

## Oil & Gas Practice



# Tackling the asset production efficiency crisis in the North Sea

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# Tackling the asset production efficiency crisis in the North Sea

*North Sea offshore oil and gas asset production efficiency has fallen to record lows, costing industry and government billions in lost revenue and jeopardising the long-term sustainability of the basin. We propose three solutions to tackle this problem: fix the basics of reliability and maintenance; establish standards in common operating tasks; and regenerate critical infrastructure within prominent hubs.*

The North Sea has been an enormously successful offshore oil and gas basin. To date, the industry has produced some 42 billion boe in the UK and 39 billion boe in Norway. Giant fields such as Forties in the UK and Ekofisk in Norway have gone far beyond their expected production lives and, more recently, have set regional efficiency standards despite their advanced years. However, sadly, not all fields today can claim the same.

Data recently released by the UK's Department of Energy & Climate Change confirms that production efficiency on the UKCS fell from 81 per cent in 2004 to just 60 per cent in 2012. Our own analysis of regulatory data and proprietary benchmarking shows that over the past decade, asset production efficiency has declined by over 1 per cent a year across the North Sea and is now at record lows in both the UK and Norway. Furthermore, our data indicate that Norway is precisely following the UK trend when the 10-year difference in maturity between the two continental shelves is taken into account (see *Exhibit 1*).

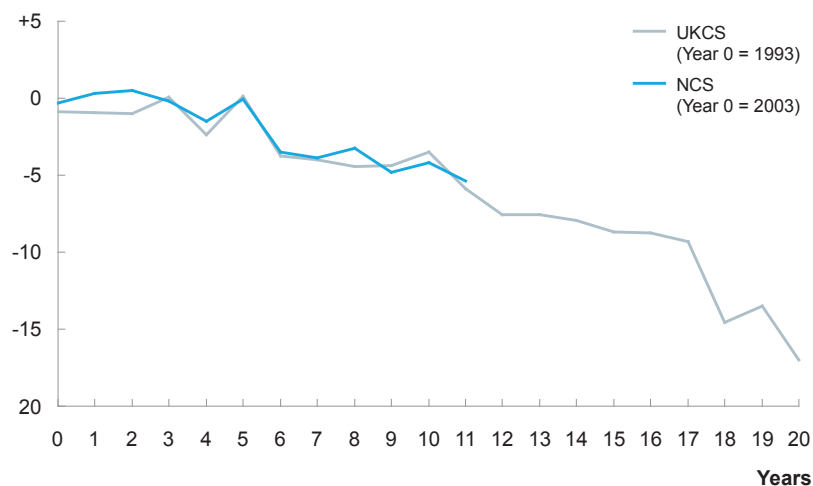
This deterioration in asset production efficiency has cost the North Sea upstream industry over 900 million boe of production and \$60 billion in revenues since 2005 – but we believe that this trend can be reversed. The industry has started to respond through joint government-industry bodies like PILOT and its Production Efficiency Task Force (PETF) in the UK. We are convinced that operator capabilities are central to the challenge, and that operators must remain at the forefront of tackling it; we describe why and how in the following pages.

## EXHIBIT 1

### Asset production efficiency trends in the UK and Norway

#### Trend in asset production efficiency, country averages

Per cent of estimated production potential based on monthly production



SOURCE: McKinsey Global Offshore Asset Efficiency Database

### Drivers of the decline in asset production efficiency

It has always been difficult to keep equipment working on an offshore oil platform. Machinery is exposed to salt water and pushed hard 24 hours a day, crucial spare parts may be a helicopter journey away and changing shift patterns can result in a single position being covered by up to six different workers in one month. It is perhaps no surprise then that equipment breakdowns and maintenance interventions – both planned and unplanned – cost the industry dearly. Over the past three years, as data from PETF have shown, plant equipment failure and unplanned shutdowns have made up nearly half of the overall losses on the UKCS, with a further quarter resulting from planned outages (the rest were due to work on wells, reservoir and export losses).

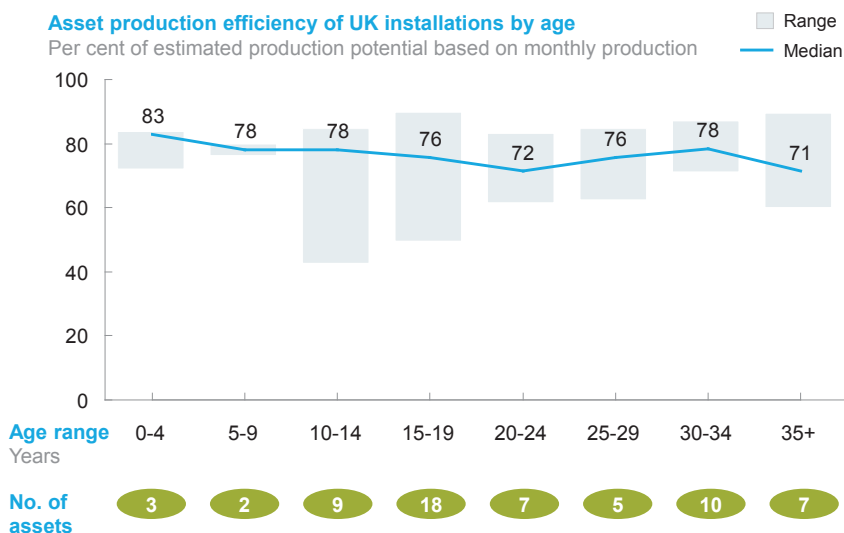
So why has delivering sustained and high production efficiency become much more challenging over time? Our analysis of 20 years' worth of regulatory data on 400 North Sea fields, as well as interviews or discussions with over 50 North Sea field managers, points to some crucial hints. First, consistent with the analysis conducted by the PETF, it dispels the commonly held belief that age is a barrier to good performance. Second, it identifies the two factors that most strongly correlate with performance: export system dependency and the quality of operator practices and approaches.

### Age is not a barrier

Our analysis of asset production efficiency correlated with the age of installations has proven that age alone does not explain lower asset production efficiency. In fact, as shown in *Exhibit 2*, some of the old installations are running just as well as or better than the new ones. This therefore raises the question: if age is not the primary driver, then what is?

EXHIBIT 2

#### On the UKCS, age alone does not explain lower asset production efficiency



SOURCE: McKinsey Global Offshore Asset Efficiency Database

### *Position on the network matters enormously*

Since 2000, indirect hubs and dependants (i.e., those fields that are tied to and rely on third-party hubs for export) have had consistently lower asset production efficiency than direct hubs, and the performance differential is widening (see *Exhibit 3*). The North Sea is an increasingly interconnected system with most fields relying on a third-party platform for export. An outage at an installation housing a major export route can have severe knock-on effects on its dependants. For instance, when a hydrocarbon leak was discovered at the Cormorant Alpha platform in early 2013, its operator had to close the Brent crude oil pipeline which flows through it<sup>1</sup>. The outage affected 27 other fields. Prolonged outages such as this can have an industry wide impact on production and asset production efficiency. However, given the downward trend in both direct and indirect hubs and fields, it is clear that this is not the only reason for the decline.

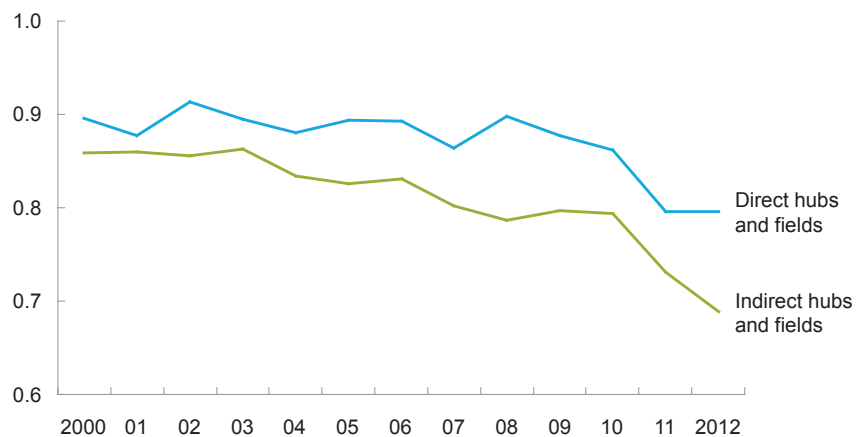
<sup>1</sup> Reuters

EXHIBIT 3

#### **Indirect hubs are significantly less efficient than direct hubs, and the gap has widened since 2000**

##### **Asset efficiency of UK installation by network position**

Per cent of estimated production potential based on monthly production



### Capabilities are critical and the bar is rising

Not all operators have seen their asset production efficiency affected in the same way. When we look at individual contributions to the overall decline in efficiency on the UKCS from 2003 to 2012 we see a wide range of performance. There are two operators, both new to the basin, who actually improved production efficiency for their assets during the past decade. Over the same period, five operators accounted for over 80 per cent of the decline in asset efficiency, despite operating just over a third of the production (see *Exhibit 4*).

Regardless of company type, size and history in the basin, operator maintenance and reliability practices and approaches are the most significant differentiators between leading and lagging performers.

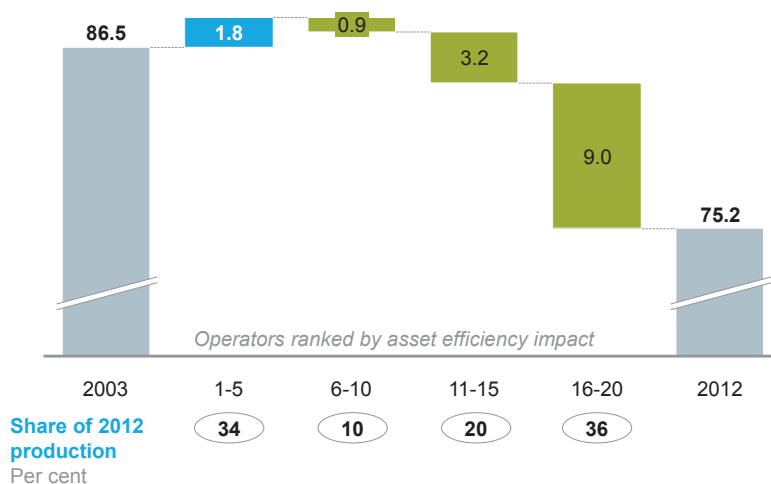
We looked at production efficiency correlated with reliability practices in 2005/06 and then again in 2010/11. Best or good practice operators had higher asset production efficiency regardless of the year of study. In fact, leading performers were further ahead of less advanced operators in 2010/11 than they were five years earlier (see *Exhibit 5*), indicating that the bar for good performance is rising.

EXHIBIT 4

#### Some operators have had a disproportionate impact on the efficiency fall

##### Change in asset production efficiency by operator

Per cent of estimated production potential based on monthly production



SOURCE: McKinsey Global Offshore Asset Efficiency Database

To find out what made the difference, we held in-depth interviews with platform operators in our benchmarking group to explore their maintenance and reliability approaches and techniques. This research revealed a group of practices that make a decisive difference to reliability performance in the offshore environment. In particular, high performing operators were far more likely to:

1. Challenge and minimise planned downtime.
  2. Continually improve reliability by learning from failures.
  3. Create a culture of responsibility in operations.
1. **Challenge and minimise planned downtime:** Planned downtime takes many forms, from short scheduled stoppages to carry out preventative maintenance to longer turnarounds to replace worn-out equipment or conduct more substantial maintenance interventions. One of the key differences between high-performing platforms in our survey and the rest of them is that the best performers do their utmost to minimise the duration of planned maintenance stoppages. They use a number of techniques to do this, for example, detailed planning and preparation before the event so that all the necessary parts, equipment and manpower are in place to complete the work in the shortest possible time, for example, and adopting documented standards for maintenance work to ensure that activities are conducted as efficiently as possible.

However, the most significant difference was the mindset of the best performers who fundamentally believed that work done during these events should be minimised. Less productive platforms might treat a shutdown period as a good time

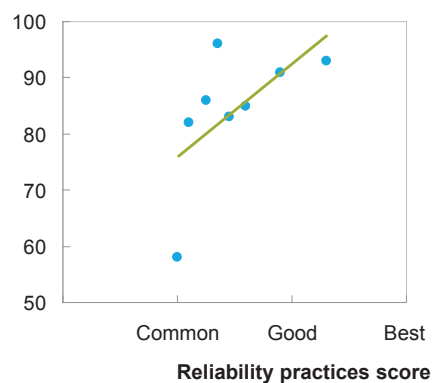
#### EXHIBIT 5

### Practices correlate with performance, and the reward for good performance has increased

● North Sea offshore operators

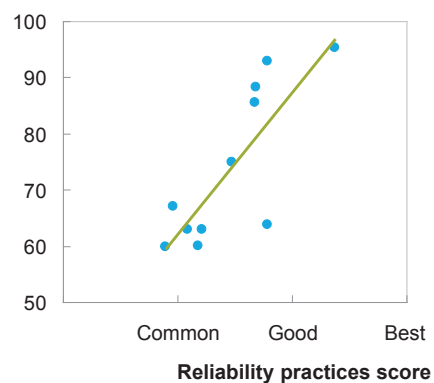
#### McKinsey reliability survey results 2005-2006

##### Production efficiency Per cent of MPP



#### McKinsey reliability survey results 2010-2011

##### Production efficiency Per cent of MPP



SOURCE: McKinsey Offshore Operations Benchmarking Database

to complete a long laundry list of maintenance tasks that has been building up since the last intervention. The best, however, are determined to exclusively conduct only the most essential activities during turnarounds and postpone all others until normal operations resume. One high-performing operator, for example, brings in reliability specialists from elsewhere in the company to study turnaround plans and eliminate unnecessary activities wherever possible.

2. **Continually improve reliability by learning from failures:** A doctrine of continuous improvement is the second key area where high-performing platforms in our survey differentiated themselves from the rest. While low performers only sometimes carried out detailed investigations into safety-related failures, high performers were much more thorough. In fact, the best companies routinely prioritise and conduct in-depth investigations into the root causes of failures that result in lost production, often making full use of advanced analytic techniques. Once causes have been identified, these companies will, where possible, make appropriate changes to equipment, operating protocols or maintenance strategy to minimise the chances of recurrence. The investigations root out causes of losses both from larger events and frequent smaller failures.
3. **Create a culture of responsibility in operations:** Differences in equipment reliability among the platforms in our survey did not only involve maintenance processes. The way platforms are operated is equally important. In fact, the best performing operators have been extremely successful in instilling a real sense of responsibility for the care of equipment by those who use it every day. Top-performing operators frequently use the phrase “ownership” when describing the attitude of their offshore workers. This culture of responsibility is supported by widespread adoption of operating standards. The most productive platforms not only maintain written standards that minimise the chance of equipment damage during production, they also ensure that their standards are visual, accessible and written in plain language, and that they have the management processes in place to identify and manage deviations from those standards. On the best platforms, identifying such deviations becomes standard work for supervisors and managers.

It is this final point on the importance of creating a sense of responsibility that has been frequently cited as the reason many operators have struggled to make the outsourced operations and maintenance model work well. While good performance can be achieved with outsourced offshore activities, doing so requires a clear delineation of responsibilities and a careful alignment of incentives with the service provider. This has proven difficult, and our data suggest that when this is not done well, production efficiency performance can suffer.

### *How can North Sea operators win the prize?*

The case for tackling the crisis in the UK is clear. The prize is substantial and the industry may soon encounter a more active regulator<sup>2</sup> that sets specific performance expectations for individual operators. Operators in Norway, too, must not neglect the problem to avoid following the same path as the UK.

We believe that North Sea operators should focus on three areas:

1. Fix the basics of reliability and maintenance.
  2. Establish standards in common operating tasks.
  3. Regenerate critical infrastructure within prominent hubs.
1. **Fix the basics:** Adopting good reliability and maintenance practices is vital to improve asset production efficiency. Delivering sustained improvement in operating performance is tough across many industries – and the North Sea offshore is no different. However, we believe that it can be done with a concerted and co-ordinated programme. Such a programme should have strong operating practices at its heart together with six other characteristics:
- The asset, and its operating team, is the centre of the improvement effort.
  - Leaders throughout the organisation are committed to making the change.
  - There are clear performance goals for the asset, and there is a focus on and a prioritisation of the biggest volume opportunities to achieve them.
  - There is rigorous root cause analysis combined with concerted elimination of the identified problems.
  - Front-line staff improve their capabilities (in both classroom and on-the-job settings) regarding operating standards, equipment care, process confirmations and performance management.
  - There is a specific effort to create a “one-team” culture, and to eliminate tensions and misalignment that can grow between contractors and staff.

Investing in facility upgrades and integrity-enhancing projects may be necessary as well.

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<sup>2</sup> The recent Wood Review suggests a more “directive” role for DECC or the new regulator to achieve the UKCS PE target of 80 per cent by 2016



2. **Establish standards in common operating tasks:** The North Sea is one of the most mature basins in the world, and the companies working there face significant operating challenges as the basin continues its natural decline. In this context, operators and service companies need to benefit from their collective experience; the Wood Review has recommended that the new regulator serve as an independent conduit for such knowledge sharing. The annual Share Fairs and Task Forces by PILOT are already a step in the right direction, but we believe that the industry could go further. It has achieved much success in safety through common reporting and standards and can now use its collective knowledge to develop similarly consistent standards related to the most critical operating practices (e.g., loss reporting, Maximum Production Potential target setting). A new Aberdeen-based Asset Production Efficiency Academy could train and certify operators on these standards, adopting an “engineer licensing” approach not unlike the ones that have benefited the nuclear and aviation industries.
  
3. **Regenerate critical infrastructure within prominent hubs:** There are close to 20 major infrastructure hubs on the UKCS. Given the interconnectedness of the infrastructure, we believe that the industry must develop a new operating norm at this hub level. First, production efficiency audits by a new regulator should begin by targeting operators of the most critical pieces of infrastructure. Second, peer reviews of these operators, particularly by those who supply third-party volumes to them, should assess the integrity of “system critical” infrastructure and encourage higher levels of performance. Finally, the industry should debate whether it would benefit from a more collective approach to managing “system critical” infrastructure. For example, should suppliers of third-party volumes to hubs have stronger powers, allowing them to require hub operators to adopt practices that lead to good performance? Or should operators within a hub jointly share knowledge and expertise to resolve infrastructure outages sooner?

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The dividends from tackling the asset production efficiency crisis in the North Sea will be considerable, not just in current production and revenue, but also in extended field life across the UK and Norwegian continental shelves. The future is in the hands of the North Sea operators – by improving their operating capabilities and becoming better stewards of the basin, they will be able to meet the challenge and win the prize.

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