decline in North Sea production is inevitable, for BP's business in the region, there is the opportunity to sustain production at current levels for some time. In fact, with its high-quality asset base, technical capabilities and decades of operational experience in the region's harsh conditions, BP is at the forefront of the management of a 'new North Sea' that still has potentially decades to run.

This new North Sea is one where reservoirs that were technologically out of reach 30 years ago are now being developed; hardware replacements allow substantial extensions to field-lives, in some cases up to 100%; and there is continued demand for some of the global industry's most experienced personnel.

"BP has been a major investor in the North Sea since the mid-1960s," says Trevor Garlick, regional president, BP North Sea. "It is a key part of the group's portfolio, and BP believes the North Sea holds good potential for sustained production for years to come.

"The conditions and the reservoir complexity mean the area presents some of the greatest challenges in the global oil industry, but BP's experience in the region places us in an excellent position to continue to invest with confidence in the UK and Norway."

Today, BP produces more than 200,000 barrels of oil and gas equivalent per day from the UK and Norwegian sectors of the North Sea. It operates more than 40 oil and gas fields, four major terminals and a huge network of pipelines, as well as employing almost 4,000 people.

In 2011, BP and its partners announced a total of $16 billion of new investment in a »

*BP's *Statistical Review of World Energy 2011*

Offshore life: clockwise below, personal protective equipment hangs in place at the muster point onboard the Clair platform; the launch of the final section of the Kinnoull pipeline bundle, Wick, Scotland; food preparation (opposite) onboard BP's Clair field platform; the Byford Dolphin drilling rig (above).

"BP's experience in the region places us in an excellent position to continue to invest with confidence in the UK and Norway."

Trevor Garlick

New arrivals: shift change at the helideck on the Byford Dolphin drilling rig.

"Our strategic goal in the North Sea is simple. We want to sustain a material, high-quality business for the long term, and our focus is on maximising recovery from our base and investing in high-value assets with growth potential."

Trevor Garlick

number of exciting North Sea projects. As the largest annual capital allocation ever made in the region by BP, the company could not have made its commitment to today's North Sea clearer. This level of new investment means BP's North Sea presence – and its current level of regional production – is assured until 2030 and, in the case of certain fields, beyond.

To achieve this, the business is taking a three-pronged approach: focusing the portfolio, working to get the most out of existing assets, and exploring and developing to build new production.

Although a number of North Sea fields are undoubtedly mature, others are far from spent. Years of familiarity with individual reservoirs, coupled with extensive developments in what is possible from a technical perspective, mean that BP is able to increase recovery at a number of its fields, and continue to produce oil and gas from reservoirs that, by original estimates, 'should' have ceased production years ago.

Enhanced oil recovery (EOR) techniques, such as 'water alternating with gas' flooding, are expected to have a significant impact on output from a number of BP's older reservoirs over the next several years. In addition, the company has spent the past three years renewing its seismic data for almost the entire North Sea, dramatically enhancing its imaging and understanding of existing reservoirs, as well as opening up the possibilities to expand into new ones.

"A new approach to seismic planning and acquisition means our North Sea seismic activity levels are higher than they have been for the past five years," says Herlinde Mannaerts-Drew, North Sea seismic delivery manager. "By the end of 2012, we will have new seismic data for all the North Sea hubs, making a major contribution to resource progression."

Just as upgrading all the radiators in a house without changing the boiler makes little sense, some of BP's North Sea hardware is being replaced in order to develop the newly-attainable pockets in older reservoirs. For example, BP is changing around half of the equipment at its Magnus platform, which will celebrate its 30th anniversary and its 1 billionth barrel of oil in 2013. Meanwhile, Norway's Valhall field has just become BP's first, and the world's farthest, offshore installation to be powered entirely from an onshore generation source.

Meanwhile, its Schiehallion field will receive a brand new floating production, storage and offloading vessel in 2015 that will support production for the next 20 years, and possibly more.

"In a lot of cases, the reservoirs are no longer the limiting factors," says Dave Lynch, vice president for resource. "Some of our assets have tremendous field-life left in them, but facilities that were originally built to last 25 years and have served very well are not necessarily up to the job of producing for the next 20 years or more. By changing and upgrading facilities where we need to, we will be able to safely and efficiently prolong production."

At the same time, BP North Sea has been working internally to streamline the way it plans and approaches turnarounds and maintenance on platforms, to give more reliability and predictability of operations and production.

Analysts say the North Sea could still hold in the region of 30-40 billion barrels of oil, and it is through exploration and new developments that BP is working to build a sustainable future – developments such as the $7 billion Clair Ridge oil project, the $5 billion redevelopment of the

Schiehallion and Loyal fields, the central North Sea Kinnoull and Devenick developments, $1.1 billion and $880 million respectively, and the $6.7 billion Skarv development in Norwegian waters. All represent significant investments that will bring BP important new production over the next four decades.

BP received UK government approval to proceed with Clair Ridge, the second phase of development of its giant Clair field, in October 2011. Two new, bridge-linked platforms are expected to be installed in 2015, with production due to commence in 2016. The very fact that these new facilities are being designed for 40 years of production is testament to the life that is still in the North Sea. The new development will have the capability to produce an estimated 640 million barrels of oil, and will provide a hub for future expansion, subject to further appraisal. Peak production is expected to be up to 120,000 barrels of oil per day.

Also in October 2011, BP confirmed an extension to the southwest of the original Clair development, further increasing confidence in the potential of the greater Clair field. BP will acquire further seismic data in 2012 to establish the extent of the reservoir ahead of possible development. In addition, BP is planning to explore the North Uist prospect, West of Shetland, in the spring of 2012.

The strategy behind these investments has also meant some reshaping of BP's UK portfolio in order that it can best focus investment on those areas where it believes the greatest long-term returns lie. This includes the sale of its onshore Wytch Farm oilfield, in December 2011. Similarly, BP is marketing a selection of gas assets in the southern North Sea that do not fit with its future strategy.

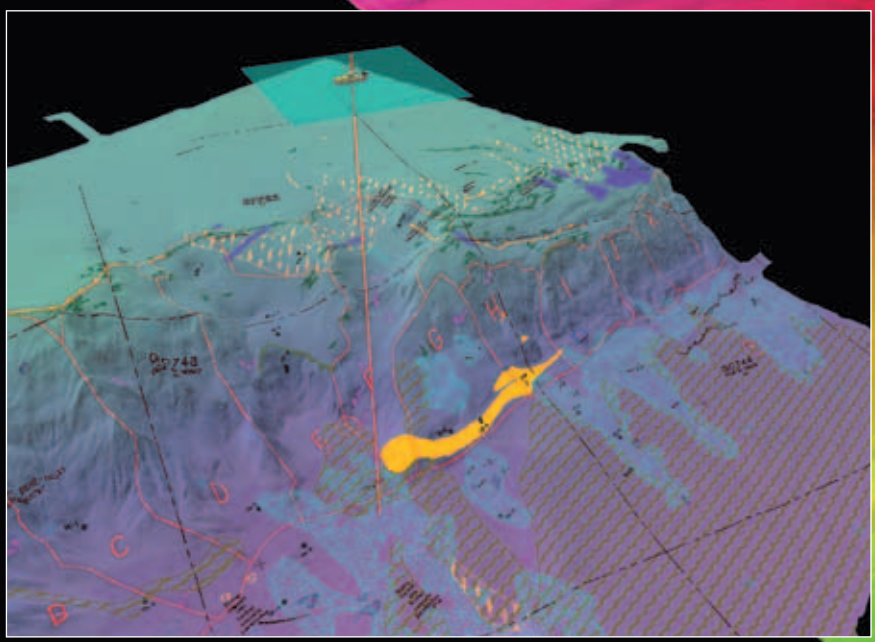
"Our strategic goal in the North Sea is simple," says Garlick. "We want to sustain a material, high-quality business for the long term, and our focus is on maximising recovery from our base and investing in high-value assets with growth potential."

With more than 5 billion barrels of reserves produced to date, and assets that BP believes could yield more than 3 billion barrels in the future, the North Sea looks set to remain a key part of BP's portfolio for some time. ■

"A new approach to seismic planning and acquisition means our North Sea seismic activity levels are higher than they have been for the past five years."

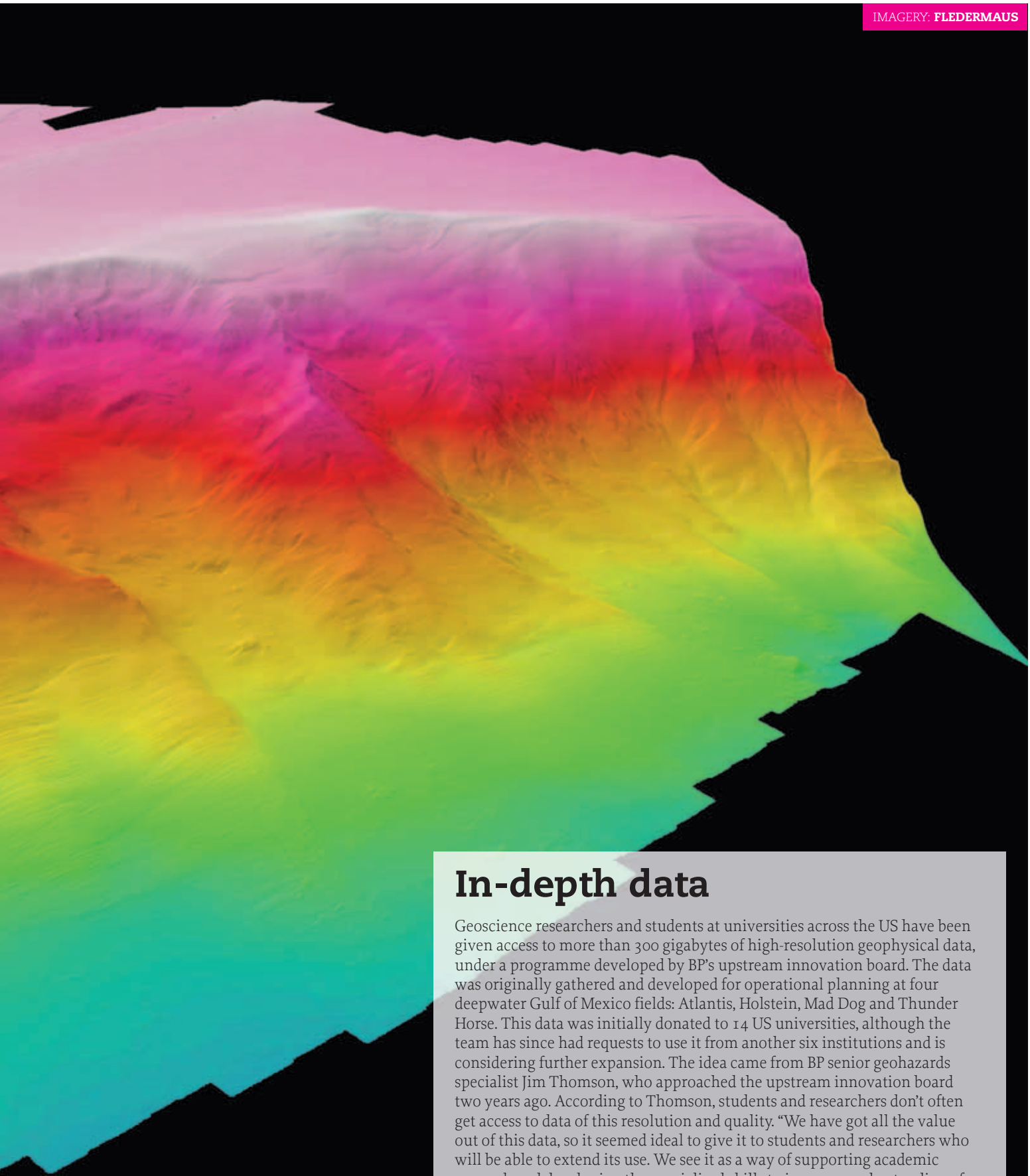
Herlinde Mannaerts-Drew

Offshore life: drilling engineer Claire Horsman (far left) carries out derrick inspection onboard the Byford Dolphin drilling rig. Offshore staff run the diverter – used to direct fluid – on the Byford Dolphin.



Above: In the Atlantis field area, a map of the geological interpretation is draped on the seafloor topography. A model of a deepwater drilling vessel floats over a drill site at a water depth of approximately 2,100 metres (7,000 feet). Main image: The sea floor above the Mad Dog field. The data was gathered by an autonomous underwater vehicle (AUV) that travels 40 metres (130 feet) above the ocean floor, under a preprogrammed guidance system. Using sonar to map the area, the AUV brings data up to the surface that can then be used to build a computer model, complete with contours and, in this instance, colour coding to show different water depths. The colours can be adjusted in order to highlight different geological points of interest. BP uses the data to help it plan the layout and installation of field wells, subsea equipment and export pipelines. In this image, you can see a 'cliff' at the edge of the pink/red area. This is the Sigsbee Escarpment. In the centre of the image lies the Mad Dog 'amphitheatre'. For the trained eye, there are lots of interesting features to note, and avoid, such as seabed faults and slump blocks (a mass movement of rock along a concave slip surface).

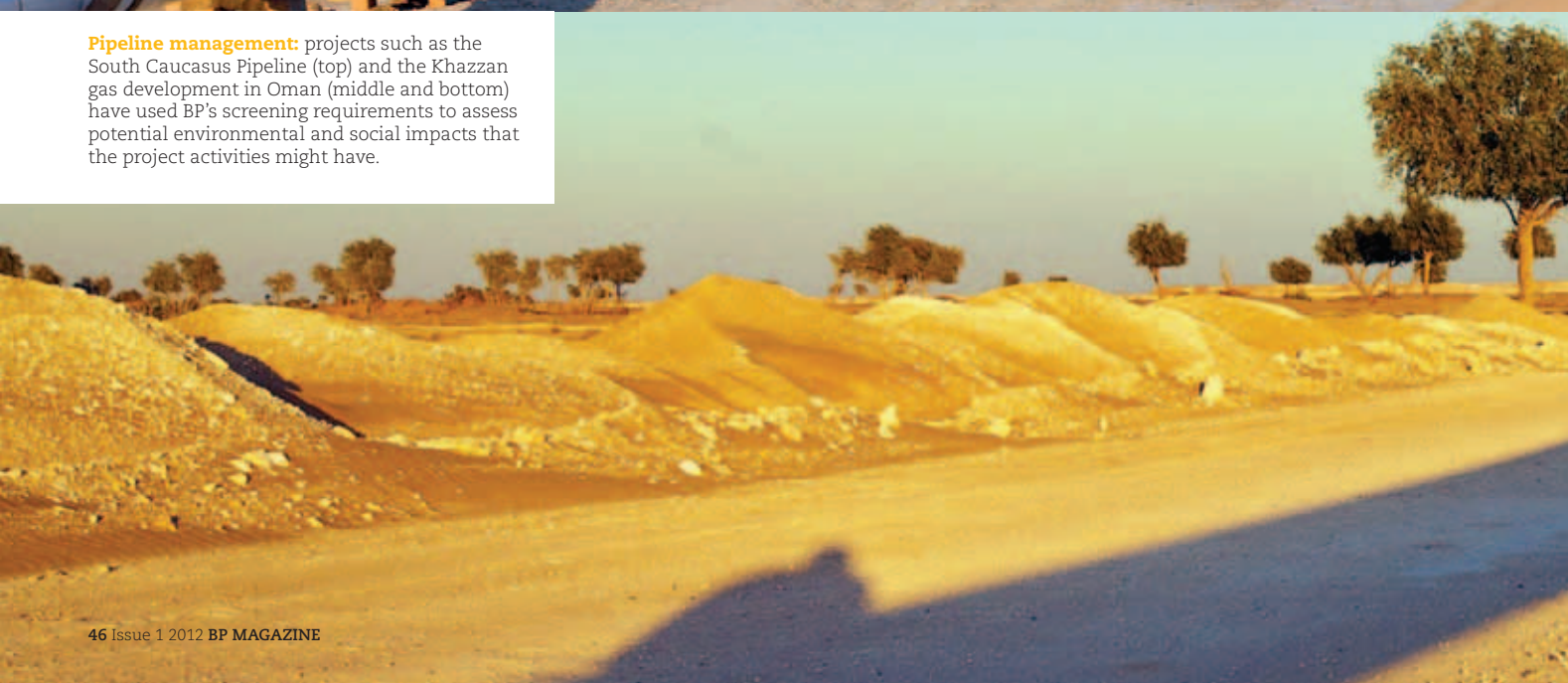
IMAGERY: **FLEDERMAUS**



In-depth data

Geoscience researchers and students at universities across the US have been given access to more than 300 gigabytes of high-resolution geophysical data, under a programme developed by BP's upstream innovation board. The data was originally gathered and developed for operational planning at four deepwater Gulf of Mexico fields: Atlantis, Holstein, Mad Dog and Thunder Horse. This data was initially donated to 14 US universities, although the team has since had requests to use it from another six institutions and is considering further expansion. The idea came from BP senior geohazards specialist Jim Thomson, who approached the upstream innovation board two years ago. According to Thomson, students and researchers don't often get access to data of this resolution and quality. "We have got all the value out of this data, so it seemed ideal to give it to students and researchers who will be able to extend its use. We see it as a way of supporting academic research and developing the specialised skills to improve understanding of geotechnical, geological and engineering concepts in the deep water." The data was donated by BP and its partners BHP Billiton, Chevron, ExxonMobil and Shell. ■

Pipeline management: projects such as the South Caucasus Pipeline (top) and the Khazzan gas development in Oman (middle and bottom) have used BP's screening requirements to assess potential environmental and social impacts that the project activities might have.



Report> Nick Reed
Photography> Mehmet Binay / Aaron Tait

GOOD BUSINESS PRACTICE

As part of its Operating Management System, BP is using a set of environmental and social practices designed to identify the potential impacts of projects in early planning and provide a framework through which they can be managed.

By any measure, BP's Khazzan project in Oman is a big deal. With first gas expected in 2016, the 2,800-square kilometre (1,080-square mile) field is eventually expected to have as many as 300 wells yielding up to 30 trillion cubic feet of natural gas over the next 30 years.

Early identification: screening in Oman (above) identified a number of potential issues, including greenhouse gases and groundwater resources. Opposite, screening at BP's Zhuhai petrochemicals facility in China identified potential long-term water supply issues. The process allows issues such as these to be addressed early on in the project.

With accommodation, facilities and even an airstrip part of the construction requirements, it represents a major investment for the company. So, understanding, avoiding or mitigating the risks involved is an important factor for success.

As well as risks linked to safety, efficiency and profitability, BP needs to identify and manage any environmental and social impacts the project might have.

With this kind of situation in mind, the company introduced the Environmental and Social Practices (E&SP) in April 2010 which make up part of BP's Operating Management System. These practices include new screening requirements that will be used on major and new access projects, some acquisition negotiations and projects that may affect an international protected area. The screening assesses potential impacts of project activities on either the environment or society, and is conducted by a multidisciplinary project team with an independent facilitator.

The Khazzan project in Oman is just one to feel the benefits. "Our screening revealed that proper management of drilling wastes – oil-based and water-based mud – is important," says lead environmental engineer, Ed Salter. "There were also potential issues with produced water, greenhouse gases, groundwater resources, and road safety, even our impact on local communities and some threatened species of animals and plants.

"Identifying all this so early in the process meant we could address each one and mitigate potential issues by integrating environmental and social design into the project, before submitting the environmental and social impact assessment [ESIA] to the Oman Ministry of the Environment and Climate Affairs. It is important that we were able to address these potential challenges during the assessment to mitigate the impact on costs, project timelines and BP's reputation."

One issue raised in Khazzan was the potentially significant level of carbon dioxide expected from power generation during operations. So the project's engineering team designed a waste heat recovery system that has reduced the amount of gas that is lost as waste heat from the processing plant. Instead, the waste heat is used to meet a large proportion of the facility's own power demands. As a consequence, annual forecasted carbon dioxide emissions at the facility fell by approximately 25%.

Similarly, the screening showed there could be a high salt content in the 140,000 barrels of water estimated to be produced every day from the reservoir. Forecasts suggested that the total amount of salt generated in the project's lifetime would reach 35 million tonnes. All this saline »

'MUST DO' OR 'SHOULD DO'?

BP's Environment and Social Practices have been divided into two sections: group-defined practices (GDP) and group guidance.

The GDP set out what each applicable project 'must do' in terms of impact identification. It contains a set of requirements covering nine environmental and, for the first time, social indicators (see page 50).

Each project is formally screened against these indicators by a multidisciplinary team led by an independent facilitator. Each is required to act fully on the screening report, which is circulated to senior managers outside the project team.

Group guidance, on the other hand, contains recommendations on relevant topics that are based on the distilled knowledge and experience of dozens of previous BP projects, all of which are designed to help teams take appropriate and proven actions when potential impacts have been identified.


uvex
uvex

Safe driving: road safety was identified as a potential issue in Oman via the E&SP screening. Mitigation plans were put in place as a consequence before an environmental and social impact assessment was submitted to the Oman Ministry of the Environment and Climate Affairs.

GROUP-DEFINED PRACTICES (GDP): REQUIREMENTS

BP's GDP set out nine requirements to help projects manage environmental and social issues:

Drilling wastes and discharges
Requirements address restrictions on drilling waste storage and disposal, or discharges, as well as restrictions in the use of diesel muds.

Greenhouse gas and energy management
Requirements are in line with BP's commitments to the World Bank Global Gas Flaring Reduction (GGFR) public/private partnership. These include design requirements and restrictions on certain types of projects that are forecasting specific thresholds of carbon dioxide or equivalent, or are flaring specific amounts of hydrocarbons.

Impact assessment
Requirements address the need for a project to assess and manage potential environmental and social impacts during its full lifecycle.

Indigenous people
Requirements are consistent with the UN Declaration on the Rights of Indigenous Peoples and detail consultation plans and impact mitigation plans.

International protected areas
Requirements specify the need to conduct a high-level risk assessment, as well seek internal approval at a senior level for all projects that are classified as international protected area projects.

Moving communities
Projects cannot permanently move communities.

Ozone-depleting substances
Requirements restrict the design of systems or the use of certain ozone-depleting substances, such as hydrochlorofluorocarbon, chlorofluorocarbon and methyl bromide, as well as prohibiting the sale of redundant halocarbon stock to third parties.

Security and human rights
Requirements support BP's commitment to the Voluntary Principles on Security and Human Rights, and the need to develop mitigation measures where a potential impact on human rights is identified in the screening process.

Water management
Requirements specify a range of water management issues, including consideration for community water users and requirements to minimise the risk of water contamination during project design.

"Environmental and Social Practices help BP meet external commitments that the company has made, give transparency to our governance of related issues, and provide a consistent methodology to evaluate and manage the potential consequences of our activities."

Liz Rogers

water would need to be treated and disposed of appropriately.

In response, the project's subsurface team located a site deep underground where the water can be safely reinjected. This solution is just one example of how screening for sensitivities can help project teams make changes early on in the development.

Pipeline rerouting

The story is the same across many areas of BP's business. In Azerbaijan, for instance, a screening of the South Caucasus Pipeline project led to the rerouting of the pipeline along an existing right of way, to avoid intrusion on a natural reserve and an archaeologically sensitive area. Long-term water supply, meanwhile, was a potential issue for expansion at BP's petrochemical plant in Zhuhai, China. These issues were picked up early enough to be addressed, avoiding further work, project delays, cost and even operational constraints at a later stage.

This screening process is overseen by trained and certified facilitators who are independent of the project teams (for more on the GDP and facilitators, see opposite and right).

The screening process is carried out using the United Nations Environment Programme's World Conservation Monitoring Centre's database, in order to identify relevant international protected areas (IPA). Where screening indicates that a proposed project might affect an IPA, BP then carries out a high-level risk assessment. This is supported by an independent review conducted by environment and social experts from the company's safety and operational risk team. Permission to move ahead with a project under these circumstances must be sought from the group chief executive and permission is only granted if the business considers the risks and manages them through appropriate mitigation plans.

"The need for BP to identify and manage environmental and social risks is greater now than ever before, and the E&SP provide a rigorous set of tools to help us do that," says Liz Rogers, vice president for environment, social responsibility and HSSE compliance. "Identifying possible impacts at the very outset of business acquisitions, exploration and new projects can save money, time and effort, and improve our licence to operate. So, clearly, it can add significant value."

She adds: "E&SP help BP meet external commitments that the company has made, give transparency to our governance of related issues, and provide a consistent methodology to evaluate and manage the potential consequences of our activities."

To work effectively, of course, these practices need the commitment and engagement of the project teams. There was, perhaps unsurprisingly, some initial scepticism at what was seen as yet another potential layer of bureaucracy. But perceptions are changing rapidly as teams are using the practices.

Chris Doran, head of discipline for safety and operational integrity in Alternative Energy, agrees: "The practices are thorough and systematic, and they all have some degree of challenge related to them during a screening," he says. "But they all add value."

Frontline perspective

A perspective from the frontline comes from Paul Sutherland, environmental and social manager for BP's South Caucasus Pipeline extension project. The group-defined practices (see opposite) were used here to rerun a screening assessment first carried out in 2007. "It was a clear, logical and systematic process," Sutherland says. "The outputs from the revised screening have informed the project on a far broader range of topics than the original, resulting in a more indepth and comprehensive assessment."

This understanding and acceptance by the business lies at the heart of E&SP, of course. "Every business needs rules, but they are all completely redundant unless there is a culture where people are minded to follow them," says Rogers. ■

ASSESSING THE ASSESSORS

Screening is carried out by a multidisciplinary project team that is facilitated by trained and certified facilitators, who are themselves independent of the project.

Those facilitators must go through a rigorous assessment of their own before certification, and it is by no means certain that all will succeed.

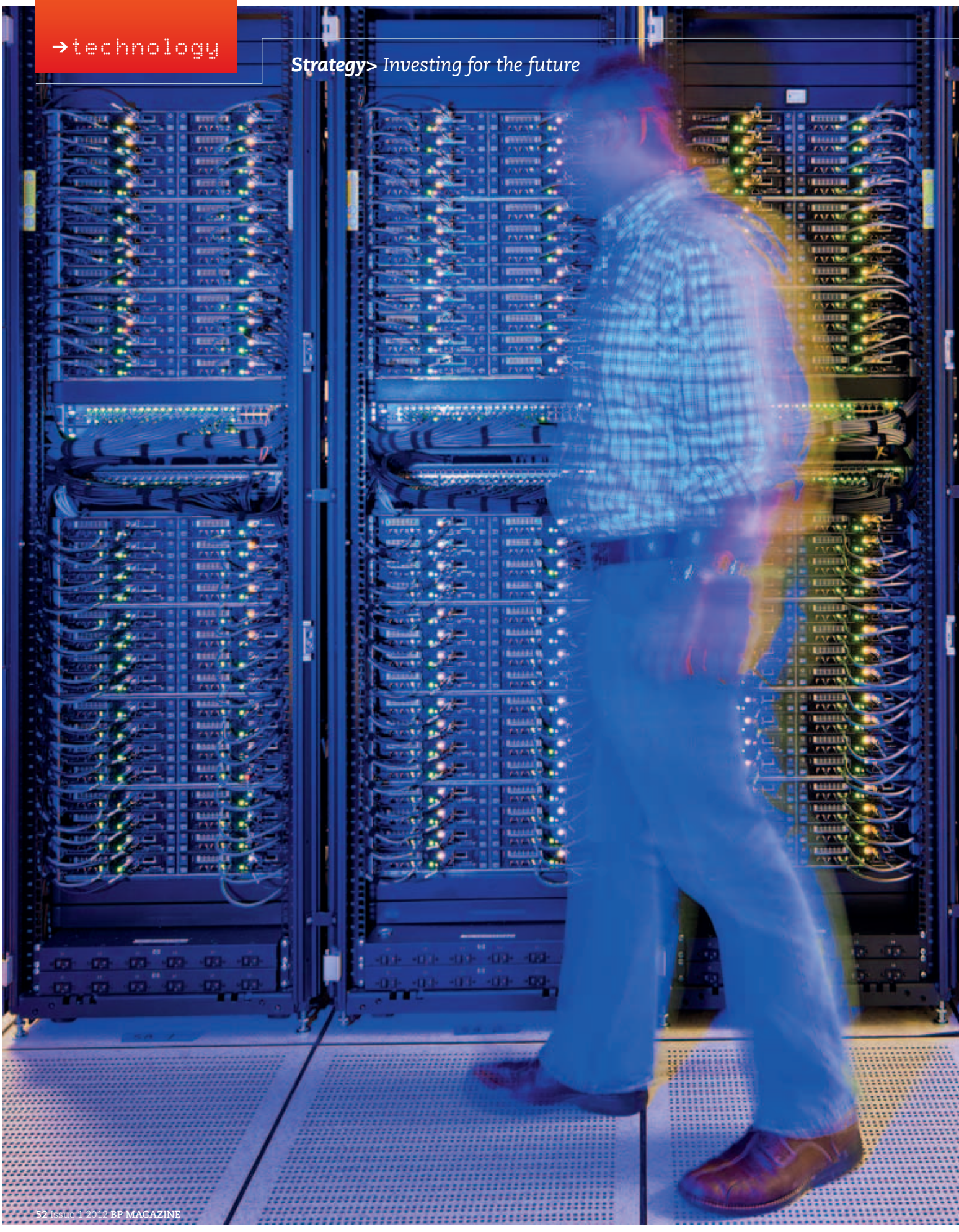
"We have to be sure we have competent people who know the E&SP inside out if the screenings are to be effective and credible," says Elizabeth Wild, director of social responsibility in BP's environmental and social responsibility and HSSE compliance team, part of the company's safety and operational risk function.

Jane Brown, environmental advisor for refining and marketing HSSE, is one of those certified facilitators and has screened several projects in the US, India and China.

"Screenings involve a wide range of participants, from joint venture partners to business development, security, communications and external affairs personnel, as well as managers, engineers, safety representatives, commercial experts and subject specialists from the project team," she says.

"This team is essential in order to identify the full range of potential project impacts, and some will also bring an important local perspective as well as their specialist area of expertise. A real benefit of the screening is that the wider team gets to understand the local environmental and social issues and is engaged at an early stage with looking for ways to avoid or reduce these impacts, for instance, in terms of changes to design, layout or location. Flexibility is a key attribute, and you need sensitivity to local issues."

Strategy> *Investing for the future*



Report> Lisa Davison
Photography> Marc Morrison / BP Imageshop

ADVANCED THINKING

For more than a century, the oil and gas industry has developed increasingly sophisticated technologies in order to better understand rock formations, produce more advanced fuels and lubricants and keep facilities running safely and efficiently. BP's head of technology, David Eyton, talks to *BP Magazine* about the company's approach and what the future holds.

Advanced seismic: BP's computing centre in Houston now has a capacity of a little more than one petaflop, making it one of the world's fastest civil supercomputers.

Broad scope: BP's head of technology, David Eyton (right). Opposite top, BP's biofuels capability has grown significantly in the past five years and spans the entire 'field-to-wheels' spectrum. Opposite middle, computer processing cables at BP's centre in Houston. Opposite bottom, an analyst labels a lubricants sample at BP's technology centre in Pangbourne, UK.

In 1961, former BP geologist-turned-lecturer Dr John Vernon Harrison received the prestigious Lyell Medal from the Geological Society of London. In his acceptance speech, Harrison – who had worked for BP between 1918 and 1938 – recalled 'strolling' about the Zagros Mountains in Iran with a colleague for almost eight years while "we mapped upon the clean paper on our plane-tables [used by geologists to rest on as they drew contours on their maps] the topography and geology of some 155,000 square kilometres [60 square miles] of southwest Iran as we saw it on the ground."

In Harrison's day, this onshore surface geological mapping was the only way to 'see' the geology of any potential hydrocarbon-bearing structures below the ground. Fast-forward a century and all that has changed.

Today, understanding the geology of the rocks around us remains important, but now BP is able to use advanced seismic imaging technologies that produce evermore precise maps of structures that lie below the Earth's surface, aided by some of the most powerful computers on Earth. In 2012, that technology took another leap forward as BP's computing centre grew to a capacity of just over one 'petaflop' – making it one of the world's fastest civil supercomputers. A petaflop is a measure of a computer's processing speed amounting to one thousand trillion (15 zeros) floating point operations per second.

Throughout its history, BP has been a leading explorer for oil and gas, enabled by its geophysical skills. What this extraordinary example shows is the critical role that technology plays, both in acquiring the data and processing it. "We invest more in seismic technology than any other upstream programme," says BP's head of technology, David Eyton, "underpinned by this massive computing capability."

It's true that science and technology underpin everything that BP does. But the organisation is also careful about how it chooses to develop its technology capability. The first call on BP's technology investment is helping the organisation manage its safety and risk management priorities. A good example of this is the installation of hundreds of corrosion sensors, codeveloped with Imperial College London, at all of its refineries worldwide. These sensors are designed to help refinery teams understand the real-time impact of acidic crude oils and, therefore, whether they should run a particular type of crude through the facility or not, and are paying the correct price for it. "Examples like this show how technology can support BP as it manages its risks more effectively, while at the same time being good business," says Eyton.

Another driver for BP's investment in technology is to create distinctive competitive advantage. In the upstream business, seismic imaging and its interpretation is one of the company's 16 major technology programmes, as is enhanced oil recovery (the ability to sweep more oil out of pores in the reservoir), along with the application of digital technologies that boost production. In refining and marketing, BP's petrochemicals and lubricants technologies are benchmarked as being at or better than the best and, while it's early days for biofuels, the breadth of BP's technology portfolio in this area is second »

"It was clear to me that scientific skills underpin transformative technology development and that if we wanted to be a technology leader…then we needed to build these capabilities."

David Eyton

to none. "We span the entire 'field-to-wheels' spectrum," says Eyton, "from our research into advanced energy crops, to demonstration plants in which to convert these, and the creation of advanced fuel molecules, all informed by our sugarcane production operations in Brazil."

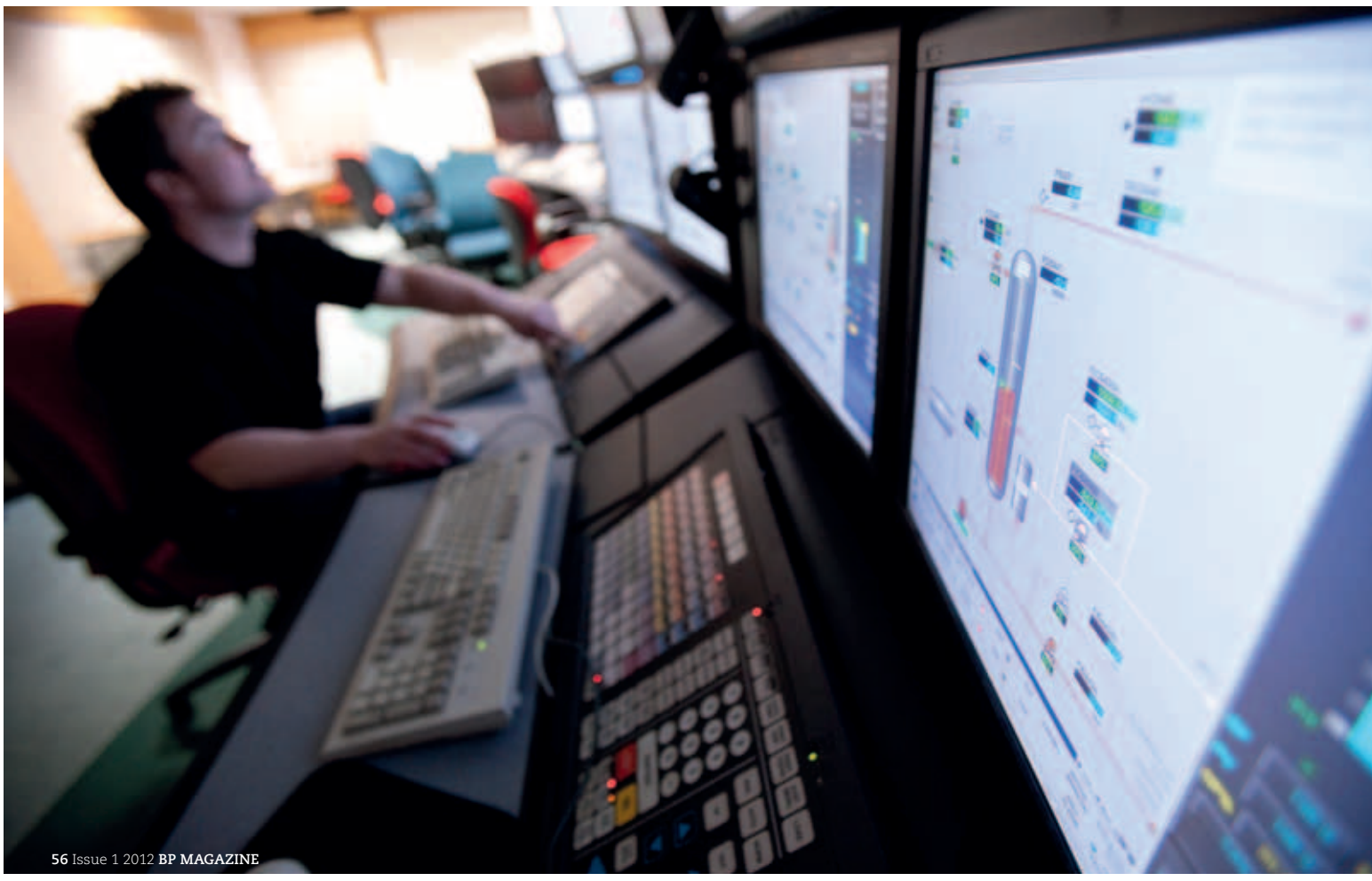
Supporting Eyton at the helm, BP's technology group now has three chief scientists – Ellen Williams, Vernon Gibson and John Pierce – who, broadly speaking, cover the core science subjects that children study in school – physics, chemistry and biology. BP has long had a chief scientist role, but Eyton decided the role needed to expand. "It was clear to me," he says, "that scientific skills underpin transformative technology development and that if we wanted to be a technology leader and manage our links with the external scientific world well, then we needed to build these capabilities. So between them, Ellen, Vernon and John spend part of their time working with our external academic partners and the rest supporting and stimulating the technology teams inside BP."

This balance between internal and external capability is important. BP spends roughly half of its technology budget inside the company, with the other half going to universities, small- and medium-sized enterprises and other joint venture partners. The decision on how to spend that money is taken on a case-by-case basis and, like everything else, is aligned with the company's strategy. "The danger of doing it all inside the company is you can become very insular and miss an important development," says Eyton. "But if you do too much outside, then you might not be able to generate as much value from the intellectual property generated. There is a balance to be struck."

Eyton believes that BP is establishing an appropriate balance, having developed strong collaborative relationships with universities around the world, mostly by adopting what is known as an 'open innovation' model. "The word 'open' is important. We have a number of such institutes that we fund, such as the BP Institute at Cambridge university, and the Energy Biosciences Institute [EBI] at Berkeley and Illinois," he says. "Academics are free to work on whatever they want. We present them with interesting challenges and they can choose to work on those if they wish. I think we have learned how to make the most of the academic freedom and support that exists in universities."

One of the best examples of this internal/external approach can be found in BP's biofuels business. In just five years, the company has moved from having a handful of bioscientists working inside the company, to setting up major external research programmes (including the EBI) and buying the cellulosic ethanol research assets and expertise of Verenium, adding more than 100 highly qualified bioscientists to BP's staff. "Balance is very important, but there is no single approach; it all depends upon the business and its circumstances," says Eyton.

Technology both informs and is informed by BP's strategy. This strategic



Practical application: a process technician at work in a simulator suite at BP's chemical plant in Hull, UK. A scientist at the Energy Biosciences Institute, one of several scientific institutions that BP funds.

alignment is crucial if the company is to continue to adapt to external trends, in technology and policy development. By keeping one eye on these, the technology group can help the company make key strategic decisions that will have an impact that lasts for decades.

"We monitor policy trends for issues such as water or climate change, which are often informed by science and technology," says Eyton. "And we monitor science and technology trends themselves. We also scan for gaps in our capability and disruptive technologies."

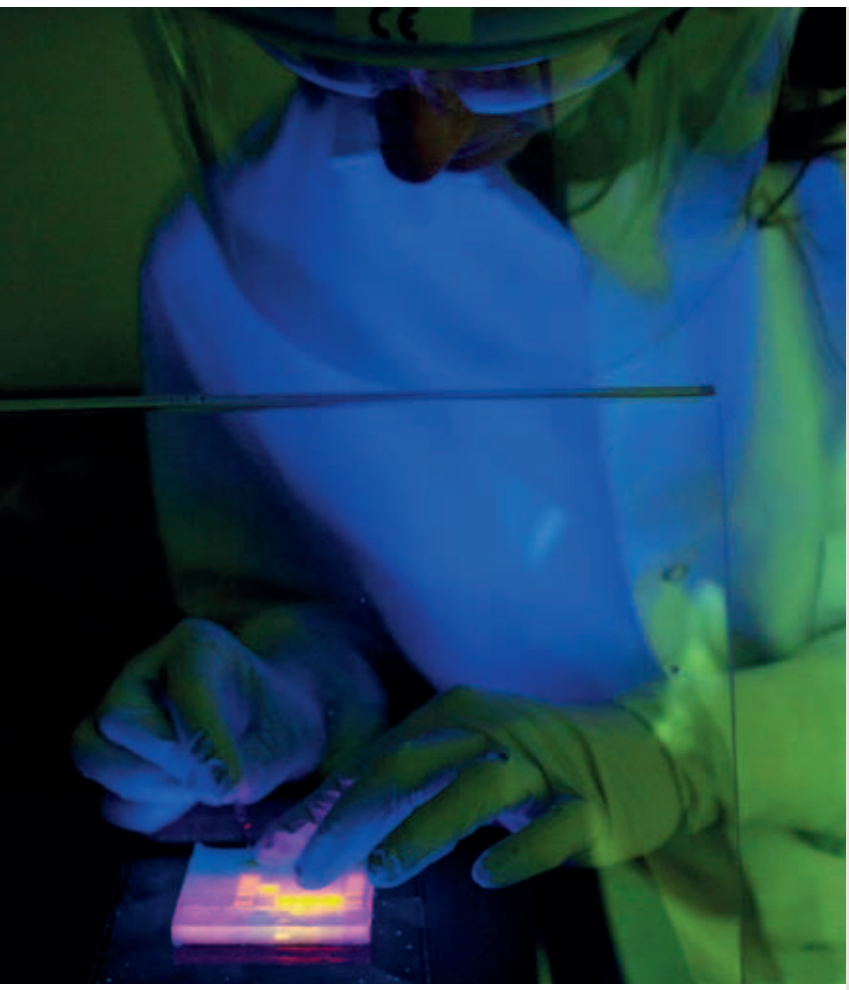
One area that may have a significant impact on BP is nanotechnology – which is not so much a technology as progressive miniaturisation and the ability to measure and manipulate materials at an atomic or molecular scale, says Eyton. "For example, everybody would like to have batteries that are more cost-effective and smaller, because then electric cars would be viable and renewable power could be stored more cost effectively. Therefore, there's a vast amount of effort going into nanotechnology for batteries. It's a long way off from being solved, but it is a potentially disruptive technology for our industry, so we keep a very close eye on it."

Helping BP is a group of eminent independent scientists and technologists from different countries, industries and academia, who sit on BP's technology advisory council (see panel below). This group meets four times a year to, as Eyton puts it, "kick the tyres" on BP's 16 major technology programmes. Each member sits on the council for up to six years, providing external challenge, advice and experience to BP's internal team.

By applying this additional external lens to everything the technology group does, BP can continue to adapt and invest in the areas that it sees as sources of strength, using science and technology to discover, recover and conserve more energy for another 100 years. ■

"We monitor policy trends for issues such as water or climate change, which are often informed by science and technology."

David Eyton



BP'S TECHNOLOGY ADVISORY COUNCIL

BP's technology advisory council has 13 members who meet twice a year to discuss the company's technology programmes. They are:

George David (chair) – BP non-executive director.
Professor Enrique Iglesia – Theodore Veremeulen chair, department of chemical engineering, University of California, at Berkeley.
Dr Peter Terwiesch – chief technology officer, ABB
Dr Scott Tinker – director of the Bureau of Economic Geology, state geologist of Texas, University of Texas at Austin.
Professor Sabyasachi (Shobo) Bhattacharya – Tata Institute of Fundamental Research, Mumbai, India.
Professor Susan Stipp – department of Geochem and leader of the NanoGeoScience group at the University of Copenhagen.
Professor Gerald Joyce – MD and PhD; professor of chemistry and molecular biology, The Scripps Research Institute.
Dr David Whelan – vice president strategic innovation, Phantom Works and chief scientist Boeing Integrated Defense, systems, space and security.
Professor Andy Hopper – professor of computer technology and head of University of Cambridge computer laboratory.
David Eyton – BP group head of technology.
Dr Ellen Williams – BP chief scientist.
Dr Vernon Gibson – BP chief chemist.
Dr John Pierce – BP chief bioscientist.

Energy Outlook 2030

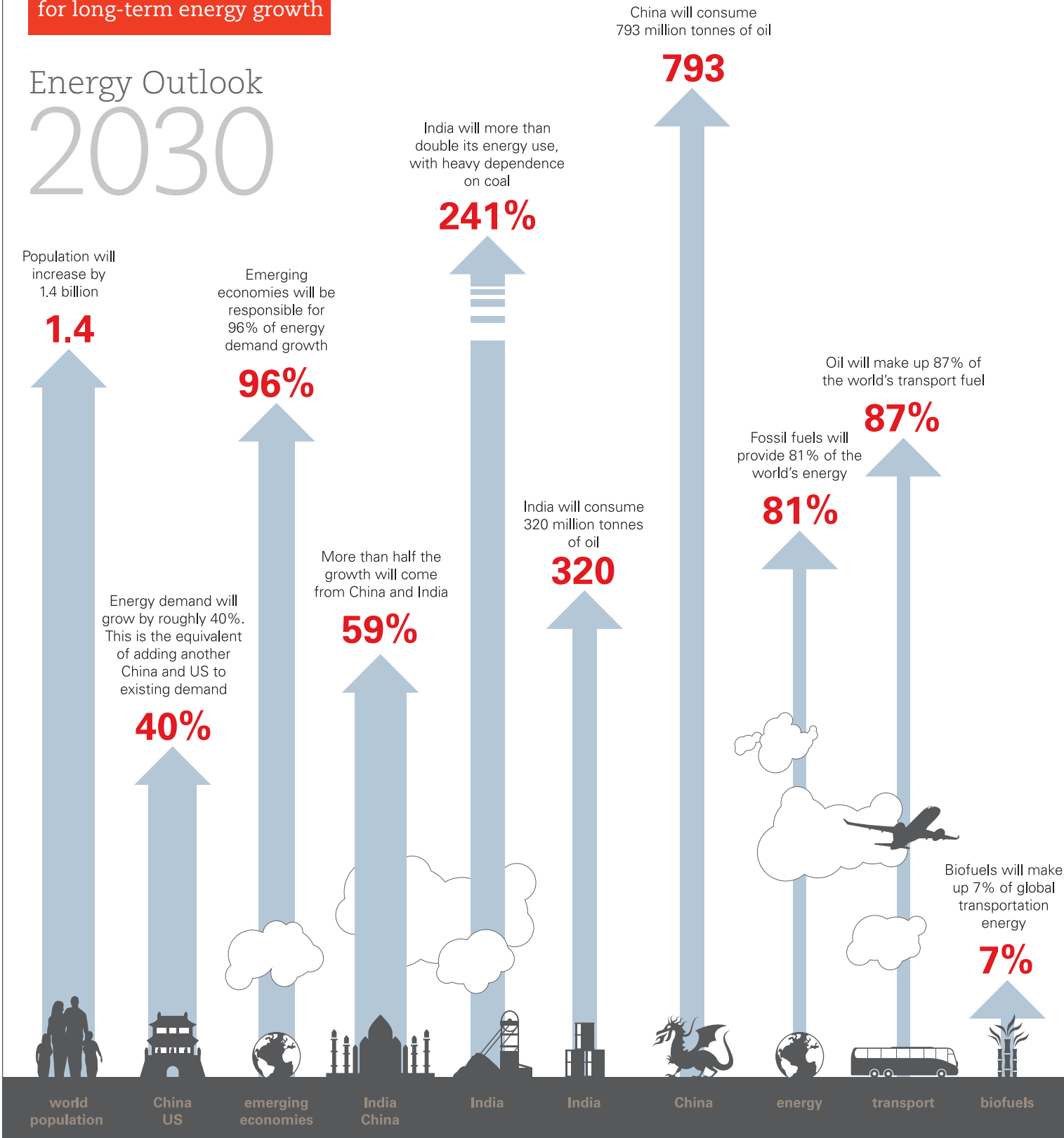
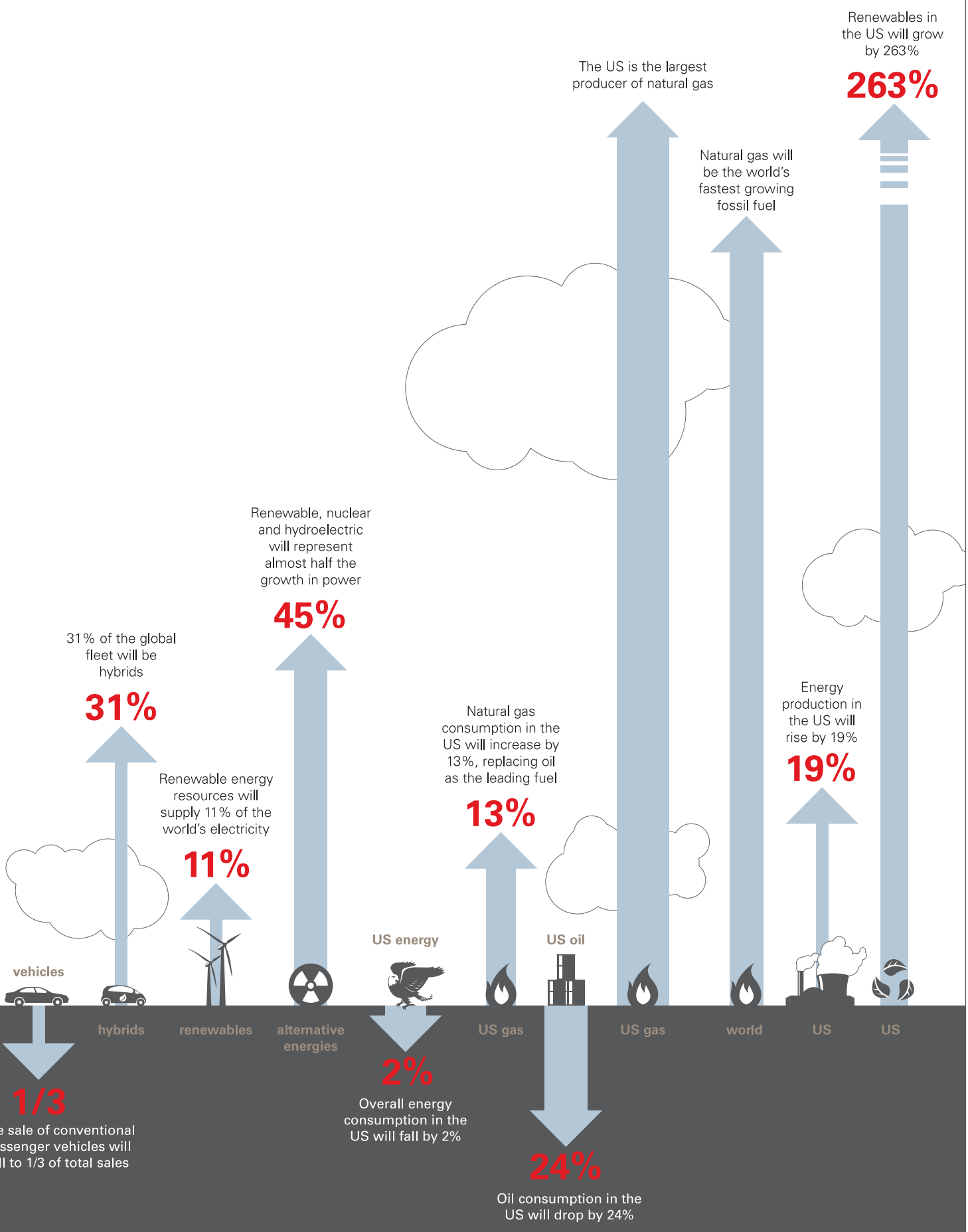
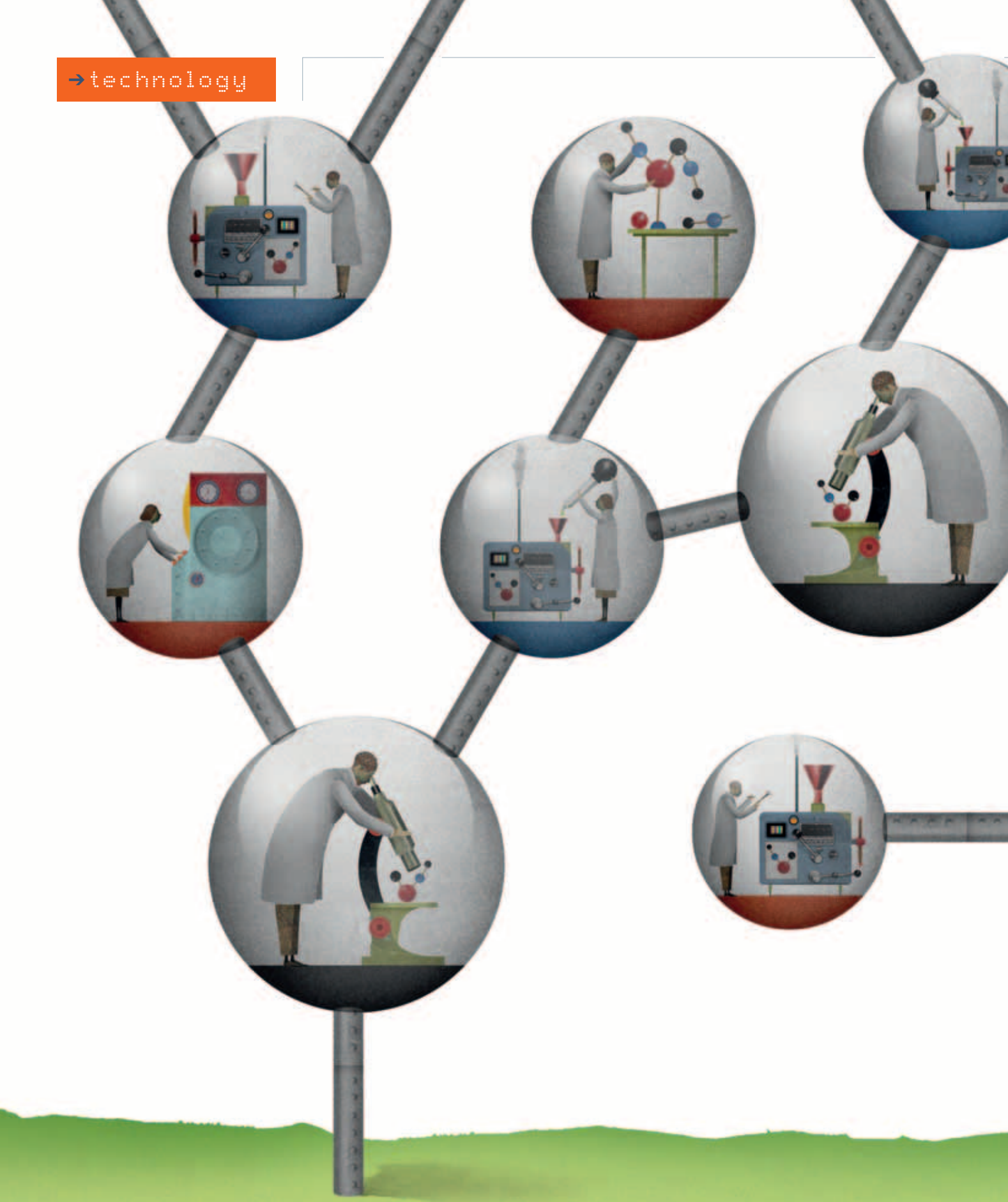
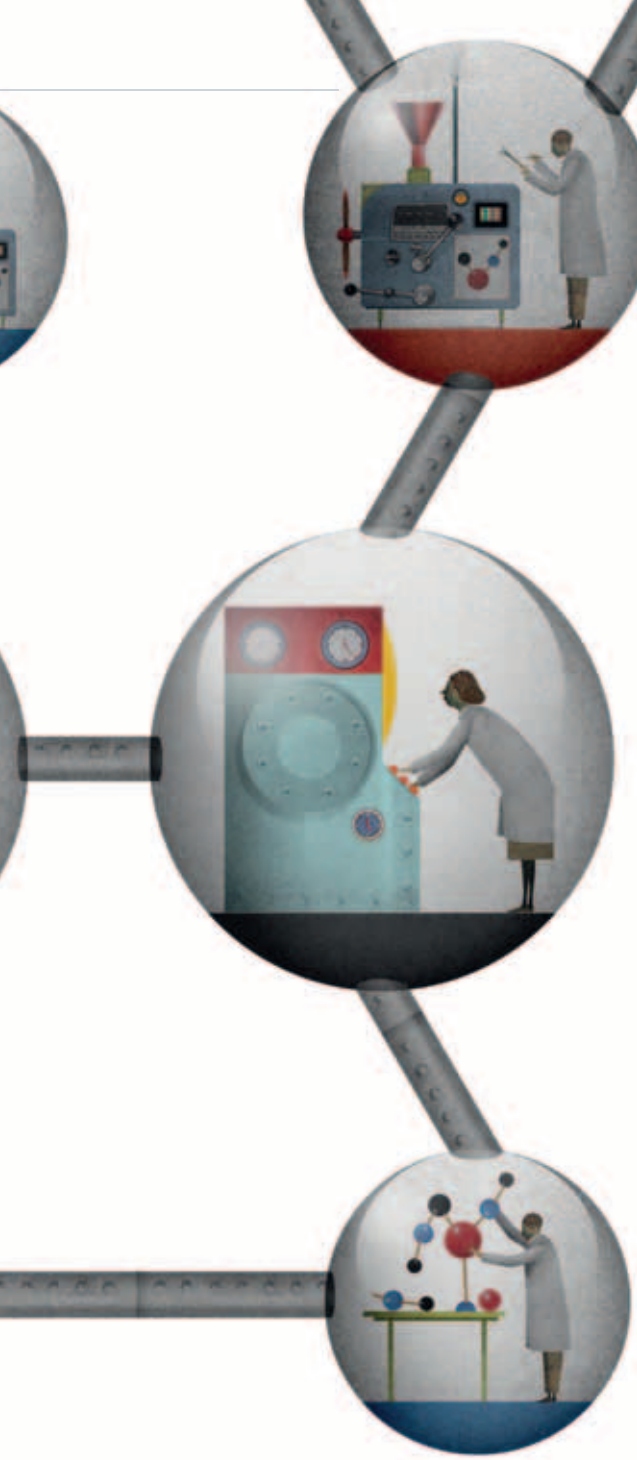


ILLUSTRATION: **MYLES TALBOT**



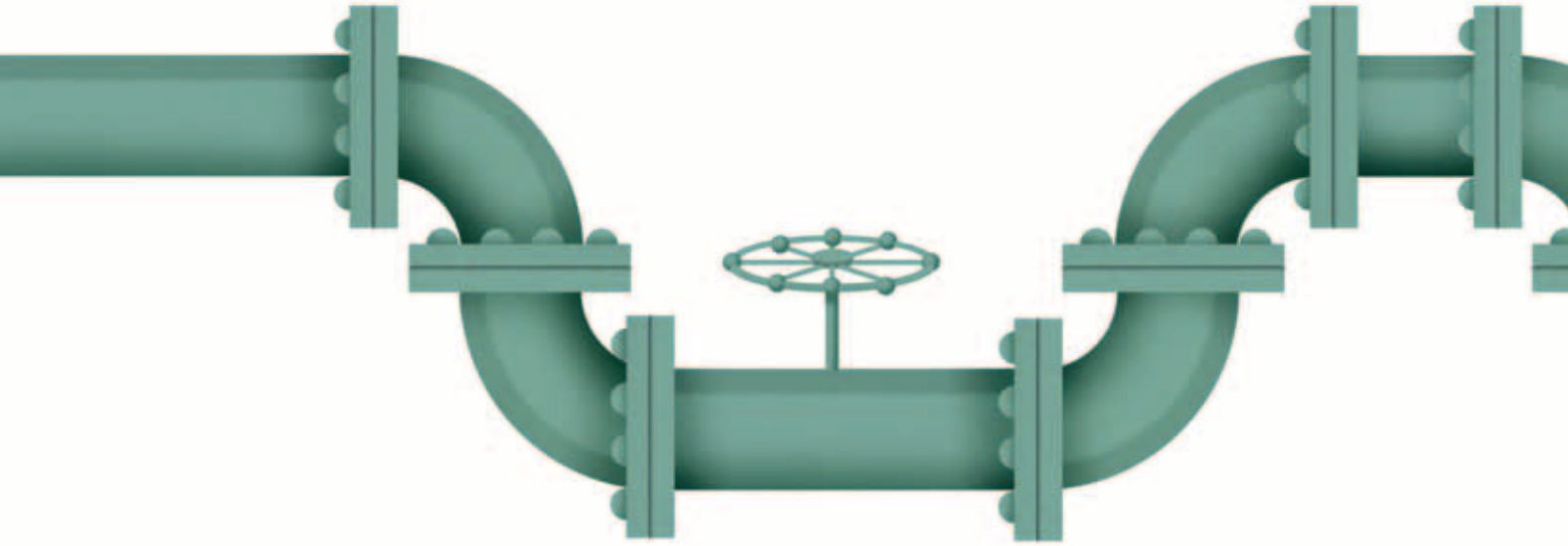




SCIENCE FRICTION

Across BP, surface scientists are coming together as one team through a newly-established network to help each other solve challenges that, at first glance, may not seem to have much in common.

Report> Martin Thomas **Illustration>** Brett Ryder



Surface science is all about interfaces – between materials, between solids, liquids and gases, between traditional scientific disciplines, and between disparate parts of BP.

It's where physics meets chemistry on an almost unimaginably tiny scale, as the individual atoms and molecules of solids, liquids or gases come into contact with each other. And it's where scientists from all over BP are finding a wealth of common ground that could be worth billions to the company.

Physics and chemistry have always involved an element of surface science – at an atomic level, there's a physical aspect of every chemical reaction. In recent years, this area of study has been termed nanoscience and it has seen an explosion of activity, prompted by improvements in microscopy – specifically atomic force microscopes becoming cheaper and more accessible and technical improvements in scanning electron microscopes.

In BP, surface science touches many parts of the company, ranging from exploration to lubricants and distribution (see panel opposite).

Given this cross-functional application of surface science, how does a company as large and diverse as BP ensure that the considerable surface science expertise available across its many functions and geographies doesn't end up working in silos and missing potentially important new ideas?

That's where the company's distributed research laboratory (DRL) comes in. The DRL was set up in 2010 to strengthen links between areas of expertise within BP and across universities and other external partners. It's a group-wide network of networks, with the aim of nurturing collaboration, building benefits of scale and joining areas of expertise.

The surface science network was the first of these to be established. It's led by Ian Collins, research and development programme manager in the team that's responsible for driving forward the technical limits of resource recovery from BP's wells. The network comprises 80 scientists – from exploration and production in Alaska, US, through refining and logistics technology in Naperville, US, to lubricants and fuels in Pangbourne, UK, and Bochum, Germany – who use surface science to solve problems in their working environments in BP, but their work has a direct bearing on the working lives of many hundreds of other BP people, whether they realise it or not.

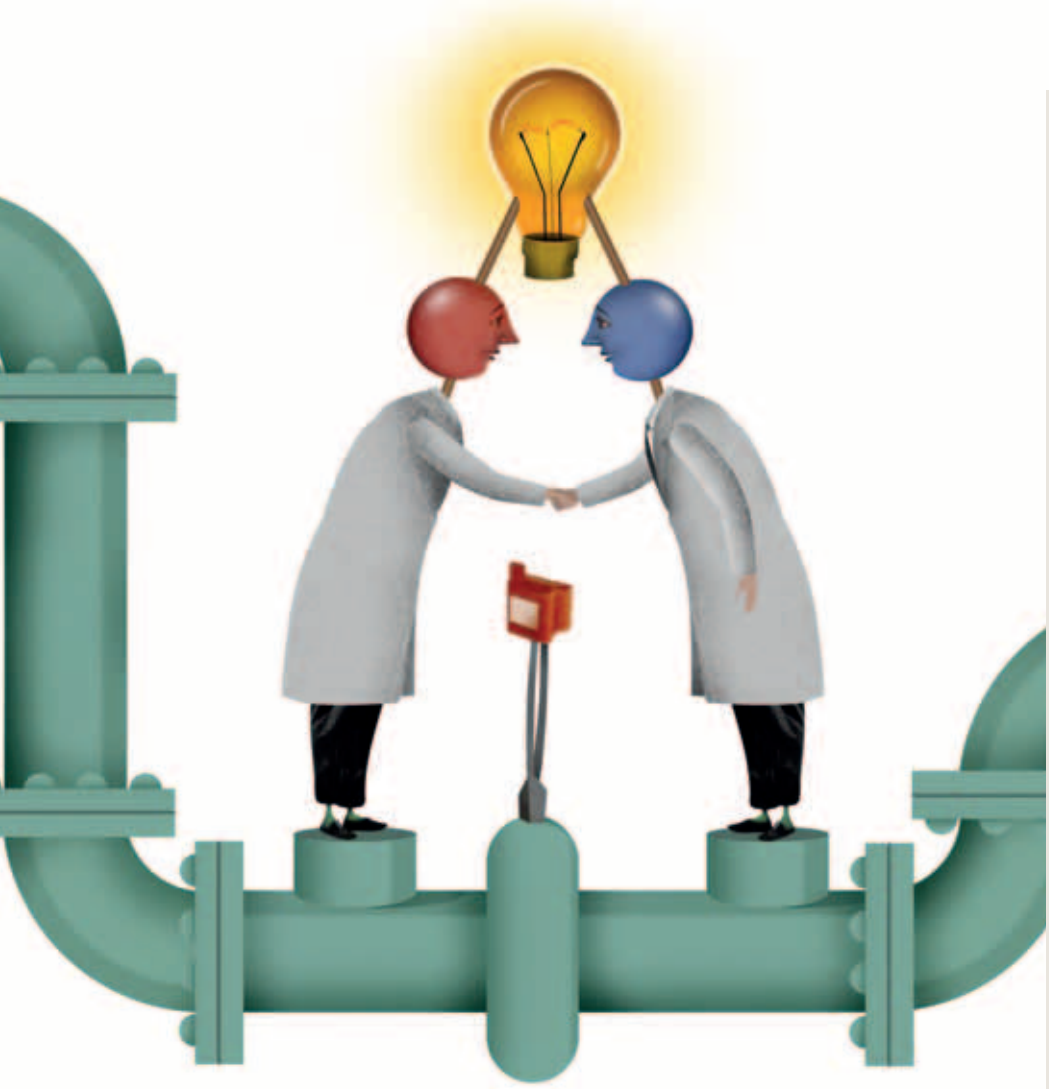
The collaboration made possible by the commitment of the surface science network has resulted in some breakthroughs that might not otherwise have happened, some of which have had an enormous impact on the business.

There are obvious benefits to setting up knowledge-sharing networks in a company as large and complex as BP. But it's one thing to set up such a network – it's quite another to give it real value by providing the resources needed to encourage a healthy flow of knowledge and the leadership support that will actually make things happen. The success of any network depends on an investment of time and effort from its members – and time is in short supply for everyone. BP's scientists all have demanding day jobs, with targets relating to specific and immediate challenges.

Collins acknowledges the challenge, but says BP is rising to it: "The business leadership recognises the benefits of these networks and there's a lot of flexibility around the time we spend on them. But the reality is that it is hard to find the time to really explore what resources we have across the company, where the expertise lies and what training exists. BP is expanding its scientific base to help address this problem. In my own team, we recruited two new chemists last year and there will be three more this year – and the picture is the same elsewhere. This helps to spread the load, freeing up people just a little to be more collaborative."

One of the team responsible for BP's DRL programme manager Peter Duff, says: "The

> "You'll get more out of a hundred brains than you'll ever get out of one."
>
> **Harry Frampton,** senior petroleum engineer and member of BP's surface science network



DRL was a concept developed by the chief scientists – initially based on [chief chemist] Vernon Gibson's vision of a laboratory connecting our eminent scientists. This has been developed under the leadership of chief scientist Ellen Williams, chief bioscientist John Pierce and Vernon, and is growing in scope and reach across our science and technology community.

"I believe four things must be in place to make this concept work – all of which we've made good progress on. The first is leadership support. In real terms, this meant our business and technology leaders taking a step back from the usual focus on the day-to-day and seeing the potential long-term benefits of this kind of network. We've been lucky in this respect, as senior managers really understand the value of this programme and have not merely supported it, but actively helped to drive it forward.

"The second requirement is for line management to support their staff participating in these networks. It's all very well having leaders on board, but the scientists' own managers have to be prepared to give them the time and space needed to build these networks. We've been working on building awareness to ensure that the business sees the value in it.

"We also had to put resources behind it. We've set up all sorts of networks in the past, but they have tended to be the first to be squeezed when budget cuts have been made. Now, we're providing seed funding for research that isn't connected to short-term deliverables and I expect that investment to grow.

"The fourth requirement is a cultural change that needs to take place among the scientists themselves. They need to believe in this process and they need to feel that they're involved in something genuinely worthwhile. There's plenty of evidence to suggest that this is happening, too."

There's one more prerequisite for success for any network: at some point, it must achieve what it was set up to achieve or no amount of support or encouragement will ensure its survival. Given the extraordinary amount that's been accomplished in its first year, members of the surface science network and the distributed research laboratory, of which it is a part, can be confident it has a bright future.

A JOINED-UP APPROACH

Production – surface science has a critical bearing on BP's efforts to extract more oil from its reservoirs. Scientists study the way rock retains the oil inside it and how the substances injected into rock to extract oil work. By understanding better how the oil is held within porous rock, BP scientists have been able to develop technologies that can break the chemical bonds holding the oil at the rock surfaces and so produce more oil.

Integrity – surface science is absolutely at the heart of areas such as pipeline corrosion and well integrity, and understanding how the corrosion inhibitors used to prevent degradation work, so that scientists can design better chemicals.

Lubricants – surface science is a huge part of BP's lubricants business, which, of course, is focused on finding ways to form a consistent and stable film between two moving surfaces to reduce friction and thus wear.

Refining – catalysts speed up the desired chemical reactions within refining processes, while limiting undesired secondary reactions. All of the important activity occurs at the surface of the catalysts, so understanding the physics and chemistry taking place there is the key to developing new and better catalysts.

Pipelines – when oil passing through pipes cools, it can crystallise and form a waxy substance that can stick to pipe surfaces and block them – a process called precipitation. Also, when gas passing through pipes cools, this often causes the water vapour it contains to become liquid. This water, together with methane molecules in the gas, can form ice-like crystals called hydrates that can grow to a metre or more in diameter. Hydrates can block pipes – or, if the pressure drops and then increases again, they can fly along them as potentially damaging projectiles. Scaling is also an issue in pipelines, just like it is in household water pipes, except that the results can be much more serious. For example, production wells can become blocked, requiring the well to be re-drilled. There are also safety implications of scaling, since valves can become stuck. In all of these cases, surface science is central to understanding the problems and seeking solutions.

THE NETWORK OF NETWORKS

Go with the flow

Simon Davies is a flow assurance engineer working in exploration, whose focus is on finding ways to keep fluids flowing in pipelines. Through the surface science network, he started talking to BP's lubricants team about a particular molecule they were considering adding to a new engine oil. Davies thought it might be possible to use the molecule to prevent hydrates sticking to the inside of oil and gas pipelines. This piece of lateral thinking – which emerged from the surface science network's first workshop – could have a significant impact. If the technology can be used to prevent subsea valves being blocked, it should reduce production interruptions and the need to deploy subsea vehicles to free up blockages.

Smooth partnership

There are a lot of molecules in a sump of motor oil – something like a million billion billion of them. If each molecule were a grain of sand, that one sumpful would make a knee-deep layer of sand over the whole surface of the world. It's the job of BP's Castrol team to make sure the best possible molecules are used to protect engines and improve performance. It takes special tools and knowledge to understand things so small and numerous and, through the DRL, the team has access to some of the world's most advanced equipment and the most skilled people. Castrol's Magnatec oils are a great example of this. Using test engines, the team spotted that warm-up is a time when engines can need wear protection, but can also fail to receive it. So, they looked for molecules with special properties that could plug that protection gap. The team partnered with a leading university and some of the world's best academic researchers to discover how they work and picture how they attach to surfaces. It took collaboration to identify the problem, and then to define the molecular behaviour, and then to confirm the performance in engines. The DRL gives the team access to the best resources and people in the world, helping to build their understanding and better equip them to develop technical solutions to real problems.

Chemical reaction

Chemical treatments sometimes need to be pumped into producing wells, for example to strengthen weak rock formations to prevent sanding – where solids (especially sand) can intrude into well bores and potentially disrupt operations. The environmental conditions are particularly extreme, with enormously high pressures and temperatures needing to be taken into account. By working with BP's lubricants experts and their analytical testing facilities at the Pangbourne technology centre, UK, the company's drilling scientists are gaining a greater understanding of the surface chemistry in these applications. One of the factors that's exciting scientists is that certain types of chemical can cause a strengthening effect and at the same time may improve the flow of oil from the well. Investigations – with the help of the advanced facilities at Pangbourne – could pave the way for a breakthrough. ■

Photography> Richard Davies

MASTER CHEF

Antonio Feliciano Luis / Chief cook

Some of the best Indian food you're ever likely to try cannot be found in any restaurant. Instead, you'd have to take a trip on one of BP's oil tankers. There, you might be treated to Antonio Feliciano Luis's signature dish: fish recheado. Made with white pomfret, kingfish or mackerel, it's an Indian dish of which Luis is rightly proud. "When I prepare it, I like the captain to come and eat fast so that it's hot!" Indian-born Luis is currently chief cook on the *British Kestrel*, and works hard to ensure the crew enjoys a nutritious diet. As well as managing a strict budget and even tougher hygiene standards (something he says BP provides lots of training and guidance on), Luis has to ensure he has enough food onboard to keep the crew going in between port stops. "We have frozen and dry stores that can last us for about two months," he says, "and then we get new vegetables on the way, but it might be a month before we can stock up again." Luis has 28 crew to look after, providing three dishes in the morning, five in the evening and another five later in order to cover shift changes. Luis loves his job, as he gets to meet a wide range of people. "Name the country and I have cooked for their people," he says. Like him, his current crew onboard the *British Kestrel* are Indian. "I'm proud to be their chef," he says. ■

THE RIGHT CHEMISTRY

BP is supporting six British athletes, and many other international sportsmen and women, as they prepare for the London 2012 Olympic and Paralympic Games. Sprinter and long jumper Stef Reid remembers her first experience of winning – at a school sports day, aged six. Born in New Zealand to British parents, she was brought up in Canada, where, one summer, a horrific boating accident resulted in the loss of her lower right leg. This seemed to put an end to her dreams of a sports career. However, one day in college, she asked to train with the track and field team, on her prosthetic leg. Her sports career was reborn and by 2008, Stef was representing Canada in the Beijing 2008 Paralympic Games. Now, she wears a GB vest and splits her time between London and Texas, US, where her husband works. Stef has a degree in biochemistry and has just completed a Master's in nutrition studies.

STEF REID

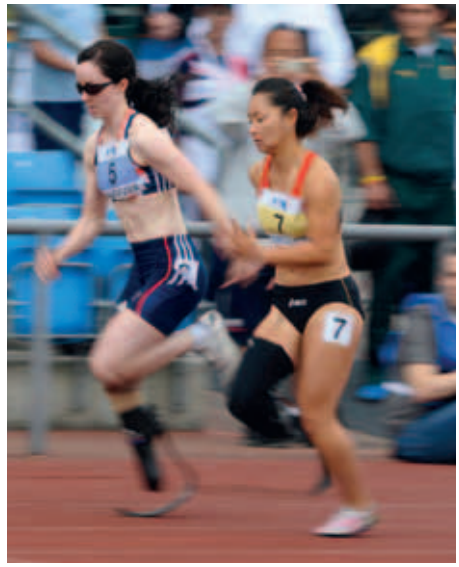
Sport: athletics
Event: 100 and 200 metres (T44 category), long jump (F44 category)
Age: 27
Main achievements: bronze medal in 200 metres T44 at the Beijing 2008 Paralympic Games; bronze in the 2010 Paralympic World Cup; world record holder for long jump (F44 category); two bronze medals at IPC World Championships in Christchurch, New Zealand in 2011

Report> Amanda Breen
Photography> Getty Images / Action Images


London 2012
Olympic & Paralympic Games
AVIVA
AVIVA
adidas

On the frustrations of her 2011 season...

My coach and I were committed to trying new things last year, including different training regimes, nutrition and new technology with the prosthesis. I had a great start and was smashing personal bests in practice, but picked up a stress fracture in my left foot – well, obviously my left one! It was hugely disappointing and put me out of running for eight weeks. When I started to train again, I then tore some cartilage in my knee. In hindsight, I'd actually say it was a productive year, as we learned about what works and what doesn't. I still managed to finish the season ranked number one in the world in my category for long jump, even though I competed only twice – and that was on my back-up artificial leg. Problems emerged when we changed things with my leg design; one good leg and one bad leg causes asymmetries in the body in terms of muscle development, so when things change, the imbalances flare up. But I need to correct those anyway, so I learned some important lessons. Injury prevention has to be my priority – I'm a workaholic and can train relentlessly, but if I can't make the start line, it doesn't matter how much training I've done.



Out the blocks: Stef (left) at the Aviva Great Britain and Northern Ireland preparation camp in New Zealand, 14 January 2011. Below, competing against Maya Nakanishi at the BT Paralympic World Cup in Manchester, 2010. Bottom, Stef (left) with Germany's Katrin Green and France's Marie Amelie Le Fur.

On her passion for playing rugby as a teenager...

I spent most of my school years in Toronto, where one of my teachers took the initiative to set up a girls' rugby team. When I was in grade nine, she recruited me to the team and I absolutely fell in love with the sport. My parents always encouraged us to be lady-like, so it was amazing to be out on a field, tackling girls and being covered in mud. The game fitted my attributes as an athlete perfectly; I was always very agile and had good speed endurance – I'd score more points in the second half when everyone was tired.

I actually quit ballet for rugby, which broke my mother's heart, but there was nothing better for me. I wanted to move back to New Zealand for university, to improve my rugby so I could eventually play for the national team. That was my goal and things were looking really good, as I'd climbed the ranks in Canadian rugby and some interest had been generated in my development.

Competitive spirit: Stef (centre right) running the 200 metres at the BT Paralympic World Cup in Manchester, 2010.

On adjusting to new circumstances after a freak accident...

The aftermath of the accident was very difficult for me; I remember lying in the hospital bed thinking, "I don't even know who I am if I can't compete in sport anymore." It was absolutely devastating and in the first week, I didn't care about anything or anyone. A nurse changed my perspective seven days after the accident – I had refused to eat anything and she slammed a tray of food down and told me enough was enough. She said a younger girl downstairs had lost both legs and could still smile. As I'm very competitive, I thought to myself, "I cannot believe a 10-year-old is coping better than me." Although I'd lost a foot, it was at that point I decided to be the best walker on an artificial leg ever. I had a new goal. A couple of days later, I went to find the other girl, and discovered that she didn't exist. The nurse had lied, but it didn't matter as she'd reminded me of the drive and determination I'd always had. Things were not perfect after that; it was a really long process, but I learned to give it time, until one day I woke up and the fact that I'm an amputee was no longer the first thought on my mind.

On being a BP London 2012 athlete ambassador...

This role with BP was totally unexpected and really just a dream come true. I'm a bit of a perfectionist and believe in excellence, so it's great to work with a company that has similar values to mine. Its support allows me to focus on training and has helped me to develop a whole new set of skills through the activities I'm involved in. I was asked to share some nutritional advice with staff, which appeared in restaurants and also in a short video. I enjoyed that so much as it's exactly what I want to do in life, when I'm away from the track.

On switching nations to compete for Great Britain...

It really wasn't difficult to make the decision – I grew up in Canada, but as soon as London won the bid for the 2012 Olympic and Paralympic Games, I knew what I wanted to do. My parents are British and feelings of loyalty and patriotism aside, the reality is that when a country hosts the Olympic and Paralympic Games, they make huge investments in their programmes, facilities and coaching. I want to win and to give myself the best possible shot, that came with Team GB – it's in the name, they are aiming for greatness.

It's been so awesome to be back, my extended family is here, but I've also made sacrifices. My husband is in Texas and having to do all this without your biggest support is scary. I also had to sit out of international competition for a year in 2009 to complete the switch. There were risks involved, but six months after joining Team GB, I broke the world record three times in the long jump, so I'm glad I trusted my instincts.

BP AND LONDON 2012

As the Official Oil and Gas Partner for the London 2012 Olympic and Paralympic Games, BP will provide fuels and engine oils for more than 5,000 official vehicles, as well as bottled gas for catering facilities at venues. BP is also a Sustainability Partner, with a key role in creating a lasting legacy after the Games end.

Advanced fuel options will help power the Games' fleets and as the Official Carbon Offset Partner with Target Neutral, BP's goal is to make sure that the carbon emitted from vehicles will be offset, helping to make London the most sustainable Games yet. London 2012 ticketholders can offset the carbon emitted as they travel to and from the Games by registering at www.bptargetneutral.com

Arts, culture and education have always played an important part in the Olympic movement. As a Premier Partner of the London 2012 Cultural Olympiad and London 2012 Festival, BP continues the long-time support of these areas.

• *Further details of BP's London 2012 activities can be found at* www.bp.com/2012

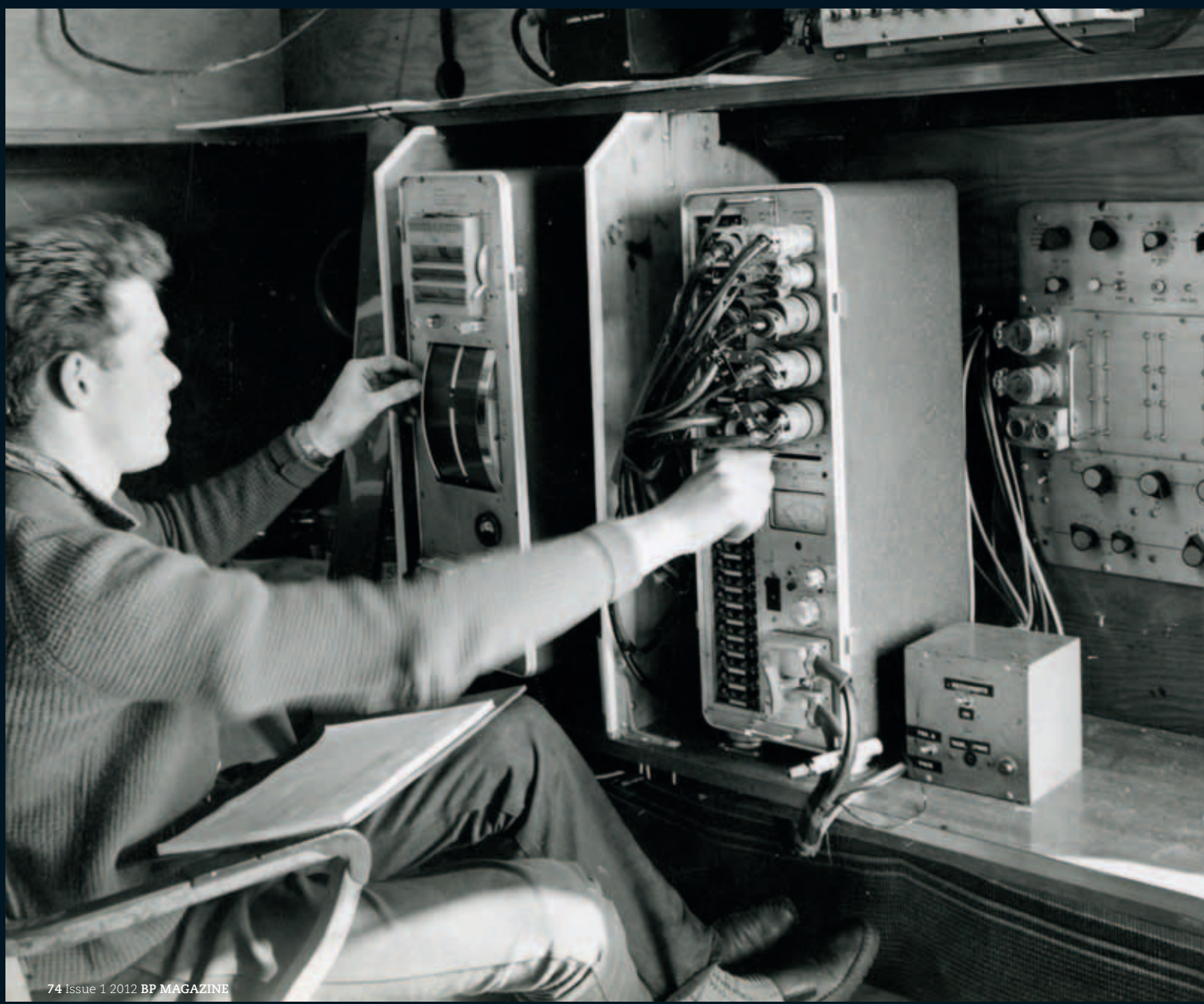
PHOTOGRAPHY: **STUART CONWAY**

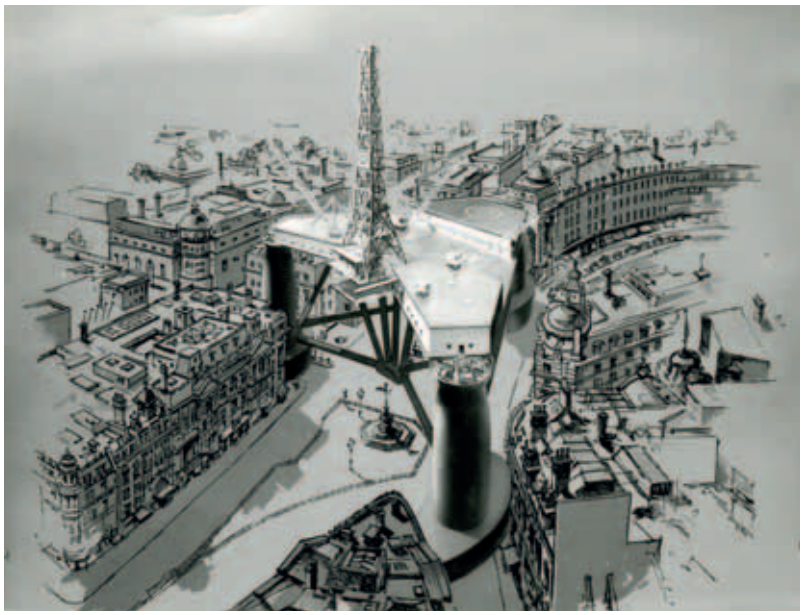
Class of 2012

BP has given 100 new recruits the chance to play an integral part in this summer's Olympic and Paralympic Games. The graduates have all been awarded short-term internships with the London 2012 Organising Committee (LOCOG). The graduates will begin the placements in June, before starting their new BP roles in September. BP is the only UK employer to offer such an experience to graduates and will provide an internship salary, accommodation and travel costs. The announcement was made on the same day that BP confirmed it is increasing its 2012 UK graduate recruitment intake by 50%, to almost 250 individuals. Here, a number of the BP graduates taking up LOCOG internships pose for the cameras alongside BP's head of UK graduate recruitment Emma Judge (below), and Olympic champion Dame Kelly Holmes (main image), who said: "It's great to see the UK's next generation of business talent being focused and determined to achieve their goals. I can't think of a better way for a graduate to start their career than a London 2012 secondment." ■

NORTHERN HEIGHTS

In 1965, BP discovered the West Sole field – the UK's first gas discovery. Since then, the oil and gas industry has collectively invested more than $450 billion in exploration, drilling and field development in the North Sea and produced some 40 billion barrels of oil and gas equivalent from the UK Continental Shelf. With BP and its partners announcing $16 billion in new investments over the next five years, we open up the archives to see where it all began.





Opposite: onboard the Texin survey vessel, October 1964. **Left:** an artist's impression of the Sea Quest semi-submersible drilling rig superimposed over Piccadilly Circus, 1964. The Sea Quest would go on to drill the well that discovered the giant Forties field. **Below:** the Sea Quest leaving Harland and Wolff's yard, Belfast, Northern Ireland, January 1966.

Right: on board the Texin survey vessel, October 1964. **Below:** life onboard the early North Sea platforms. **Bottom left:** laying pipeline in the North Sea. **Bottom right:** gas pipeline for North Sea at Brown & Roots yard, Great Yarmouth, UK.

Left (top and bottom): laying first section of submarine pipeline from the Forties oilfield from laybarge Castroro II, May 1973. **Top:** sous chef at the Northern Hotel, Aberdeen, UK, with icing sugar model of the Sea Quest drilling rig, 1976. **Above:** a Ben Maile oil painting of an oil rig. Maile was commissioned by BP to create a series of paintings, including some that depicted Alaska.

Photography> Stuart Conway

Ship ahoy

Photographer Stuart Conway shot many of the images in our North Sea feature on page 36, including this one taken from the drilling derrick on the Byford Dolphin rig. In the foreground, BP drilling engineer Claire Horsman stands looking out towards the standby vessel *Vos Vigilant* with the Murchison (left) and Thistle platforms in the background.

The next edition of *BP Magazine* will be out in July 2012.

BP Magazine was printed using vegetable based printing inks and low alcohol damping on press. The FSC® certified paper was manufactured using 50% de-inked post consumer waste fibre and 50% virgin fibre pulp sourced from well managed forests at a mill accredited for EMAS, ISO14001. Laminated using Biodegradable film

BP p.l.c
Chertsey Road
Sunbury-on-Thames
Middlesex
TW16 7LN
United Kingdom
www.bp.com/bpmagazine

Supporting Young Leaders for London 2012.

At BP, we're dedicated to fuelling the success of London 2012. We're supporting British athletes like Shelly Woods, and also providing leadership coaching to 100 children selected for the London 2012 Young Leaders Programme. These promising young people will inspire their communities through a wide range of local projects. ***Find out more at bp.com/london2012 or find us on***

official partner of the
Olympic and Paralympic Games

bp

London 2012. Fuelling the Future.