Oil & Gas
Authority

# Lessons Learned from UKCS Oil and Gas Projects 2011-2016

# Contents


**1. Executive Summary** 3

**2. Overview** 4

2.1 History and context 4

2.2 Review process 6

2.3 Analysis summary 7

**3. Lessons Learned** 10

3.1 Organisational 11

3.2 Project Management 12

3.3 Front-end Loading 13

3.4 Execution 14

3.5 Behavioural 15

**4. OGA Action Plan** 16

**5. Appendices** 17

5.1 Full review and project analysis 17

5.2 Top lessons from each project 20

5.3 Project improvement – applying lessons learned 24

5.4 OGA project stewardship recommendations 26

**6. Acknowledgements** 29




Any enquiries regarding this publication should be sent to OGA at PPR.Team@ogauthority.co.uk

# 1. Executive Summary

The successful development of new oil and gas fields is a vital part of ensuring the Maximum Economic Recovery (MER) of hydrocarbons from the UK Continental Shelf (UKCS). Development projects not only add barrels of production, but also help sustain thousands of engineering and fabrication jobs across the supply chain.

In 2016, the Oil and Gas Authority (OGA) published its Asset Stewardship Strategy, which includes a set of 10 clear Asset Stewardship Expectations designed to help facilitate the delivery of MER UK. One of these expectations focuses on robust project delivery: that operators should deliver major capital projects (including decommissioning) in accordance with the cost/schedule commitments at project sanction or as per the decommissioning programme.

The OGA has carried out analysis of 58 major projects executed over the past five years. This analysis shows a trend of cost over-run and delay in project delivery.

In order to determine how projects could be better executed in the UKCS, a series of structured Lessons Learned events was held on 11 different projects. Around half were deemed to be delivered in close alignment with their Field Development Plan (FDP) objectives, while the other half had under delivered relative to those objectives. This publication presents common lessons harvested from these reviews and summarises recommendations that, if implemented, should improve future project delivery in the UKCS. The audience for this publication should not be limited to project practitioners but should also extend to key decision makers for future developments/projects.

The OGA wishes to express its gratitude to the 11 operators and three major Tier 1 contractors who contributed to this publication as well as the MER UK Asset Stewardship Task Force members who steered its enhancement.

# 2. Overview

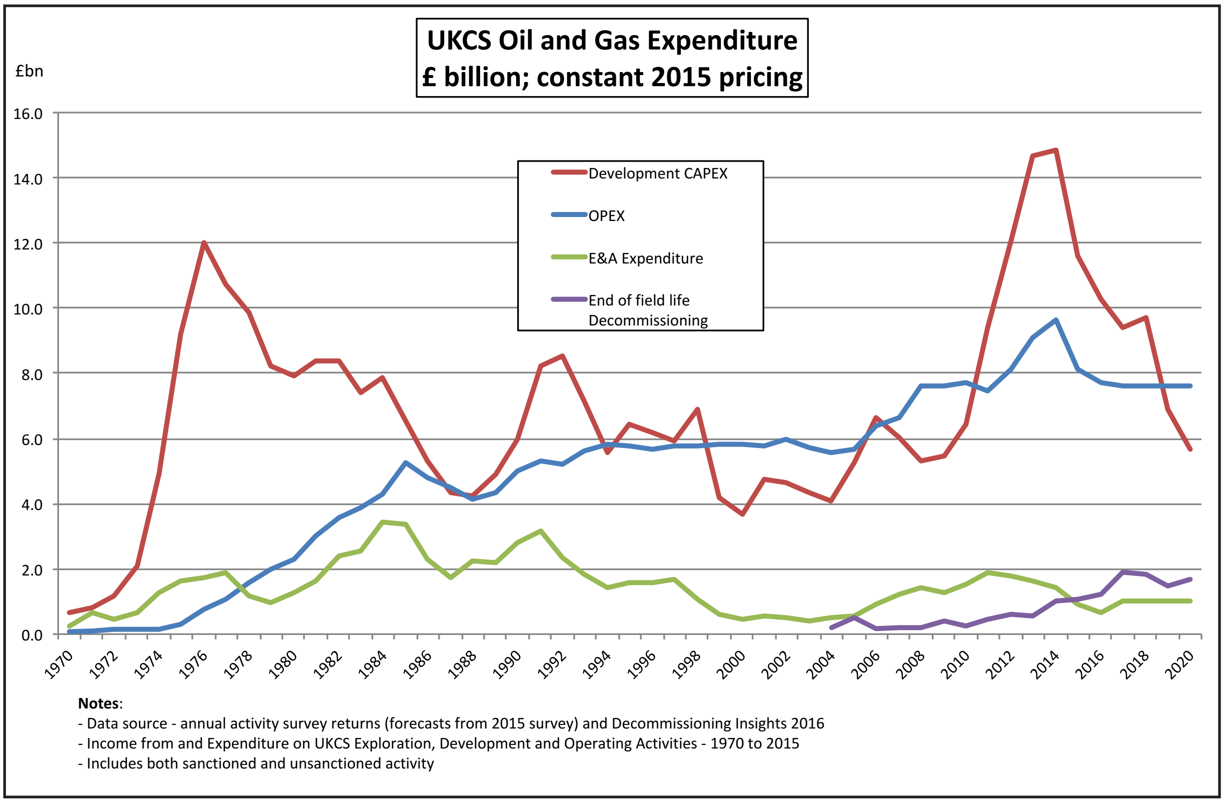
An evaluation of the current portfolio of UKCS active project work was undertaken to assess key issues and identify areas of value loss. This was carried out as follows:

- Review of 58 projects (38 where production has already started; 20 ongoing i.e. still being executed) focusing on parameters in the consented FDP versus actual performance between October 2011 and October 2016
- Selection of possible review projects and agreement with the MER UK Asset Stewardship Task Force
- Lessons Learned events held with 11 operators covering successful/under delivered projects across the UKCS; contributions from three major Tier 1 contractors with considerable project management capability
- Document findings, peer review and generation of a full report and this summary of recommendations

## 2.1 History and context

Since 2011 fewer than 25% of oil and gas projects have been delivered on time; with projects averaging 10 months' delay and coming in around 35% over budget (relative to estimates made in FDPs consented by DECC (now Department for Business, Energy and Industrial Strategy)/the OGA). In the same time period, levels of capital expenditure (see Figure 1) have been at an all-time high, averaging just over £12 billion annually money of the day (MoD) since 2011. This compares to £3 to £6 billion (MoD) per annum through the last decade; and £1 to £2 billion annually on decommissioning.

**Figure 1: UKCS Oil and Gas Expenditure £ billion, constant 2015 prices**

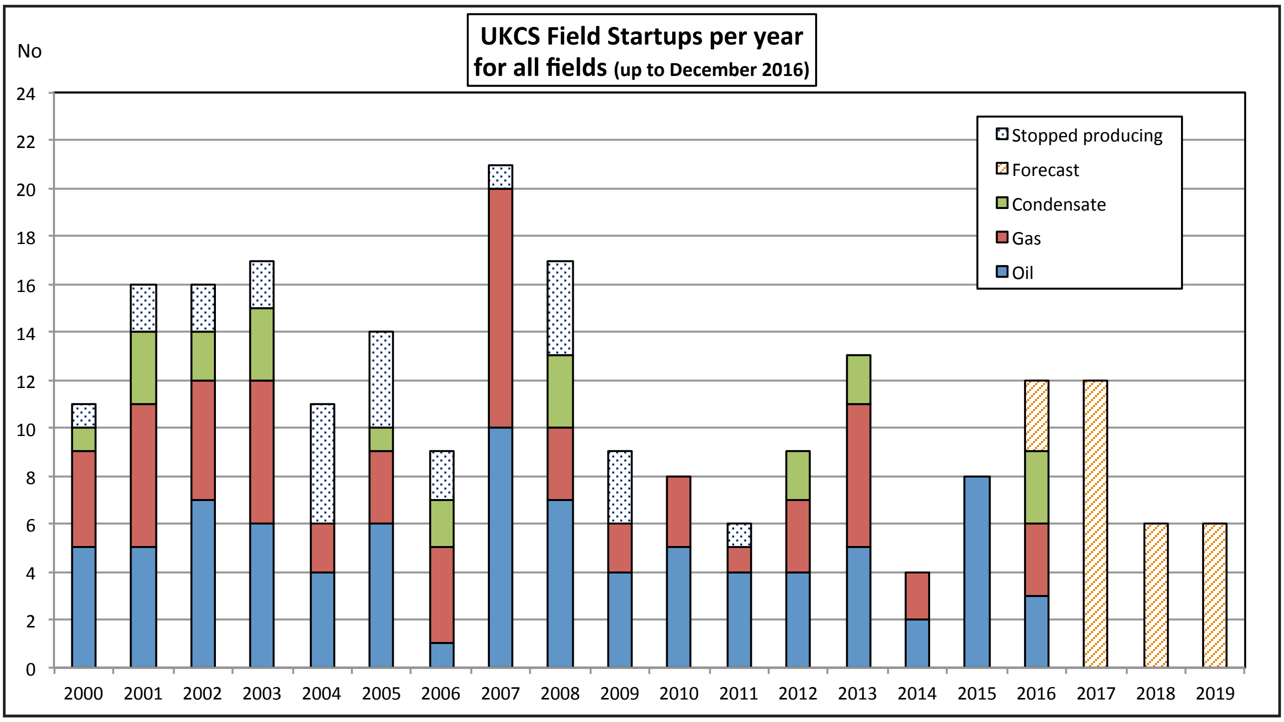


The increase in investment has been driven by a number of factors including a (previously) favourable oil price and an increase in cash rich investors.

In the five years 2011-2015, there was an average of eight field startups (irrespective of field size) per year (see Figure 2). A total of nine fields started up in 2016. This compares with 12 fields which were forecast to start producing in 2016. Typically, a major project takes three to four years to execute so the startups expected in 2017 were generally committed earlier in the decade when oil prices were significantly higher.

Near term spend on developments is dominated by projects already being executed. Once a number of current 'later than planned' projects come on stream, by mid-2017 it is envisaged there will be fewer than 10 major projects being executed in the basin.

## Figure 2: UKCS field startups per year

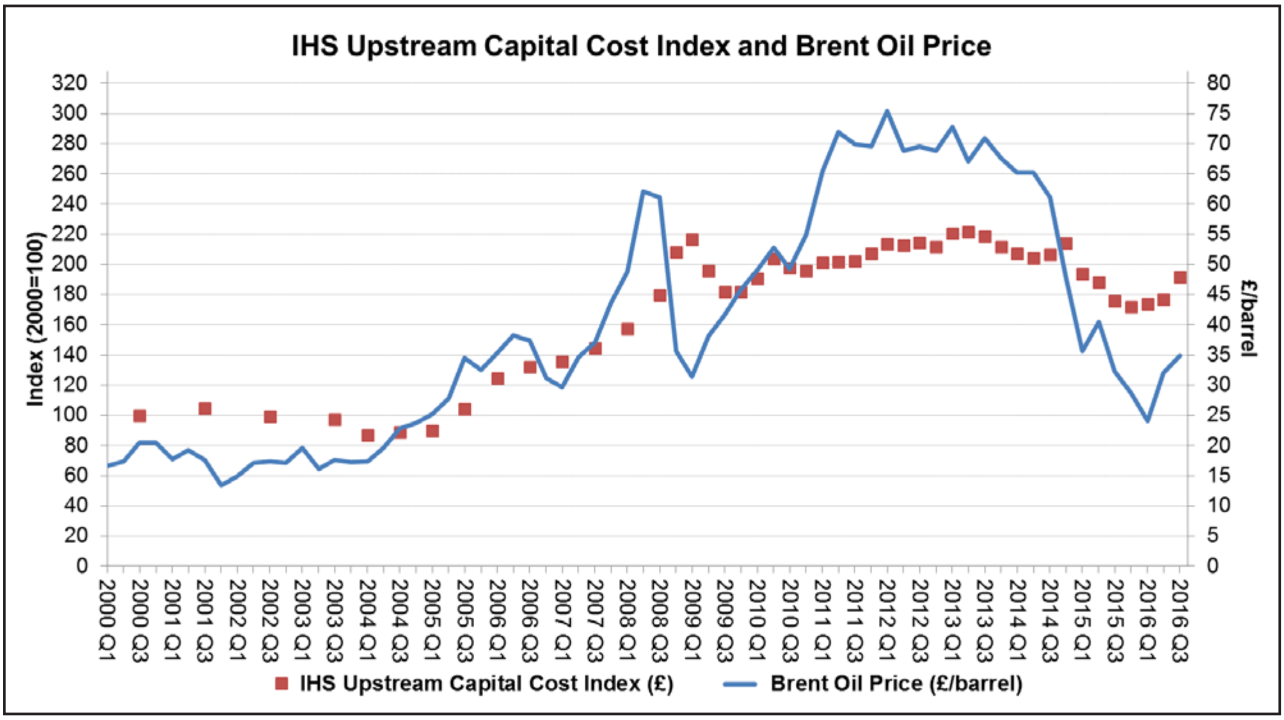


## 2.2 Review process

Using data held by the OGA, a review was made of all significant capital projects consented in the UKCS between October 2011-October 2016. For this investigation, a 'significant' project was determined to be a new field with a stated capital cost >£50 million or redevelopments costing >£250 million at sanction. All projects were consented by the OGA under an FDP or an FDP Addendum (FDPA) regulatory process – and the review focused on cost and schedule compliance relative to that stated in the consented FDP.

Expected capital costs in FDPs and FDPAs are reported in constant prices in sterling where the price base reflects the time of submission or expected approval of the field or project. Out-turn costs have been estimated in money-of-the-day rather than in constant price terms. The capital costs facing UKCS developers depend on a range of factors including in particular the global oil price. Changes in oil prices are reflected in capital costs,[1] albeit less than fully and with a short lag, as shown in Figure 3. Over the period considered here, capital costs rose and then fell, latterly quite sharply reflecting the dramatic fall in oil prices from mid-2014 onwards. We have not attempted to explore the extent to which changes in industry costs explain variations between estimated and out-turn costs. Different types of spend are subject to different cost pressures (for example, drilling costs are more volatile than other costs) and the extent to which changes in cost levels would pass through to project costs would depend on the extent to which costs had been locked in by contractual commitments.

### Figure 3: IHS upstream capital cost index and Brent oil price




[1] Measured here using the IHS Upstream Capital Costs Index (https://www.ihs.com/Info/cera/ihsindexes/) converted into sterling.

The data set included 38 projects that have started up (between October 2011 and 2016) and 20 projects currently in execution (note: three of these projects started producing in November and December 2016). Excluded from the study were smaller capital projects, infill or extended reach drilling projects, and investments where no FDP or FDPAs were submitted. Projects that may have started below but ended up higher than the £50 million or £250 million threshold were also excluded.

While there may be a significant number of lower value projects missed from the investigation, the data set of 58 projects is deemed to be representative as they contribute around 75% of the total capital expenditure over the past five years. A summary of the findings is shown in Table 1:

### Table 1: Summary of findings on 58 projects reviewed (see notes in Appendix 1)

| | No Projects | Capital cost at FDP (£ billion) | Average delay (months) | Average cost growth |
|---|---|---|---|---|
| Already started up | 38 | 13.5 | 10 | 35% |
| Under execution | 20 | 25.5 | 13 | 20% |

Table 1 may at first glance appear to suggest there are many projects currently under execution with a healthy future workload for the supply chain, however the reality is somewhat different. By Q1 2017, half of these current projects are forecast to have started production and there will be less than 10 major projects under execution in the UKCS.

## 2.3 Analysis summary

The analysis of the data (see full detail in Appendix 5.1) revealed examples of both good and poorly executed projects across:

- Greenfield or brownfield
- Development type (subsea, platform, semi-submersible)
- Operator
- Region (Central North Sea (CNS), Southern North Sea (SNS), etc.)

However, virtually all Floating Production, Storage and Offloading (FPSO) projects (both retrofit and new build) have experienced cost over-run/schedule delay (seven in the population set).

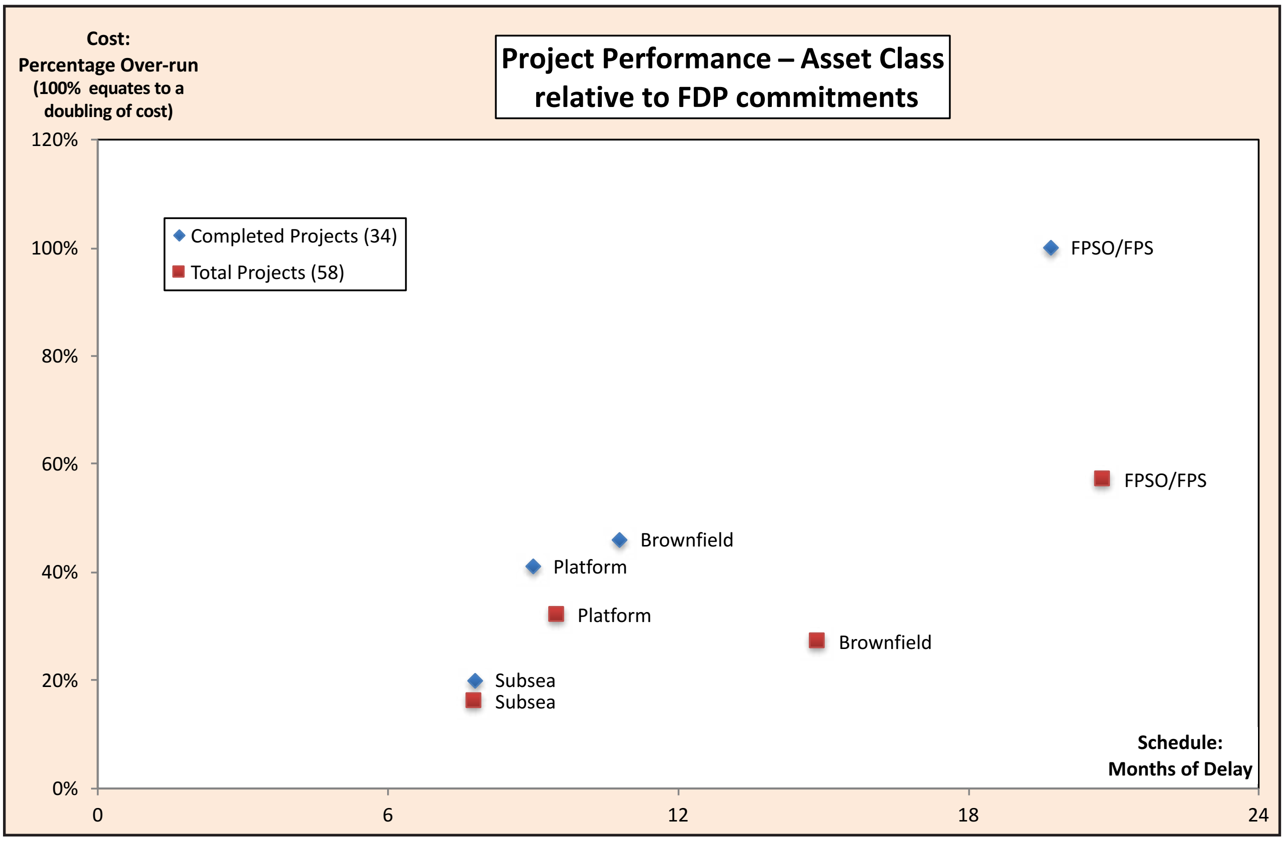
It was also established that there is no simple correlation between the size/complexity of scope and any delay/over-run. Some large, complex projects have been delivered as per their FDP commitments while conversely a number of smaller projects have been delivered late.

Based on this analysis (with the exception of FPSOs) it was concluded that it is not necessarily ‘what’ was being built that greatly influenced the cost/schedule outcome of a project, but more ‘how’ the project was executed. Many of the reasons for deviation are non-technical in nature.

Figure 4 demonstrates how projects have performed for four different asset types – with a comparison of those already in production as at 1 October 2016 (34 projects) and the complete data set of 58 projects.

While there is little to suggest schedule slippage is reducing, cost predictability does seem to be improving.

## Figure 4: Project performance for different types of asset




In order to better determine how projects are being executed in the UKCS, structured lessons learned events were held on 11 projects covering different concept types, green and brownfield aspects and locations across all regions of the UKCS. High level detail for these projects is outlined in Table 2.

Around half of the projects had been delivered in close alignment with their FDP objectives, while the other half had significantly under delivered relative to the FDP objectives.

Together they revealed a spread of success relative to FDP objectives with an average delay of 10 months and 35% cost over-run (similar to the larger data set). All should have started up by mid-2016, however one of the projects is not expected to start production until 2017.

## Table 2: Summary of 11 projects reviewed in depth for Lessons Learned

| Project | FDP cost/schedule appropriate? | Actual cost/schedule appropriate? | Cost Over-run (%) | Schedule Over-run (months) | Description |
|---|---|---|---|---|---|
| **A** | Yes | No | 20% | 3 | Subsea well tie-back |
| **B** | Yes | Yes | -4% | -1 | Greenfield platform(s) |
| **C** | Yes | Yes | -15% | -1 | Subsea well tie-back |
| **D** | Yes | Yes | 16% | 12 | Subsea well tie-back |
| **E** | Yes | Yes | -11% | 3 | FPSO |
| **F** | No | No | 24% | 25 | FPSO |
| **G** | Yes | Yes | -20% | 0 | Brownfield |
| **H** | No | Yes | 143% | 18 | Greenfield platform |
| **I** | No | No | 182% | 24 | FPSO |
| **J** | Yes – own work No – host | Yes – own work No – host | 143% | 36 | Greenfield platform |
| **K** | Yes | Yes | -30% | 0 | Subsea well tie-back |

**Operator supplied data**

# 3. Lessons Learned

Lessons Learned events were held for 11 different projects with 13 operators over the period 22 June to 25 August 2016 (on two of these projects the ‘host’ non-operator also contributed). These have been individually documented and agreed as factually correct with each participant.

The notional ‘top five’ lessons were agreed for each project, as well as suggestions on how a project might be done differently if it was to be re-executed.

An opportunity was provided to discuss and document suggestions on how the OGA could (with its wider remit and powers) enhance stewardship of project delivery.

To complement this exercise, similar lessons learned sessions were held with three key UKCS Tier 1 contractors which are/have been involved in a number of these 11 projects.

The data gathered was then analysed and aggregated – to create summary lessons learned (which are presented on the following pages).

Over and above these specific lessons, it was also clear that there is a common necessity for:

- More clearly defining the project scope prior to project sanction
- Keeping the project as simple as possible
- Increasing the accountability of project delivery
- Improving the co-operation between companies/stakeholders

The detailed lessons learned have been summarised into five key areas, which are presented in no particular order. They focus more on how development projects are planned and executed rather than what hardware is specifically built.

There was a large amount of raw data captured, and a few of the many examples gathered from individuals participating in the sessions are also quoted to illustrate and play back the input of the operators and others. (The complete ‘raw’ feedback is included in the appendices 5.2, 5.3 and 5.4 and has only been edited to anonymise the data.)

Many of the lessons learned restate common good practice and the OGA is conscious not to suggest that application of these lessons guarantees successful project outcomes.

However, the OGA would encourage companies to review their development projects against these documented lessons learned to identify any obvious gaps, and then assess whether they wish to adapt their approach before progressing further.

## 3.1 Lessons Learned: Organisational

**On all oil and gas development projects, there is a strong relationship between the project execution efficiency, the people who are employed to deliver it, and how well they are organised.**

When managing and delivering development projects, every organisation will rely to a great extent on leadership, behaviours, skills and competences of those involved in the project team.

In this instance, the project team refers to the 'team' in the widest possible sense involving all major contributors including partners and the supply chain.

It was clear that there has been a trend toward increasing owner's team costs over the last 10 years and an increasing reliance on temporary agency staff in both operator and engineering contractor workforce.

**This has affected project execution efficiency and informs these recommendations:**

Delivery organisations are not always provided with sufficient delegated authority to manage their project effectively

Time spent investing in aligning project team, partners, supply chain and regulators at the beginning is time well spent. Don't wait to develop and deepen relationships until after things go wrong

Continuity of project teams (including supply chain relationships) from one project to another reduces Front End Loading (FEL) burden and increases predictability of outcomes

Involve the supply chain early, develop co-operation and strive to work as one team. Building a single project-wide culture helps deliver successful projects

"Building a competent, efficient, focussed, project organisation takes time to put in place and requires continual effort to maintain throughout the project lifecycle."

"Operators should regard building the project team as a key investment in people."

"Maintain continuity of personnel throughout project to control cost and reduce interfaces."

"Risk management must consider organisational and commercial risks as highly as technical risks."

**Why this is important**

**A greater focus on making sure the right organisational structure is in place should help to lower owners' costs, improving communication which will lead to improved decision making and efficiency.**

## 3.2 Lessons Learned: Project Management

**Project management is a profession increasingly recognised for the value it brings. However, despite an increase in processes, tools, project controls, supervision and engineering man-hours in oil and gas developments, there has been no visible improvement in the ability to predict outcomes.**

Rigorous project management, with the completion of pre-FEED/FEED phases at a level of detail suitable for the project is key to pinning down a more defined scope, cost estimate and schedule. This minimises the likelihood of overspend and change through detailed design and execution, and supports project delivery within the approved budget and schedule.

**The key lessons learned were:**

Avoid incomplete FEL at sanction, e.g. use probabilistic costs rather than deterministic costs/ schedules at Final Investment Decision (FID)

Ensure you have a robust, resourced cascading project schedule created by competent planners

Apply strict Management of Change (MOC) processes – for schedule as well as scope

Remember the project management team is ultimately responsible for interface management. This is not something that should be delegated

"Time and time again we are faced with clients driving unrealistic deterministic schedules. It has not been unusual for our customers to dismiss probabilistic schedule analysis and one instance of it being referred to as 'mumbo jumbo'."

"Successful change management helped the project maintain both cost and schedule targets."

"Robust, probabilistic schedule risking philosophy mitigates unreasonable expectations."

"Small, technically competent project management team helps contractors optimise delivery of defined scope."

**Why this is important**

**There is generally a lack of recognition of project management skills in the oil and gas industry. Realistic, as opposed to aspirational, schedule setting and clients endorsing the value of project management qualifications, experience and competence will help to improve the predictability of project outcomes. This will also have the knock on benefit of increasing investor confidence.**

**In this context, reference is made to the The Engineering Construction Industry Training Board (ECITB) whose project management activities in the offshore region are led by the Offshore Project Management Steering Group who, with its partners, seeks to "influence the skills development initiatives that address current project management issues and competency development across the Offshore EC Industry".**

## 3.3 Lessons Learned: Front-end Loading (FEL)

**FEL is a core work process before project authorisation/sanction/FID. FEL is a process to develop sufficient strategic information to address risk and make decisions to commit resources that maximise the chance of a successful project.**

Complementing a stage gate process, the FEL work process is divided typically into phases or stages, with a pause for assessment and decision making about whether to proceed. In most cases, time taken to complete surveys and FEED in order to understand the full scope prior to sanction, even if contracted out, is time well spent. This is especially true for brownfield work.

If sufficient FEL is not undertaken, there are two main drivers of lost value: selecting and executing the wrong project (even if it is executed well); and changes required due to an incomplete level of definition subsequently impacts execution resulting in cost/schedule escalation.

**The key lessons learned from the review include:**

Many ‘schedule’ driven (not cost driven) projects commenced in 2012/13 with incomplete scope and unclear objectives and priorities – and subsequently delivered late and over budget

There is a high risk of not achieving outcomes if key resources (e.g. drilling rigs, Diving Support Vessels (DSVs), long lead material etc.) are not tied down at sanction

If you choose new/unfamiliar contractors/vendors, build a brand new project team; or the project involves significant first of a kind elements, then build in sufficient cost/schedule contingencies at project sanction

“Do not rush sanction without completing a full and thorough due diligence across all project aspects, for an acquired project.”

“Ensure detailed design is sufficiently mature before moving in to construction.”

“Ensure that there is the right level of due diligence when outsourcing key project management scopes to ensure that the resources provided have the right competencies and that the outsourcing company has robust delivery processes to support the scope – don’t assume.”

“Finish FEED before starting detailed design!”

“Have an agreed list of big ticket items which must be landed during FEED and before project sanction to avoid big changes later on.”

**Why this is important**

**Generally speaking projects with high levels of FEL have more predictable costs, shorter schedules and better production attainment. Assessing FEL provides improved efficiency by aligning all elements of work in parallel, at similar levels of definition, to ensure better quality decisions. Benchmarking can confirm the readiness of a project investment decision and the appropriateness of cost/schedule.**

## 3.4 Lessons Learned: Execution

**In the execution phase between investment decision and startup most activities are carried out by parties contracted (or subcontracted) by the operator. This has on occasion led to a tendency to place the fault for any execution problems on those contracted parties.**

However, if the project is set up properly and all parties are clear on their responsibilities, then the extent of execution problems can be minimised.

**Some specific lessons gleaned from the projects reviewed include:**

Finish FEED before starting detailed design and finish detailed design before starting construction, OR aggressively manage the cost/schedule and organisational risk, and include appropriate contingencies

An alternative view is that fast tracking can be effective if the risks and uncertainties are understood and accounted for in the estimates and managed accordingly

Scope growth from vendor packages and specifically weight control from FEED to detailed design is a recurring challenge (insufficient allowances included at sanction)

Transition management is critical and many projects underestimate offshore hook-up and commissioning effort (by multiples) which inevitably takes longer and is more costly. Fabrication is rarely complete when facilities are sent offshore

Subsea scope is largely delivered as predicted. Drilling and facilities (particularly FPSOs) present a much larger spread of outcomes in projects

"Have a well-defined contract strategy covering all work areas. Build deep relationships with supply chain."

"A partnership between the operator and supply chain in field development through FEED and ITT into execution can secure better delivery of projects due to common buy in."

"Challenge changes in execution planning early – specifically fully assess the impacts of the change."

"Rigorous, company-led interface management with partners, contractors and suppliers is required to maintain delivery schedules."

**Why this is important**

**Due to the high amounts spent, poor execution can rapidly erode value and supply chain margins. Despite the reality that both client and contractors are adversely affected by execution problems, the collective desire to address issues early and collaboratively can make the difference between project success or failure. And while proper front-end loading can avoid many execution risks materialising, a project-wide no-change mindset and a swift acting effective risk management system (where risks are held by the correct party) can help all parties meet their objectives.**

## 3.5 Lessons Learned: Behaviours

**The UK oil and gas sector has evolved with a high degree of prescriptive control in the way projects are delivered. Contracting terms and behaviours have been largely construed as adversarial, on the large, rather than collaborative.**

Many behaviours continue to contribute to poorer project delivery, inflated budgets and schedule, or projects not even getting sanctioned.

**These include:**

- Defer, delay and do nothing culture
- Aversion to risk and a fear of failure
- Reliance on policy, process, practice and procedure
- Centralised functional control
- Micro-management
- Lack of trust
- Over optimistic reporting
- Focus on management rather than leadership

**There is a need for the oil and gas industry to focus more on leadership, culture and behaviours such as:**

- Leadership
- Agility and sense of urgency
- Competence and capability
- Devolved decision making
- Accountability, authority and autonomy
- Best answers win
- Respect, integrity and trust

The need to build the right behaviours, focussing on successful project outcomes, is wide reaching and integral to all four of the themes discussed in the lessons learned above.

"Many (but not all) operators issue too many specifications – many of which are not applicable or even contradictory. The larger the operator is, the more paper there is."

"Too much time spent discussing requirements which are not 'critical'."

"Huge client team for a single subsea tie-back – particularly when considering dedicated field operator and platform host operator Project Management Teams. Combined client's team was bigger than the contractor PMT."

"The Project Team went to great lengths to communicate the objectives and Key Performance Indicators (KPIs) of the project as well as expected behaviours and need for alignment to reach common goals."

**Why this is important**

**Reducing project cost over-runs and meeting predicted production targets increases investor confidence. Effective collaborative teams are smaller and, therefore, cheaper, and generally faster when everyone involved is seeking to deliver the end outcome in the minimum possible time. Better motivation within the project culture means that all parties benefit.**

# 4. OGA Action Plan

The OGA has a valuable role to play in transferring lessons learned across the basin, setting expectations, providing recommended practice and influencing operators to protect against downside risks or value erosion.

The OGA will use this review, the recommendations harvested from the Lessons Learned event and input from the MER UK Asset Stewardship Task Force, to hold operators to account on their project delivery commitments.

The actions in support of this include:

### Robust Project Delivery Asset Stewardship Expectation

A specific expectation has been published entitled SE-05 Robust Project Delivery. This good practice expectation is aligned with the MER UK Strategy. SE-05 is designed to help operators demonstrate competitiveness and robustness of project delivery.

(Refer to https://www.ogauthority.co.uk/exploration-production/asset-stewardship/expectations/)

### FDP Consenting Process

The FDP consenting process, and how a project needs to demonstrate MER UK value, is being updated to ensure project optimisation is addressed.

### UKCS Asset Stewardship Survey

Improved project data will be secured via the new annual UKCS Asset Stewardship Survey. The survey creates a single source of aligned, robust data. It will be used to inform asset stewardship reviews and provide meaningful insights into current and forecast activity in the UKCS. This approach to data collation will also create a virtuous cycle of data quality improvement over time.

(Refer to https://www.ogauthority.co.uk/exploration-production/asset-stewardship/surveys/)

### Stewardship Reviews

The broader scope of oil and gas lifecycle asset stewardship requires a structured, informed and prioritised approach to project delivery. The OGA will take a structured, tiered approach to project reviews, which will enable the OGA to share best practices, monitor performance to identify any areas of performance improvement, and to discuss and agree improvement actions. These are not assurance reviews but are intended to stimulate a faster improvement loop in project delivery with a specific focus on meeting first year production targets.

(Refer to https://www.ogauthority.co.uk/exploration-production/asset-stewardship/reviews/)

### Major Project Review Meetings

The OGA should be informed about relevant meetings and has the right to attend such meetings and be provided with a written summary. Such meetings include decision gate meetings between joint-venture partners for major investment projects (of £300 million or more) for greenfield, brownfield and decommissioning.

(Refer to https://www.ogauthority.co.uk/media/2725/oga_meetings_statutory_notice-1.pdf)

# 5. Appendices

## Appendix 5.1: Full project review and analysis

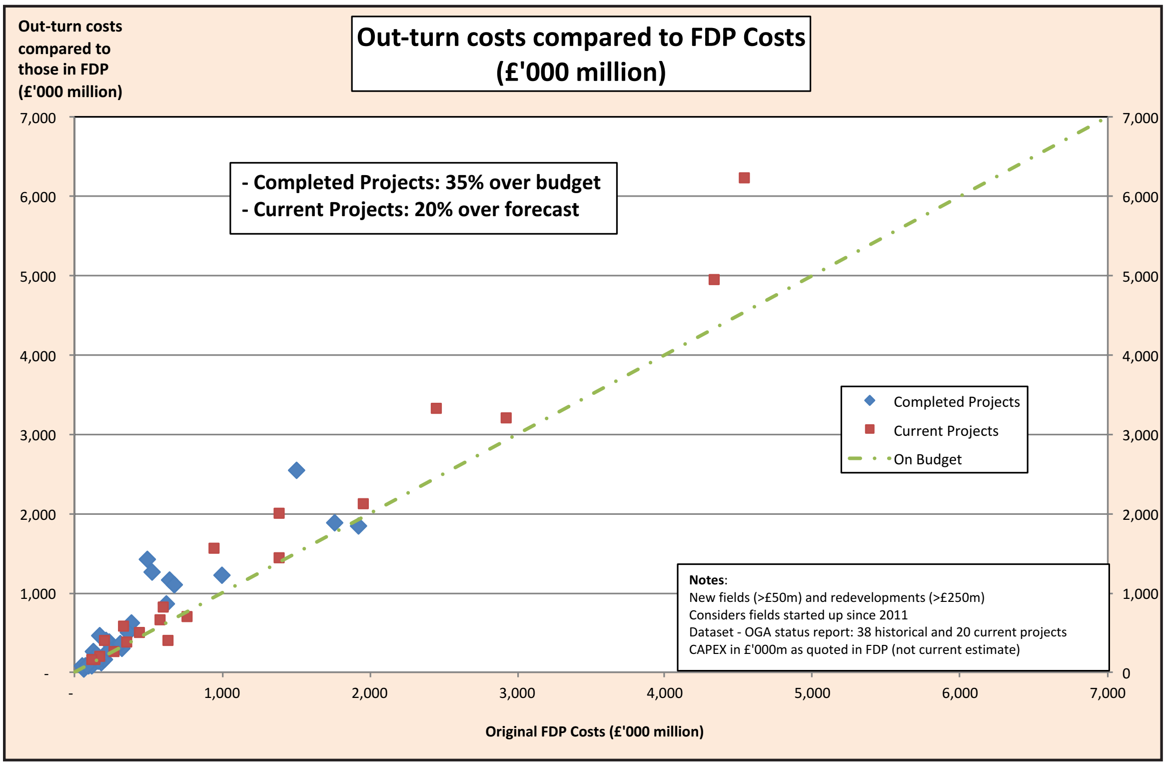
### Summary

Using data gathered by the OGA, a review has been made of all significant capital projects consented in the UKCS between October 2011-October 2016. For this investigation, a ‘significant’ project was determined to be a new field with a stated capital cost >£50 million or redevelopments costing >£250 million at sanction. All projects were consented by the OGA under an FDP or an FDPA regulatory process.

The data set covered 38 projects that started up and 20 projects in execution as at 1 October 2016. Excluded from the study were smaller capital projects, infill or extended reach drilling projects, and investments where no FDP or FDPAs were submitted. Projects that started off low but ended up higher than the £50 million or £250 million threshold were also not included. While there may be a significant number of lower value projects missed from the investigation, the data set of 58 projects is deemed to be representative as they contribute around 75% of the total capital expenditure over the past five years.

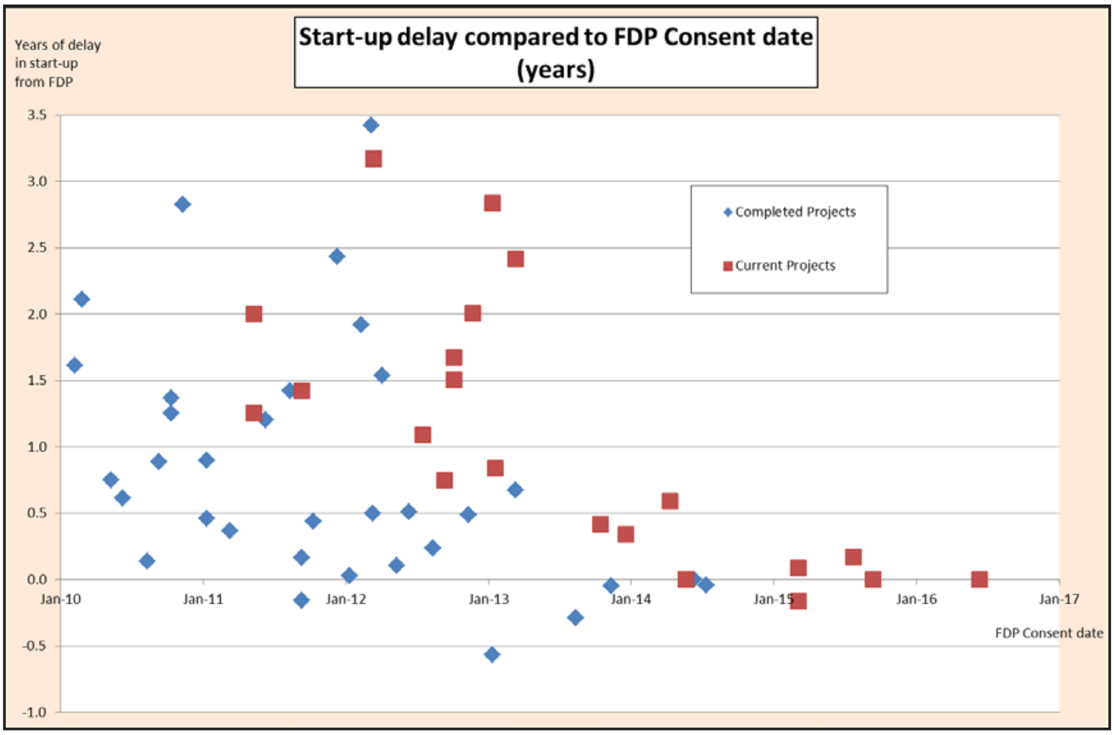
While maintaining high standards of safety and environmental management are high priorities for industry, this report doesn’t consider these factors are they are not within the OGA’s remit. While initial production rate can be a good indicator of project performance, it became apparent that the OGA does not hold this data comprehensively and is not readily available from any other source. The review, therefore, focused on cost and schedule compliance relative to that stated in the consented FDP. See Figure 5.

### Figure 5: UKCS projects – out-turn/forecast costs compared to costs in FDP



As depicted in Figure 6, the analysis suggests that while there remains a significant number of late projects yet to start up, the ability to deliver to the cost/schedule commitments in FDPs seems to be improving with time. Most of the significantly, delayed projects were consented between 2011 and 2013.

## Figure 6: UKCS projects – start-up delay compared to FDP consent date




The summary of findings is shown below:

| | No Projects | Capital cost at FDP (£ billion) | Average delay (months) | Average cost growth |
|---|---|---|---|---|
| Already started up | 38 | 13.5 | 10 | 35% |
| Under execution | 20 | 25.5 | 13 | 20% |

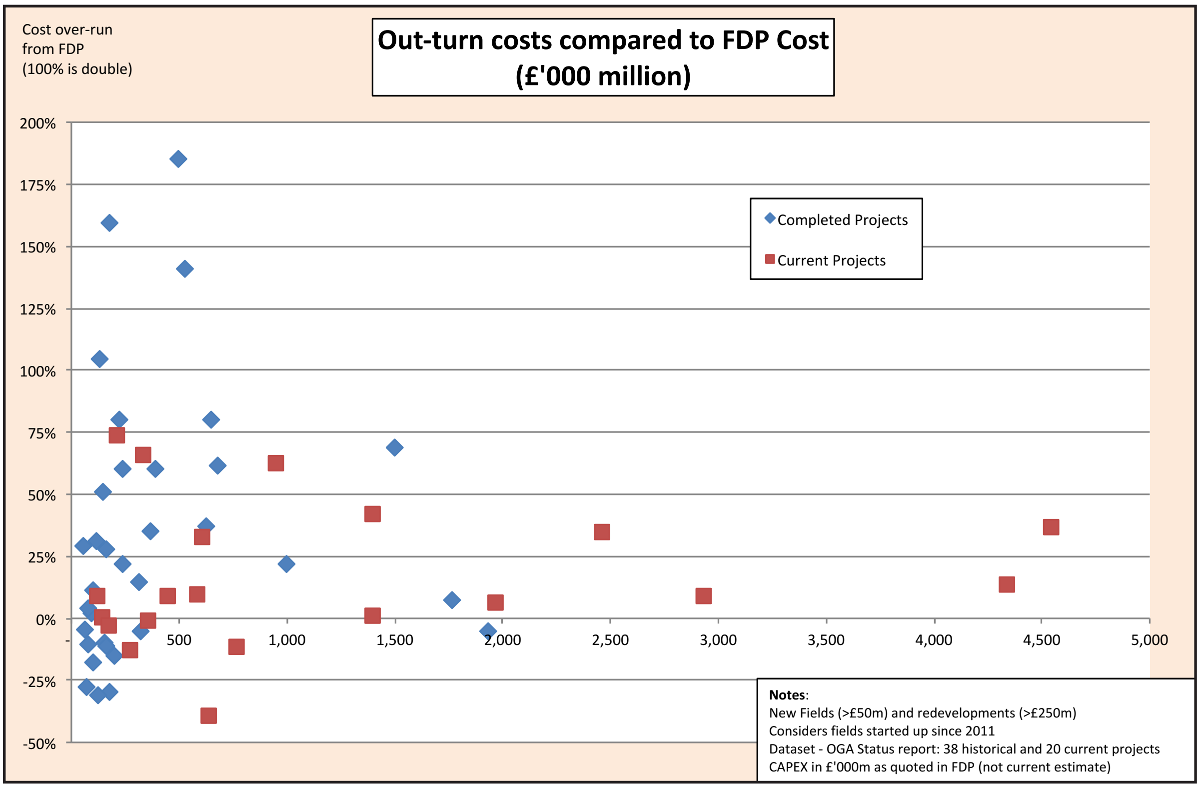
**Notes:**

1. The definition of capital costs in FDPs is not wholly consistent and, significantly, capital costs stated in the FDPs are not necessarily the total cost of any particular project. Some FDPs include some pre-investment costs while others do not.

2. In determining the average delay, there is a high degree of confidence when determining the actual startup date relative to the date in the FDP. For the projects not yet started up, the predicted startup dates generally come from information in the public domain or from the operators themselves. Many operators choose to offer optimistic forecasting rather than realistic estimates, so the average delay could well be more than the 13 months shown in the table.

3. There is more confidence in the schedule than the cost data. Data on actual costs generally comes from operators during interactions with the OGA and from the public domain. Data verification was done for many (but not all projects) which revealed that the OGA doesn't always hold the latest cost data. As per note 2 above, there is more confidence in the actual costs than predicted out-turn costs which are judged to be optimistic (i.e. these 20 ongoing projects could well end up more than 20% over budget).

## Figure 7: Out-turn/forecast cost as a percentage of FDP costs



## Appendix 5.2: Top Lessons from each Project

**Note:**

Content of the table is as provided by the operators/contractors. Editing has been done only to anonymise the data.

| | Top Lessons |
|---|---|
| **A** | 1. Importance of performing Cost Schedule Risk Assessments (CSRAs).<br>2. Rigorous, company-led interface management with partners, contractors and suppliers is required to maintain delivery schedules.<br>3. New technologies can have significant and unexpected impact on cost and schedule; include for this in contingencies.<br>4. Contractor and vendor quality commitments cannot be relied upon thus requiring significant company involvement and intervention.<br>5. Market conditions (2013) meant rig availability was limited in a tight market, resulting in contracting with a company for the first time, which presented a number of challenges.<br>6. Increased oversight of rig owner is required and can be effective in managing safe and reliable operations and mitigating poor performance.<br>7. Maintain continuity of personnel throughout project to control cost and reduce interfaces.<br>8. Importance of partnership between Joint Venture (JV) companies. |
| **I** | 1. Have a ring fenced and dedicated project team.<br>2. Understand the full scope prior to sanction, even if contracted out. Take the time to complete FEEDs.<br>3. Have a well-defined contract strategy covering all work areas. Build deep relationships with supply chain.<br>4. Build trust with management, shareholders and supply chain by consistently delivering on targets. |
| **K** | 1. Placing orders and package managing main subsea procurement/fabrication scopes internally, through the project team, with support as required from third parties, maintains close project focus on delivery within the overall schedule and keeps ancillary costs/mark-ups to a minimum.<br>2. Topsides package management through main Engineer, Procure, Install and Commission (EPIC) type contractors is an issue that requires addressing, noting that most main packages managed by incumbent contractor were late to varying degrees, as well as changes/growth through leading to increased final costs.<br>3. Increased and earlier engagement/closer liaison with the Health and Safety Executive (HSE) throughout the project, to ensure issues such as safety case changes are understood, agreed, and actioned accordingly in a timely manner to negate any risk to the overall schedule.<br>4. Completion of pre-FEED/FEED phases at a level of detail suitable for the project/development is key in pinning down a more defined scope, cost estimate and schedule, minimising opportunity for growth and change through detailed design and execution, and supporting project delivery within agreed/approved budget and schedule.<br>5. There is significant benefit to be had from making use of what you already have, i.e. looking harder at existing facilities, destructing redundant equipment to make space for new (rather than creating space through expansion, cantilevers etc.), using infrastructure already there but previously used for something else (such as old production risers now used as conduits. There is also significant benefit from ensuring a fit-for-purpose design that meets required standards, without additional ‘nice-to-haves’ or specific /particular additional specifications that only add cost rather than tangible benefit. |
| **E** | 1. Early appraisal is important (during the exploration phase and through further appraisal when drilling development wells).<br>2. Alignment of stakeholders (or 100% ownership).<br>3. Collaboration with the OGA on early understanding and agreement of FDP.<br>4. Availability of resources (rigs, DSV, long leads subsea and drilling material). Having lots of inhouse staff (all disciplines) managing long-term contracts with good relationships aids project delivery. Staff continuity and repetition of projects also helps. |

| | Top Lessons |
|---|---|
| J | 1. Hosts' attitude to third party is evident amongst UKCS host operators:<br>• Nuisance/irritation<br>• Risk<br>• Not material<br>• Do it because they have to do it<br>While granting access, host operators rarely proactively collaborate to deliver a project to schedule and budget, yet still reap financial benefits.<br>2. Developer project team had extensive experience in tie-backs but none foresaw the difficulties that occurred on host platform. Risk management must consider organisational and commercial risks as highly as technical risks.<br>3. Host and developer must be aligned on the project's objectives and the value drivers (for each party). Commitment is required from all levels of both organisations (willing partnership from the top) and Project Sanction should only be secured once this is in place. 'Skin in the game' influences successful outcomes so could consider one or more of the following: equity, carrot and stick commercial agreements combined project team, open book, or target agreements.<br>4. Early OGA involvement to explain the project intent – it may be able to give expectations to each operator on what is reasonable behaviour and guidance on what is MER.<br>5. Continuity of key staff helps.<br>6. Planning: should be realistic and well-executed.<br>7. Management team: ensure well-resourced.<br>8. Complexity: appreciate what modifications entail.<br>9. Safety: awareness and culture (especially contractor competencies).<br>10. Brownfield: host to execute modifications. |
| C | Project was successful thanks to strong execution of a robust project plan:<br>1. Small, technically competent Project Management Team (PMT) helps contractors optimise delivery of defined scope.<br>2. Robust, probabilistic schedule risking philosophy mitigates unreasonable expectations.<br>3. Don't burden a small development with 'science, process and technology' project if you're schedule driven.<br>4. In an overheated market you sometimes get unexpected outcomes.<br>5. Experience and competence crucial during fabrication and installation. |
| B | 1. **Safety First Leadership** – the project team has to set the standards/expectations. The team showed commitment to ensure 0/0/0 was every day and had practised extremely visible safety and environmental leadership working hard with their partners and contractors to take the right approach to safety leadership. Safety and environmental performance was part of tender evaluation.<br>2. **Do It Right** – employing the right PM and PMT – the project team followed an execution strategy evolved since earlier field developments (over 10 years) ensuring a continuous improvement loop is in place and ensuring the team had experience in delivery. The project team was motivated and experienced to manage and own the complex risks, technical and interface challenges.<br>3. **Win Together and Be the Best** – the project team went to great lengths to communicate the objectives and KPIs of the project as well as expected behaviours and need for alignment to reach common goals. The team set the tone, adopted a good level of communication and adopted a no surprise culture. The contracting community was aligned with any issues quickly resolved.<br>4. **Be Bold** – proper risk and opportunity management was led from the PMT and within the major contractors. They ensured regular risk sessions were held. The team ensured that there was sufficient resources to provide capacity when it was least expected.<br>5. **Results Matter** – successful change management helped the project maintain both cost and schedule targets. Effective MOC via the Project Change Committee, which was implemented at the start of execute. Understanding the requirement for the change and the cost, but more importantly the schedule impact associated with it. |

| | Top Lessons |
|---|---|
| **D** | 1. Challenge established protocols where benefits are unclear (spools, connectors, software etc.).<br>2. Inhouse management gets results – more focus from suppliers and better risk/technical decision-making.<br>3. Keep it simple, focus on the objectives.<br>4. Saturation versus air diving cost effectiveness beyond certain durations and environmental conditions.<br>5. Working with new contractors to leverage value and introduce competition. |
| **G** | 1. Estimation of scope and its liquidation. Good inspection means good work. 75% inspected prior to sanction which resulted in limited scope growth during execution (10%). However the wrong NORM3 for fabric maintenance was used. 10 hrs/m2 was used which came from another more recent project; when it was taking 23 hrs/$m^2$. The reason for this was not fully understood initially: (a) work moved from summer to winter with late flotel; (b) other comparative project was shut down whereas this platform was live; and (c) other comparative project had 10 work locations compared to this project which had 40, so much bigger control of work logistics.<br>2. Poor alignment of execution of fabric maintenance between Ops and Project (support team). Recommend leader for the fabric maintenance scope has an ops/maintenance background.<br>3. Changes in execution planning – specifically fully assess impacts early e.g. later than planned arrival of floatel – should have changed the plan given that different weather conditions/and changed circumstances; project had access to only one crane – this should have been challenged earlier.<br>4. Simultaneous Operations (SIMOPS) and work prioritisation – on a live platform project activity is fifth priority after safety, production, maintenance etc. Initially this resulted in poor (four hours) productivity which they tried to focus on instead of filling all the beds and also focussing on progress (didn't mobilise all the personnel initially). |
| **H** | 1. Do not rush sanction without completing a full and thorough due diligence across all project aspects for an acquired project.<br>2. If it has been highlighted that the Health, Safety, Environment and Quality (HSEQ) and experience/productivity at a contractor is poor, do not select them, or at least understand the risks and mitigations required, and so plan accordingly if there is a limitation on who is available to carry out the project.<br>3. Ensure detailed design is sufficiently mature before moving in to construction.<br>4. Continually review the schedule risks and mitigate against these rather than firefight when problems arise.<br>5. Involvement of contractors in project management and working as one team for achieving the goal at an early stage.<br>6. Retain team, define contract requirements, produce good quality plan and consider contractual success driver for contractor to deliver. |
| **F** | 1. **Organisation and Governance:**<br>• Improved Project Delivery Model (PDM) developed and implemented<br>• Clear accountability at Executive Committee (ExCo) level defined<br>• Clear definitions of expectations communicated at all levels<br>• Implemented high degree of 'Parent Company' financial governance and monitoring<br>2. **Contractor or operator alignment/interface/performance:**<br>• Key project controls defined in PDM to drive selection of engineering contractor with proven capacity, capability, structured engineering delivery model and competence<br>• Key project controls defined in PDM to drive selection of construction contractor with proven capability and knowledge of delivering to UKCS regulatory environment<br>• Revised quality strategy and processes to drive improved quality management of sub-contractors and sub-sub-contractors critical for key delivery scopes at the contracting stage<br>• Cannot rely on International Standards Organisation (ISO) or First Point Assessment – (FPAL)4as a guarantee of delivery<br>3. **Contracting Arrangements:**<br>• Careful consideration of the most effective Independent Verification Body (IVB) contracting strategy (IVB-Operator versus IVB-EPC)<br>• Be prepared to intervene early when required and be bold enough to ensure that the intervention has sufficient depth and strength to be sustainable<br>4. **Resourcing:**<br>• Ensure that there is the right level of due diligence when outsourcing key project management scopes to make sure that the resources provided have the right competencies and that the outsourcing company has robust delivery processes to support the scope – don't assume<br>5. Finish FEED before starting detailed design. |

## Tier 1 Contractors:

### Top Lessons

1. Better to do work under existing (known) commercial terms rather than negotiating new terms for every contract.
2. Undertaking a portfolio of work (client projects) improves productivity and reduces costs and schedule uncertainty.
3. To save time and money on tendering, promote design competition solutions (design in execution-ability early) to functional specifications before FID. Operators sometimes try to accommodate for different contractor capabilities in tenders but end up reducing to the same parties to the detriment of time and cost.
4. Based on benchmarking/norms consider target cost approaches utilising risk/reward mechanisms (very difficult to do this via competitive tendering).
5. Significant industry growth in a very short period and the choice or having no option but to award to new suppliers (including new supplier of FPSOs due to favourable payment terms in exchange for learning on the job, and awarding significant scopes prior to achieving a suitable level of definition) has served only to dilute expertise between clients and multiple layers of service contractors. Periods of stability lead to more predictable outcomes in terms of cost and schedule and suitable capability remaining within the supply chain. Stewarding of project execution and incentivisation during low periods will assist to level out high and low cycles.
6. Improve governance and assurance at the beginning of the project:
   - Don't progress until all disciplines are at the same level of definition or risk
   - Reduce scope creep by being disciplined (that includes saying "no" to clients)
   - Stringer change management process in place including effective (quality) decision making
7. Have an agreed list (client and contractor and even shareholder) of big ticket items which must be landed during FEED and before Project Sanction to avoid big changes later on, e.g. these could be flow assurance, CO2 specification or even shutdown timing/duration.
8. Reduce multi-party Inspection and Test Plans (ITPs). The 'witness and hold point' requirements create inefficiency because the job stops and starts and inevitably takes longer. Primarily driven by lack of trust' between parties, ITPs have generated a whole industry of day rate individuals and third-party verification entities that are (cynically) incentivised to make work recycle.
9. A partnership between the operator and supply chain in field development through FEED and Invitation to Tender (ITT) into execution can secure better delivery of projects due to common buy in. Trust is required between all parties. Considerable time can be saved by not tendering and single sourcing FEED and detailed design.
10. Many (but not all) operators issue too many specifications – many of which are not applicable and even contradictory. The larger the operator, the more paper (recent operator issued 300,000 words of specifications). Too much time is spent on discussing requirements which are not 'critical 'or 'core'.
11. In a tight budget environment there is a tendency in the industry to be overly optimistic in estimating (both cost and schedule) which should be authenticated at Project Sanction.
12. Need to control preferential engineering and methods driven by client teams. They can often be engaged on a contract basis and can drive preferences, strategies and drive decision making regardless of what has been tendered driving additional costs.
13. Added complication of client-based procurement to project execution as it creates unnecessary interfaces in the engineering procurement construction flow.
14. Better buy-in and capacity from operations teams in order to successfully support project delivery.
15. Client funding continuity between phases of projects is a routine issue where time is wasted unnecessarily and pressure mounted on the execution contractor.
16. Time and time again we are faced with clients driving unrealistic deterministic schedules. It has not been unusual for our customers to dismiss probabilistic schedule analysis and one instance of it being referred to as "mumbo jumbo". Deterministic schedules are also a broad spectrum where some can be built with the necessary realism such as winter working productive day, etc. However, without probabilistic schedule analysis stakeholders can be misled as to likely outcomes.

## Appendix 5.3: Project improvement – applying lessons learned

**Note:**

Content of the table is as provided by the operators/contractors. Editing has been done only to anonymise the data.

| | If you were to re-execute the project, how would you do it differently? |
|---|---|
| **A** | • During FEED, the estimate had increased significantly, costs were at an all-time high, and we were dependent on several new technologies which added significant complexity, although most worked as expected. With perfect hindsight we would have been better off delaying project sanction allowing the market to cool down to reduce costs and get more contracting options to reduce execution risk<br>• Utilise a different drilling contractor that company has experience working with<br>• Use a different tree design (vertical tree created a huge and costly fishing protection structure).<br>• Challenge need for spares/back-ups (two trees) and make design more fit-for-purpose (e.g. number of bulkheads on reelable pipe-in-pipe)<br>• Integrated project team, co-located (topsides and subsea) |
| **E** | • Early open communication with the OGA on development plan scope, uncertainty and ranges. Creating clarity on feasibility of scope, both technical and economical<br>• Endeavour to collect more information to reduce the range of uncertainty at time of exploration well drilling (in this case, oil water contact was not tagged in the exploration well, only an oil down to depth)<br>• Evaluate the impact of fluid on the production system in more detail early<br>• Ensure as much team continuity as possible |
| **J** | • **Subsurface:**<br>– Consider geological side-track to appraise exploration well<br>– More extensive sub-surface sensitivity analysis<br>– More extensive well testing<br>• **Greenfield:**<br>– Pipeline chemical dosing<br>• **Host Platform:**<br>– Firm commitment from host's senior management prior to sanction; and continue engagement throughout execution<br>– Develop a fair and equitable balance of risk and reward<br>– Agree 'carrot and stick' commercial arrangements (no blank cheques)<br>– Steering committee with host and transportee (and possibly the OGA) senior management<br>– Agree schedule, budget, approach and applicable systems prior to sanction<br>– Consider greater range for cost and schedule outcomes<br>– Implement more control measures to manage<br>– More forceful about driving optimum (MER) solutions e.g. use of Lennox separator<br>– Integrated team driving towards common goals<br>– Dictate organisational and personal accountability |
| **C** | • Operational 'no touch requirement could have been challenged further. This would have widened the range of technical solutions, allowing more contractors to bid for the subsea system<br>• A better understanding of the electrical and instrumentation scopes and risk may have led to a different control system scope for this project<br>• Revisit the complex flowmeter arrangement and possibly simplified |
| **D** | • Tighter DSV contracts and earlier commitment. Collaborate with controls contractor on design/Statement of Requirements rather than accepting off-the-shelf solutions |

| | If you were to re-execute the project, how would you do it differently? |
|---|---|
| G | • There has been considerable improvement in execution from previous brownfield projects. Some success factors being:<br>– Use contractors specialising in brownfield<br>– Compliance with company development brownfield practices<br>– Complete the same level of definition one stage earlier (e.g. detailed design by project sanction)<br>– Complete work packs prior to going offshore<br>– Close alignment with Operations |
| H | • Be more diligent and circumspect when inheriting (through acquisition) a strategy to deliver a complex project from a Joint Venture Project (JVP). Resist fast track schedules for early production<br>• Make a final sanction decision in the light of facts regarding the project risks and their mitigation<br>• Ensure key decisions which move the project through different phases – design to construct, construct to commission, onshore to offshore – be taken with a rounded view of the upsides and downsides of moving to the next phase. The maturity of the topsides work at sail away should have been clear that further time was required onshore to complete fundamental aspects of design, construction and commissioning |
| F | • More governance/external verification at sanction<br>• Understand better the consequences/risk of moving from leased to owned FPSO<br>• Understand better the risk of an FPSO integrated build in the Far East<br>• Better/more accurate project benchmarking from external consultants at sanction |

## Tier 1 Contractors:

**If you were to re-execute the project, how would you do it differently?**

- Create a ‘one team’ environment
- Have early involvement in project (design for constructability/instability)
- Appropriate and standardised contract terms
- Critically check basis of design highlighting any major issues to client before Project Sanction
- Better integration and alignment with client – work softer areas more. Create effective relationships with clients at the same level of seniority and agree levels for escalation
- Promote more vertical integration – less individual disciplines

## Appendix 5.4: OGA project stewardship recommendations

**Note:**

Content of the table is as provided by the operators/contractors. Editing has been done only to anonymise the data.

| In the future, how could the OGA (with its wider remit and powers) enhance stewardship of project delivery on UKCS? |
|---|
| • Recommend that the OGA does not have any direct involvement post sanction<br>• Structured reporting should be agreed between the OGA/operator for flow of information rather than intervention. These should be separate engagements with the OGA at an appropriate frequency (e.g. quarterly) and not aligned with partner interactions<br>• Prior to project sanction (i.e. at FDP approval), the OGA should seek to have alignment on engineering % complete (to avoid late design changes that impact productivity in execution), probabilistic cost/schedule (particularly integrated project plan) and FEL (including a list of potential changes and risks moving forward) and awareness of project execution risks, standards and requirements on operators deemed to be increasing – it would be useful to have an integrated regulator view point rather than multiple regulators<br>• How are OGA 'promoting' longer term industry challenges such as productivity, quality, efficiency and supply chain (competitiveness and competency)? |
| • Reserves process between the OGA and operator is sufficient<br>• Subsea/wells cost benchmarking is well established in the industry<br>• Benchmarking of FPSO cost/schedule is not well established so the OGA could provide some sense checking of this area at FDP approval<br>• Consider sitting in Stage Gate reviews (particularly when there are few partners in a development) |
| • Sharing some of these learnings between operators and main contractors can only streamline project/development execution to reduced costs and shorter schedules, although this is more difficult to achieve for the Tier 1 contractors or major operators due to the significant processes, business management systems, and inflexibilities involved. It is possible for projects/developments to be delivered faster and for less than some are achieving right now. OGA seminars, training, education, information sharing, steering groups etc. may help to improve at some of the areas that are having a detrimental effect on delivery performance around the industry<br>• There's a requirement for templates and regular meetings (quarterly) to update on delivery. Open, honest post project wash ups with a standard delivery template where all operators are invited to learn and can be benchmarked. Get hosts moving to deliver and encourage tie-backs with tariffs and standard unchangeable agreements |
| • At FDP stage discussions with the OGA on gas and condensate export resulted in misaligned expectations on value. Effort and money have been spent on evaluating solutions that are uneconomic (including various export options, fuel use and re-injection)<br>• Do not mandate parameters in FDPs, e.g. allow operators to use realistic uptimes in FDPs. The OGA sometimes demands higher uptimes than is practically achievable<br>• Communicate early and agree timeframe for FDP approval |
| • In order to improve the success rate for projects it would be useful for the OGA to develop a more rigorous framework and Code of Practice for the submission of prospective projects and associated FDP. An example would be the safety case regulations that are very clear about what should be included but also go through a rigorous review by the regulator before acceptance. This would go some way to ensuring that projects have been thought through fully prior to submission for approval/acceptance |
| • Promote both cross-industry standardisation (e.g. subsea equipment/hardware); and supplier/industry-led solutions<br>• Company didn't identify any additional 'help' needed from the regulator. Even though two of our projects are significantly over budget and late, company has already captured learnings from these projects and has implemented these changes in their Global Project Processes<br>• Give regular updates to regulator during front end development |

**In the future, how could the OGA (with its wider remit and powers) enhance stewardship of project delivery on UKCS?**

- Roll out industry lessons learned regularly and meet with operators before sanction to make sure they have thought about all the main lessons learned. Potentially develop a check-list for major projects as an aide memoire. Make the OGA more visible at the start of a project
- Have more influence on contractors to deliver major projects if they are being problematic – with government sanctions etc. Understand fully the pros and cons of promoting UK plc for 'local' contract execution, as unfortunately we have lost some key skills and capacity and we should recognise this.

---

- Change licence conditions to place legal obligation on host operator to meet certain performance standards during implementation phase
- Closer scrutiny of infrastructure tie-back projects as part of (quarterly?) stewardship reviews:
  – Structured monthly reporting by host and transportee
  – Seek transportee input to steward reviews
- Incisive enquiry of host and transportee ('Select Committee Approach' comprising regulatory and independent 'advisors/experts')
- Insert a 'Project Governor' onto failing projects Secretary of State's Representative for Maritime Salvage and Intervention (SOSREP) model)
- Rigorously apply MER toolbox:
  – Improvement notices and fines
  – Set a visible example by punishing repeat offenders
- Create a standard set of third-party agreements cascading from Infrastructure Code of Practice (ICOP) for tie in to third-party hosts
- The OGA currently request a Modifications Document from the host operator stating the modifications required and a commitment to the project. However, beyond that there are currently no agreed obligations on the host operator to carry out this plan in the same way that an FDP places commitments on the operator of the third-party development. Consider similar approach to HSE's dealing with safety case, where a design notification is submitted to the HSE ahead of safety case submission giving the HSE opportunity for early enquiry and challenge. Mirror this with the need for a combined host/transportee submission to the OGA that sets out development concept (including transportee and host profiles), high level commercial terms, HSE statement of intent, project execution strategy and participating company's statement of intent towards timely and cost effective implementation
- To achieve MER, bring both sides in at definition stage
- The OGA to contact platform host, not just operator
- The OGA to look for warning signs in project execution

---

- Assess opportunities to rationalise UKCS infrastructure to reduce operating costs and increase the competitiveness of new developments (full cycle)
- Encourage and support minimum facility concepts/design simplification, including fit for purpose risk-based HSE and regulatory requirements, i.e. simpler designs increase delivery predictability
- Screen UKCS projects' authorities interaction requirements for stream-lining opportunities; e.g. understanding implications of new HSE guidelines and comment before they're implemented
- Support initiatives to improve productivity and engineering/project management capability across the supply chain over the long term, to reduce costs and improve delivery predictability

---

- Ensure the regulator is adequately resourced to deal with timely turnaround of Environmental Statements and FDPs
- Provide a faster turnaround time for approval of regulatory submissions

---

- Initiate a cost/benefit and comparative assessment analysis on extent of environmental bureaucracy
- Develop standard proforma anonymised and online for Project Delivery and Lessons Learned. Incentive this.
- Develop an OGA website for available rigs/DSVs/ barges and promote campaign mobilisations and opportunistic hires
- Develop specific Marine/Subsea LOGIC5-type contract proforma

## Tier 1 Contractors:

**In the future, how could the OGA (with its wider remit and powers) enhance stewardship of project delivery on UKCS?**

- Adding checks and balances to operators prior to Project Sanctions
- Distributing generic lessons learned
- Stewarding of project execution
- Could perform a review of the major basis of designs highlighting any major issues to operator before Project Sanction
- Actively promote elimination of paper (e.g. ‘cloud’ and JP101 joint industry initiatives)
- Promote technology to be used across industry
- Get realistic costs and schedule agreed between the OGA and operator at sanction
- Overoptimistic schedules can lead to poor behaviours. Significant costs are time-based so it is important to get the schedule right
- Create a clear definition for sufficient front end loading at sanction

# 6. Acknowledgements

This document has been compiled with the help, input and advice of many people and organisations. The OGA would like to acknowledge the efforts of William Lindsay, Shell, and Selma Hunter, Doosan Babcock, in leading delivery of this report, in addition to the following contributors:

**The MER UK Asset Stewardship Task Force, comprising representation from the following organisations:**

- BP
- Centrica
- Chevron
- Doosan Babcock
- EDF Energy
- Ineos
- Maersk Oil
- Nexen
- North Sea Midstream Partners
- Petrofac
- Ramboll
- Repsol Sinopec Resources UK
- Subsea UK
- Wood Group

**The individual companies who contributed to the Lessons Learned events:**

- Aker Solutions
- AMEC Foster Wheeler
- Apache
- BP
- Chevron
- ConocoPhillips
- Dana Petroleum
- ENI
- EnQuest
- EOG
- Maersk Oil
- Nexen
- Perenco
- Premier Oil
- Subsea7

Oil & Gas Authority



Oil and Gas Authority is a limited company registered in England and Wales with registered number 09666504 and
VAT registered number 249433979. Our registered office is at 21 Bloomsbury Street, London, United Kingdom, WC1B 3HF

www.ogauthority.co.uk