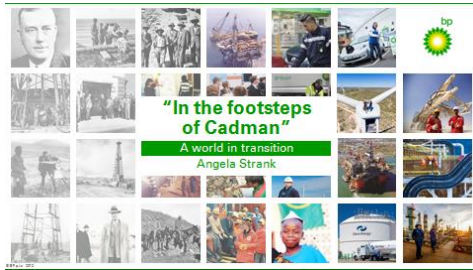


In the footsteps of Cadman – a world in transition



PART 1

Introduction

Good evening ladies and gentlemen – and thank you, Malcolm, for that very generous introduction.

Let me start by saying how honoured I am to receive the Cadman Award.

It is indeed, an enormous privilege to join such a distinguished group of award recipients.

I'm especially delighted to be the first woman in our industry, to receive the award since it began more than 70 years ago.



Having done some research on Lord Cadman, I find myself feeling a particular affinity with him - not least because the award has come back to BP, the company he once led with such great distinction.

Like me, Lord Cadman was a geologist. He joined BP's forerunner - the Anglo Persian Oil Company - almost a century ago in 1922 - and held a number of roles, not unlike mine– helping direct the company's science, engineering and technology agenda.

And like us today, he too worked at the threshold of a new energy transition.

It was the beginning of the great age of oil – just as the industry today is at the beginning of its transition to a lower carbon future.

So it felt appropriate to call my talk today: ‘In the Footsteps of Cadman’.

The Energy Institute asked me to talk this evening about ‘transition’, drawing on my own personal experience.

So the first transition I’ve chosen to talk about is the one we’ve seen for women in our industry.

Then I’ll change tack completely – and talk about the opportunities we all face today in our transition to a lower carbon future.

And I’ll share some of the exciting technologies that are helping us get there.

Lord Cadman’s world

I wonder what Lord Cadman would have to say about women in our industry today – more than 75 years after his retirement?

It’s taken a while - but we have come an awfully long way.

If he were in conversation with our current chief executive, Bob Dudley – whom I’m delighted to say is here tonight with his wife Mary - what would Lord Cadman make of the company he once led?

Well, he’d find that about a third of our main board are women.



I'm sure he'd also be delighted to know that last year 45% of our graduate recruits were women, as were 40% of our experienced hires.

And also today, 23% of our top 400 executives are women.

But what about the industry as a whole?

Here, he'd find that women make up about 20% of the workforce and still only between 10 and 15% at senior levels.



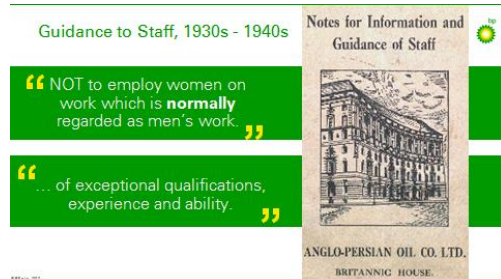
So, he might have grounds for some disappointment, given that 100 years ago, he lived during such a transformational period for women's rights, and witnessed them breaking down many barriers in society.

In Lord Cadman's early 20th century Britain, access to higher education, the right to vote, and the dismantling of barriers to enter the professions, would have given enormous hope to all women.

In that regard, it feels even more symbolic to be the first woman to receive the Cadman Award, this year -in 2018 – exactly 100 years since the first group of British women won the right to vote.

Company policies

But, what about the policies and attitudes towards women in the oil industry, and the Anglo-Persian Oil Company itself, during Lord Cadman's early career?



According to documents from the archives, he would have found that Anglo-Persian's policy was (and I quote) "NOT to employ women on work which is normally regarded as men's work."

I hasten to add that such a policy was common business practice at the time, not just confined to the oil industry.

Exceptions were made, however, for individual females who were (and I quote again) "of exceptional qualifications, experience and ability."

But in reality, only a very small number of women worked in the industry - largely in more traditional, but important, nursing or secretarial roles.

And when signing their contracts, these women would find a clause that compelled them to resign if they should ever decide to get married.

And this was something that actually happened to my own mother in local government, when she married my father – a story that not only dumbfounded me, but influenced me greatly as a child.

That didn't mean that the Anglo-Persian or the industry opposed marriage. Far from it in fact!



It positively encouraged men to marry, if they were destined for far-flung corners of the world – such as the Abadan refinery in south west Persia. Here Anglo Persian's HR policy of the day, actually advised men 'to tie the knot' and take their spouse with them.

Confusing women with cars

Women did feature prominently though in another aspect of this new oil industry – in the marketing of products.



As you can see from this advert from the 1930s, the industry's fuel marketers were no exception to the advertising norms of the time.

I think this rather inauspicious advert is 'of its time' and speaks for itself! Thankfully those days have long gone.

Post war era



But it is fair to say that the post-second world war period marked something of a watershed for women, in terms of participation in the workplace.

Company policies were starting to move with the times.

In common with many others, BP removed its 'resignation on marriage' policy and recruited its first female graduates in the 1950s.

By the '60s, a talented mathematician called Paula Harris – became the first woman to reach senior ranks.

This allowed her to gain access to BP's senior dining room - in what was considered a huge breakthrough at the time!

My life as a baby boomer

It was into this post-war era of the 1950s and '60s that I was born and grew up.

But, what attracted me to the male-dominated world of engineering, science and the oil industry?

Like many, of course, I owe an important debt to my parents.

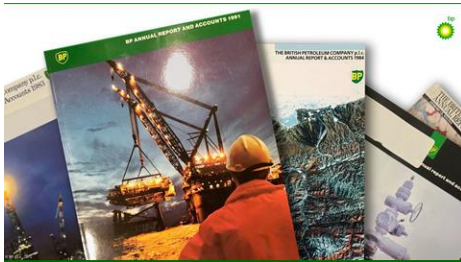
My father was an architect and engineer – a great combination of science and creativity.

My mother won a scholarship at school, but her parents didn't encourage her to go to university because, as she often quoted, she was 'only a woman'.

And she made jolly sure that wasn't going to happen to me!

They were both great role models. But some of the credit for choosing a career in the oil industry, has to go, to our postman.

And I think perhaps I had better explain that!



My father used to dabble in stocks and shares.

I can vividly recall, as a young girl, the postman delivering all manner of company annual reports including those from Shell, BP and Burmah Oil.

They contained amazing, dramatic images of extraordinary metal giants.

Drilling rigs, platforms, refineries, tankers – all pictured in exotic, faraway locations around the world - images that inspired and really excited me.

And I knew I wanted to be part of it.

That said, I think it would be fair to say I had a keen sense of the stereotypes facing women in industry in the 60s.

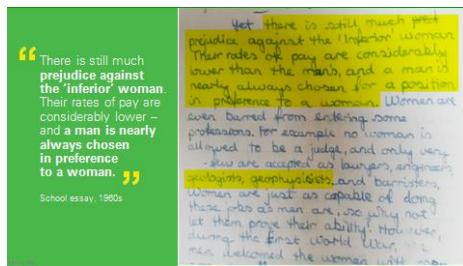
School

When I was about 14 years old at school, we were asked to write an essay about three things we really disliked.

So, I wrote about spiders (understandable I guess), false teeth (still not my favourite topic) – and most importantly – I wrote about ‘unfair discrimination against women’.

Remember, this was the mid-1960s - and teenage revolution and the Women’s Lib Movement, were in the air!

I still have that essay - an excerpt of which you can see here.



The essay went on to decry the lack of female judges, lawyers and engineers.

Why couldn’t women be considered for these jobs?

It was all such a terrible waste of talent and seemed so ludicrous to me.

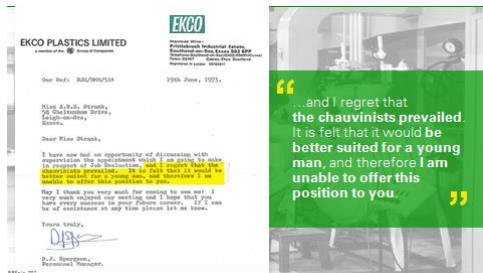
Perhaps most revealing of all – my essay even noted the lack of female geologists and geophysicists – although I’m not sure I really had a clue what they did at the time...but it sounded really exciting.

So - in the early 70s I embarked on a geology degree at the University of Manchester– where I was one of only two females in a year of 50 or so undergraduates.

It was great - but it wasn’t all plain sailing for women in those days.

In 1973, I applied for a summer vacation job supervising a production line in a plastics factory, to help swell my dwindling student bank balance.

I was interviewed alongside four young male students, and a week later I received a letter from the HR department.



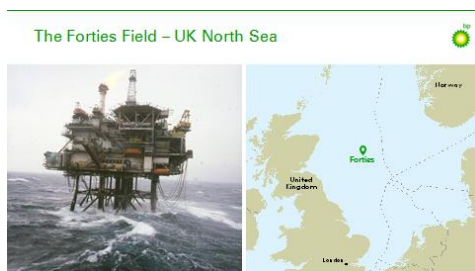
It reads, 'and I regret the chauvinists prevailed. It is felt, that it would be better suited to a young man, and therefore I am unable to offer this position to you'.

This was my first formal taste of rejection and discrimination.

I kept this letter - and subsequently several others, just like it.

They have served as a reminder of the illogical attitude towards women that was considered so acceptable at that time and which I felt strongly needed to be overcome to attract more women into STEM careers and the oil and gas industry.

Breaking through offshore



Nevertheless, in spite of these attitudes, times were slowly changing and opportunities were opening up.

The giant Forties field in the North Sea had just come on stream. However, UK maritime law actually precluded women from working offshore on the rigs, which was a bit of a handicap for an exploration geologist like I wanted to be.

So I did some homework about the industry and discovered that palaeontologists were in great demand, to date the rocks penetrated by exploration wells.

And even more importantly, this specialist palaeontological work could be done onshore, without the need to work offshore!

So I decided to do a PhD in palaeontology which I hoped would be my entry ticket into the oil industry.

Thankfully, this time, the chauvinists didn't "prevail" – and 3 years later in the early 80s, I was approached by BP for my palaeontological skills - and my long career in the industry began.

A few years later, the chance did come for me to work offshore in the Dutch sector of the North Sea.



I did rather stick out like a sore thumb when I arrived on the rig.

In fact, I had to sleep in the medical centre on the hard, narrow examination couch, because in those days there was no separate accommodation or washing facilities for women on board.

I remember lying down on that couch the first night and looking up at the examination light above my head thinking, 'well, I might be uncomfortable, but at least I am here!'

Today, of course, I'm pleased to say that men and women work alongside each other across many facilities all over the world, both onshore and offshore.

Children or career

When the challenge of having children or career in the oil industry presented itself in the late 80s – I was minded to try and find a way to do both. I was featured in a double-page spread from BP's in-house magazine, published just after I returned to work in 1989, following the birth of my first child.



It was my first, very public attempt to encourage more women and mothers to stay with their careers in STEM, and the oil industry.

The article seems really embarrassing and almost outlandish now, especially the headline.

But at the time, returning to work as a young mother – in an international role in oil and gas exploration, was considered

- unheard of,
- unusual, and even by many, thought to be
- unmanageable.

It was hard, and, compared with today, rather inflexible in the 80s to manage both such a career and a young familyso many women left our industry.

But today, and for many years now, I am pleased to say, BP has a multitude of great policies and support mechanisms for all parents.

They're enabling employees to better manage work and family life, and continue their careers, so that their valuable talent is retained.

And as a result, 91% of mothers in BP now return to work– which is such a fantastic turnaround, and the right business outcome.

Angola – a legacy

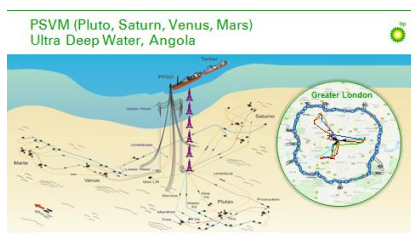
I was also asked this evening to talk, about one of the greatest challenges in my career, so I'll share that with you now.

It was in Angola in the late 90s where I was business development manager.

My job was to win operatorship for BP of the best frontier, ultra-deep water block offshore.

At the time, Angola was a difficult and sometimes distressing environment in which to work.

The 27-year long civil war was still raging in country, much of the infrastructure and many services were affected, land mines littered the country and many people were suffering.



However, in early 2000, we won the operatorship, for Block 31 where BP and our partners subsequently made 19 discoveries.

Later, BP went on to develop PSVM – at the time, the world’s largest ever, subsea oil and gas development - in water depths 6 times the height of the Eiffel Tower.

My role in Angola also covered BP’s social investment programme.

It was an opportunity to make a more direct contribution to a society impacted by war.

I’m proud that we invested in the welfare and education of children who had been orphaned, in particular, those taken care of at our Palanca boys’ camp in Luanda, which we ran with our partners Statoil.

We also helped introduce unmanned mine-clearance machines as part of Angola’s efforts to restore its land.

And, in 1997, the visit by Princess Diana was inspirational for us all.

At the time, just two of the BP staff working in the country were Angolan nationals – and so we created programmes to recruit and train Angolans - who now – 18 years later - comprise most of our field operating teams.

Jolo Lucio, Production Supervisor, Angola, 2018



Let me introduce you to Jolo Lucio – who is our production supervisor on the PSVM offshore vessel in Angola today.

Jolo holds the distinction of being the first woman to work in our offshore operations in the PSVM field.

I think Lord Cadman – like me – would be very proud of Jolo, and the other women like her who are forging great careers in today’s oil and gas industry.

Closing the gender gap

So, that’s enough of the past – let’s look to the future.

The evidence is overwhelming that gender diversity leads to a workforce with stronger ambition and engagement, with greater creativity and resilience.

This is why it has become a business imperative, as well as morally the right thing to do.

And I am very proud to say that - throughout the four decades of my career - BP has always pioneered and worked hard to attract, develop, retain and reward the very best talent, men and women.

The company has created a diverse work environment of inclusion and acceptance where everybody is treated equally and without discrimination.

Of course, though, all of us can and must do more.

Education



We must do better in growing the talent pool available to our industry – something that begins with society in general, and at school in particular.

Only last month the Institute of Physics reported that, in 2016, there were no girls taking physics A Level in 44% of schools in England.

This in itself, stifles the pipeline of engineering talent for our industry.

We all have to continue to work hard to change that paradigm around girls in STEM and careers in the energy sector.

But today, I'm pleased to say, there's a great deal of first class work going on across all our businesses and learned institutions, such as here at the Royal Academy of Engineering.



[image only]

Their fantastic 'This is Engineering Campaign' is sponsored by several companies represented in the room today, including BP.

It's aimed at changing the perception of engineering amongst young people, especially girls, aged 13-18 through carefully targeted, bold marketing campaigns on social media platforms.

It shows how engineering drives many of the things they are already interested in - fashion, sport and entertainment for example.

And they can follow what they already **love** to do, into engineering, and help shape a better future for us all.

It's really inspiring.

A milestone year for women



Since Lord Cadman's time, women in STEM and our industry have made enormous strides.

But, I hope that we might look back and consider this year, 2018, to be far more significant than simply an historical anniversary for women's rights.

Today, it feels as though there's a real groundswell of momentum and acceleration for change.

Public awareness and debate about the issues surrounding gender equality have reached unprecedented levels.

Hardly a day goes by without some news in the media about inequality in pay or opportunity, being exposed and challenged.

What is striking is that there is far less 'hand-wringing' – and much more bias for action and real change.

We can see this playing out in impactful, far-reaching initiatives like the Lord Davies and Hampton Alexander Reviews recommending gender targets on Boards and in executive teams across the FTSE 350 companies.

We see it also in the government's measures to place the gender pay gap firmly under the spotlight.

And we can see it, in the confident and open way, women and men, are now able to talk about, and act upon the issues of equality, enabled by a more connected world.

This is all allowing us to be bolder together in our ambition to develop and harness the talents of us all.

And bolder as we seek to finally break the paradigm around women in STEM and in careers the energy industry.

It is a boldness that I am sure Lord Cadman would recognise, be proud of and applaud.

Part 2: Advancing energy transition



I now want to change tack completely, to talk about a second transition – one of a different kind – in energy itself.



When Lord Cadman joined BP in the 1920s, 10,000 Model T cars were rolling off Ford's production lines each year.

Today, Ford produces around 6 million vehicles a year.

At the same time, aviation was a fledgling industry, and just 11,000 passengers took to the air, with a new airline called Imperial Airways.

Today, Imperial is called British Airways, carrying more than 45 million passengers a year.

At sea, the Royal Navy was powered almost entirely by coal.

Today – all the Navy’s surface fleet is fuelled by oil.

On land, in the air and at sea, an energy transition of epic proportions had begun.

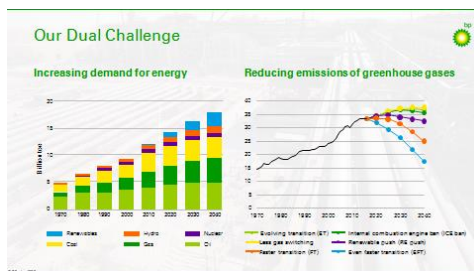


Energy transition – a century on

A century later, we face a new energy transition of similar scale – one that brings a dual challenge.

There’s a challenge to produce more of the affordable energy that society needs.

And there is also the challenge to produce energy that’s less carbon intensive, to help meet the world’s energy and climate goals.



We expect global energy demand to grow - up by around a third over the next two decades.

That’s equivalent to adding the energy requirements of another China and another EU to today’s demand.

We’ll need to embrace new, advanced technologies to both access new energy sources, and produce conventional energy more efficiently.

But it's not a race to renewables, it's a race to lower greenhouse gas emissions.

Although renewables and clean energy are growing fast, the world is going to require gas and oil for decades to come, to fulfil much of its energy demand.

These changes are leading us towards having the most diverse fuel mix there's ever been.

By 2040, we believe there will be a quarter-share each for oil, gas and coal.

And the final quarter we see coming from renewables, nuclear and hydro together.

That mix will certainly help to slow down the growth rate of emissions over time.

But that's still growth - when the climate goals set out in Paris require a sharp fall.

To meet the challenge, policy changes will be required.

And we believe that carbon must be priced – and only governments can do that.

Put a real price on carbon, and you incentivize everyone to use less energy.

You incentivize the use of lower carbon fuels.

And you incentivize innovative science and engineering, and the hunt for all kinds of ways to lower emissions.



Tackling the dual challenge – BP choices

Our approach in BP is tailored to meet this dual challenge and to be resilient to a range of scenarios in a changing world.

Firstly, we're growing gas and advantaged oil in the upstream and producing both with increasing efficiency.

In downstream, we're innovating with advanced lower carbon fuels, lubes and petrochemical products for our customers.

We're pursuing new ventures and innovative partnerships – where we believe they will play an important role in energy provision of the future.

And finally, we're modernising our entire business through advanced digital solutions.

I'll talk a little now about how technology is enabling this approach.



And of course there is much on this front that we can learn from Lord Cadman.

He too was engaged in finding ways to meet dramatic growth in the world's energy demand, by developing Anglo Persian's nascent oil business.

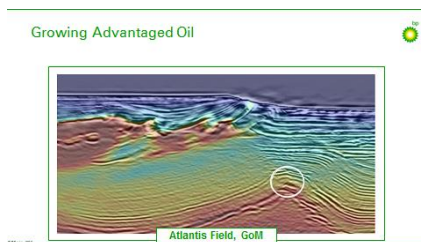
Advantaged oil

In the 1920s, Lord Cadman oversaw the company's very first use of seismic surveying.

It led to a golden era of oil exploration with four major oil discoveries by the end of that decade - including the first to be made in Iraq at Kirkuk in 1927.

Today, we're using advanced seismic imaging, and other technologies, to find new sources of oil and produce them more efficiently.

In a major technology breakthrough last year, we used advanced algorithms to enhance a seismic technique known as full waveform inversion.



This technology allows us to see clearly beneath complex overburden, and huge subsurface salt bodies, into new untapped reservoirs.

This breakthrough resulted in the discovery of a billion barrels of additional oil, across the Thunder Horse and Atlantis fields, in the deep-water Gulf of Mexico.

Shift to gas



Today, we also believe that gas has a key role to play in the energy transition.

A century ago, Lord Cadman was also aware of the great promise of gas – but only if ways could be found to use the large volumes produced in association with oil.

He instigated research into ‘gas to liquids’, and oversaw the development of a multi-stage, gas separation process.

Today, once again, we’re using science and engineering to maximise the role that gas can play – travelling ever greater distances to reach the customer.

In Azerbaijan for example, one of the biggest energy projects in the world is creating a brand new, 3,500 km gas pipeline for Europe – known as the Southern Gas Corridor.

This multi-partner project is bringing gas from beneath the Caspian Sea across Azerbaijan, Georgia, Turkey, Greece, Albania and under the Adriatic, into Southern Italy - a major feat of world-class engineering.

Let’s take a look.

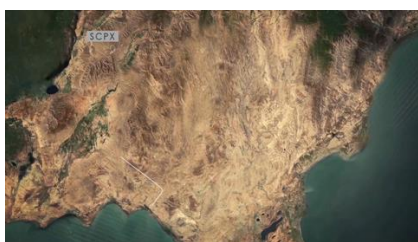


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Just to bring you right up to date, two days ago, we announced the start-up of gas production. And the first commercial deliveries of gas to Turkey, were made through this remarkable engineering achievement.

Market-led growth in the downstream



Back in the 1920s, Lord Cadman recognised that the rapidly expanding upstream would require major investments in a new, downstream infrastructure.

Under his leadership, research and development led to the introduction of new 'anti-knock' fuels for increasingly powerful engines.

Today, in the downstream we're innovating in the development of advanced lower carbon fuels, lubricants and petrochemical products for our customers.

And science and engineering remain at the heart of our approach .

Our Ultimate fuels with ACTIVE technology contain molecules specially designed to protect engines from dirt, which forms harmful deposits and causes a loss in performance.

These molecules attach themselves to the dirt and drag it away from critical engine parts.

In lubricants, we've recently launched Castrol MAGNATEC with DUALOCK technology.

DUALOCK uses a combination of two different protective molecules that lock together at the engine surface, to create a powerful force-field of protection.

This technology delivers a ground breaking, 50% reduction in wear, and provides protection during stop-start driving, whilst also improving fuel economy – and of course emissions.



And in petrochemicals, we've recently developed a new PTA product called PTAir, which is used in the manufacture of many everyday items including clothes, paint and food packaging.

The new manufacturing process for PTAir has a carbon footprint 29% lower than conventional PTA.

Venturing and low carbon businesses



But we're not just looking at improving existing products and processes in our core businesses.

We're also investing in a host of new low carbon opportunities that have the potential to transition the energy business over the long term, in areas such as advanced mobility, advanced bio products, carbon management, power and storage and, of course, digital.

We don't have time to explore all these areas today, so I'll mention just a few.



A good example is in advanced mobility, where we are investing in new technologies and business opportunities presented by electrification, connected and autonomous vehicles.

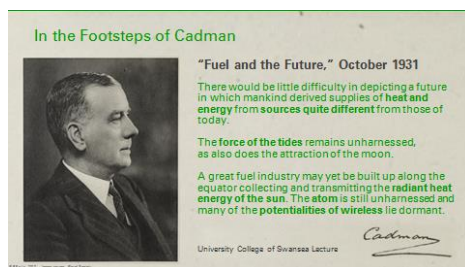
Only last week we announced the acquisition of Chargemaster – the UK’s largest electric vehicle charging company.

By combining Chargemaster’s network of 6,500 charging points with BP’s 1,200 service stations in the UK, we’ll continue to be the country’s leading fuel provider no matter what vehicles our customers drive.

There’s a great deal going on in these spaces, much too much to talk about today, but this short video will give you a flavour.



Vision – A Century On



All this, requires vision.

Lord Cadman, had vision.

And I am very grateful to his great grandson - John Calvin (whom I'm pleased to say is with us this evening) - for sending me the following quote from a lecture Lord Cadman gave in 1931, entitled 'Fuel and the Future'.

He said:

"There would be little difficulty in depicting a future in which mankind derived supplies of heat and energy from sources quite different from those of today.

The force of the tides remains unharnessed, as also does the attraction of the moon.

A great fuel industry may yet be built up along the equator collecting and transmitting the radiant heat energy of the sun.

The atom is still unharnessed, and many of the potentialities of wireless lie dormant."

I think you'll agree that Lord Cadman showed remarkable prescience!

From smartphones, tablets and laptops, through to electric connected cars, there are now more wireless devices in the world than there are people.

We're fast approaching a time when being tethered for long periods to a connection in the wall for power, will be simply unacceptable

It's up to companies, like all of us, to do something about that.

This small item in my hand is a StoreDot battery for a smart phone. This battery can be fully charged in just one single minute.

We think the science and technology in this gadget, has the potential to charge an electric vehicle, in the time it takes to fill a tank with petrol or diesel.

That's why we have just invested \$20 million in StoreDot to help develop this technology for the market.

Conclusion

My time today is up.

I hope - in my remarks this evening - that I've drawn some interesting parallels between Lord Cadman's world in oil and gas a century ago – and the world of energy today.

It's clear that as well as presenting challenges, transitions are a time of great opportunity.

To take full advantage of these opportunities will require the finest minds, creative thinkers, entrepreneurs, and the very best scientists, engineers and technologists.

Our industry, in common with many others, has in the past, overlooked a significant part of the potential talent pool that it can tap.

We still have some way to go – but I am delighted that we're in an era in which harnessing the best talents of the world, men and women, has become a real business imperative.

As we grapple with the challenges of a new energy transition, I can honestly say there is no better time to be in STEM, and what's more, there is no more fascinating, intellectually stimulating or exciting sector to be in than the energy sector.

On a personal level, I feel a huge debt to the many people, who've helped open up the opportunities that both men and women enjoy today.

It is they, who have allowed me to walk in the footsteps of Lord Cadman, and stand here before you tonight.

And I am greatly honoured to accept the award that was created 70 years ago, in his great name.

Thank you very much for listening.

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