



The connected upstream

Gordon Birrell, chief operating officer production,
transformation and carbon





Dobroe utro - Good morning everyone.

On behalf of BP, let me say we welcome the opportunity to contribute today.

Thank you Eric, for the invitation.

We are privileged to have a distinctive position in Russia.

We have a lot of history here - a lot of experience - and we're very committed to further developing that position alongside our colleagues in Rosneft.

There are unique opportunities here that we can help to unlock together with our partners - as we are already doing in East and West Siberia.

As we all understand, the future has its challenges - the new realities

- Global energy demand is still rising, but at a slower pace.
- Hydrocarbon resources are abundant.
- Renewables are increasingly competitive.
- And the world is on a transition to lower carbon.

No country and no company is immune to the speed the world is changing, however, hydrocarbons will be required for a long time to come.

Looking twenty years out, we see oil and gas contributing more than half of the fuel mix in our BP Energy Outlook to 2035.

That is not very different to today - with oil down a little and gas up a bit. Within that mix though, hydrocarbons that are producible at lower cost are going to be dominant - which is going to require companies to change and modernize.

My role in BP is to make sure our Upstream business across the globe is ahead of the changes and highly competitive in a low-cost, lower-carbon world.

We are already some way along a modernization journey and I'll aim to give you a brief overview of our progress, with some specific examples from across the BP Upstream.

The connected upstream



Looking at our upstream as a whole, we have a vision that we call the connected upstream - a globally connected network of technology, people and digital processes.

Broadly speaking, that falls into four areas of activity.

The first is intelligent monitoring, and we now have more than 2,000 kilometres of fibre optic systems linking our offshore operations to onshore monitoring centres.

That's in addition to other systems that constantly assess equipment to detect potential faults and avoid costly maintenance later.

One example is the acoustic system used to mitigate sanding in the Caspian ACG field. Each hour we record a terabyte of data using such systems.

That is like downloading 1,000 Mosfilm films at the same time.

Second, and closely related, is system optimisation.

We use a tool called Apex to simulate and optimise production 24/7 by modelling physical constraints and adjusting flows accordingly.



The third area for digital investment is predictive analytics, where we are using a cloud-hosted wells data platform called Argus, which is in place on 99.5% of our well stock globally - so nearly 2,500 wells.

It's making well-sensor data available to engineers and operators within seconds for monitoring and value optimization.

Well reviews that used to take 1 or 2 people a month to prepare and now being conducted live in Argus, using material that's just a click away.

All of this is underpinned by a growing digital foundation

Data - and the ability to turn that data into insight and intelligence - is the key to transforming business performance and fundamentally changing the way we work.

We now have a data lake of over a petabyte - roughly equivalent to 20 million filing cabinets of information within "biblioteka imeni lenina", and every day we are pumping in a billion new data records from our operations.

That is roughly double the daily tweets on Twitter.

In 2013 we opened our supercomputing centre - one of largest research computer centres in the world.

At the moment it has 6 petaflops of power and that is rising to 10 petaflops - which I am told is 10 thousand trillion calculations a second.

Recently we conducted analysis in a week, where the algorithm helped unlock potentially 1 billion bbls of reserves, and in 1999 this calculation would have taken 2000 years.

Khazzan, Oman



Just to give you a very recent example of what being connected means, last week we announced the start-up of our giant gas project in Oman, in the Khazzan field.

It's a project that will involve us drilling around 300 wells over time in some of the deepest, densest, reservoirs in the world.

We have taken the tight gas technology and fracking techniques we've perfected in the onshore US and transferred that experience to Oman, with very satisfactory results.

The early progress was so encouraging that we agreed an extension to the project that will add another half-a-billion cubic feet of gas a day to the current Phase 1 plateau production of a billion cubic feet a day.

Given the high number of wells and the potential to translate improvements from one well to the next, Khazzan is proving to be a great test bed for a range of new digital drilling technologies.

We have pioneered digital technologies that have enabled the Oman team to produce a field development plan in under a week instead of the usual three or four months and to optimize the drilling sequence in two or three days instead of two months.

We also piloted a tool that's now in use on all the rigs in the region that provides near real-time automated and objective analysis of drilling performance - cutting out the 24-hour wait for results and the associated outsourcing costs.

Transforming exploration



Oman is an interesting example because the journey to where we are today started with the transformation in what can be achieved with seismic data.

BP has long been an innovator in the field and we are continuing to work on a range of new developments that are contributing towards a leading position for us this year in terms of discovered volumes.

So far in 2017 we've made four significant discoveries and identified a new 200-million barrel field within our existing Atlantis field in the Gulf of Mexico.

It was revealed by the sharper images we can produce using BP proprietary algorithms applied to a technique called full waveform inversion, which matches seismic simulations with existing seismic data to produce high quality subsurface images.

We're also working on digital tools that will enable us to examine and compare data archives for thousands of wells - and by making simultaneous comparisons possible we believe this will enable us to readily identify the highest-value opportunities overlooked by older methods.



We also recently invested in a tech start-up called Beyond Limits, which will give us access to artificial intelligence and cognitive computing expertise developed for NASA's space exploration programme.

The latest innovation we are involved in is one we have very high hopes for.

It's a project called Cheetah - or project Gepard here in Russian - and like all the best ideas it's a very simple concept.

Take the technology used for big seismic surveys and make it smaller, cheaper and more portable, without compromising the quality of the results.

Conceptually, it's like the difference between smartphones and telephones - and by telephones I mean the old ones with wires into the wall.

It started with an idea in the head of one of our BP experts, and we supported the early development work on it.

But we knew we could move quicker with the right partners.

So now we have a project - which Rosneft and Schlumberger's WesternGeco are equal partners in, to make it easier and quicker to acquire seismic data in remote and difficult terrain.

Areas where access is limited by topography or ground cover or extremes of weather.

Like much of Siberia, in fact, where we think it's going to revolutionize land seismic acquisition.

To put it simply - it's about building light-weight receivers. The picture you can see behind me shows one working on the ground.

As you can see, their size means they can be deployed more quickly and easily, to cover vast exploration areas with a 3D array, as opposed to 2D, to get much better subsurface data.

The expectation is to cover 30% more area in any set timeframe - so it's quicker, more cost-effective, and it produces better images.

By the end of October we will have conducted two field trials, in Norway and Abu Dhabi, with encouraging results so far, and we have plans for two more in Russia next year.

Transforming operations



Let me finish with a few examples of the progress we are also making in our global operations.

One tool we have been developing with GE is something we call Plant Operations Advisor.

I like to think of it as a scientific crystal ball - one we can use anywhere in the world.

Once it is rolled out it will predict the future based on a bank of data that is increasing all the time.

By interrogating that data - continuously and automatically - it can identify anomalies, the likely cause and what's needed to resolve it.

What does this mean for business?

It means reduced downtime, with problems fixed before they result in a shutdown.

Imagine being in charge of a plant and the gas compression system starts to vibrate.

It might be a mechanical problem, like with a bearing - or it might be process problem, such as liquid carry-over from the separator.

You don't know, so you shutdown the plant.



Mechanical engineers will need to look at the machinery data and process engineers will need to analyse the plant data for root causes.

With Plant Ops Advisor, you get all the relevant data on a single screen, it does the analysis and it guides the engineers to the root cause.

If it's a process problem, that can be fixed without shutting down.

If it's a mechanical problem, then you can plan the maintenance in a way that is most efficient.

Already from piloting at our Atlantis field in the Gulf of Mexico we are seeing huge potential in terms of safety and reliability and we are planning to deploy the technology across our facilities globally over the next two years.

This is actually just one of a whole range of transformational technologies we have under development at the moment.

We are using permanently-installed guided wave technology to remotely monitor the integrity of pipelines, including millions metres of pipeline in the Arctic, in Alaska. It means we can reduce the need to send people out in difficult conditions, and avoid removing insulation as much as possible.

We've got robotic crawlers inspecting the hulls of ships, avoiding the risks of putting divers in the water and saving millions of dollars each year in inspection and maintenance costs in our Angola region.

And we're about to roll out a new tool we're calling Operator Workbench to all of our operational site staff in 10 countries around the world.

It's essentially a tablet that brings together all our various operations platforms for procedures, work orders, hand-overs, self-verification and systems monitoring on a single mobile device.

That enables two transformational changes.

First, it means that our site teams can access all the relevant data for the equipment they will work on that day.

They can be more aware of equipment performance on site, better able to spot anomalies, and in a better position to bring in engineers that can fix things before equipment deteriorates and needs a bigger overhaul.



Second, it means we can update information to everyone, instantly. Inputting the information just the once, in one system.

So, for example, no need to copy and paste data from an operator's log to the shift handover document anymore. And once developed, that information will be available in multiple languages.

And it means any member of the team, anywhere in the world, can access what they need, where they need it, when they need it.

So it will make it easier to get work done on the frontline, easier handovers, and easier to track task completion across disciplines and shifts and to self-assess and follow up.

People, skills and mindset

Those are just a few of the practical examples emerging from our modernisation programme so far, and it is making a difference.

Over the last few years we have seen safety improve, reliability improve and costs improve.

Our unit production costs are down 33% on 2013.

Cash and capital costs have come down \$9bn in 3 years.

And our base production decline was 1% last year instead of the originally expected 3 to 5%. That is production before we add in production from new wells.

So the modernisation programme is playing a big part in BP's future, alongside our growth plans, of 5% per annum average production growth out to 2021.

By then we expect to have added more than a million barrels of oil equivalent per day, compared with 2016.

That is a good start, but it is only the start. We have a vision of an upstream business that is fully globally connected - and by connected I mean our physical equipment, our digital processes and our people.

I'd like to finish on that last point, because none of this can happen without having the right people with the right skills and the right mindset for the future.



As well as technological change and process changes, people need to change as well - to learn new skills, new ways of working, and to be open to keeping pace with the speed at which the world is moving.

Of course, these changes can only take place if leaders embrace change themselves.

In my case that has meant spending much more time with technology companies, learning about AI, robotics, automation and a lot more - and figuring out how we can apply this wave of innovation to oil and gas production.

More broadly, we are putting a real emphasis on developing people who are prepared to think, who are keen to keep learning and improving, and who are highly focused on what keeps BP competitive and a leader in what we do.

And one last thing that hasn't changed.

Above all, this is a relationships business. So while the future is going to be different, it will always depend on being able to work productively with others and build the kinds of partnerships and relationships that have been the cornerstone of the industry for as long as I can remember, and long before that.

Finally, let me say a word or two about Rosneft.

This is a company we greatly admire in BP.

We're proud of the relationships we have built on many levels and we see the potential for much more collaboration in exploration and production projects - particularly in areas where technology and innovation can be applied.

Spasibo, thank you.