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INSIGHTS

APRIL **2017**

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Published by:
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45 Beech Street
London EC2Y 8AD
United Kingdom

How oil and gas companies can improve decision making

Oil and gas management needs to improve if the industry is going to survive in a $50 to $60 world – and perhaps the best way to describe the necessary improvement is 'more rigour', as well as more continuous decision making, says Petromall's Graham Scotton

One major factor that the industry needs, in order to continue to thrive at a $50 to $60 oil price, is more rigour in management decision making, says Graham Scotton, consultant with Petromall, and a former COO of Dana Petroleum and GM of BP Angola, among other roles.

Graham Scotton

"The approaches and judgement required by managers making proposals, and for decision makers, needs to be sharpened from the practises of the past," he says.

Today, it is too common for projects to cost 2-3 times their original sanction estimate, and come in years late, based on decisions made 5 or 6 years ago.

At best, the typical reaction is for people in the industry to shrug their shoulders and say, 'that was all in the past'. At worst, they can be victims of the failure.

A common root cause of the overruns can be blamed on people trying to fulfil past promises to the market or to government, which they probably should not have made, he says.

Then the industry has a propensity to keep throwing money at challenged projects, and end up losing money overall, he says.

And companies don't have much room to lose money when they are in a tight financial situation.

Perhaps what is needed can best be described as "more rigour of thought," being far more thorough in going through the different options and making sure projects are worthwhile continuing with, he says.

Typical reasons for lack of rigour are that people take personal ownership over a project ('it's my baby') and won't let it go, or they don't want to cancel something which they have spent a lot of money on.

Or they have made a commitment to government to develop the license.

It is so common that you hear board members or senior managers saying, 'we had to do something because someone else wants it to look this way,' he says.

"These are red flags that go up around the decision making," he says. "It causes a compounding of errors sometimes, cost overruns and schedule delays, and something you didn't want at the end of it".

Anyone in projects should be motivated by wanting to meet the cost schedule and scope of work, and everyone including contractors and stakeholders need to be aligned around that goal.

Accountability

The industry needs to see more clarity of accountability.

Too often, "accountability tends to be diluted and dispersed," he says. So if something goes wrong, "everybody stands there and points figures at one another and shrugs their shoulders.

"The industry can't live like that anymore. You cannot look to blame the nearest contractor, government official."

You can recognise confusion of accountability, if you are in a situation where you are not sure if a decision should be made centrally or by a regional office, if

it should be made by a line or by a function, or which function should make the deision.

The industry perhaps needs to be better at recruiting, appointing and training managers who are willing to stand up for the decisions that they have taken, rather than hide from them, he says.

Cost cutting

The industry also needs to be much more rigorous in how it reduces and manages its costs.

But of course reducing safety margins is something which needs to be done very carefully.

Perhaps risk management is actually a much more important skill in the North Sea than engineering, science or finance, he says.

The industry is known to make changes in response to desperation, when it is the only way to survive.

But this sort of cost cutting has its own problems - as an example consider the Baker Report into the Texas City Refinery explosion of 2005, which blamed the incident on cost cutting by BP after its acquisition of AMOCO, and one of the root causes was reducing supervisory levels of staff in the control room.

Companies end up using a "one dimensional cost lever", he says, and it also means that the people who take decisions are not the people who end up being accountable for any problems.

Suppliers

The industry can also be more rigorous in how it works with suppliers.

Ultimately business success is about cost efficiency - making sure that every dollar which gets into a pocket of a supplier works as hard as possible. "It needs to be efficient at every turn," he says.

Companies should start out by working out which component parts will meet the specification and the schedule.

What happens instead, too often, is that the procurement process is designed so that no-one can be blamed if it goes wrong, he says.

It is too common in the oil and gas industry for suppliers to deliver something different to what was actually asked for and people accept it.

This would never be tolerated in the consumer world, for example if you order a car with a certain type of seats and a certain stereo and it arrives set up differently. But it is fairly normal in the oil and gas industry, he says.

People say, it isn't my money we're spending, why should I sort it out. "It's that sort of attitude," he says.

Continuous decision making

Another factor is that companies should be more willing to continuously review and if necessary change their decisions, not make a decision in an annual meeting and refuse to change it.

Oil and gas operators, suppliers and investors can all be guilty of refusing to change decisions once they have been made, he says.

But decisions are made based on a forecast of what is going to happen, and may need to be changed if the forecast turns out to be different to reality. Otherwise it is like making plans on the basis of a weather forecast, and refusing to change the plans if the weather forecast turns out to be wrong, he says.

"The truth is that quality decisions are required on a day to day 24/7 basis."

Also, if decisions are only made once, then you end up trying to adapt the actual business results to the decision, rather than changing the decision to meet business changes, he says.

Companies develop a plan which fits with their budget and overall strategy direction, and then try to make what actually happens fit with it. "There is no degree of freedom to challenge that," he says.

Afterwards, people wonder why a decision which had so much thought going into it turns out to be wrong. But perhaps the inflexibility of decision making is part of the reason that the project failed.

The business opportunity in decommissioning planning

With the decommissioning projects undertaken so far in the North Sea, many contractors have come out poorly because they did not properly understand the task ahead of them, says Greg Coleman of Petromall. Conversely, there should be business opportunities for companies who can help better plan, or manage the risks

There have been a few standalone decommissioning projects in the UK and Norway where the contractors "have come out of it very poorly," says Greg Coleman, consultant with Petromall.

"All of the projects done so far, with one exception, have seen significant cost overruns, both in terms of expenditure and time taken to deliver the project," Mr Coleman says.

"It wasn't planned properly, the right equipment wasn't made available.
They hadn't really understood the scope of what was asked to be done," he says.

"It's in the interest of contractors to get

Greg Coleman

that right, so they're not stuck with having to accept the risk without understanding what they're doing."

However, if companies have seen big losses due to work being poorly defined or cost overruns, then, conversely, there ought to be business opportunities for companies who can help improve planning, or better understand the risks, or actually cover the risks, he says.

There should also be business opportunities for major contractors who are able to get the decommissioning planning right, he says.

To indicate the size of the potential business, consider that total spend to decommissioning UK oil and gas infrastructure is estimated to be between £50bn and £100bn in the UK – and most of the work will go to contractors.

Mr Coleman also serves as CEO of a small cap exploration and production firm, and was formerly head of investor relations and head of Group HSE (health, safety and environment) at BP.

Surveying

One of the main areas for reducing costs, or avoiding cost escalation, is from having a better understanding of the task to begin with.

This leads to business opportunities for companies offering technology and services which can help better understand a decommissioning task and do surveys, include drones, underwater cameras, laser scanning services, corrosion detectors and more.

Technology is being developed which can help you get a sense of internal corrosion on places which cannot be accessed directly.

"You can see the outside of the pipes and vessels, it's more difficult to see the insides, and that's where the damage will be," he says.

Data

There may also be business opportunities for consultants or software companies who are able to help organise all of the old data which describes how the offshore platform has been built and what is installed on it.

Many of the facilities have already been surveyed many times over the past few decades, but that doesn't necessarily mean the data is available, or in a usable format, Mr Coleman says.

"Quite often [the operator will] hand the contractor a big data file and say here's what we have, good luck."

"The contractor says, 'that's way too complicated,' and they miss some of the key elements."

Much of the data does not run easily in modern software, and so is very hard to work with.

The data is probably kept in written documents (not digital), "which are not very accessible for a computer orientated society," he says.

Working on a new project with a computer system is comparatively easy, because you start with a simple design and then gradually add detail, Mr Coleman says.

But when you decommission, you start with equipment, a set of wells and a reservoir, with 30-40 years of information, and the information hasn't necessarily kept up with reality. So it is like looking backwards. Putting all of that in a computer system is not easy.

Unknown risks

A further factor is the risks which still cannot be fully known until the work is actually done.

Sometimes maintenance will have been quietly cut back as the asset nears the end of its life. Or there will have been less inspections going on. There may also be large corrosion which was not previously known about.

Large and unquantifiable risks cannot be carried by a small company or a consultancy. They can only be carried by a large company, or perhaps only the government.

The licenses to operate in the North Sea were originally given only to very large companies, who were thought to have a balance sheet large enough to live with the asset over its lifetime, Mr Coleman says. But today, many of the operators are smaller companies.

Perhaps a financial arrangement could be put together whereby a deep pocketed organisation, such as a sovereign wealth fund, would agree to underwrite the risk of an unknown decommissioning project, in return for a fee. "There is financial opportunity in here somewhere," Mr Coleman says.

Insurance companies might be unlikely to want to get involved, because even insurance companies only want to cover risks that they feel they understand, such as car insurance, when they can fairly accurately quantify the total risk of a certain pool of drivers based on past records, Mr Coleman says.

But decommissioning projects are all individual, each basin has its own weather conditions, and fiscal conditions.

Very hard decommissioning

Some decommissioning is extremely tricky. For example both the Frigg and Brent complex have large concreate storage tanks, with 1m thick concrete containing steel reinforcing bars, on the seabed.

The oil and gas industry did not build facilities bearing in mind they would need to be decommissioned. "It looks like people assumed they would be there forever, especially for big concrete storage tanks," Mr Coleman says.

But altogether, the challenge is not beyond the capability of human and technical expertise in 2017, Mr Coleman says.

Perhaps there are useful lessons to be learned from nuclear decommissioning projects, or major infrastructure like the London Olympic Park, which included a site for radioactive waste.

"There are a lot of lessons to be learned from other decommissioning projects that have gone on in the world," he says.

Planning

If contractors can make a 'conveyor belt' of projects, so one leads sensibly to the next one, they can take a big chunk of their costs, because there is less interim mobilisation and demobilisation efforts – the right equipment and facilities can already be in the right place.

There might also be business opportunities for companies making software tools which

can be better used to plan the decommissioning work, including providing a simulation of the work on screen. Then you can plan how you are going to remove individual items in more detail.

Computer tools in theory can give you much better management of the whole project and make sure the right services are available at the right time and your risks are covered and better understood, and the schedule is optimised, Mr Coleman says.

"There's a significant amount of planning that needs to go into doing this work - so they can do it at the right time and for most optimum costs," he says.

Contractors might also use software services which can help them come up with the optimum schedule for different tasks, so they can minimise re-positioning of equipment and assets between jobs, including accommodation vessels.

Financial planning is also an issue. You need to plan the work so that operators can recover as much tax as possible from the UK Government, Mr Coleman says.

There might also be business opportunities developing technology to do tasks like plug wells in a more efficient way, with a range of different tasks to follow, he says.

Human expertise

The more complex a project is, and the more unknowns it has, the harder it is for rigid computer software to help. But human beings have minds which are evolved to handle complex projects and build up a body of complex knowledge.

If you have been involved in one decommissioning project, you will probably have knowledge which will be very useful in another one.

"A lot of these facilities were started up at the same time. After you've done a few of them you learn where the key weak points are in the system," Mr Coleman says.

Most of the people who were involved in building the assets in the first place are "long gone now", he said. So you will probably need to build up much of the knowledge from scratch.

For example the Forties Field, the largest oilfield in the North Sea, first produced oil in 1975. And even if you can find some of the people who were involved in it still alive, they might not have much memory of how it was built, Mr Coleman says.

There could be business opportunities for younger professionals, with a few decades of working life ahead of them, because the more knowledge they have of decommissioning projects, the more valuable they will be.

It might be better for younger professionals to focus on gathering knowledge of actual projects, rather than focus on the digital or machine learning side of things, Mr Coleman suggests.

Good management is the best way to cut decommissioning costs

As we keep hearing, the estimates of the costs of decommissioning the North Sea oil and gas infrastructure keep going up, now to around £50bn – about half of which will be paid by the UK government, in terms of tax rebates. This is a growing concern for both the industry and government.

Perhaps the right way to keep the costs down could simply be expressed as having good managers to run the decommissioning projects, who are able to win the trust of the workforce, suppliers and everyone else involved, says Graham Scotton of Petromall, a former COO of Dana Petroleum and head of BP Angola (among other roles).

Good managers can also ensure decommissioning is done in a way which avoids exposing shareholders to big losses or getting the company in regulatory problems.

This person also needs enormous oil and gas expertise – covering both project development and operations, and perhaps also subsurface, not someone who has spent their whole career in a specific area.

The decommissioning manager is probably not the person who was in charge of operating the platform during its lifetime, because he or she needs to have a very different mind-set, with an end goal of leaving the sea and seabed in the same state it was in before the oil and gas industry arrived, as international regulation requires.

"The industry ought to have its best people managing these sorts of projects," he said.
It sometimes doesn't end up this way, if the company senior management want to put their top people in roles which they see as more critical to the overall success of the business, such as exploration or project development.

The decommissioning manager needs to be able to handle everything at once – managing the risk, managing the technicalities and making sure all of the stakeholders are aligned, including employees, partners and regulators, he said.

Graham Scotton

"In this particular case we need to be all things to all men. We cannot just be one dimensional geoscientists, or one dimensional project engineers. "We've got to be very elegant in closing down of something."

We have to be as professional as we always were. We were professional about building these things," he says. "The oilfields were constructed with pride, we need to get back to the end state with the same pride as that."
This "doesn't necessarily mean everything

needs to be gold plated, it needs to be done in line with the standards and the expectations."

There have been suggestions that the right approach to decommissioning is for a specialist decommissioning company to take full ownership of the asset in late life, with the skills to get maximum value from it and then remove it.

But this could be a difficult path, because it involves complex legal and financial work for another company to acquire the asset and its associated liabilities, and it would mean removing the people who have massive knowledge of the platform from the project.

Same operational staff

However, when a platform moves into the decommissioning phase, it makes sense to have the same staff working on it, who were working on it during its productive lifetime, because they have an intimate knowledge of it, and this knowledge is invaluable, Mr Scotton believes.

"If you're going to keep running things – you're going to have to have a team of people who do know things, they know where every last needle valve is, the idiosyncrasies. There's no point in throwing away institutional knowledge."

In a similar argument, if you sell a corporate aeroplane to someone else, you might want to keep the same pilot, because they understand how the plane works.

The big challenge is getting this workforce also switched into a decommissioning mind-set, and comfortable working towards the deconstruction of something which they may have been working on for their entire careers.

Experience

The decommissioning manager would ideally have been involved in other decommissioning projects before, to be best able to make use of the industry's small but slowly growing collective decommissioning experience.

The oil and gas industry places a big reliance on precedence, learning from what happened before.
With every task done, a new set of experiences and facts is going to be generated, which can then be expanded upon.

"My observation of the industry is there's lots of talk and talk is cheap - and everybody is wondering who is going to act first," he said.

Costs

It is easy to see that the main driver to reducing the overall costs is the quality of the effort that everybody puts in, he said. Costs will rise "if people want to fool around or drag their feet or be obstructive, and decisions can't be taken."

There is a fairly simple relationship between how well the overall costs are contained, and whether the decommissioning work proceeds according to plan – the more it goes off the plan, the more likely the costs are to spiral.

The industry does not need to be put under pressure to cut costs – but perhaps it does need to better understand the pathways for how those costs can be better managed, Mr Scotton says.

Decommissioning mind-set

The standard oil industry mind-set is far more about building than taking apart. Oil people like exploring, drilling wells, building something until it is a commercial entity, then moving onto the next one. "Decommissioning is psychologically opposed to why an oil man exists," Mr Scotton says.

The idea of making a profit from decommissioning sounds like it does not make sense (although it can make sense, if you find a way to meet your decommissioning obligations at a reduced cost).

Some people enjoy re-inventing themselves to a new role - Mr Scotton gives an example of a former senior drilling manager he knows, who now works as a tourist guide in London.

Agreeing on a date

The toughest part of the decommissioning work is perhaps to agree on the date for 'cessation of production' – and have it accepted by everybody concerned, particularly the workforce who may have concerns about their employment once the platform has been decommissioned.

The amount of organisation required to decommission an asset is so enormous, including scheduling heavy lift vessels and co-ordinating with contractors, so a fixed date a few years in makes a lot of sense.

It may not be a decision everyone agrees with, but once the decision has been made, the best approach is to accept it and get on with it. "At the end of the day there has to be a decision, about things you've got emotional and intellectual attachment to."

You can compare it to decisions to remove trams and trolleybuses, or London's Routemaster buses, from city streets, he says, or the cuts to 30 per cent of the UK's rail network and 55 per cent of its stations, led by Lord Beeching in the 1960s. "At the end of the day, people come around, they say OK, yes fair enough, we're going to get behind this program."

There is always a wonder if oil prices might rise, or you might discover a new reservoir a couple of hundred metres deeper. You can do one last sweep of the geoscience, in case there is anything left to produce, and finally "you've got to come to the conclusion this truly is the end."

The decommissioning management has to get everyone behind the plan. There is always fear of anything unknown, and people are more comfortable in an environment that they know.

"All the things that go with the offshore platform – the contracts, the people, the helicopters, are no longer required to service this thing. People are very comfortable with the salary, the seat on the helicopter, it becomes normal. Then it comes to the end and people don't want to give it up," he said.

"In some instances, people have spent their whole working career in this thing. You've invested in something."

It is a question of "the leadership of the new team being able to convince the old team that this is the right thing to be doing."

"This is not personal, it is just the physics (depleting reservoirs) that causes this [need for decommissioning], he said.

"People tend to be realists – they need the right communication and the right leadership," he said.

Perhaps it makes sense to have a reward scheme for staff, or project managers, if they complete the decommissioning project on time and on budget.

"You can be very practical about this. At the end of the day people have their lives to lead, people know what they like to do."

Oil companies often make financial rewards to companies who complete new build projects on time, he said. Perhaps decommissioning could be the same.

Some governments refuse to accept it, an example being the Egyptian government for the Gulf of Suez, where the regulator "doesn't want to accept, will not accept, its game over," Mr Scotton said.

The government wants to see continued investment in the assets.

Why we should start decommissioning now

If the oil and gas industry starts decommissioning earlier and gets a pipeline of projects together, it will enable it to retain expertise, build up a supply chain and organisational capability – and reduce a future decommissioning bottleneck, says Chris Lloyd

At the moment there are nearly no decommissioning projects going on, and all the expertise, organisational capability and supplier capacity built up on the small number of projects is basically being lost, says Chris Lloyd, consultant with Petromall.

So it may make a lot of sense, in terms of reducing the overall decommissioning cost for the industry, if companies start decommissioning at least one major platform every two years right now.

This would enable the industry to retain expertise from one project to the next, and build up organisational capability and supply chains, he says.

If companies want to keep producing a few more years to get a few last drops out of their reservoirs, then it may make sense to switch the production to subsea equipment and decommission the platform. Perhaps the subsea infrastructure can be re-used then the well is finally abandoned, he says.

Frigg

Mr Lloyd has personal experience of the way decommissioning experience is being lost. He was a project engineer for the massive Frigg decommissioning project in 2008-2009, to dismantle and remove a cluster of platforms which lay over the maritime border between Norway and the UK.

Mr Lloyd was working for heavy lift contractor Saipem, under major contractor Aker Kvaerner, for oil operator Total.

About 700 crew were involved in the decommissioning project, working around the clock for months, preparing the platform for decommissioning, heavy lift and transportation. (Some trivia: the platform had 'dual residency' being managed by both the UK and Norwegian authorities. It was possible to walk between the UK and the Norwegian waters across a bridge. For a while after decommissioning, the bridge was placed as an exhibit outside the Norwegian Petroleum Museum in Stavanger).

"That kind of effort requires a wide and deep variety of skills, everything from chartered structured engineers, naval architects, marine operations experts, down to cutters, welders, fitters, and everything in between. Behind those people there's an industrial hinterland of support personnel," he says.

"A project of this magnitude requires a significant amount of organisation to make it happen. It takes a long time to create an organisation for that group of people to get work done efficiently."

An enormous amount of decommissioning expertise and organisation was gathered in that project, which is basically now lost, because there haven't been any jobs done on that scale since, he says. "We've almost lost a generation worth of experience there."

Engineering contractor Aker Kvaerner built a quayside specifically for decommissioning Frigg (and an expected run of future projects), together with cranes, facilities to handle contaminated waste and chemicals.

Since then, there have not been any more decommissioning projects of that scale, so the quayside is being used as a supply base. However it could be brought into action for decommissioning if it was required again, Mr Lloyd says.

Chris Lloyd

Organisational capability

It is not just the expertise which is lost at the end of a standalone decommissioning project, the organisational capability is also lost.
A decommissioning project ends up with many concentric layers of different companies all working together.

In the middle you have people working on very specific parts of the project, what is going to be cut and what is going to be lifted, and doing risk assessments.

Outside that, there is a layer of people doing related tasks, but not so deeply in the project, for example people operating tugboats or doing a short term cutting or welding task, with the company following its own processes and procedures.

Outside that, there are people doing tasks which support the decommissioning but are not doing decommissioning – such as catering, laundry, accounting.

In some respects, operating a tugboat or doing catering on a decommissioning project is exactly the same as many other projects, but in other respects it is not the same.

"In some circumstances the decommis-

sioning element is so different to normal, but no-one recognises that until it's too late," he says.

A project pipeline

So it may make sense for the industry to come together and put together a project pipeline, starting a major decommissioning project as soon as possible and after that decommissioning a major platform every 2 years, he says.

That way, people with the right expertise have a reason to stay in the oil and gas industry rather than look elsewhere.

The industry can build up expertise, which is usually a pathway to finding ways to reduce costs.

Sometimes the obstruction to decommissioning comes from the people who work on the platform, who see it as a way of signing away their salary. But this problem could be solved simply by oil and gas companies assuring their employees and contractors that they have further employment for them after their platform has gone, Mr Lloyd says.

Supply chain

The current situation for the North Sea decommissioning supply chain is that there is some expertise being developed from some projects, many suppliers ready to provide decommissioning services, and not much work (because hardly any decommissioning projects are happening).

There are plenty of individuals and companies ready to provide decommissioning services, as can be seen by looking through the delegate lists of decommissioning conferences. But they aren't yet able to actually learn from a real project, he says.

There are also companies outside the oil and gas industry – such as in the nuclear industry – who have relevant expertise they would like to offer.

"The supply chain is ready and is keen, but there's very little the supply chain can do without someone to award them a contract," he says.

Industry bodies have been calling for innovative ideas and technology, and it is being delivered, he says.

But contractors do not have budgets which enable them to develop methods and retain staff, unless they are getting a stream of relevant work.

Going subsea early

Another idea is that an operator could replace a platform today with new subsea infrastructure, sized around a reduced production rate.

The processing equipment on the platform could be moved subsea, or the well could be tied to a neighbouring platform, and the oil or gas processed there.

Or oil could be gathered and processed on a low cost FPSO.

Companies can get shot of the complex liability of having old offshore platforms, and replace them with something with much more manageable decommissioning challenges.

It might even be possible to re-use some of the subsea equipment when the well reaches the end of its life.

"Doing something like that - will keep production levels up, keep fields alive, remove the bulk of the decommissioning liability from an oil company balance sheet, and replace it with a much smaller and easier to deal with liability for the subsea efforts," he says.

Chrysaor and Enquest buying North Sea assets – two different financial approaches to decommissioning

In January 2017 there were two big North Sea acquisitions – Enquest buying 25 per cent of BP's Magnus field ($85m) and Chrysaor buying some of Shell North Sea assets ($3.6bn approx.) Both transactions take a different approach to the decommissioning financing – and illustrate ways it can work

In the last week of January 2017, there were two North Sea asset sales announced, each with a different financial approach to decommissioning.

Enquest Petroleum acquired of 25 per cent of the 16.6 mboepd Magnus field from BP. The field is 160km North East of the Shetland Islands. The deal was announced on Jan 24 2017.

Chrysaor, a venture capital funded E+P company founded in 2007, acquired a group of Shell North Sea assets, in a transaction worth around $3.6bn. The deal was announced on Jan 31 2017. Both took a different financial approach to decommissioning.

They illustrate the different ways decommissioning financing can work, says Greg Coleman, consultant with Petromall. They also perhaps provide some ideas for alternative financing systems.

Mr Coleman is CEO of small cap operator Independent Resources, and formerly in various roles at BP, including group vice president overseeing health, safety, security and environment globally.

Magnus

With the Magnus field, BP retains ownership of 75 per cent of the field, and all of the decommissioning liability. However Enquest becomes the operator of the field for its remaining years.

The field currently produces 16,600 boepd, so Enquest's share is 4,150 boepd. The reservoir has 15.9m boe of 2P reserves (about 3 years worth of production at 16,600 boepd). Enquest is paying $85m for the 25 per cent share, which will come out of its

cash flow, so it pays no cash up front. It will also become the operator of the asset.

However, in the transaction, BP retains the decommissioning liability itself.

So you can say that BP is really selling the difficult work of getting value out of a declining reservoir, and aim to extend the time until decommissioning starts.

"That's a good approach for everyone," Mr Coleman says.

BP would probably like its staff to be working on more high value projects (i.e. bigger reservoirs). "BP only wants things at a certain scale. Magnus is at the end of its life. BP would rather release the people to work on something else," Mr Coleman says.

It is perhaps unexpected that BP wishes to keep the decommissioning liability, although maybe Enquest did not want to, or was not in a position to accept it.

"With big companies, the core competence is not taking these things apart," Mr Coleman says. "When it gets to late life, the motivation for taking things apart, and removing debris is not something they can get excited about."

Enquest has done a similar arrangement when it acquired the Thistle oilfield and platform in 2010 from Lundin UK, he says.

"Enquest has the track record of being able to demonstrate to BP and the regulators that they can successfully manage that life extension, and in the process maximise economic recovery of reserves, which is an important agenda for the Oil and Gas Authority [OGA]."

Chrysaor

In the second transaction, Shell has sold a portfolio of assets in the North Sea and West of Shetlands to a fairly new (founded 2007) private equity funded firm called Chrysaor.

There are a number of different assets involved, and Shell's ownership in each one (which it is selling to Chrysaor) ranges from 10 per cent to 100 per cent.

Chrysaor will assume operatorship of three of the assets which Shell currently operates, Armada (76.4%), Everest (100%) and Lomond (100%). 400 Shell staff members will transfer to Chrysaor as part of the transaction.

The agreed price is $3.0bn with a further $600m between 2018 to 2021 depending on the oil price. The package has an equivalent production of 115,000 boepd (Shell's share of the total production of the assets).

Chrysaor is funded by private equity – its investors are Harbour Energy and EIG.

Shell has agreed to cover a fixed $1bn of the decommissioning costs associated with the package of assets, and Chrysaor will take the remaining liability, estimated at $2.5bn.

This means that Chrysaor has a big financial incentive to try to reduce the decommissioning costs, Mr Coleman says.

For this agreement to work, Shell must have been comfortable that Chrysaor was able to accept the decommissioning liability. Under UK law, if a company sells an asset to another company which is not ultimately able to pay for decommissioning (maybe because it goes bankrupt), the liability falls back to the selling company.

This set-up ensures that the government will never be landed with decommissioning liability if the buying company goes bust – but it can also put a spanner in the works for the sale of a late life asset to a smaller company who might be more motivated to do something with it.

There could be some kind of escrow fund from Chrysaor's investors (EIG Global Energy Partners) – but at $3bn this would be an enormous sum even for a large private equity company, Mr Coleman says.

Or there could be a 'letter of credit' guaranteeing that a bank would pay for the decommissioning, but again this means that the funds would need to be taken out of the company's balance sheet.

Shell says that its objective is part of a move to "high-grade and simplify [its] portfolio following the acquisition of BG, to ensure the company represents a world-class investment case."

Different financial products

The complex financial liability issues might mean there is a business opportunity for someone who can develop a financial product which enables it to be managed in a different way, Mr Coleman says.

Mr Coleman says he is trying to develop special financial products which would relieve the selling company from some of its financial liability. "If they sold it in a different way, they could transfer the liability confidently to another party," he says.

An alternative arrangement could be an annual payment, where the operator makes an annual payment to an insurance scheme, which builds up a fund which is used to pay for decommissioning. This is similar to how we buy life insurance, paying annually then receiving a lump sum when we die, Mr Coleman says.

Of course there are risks that the decommissioning costs are greater than planned for, but the parties can make allowance for this – for example by making payments into a separate fund which can be made available to any company which is unable to cover its own decommissioning costs. There is a similar scheme for UK pension funds, with a pot of funds available if any company is not able to meet its pension obligations.

The UK's Oil and Gas Authority (OGA), together with the Treasury (which manages the UK government finances) and the Department for Business, Energy and Industrial Strategy (BEIS) "all need to be supportive of some of these concepts," he says.

Another issue here is transferability of taxes. Oil and gas companies can claim money from the government to do decommissioning in the form of a rebate on corporation tax and other taxes they have paid.

The tax is paid (during asset operations) as a proportion of company profits, but the calculation of profits does not include the cost of decommissioning. If it was, the profit would be lower.

However, if a platform is sold to another company shortly before the end of its life, it may not pay much corporation tax, so there will not be much to reclaim. However it is possible Chrysaor and Shell have found a way around this, Mr Coleman says, with Chrysaor somehow reclaiming back from taxes paid by Shell.

Or perhaps both parties are expecting to get enough production (perhaps a decade) that Chrysaor will pay tax which it can then claim back, Mr Coleman says.

Scotland – reduce reliance on wind, develop fracking and clathrates research

Scotland should be very wary about further investment in wind power, it should develop fracking for gas, invest in energy storage, and do research into arctic methane clathrates, says Professor Brian Smart, former head of petroleum engineering at Heriot-Watt University

Professor Brian Smart, former head of petroleum engineering and vice principal at Heriot-Watt University, Edinburgh, believes that Scotland may be pushing too hard with its efforts to switch to 100 per cent renewable electrical energy by 2020, because the country could become too dependent on now-proven intermittent wind-powered electricity generation.

It would be better developing shale gas fracking, to provide a home-grown electricity supply, which can plug the gaps when the wind is not blowing.

Scotland should also look hard at energy storage, but probably not expect a large scale energy storage solution to be available in the near future.

He also suggests that Scotland could apply some of its research capability into finding ways to mitigate the threat of melting methane clathrates sending methane into the atmosphere, including 'mining' the methane and putting it to industrial use. This could draw on Scotland's research capability in subsurface, subsea, petroleum engineering and project management.

With challenges over the EU, Scottish independence and the economy, "there are enough major uncertainties facing Scotland in the future without having to live with a self-induced uncertainty of electricity supply come 2020," he says.

Wind

Scotland's energy policy of the past few years has been largely about developing wind power. But this policy may have reached its limits, because the more a country is dependent on wind, the more dependent it is on back-up power supplies, Professor Smart says.

It has been argued in the past that sufficient wind would always be blowing somewhere to fulfil power requirements. This has been shown to be incorrect, he says. "There is enough experience now of the output and management of distributed wind power to enable strategic decisions and plans to be made."

Strategic mistakes have been made in over-reliance on wind power, without providing sufficient back-up storage.

Policy makers also assumed that it would be economically acceptable to the public, for governments to build over-capacity of wind power, and for electricity buyers to finance 'constraint payments', paying the wind sector not to generate.

As an alternative, Scotland has power available from nuclear, gas, biomass and hydroelectric, but the nuclear power is scheduled to be decommissioned by 2030. There is no appetite for coal power in Scotland, and some limited tolerance for gas and nuclear, he says.

If Scotland cannot provide its own electricity, it must be imported from England, or perhaps elsewhere in Europe, and this power is likely to be generated using fossil fuels.

The contribution which the wind power sector can make to provide a reliable electricity supply for the country can be misleading, Professor Smart says. The wind power industry will typically quote its average output, and output on particularly good days.

But customers want continuous electricity supply. This means that when it is not windy, the wind power needs to be supported by nuclear, gas, coal, hydro and biomass, and electricity imports from Europe, he says.

The picture is clear by looking at real time information about the UK's electricity generation, which is freely available online.

For example, on September 15 2016 at 10am, the UK's total demand was 36 GW, 22 per cent being supplied by nuclear, 47 per cent by gas, 16 per cent by coal, 3 per cent by hydro, 4 per cent biomass and 1 per cent by wind. 7 per cent was imported from Europe. At this time, Scotland was importing almost 1GW from England.

Professor Brian Smart

The cost of the wind power to the National Grid is also influenced by Constraint Payments, whereby the National Grid pays the wind power industry not to generate, preferring to use output from other generation sources that can't be switched off, such as nuclear.

The Scottish Government plans to get electricity generation to be 100 per cent renewable by 2020, largely without storage, and ultimately without nuclear power. This is a solution which addresses global warming, but without storage, threatens security, surety and affordability of supply.

The problem would not be solved simply by pushing the date (for 100 per cent renewables) backwards, to allow time for storage to be developed, because Scotland plans to decommission its 1.2 GW Torness nuclear power station in 2023, and decommissioning its 1.0 GW Hunterston nuclear power station in 2030. This will create a further hole in demand for reliable electricity.

Other "secure and sure" electricity capability is the Peterhead gas power station (0.4 GW), and 1.5GW of hydroelectricity, and 0.5 GW of biomass. So by 2030, the 'secure and sure' electricity capability will be reduced from 4.6 GW now to 2.4 GW. Meanwhile Scotland's electricity demand varies between 3GW and 6GW.

At the moment, wind must supply at least 1.4 GW at times of peak demand, or

electricity is imported from England, if it is available.

This assumes that England has sufficient capacity, either generated in England or imported from the continent. It is likely that much of this imported electricity will have been generated by nuclear and gas, detracting from Scotland's 100% renewable vision, and potentially putting a brake on independence.

Electricity demand can be reduced through more efficient homes and smart grids. "But this will take time. Also this is not a competent solution to wind's intermittency – there are times when wind power output is reduced to zero," he says.

Electricity storage

There is a need to develop energy storage capacity, "preferably using a range of technologies," he says. This can include pumped storage and hydrogen power.

Distributed battery storage can also contribute, but will take time to build. Production of Lithium has environmental issues, so batteries are not properly green, he says.

The Scottish government did study a "Energy Storage and Management" study in 2010, which may be worth re-examining.
http://www.gov.scot/Publications/2010/10/28091356/9

A revised study could get an understanding of how significant the degree of wind power intermittency is to the need to provide reliable electricity in Scotland.

If Scotland does not have enough energy storage to cover the periods of low electricity supply from renewables, it will probably have to rely on gas power, he says.

Shale gas and fracking

Shale gas (accessed by fracking) from Scotland can fill gaps in renewable electricity supply. Nothing needs to be imported. And if the gas power station has a carbon capture and storage system, it could be zero carbon.

It would be possible to build CCGT (Combined Cycle Gas Turbine) plants which can be reasonably easily cycled (power output moved up and down check) to compensate for wind's intermittency.

Many people are opposed to fracking for environmental reasons. They need to be somehow convinced that shale gas is safe, and essential in retaining current living standards, at least through a transitional phase, Professor Smart says.

"Misinformation and emotion have superseded strategic need and science and engineering, creating a powerful anti-fracking political lobby in Scotland, England and Wales."

"The anti-frackers in Scotland have also chosen to ignore the two hundred years of experience of the much more intrusive surface and underground coalmining in Scotland, which did not ruin the local environment. On the contrary, this industrial effort powered the industrial revolution, creating the foundation for the standard of living we all enjoy today. The local environmental legacy of coalmining has been managed.

"The British Government has taken the anti-fracking lobby on, and it is likely that fracking will proceed in England."

Arctic methane

A related energy issue of interest to Scotland, Professor Smart believes, is that rising Arctic temperatures might lead to a release of massive amounts of methane currently held within ice water crystals in the Arctic (known as methane clathrates).
Methane itself is an especially powerful greenhouse gas. So this could lead to an irreversible and large kick in global warming.

Clathrates are "a compound in which molecules of one component are physically trapped within the crystal structure of another" – so in this case, methane molecules are trapped within ice crystals. The methane comes from bacterial decay of organic matter, or are leaked from underlying oil and gas deposits. The methane is prevented from entering the atmosphere in the first place, because of it forms into clathrates.

Scotland has all of the academic competences to develop an industrial method to 'mine' these clathrates so they can be burned as part of normal gas power supplies – including subsurface, subsea, petroleum engineering and project management, Professor Smart says.

This may be an interesting area of research for Scotland universities, given its expertise in the critical areas of subsurface, subsea, petroleum engineering and project management, Mr Smart says.

"This is a potential project with a big concept and very substantial multi-disciplinary content."

A project could begin by assembling the data, analysis and opinions already available, enabling a position to be taken. If that position is that the predicted risks are credible, the complex project scope can be outlined, at least to the point where serious discussions with the various likely protagonists can begin.

There are "opportunities for geoengineering type and scale projects that look at capturing methane at source before it is released to the atmosphere, as well as the more conventional geoengineering projects that engage with the atmosphere," he says.

There has been studies on clathrates in an oil production context, where they can block pipelines. Work has been done by Prof Bahman Tohidi's work in the Institute of Petroleum Engineering at Heriot-Watt University. The physics are the same as with naturally occurring clathrates.

There is a growing network of foreign academics and research organisations working on these, primarily from a fuel resource of view. The Japanese are probably leaders in the field, and have successfully prospected for and produced gas from hydrates. http://www.mh21japan.gr.jp/english/

Perhaps it will be possible to develop technology which will capture Arctic methane at source, and liquefy it for transport to a market, rather than let it into the atmosphere.

Japan has managed to capture subsea hydrates, but no-one has developed techniques for capturing methane from the Tundra.

If environmentalists are presented with a dilemma of whether to support the industrial scale access to fossil fuels in the Arctic, or the risk of accelerated global warming, "It makes the anti-fracking conundrum look small in comparison," Prof Smart says.