DeCAF – how to invest in a post-carbon world

March 2017
Decarbonisation initiatives to halve global emissions will dictate how much certain industries can produce over the coming decades. DeCAF – Deutsche Bank’s Carbon Alignment Framework – is a new investment approach which recognises that the volume goals of policymakers and value goals of investors are not necessarily aligned.
konzept
Editorial

Welcome to a milestone of sorts: the tenth issue of Konzept, Deutsche Bank’s flagship magazine showcasing the best of our research. We hope you have enjoyed (or even made money) reading Konzept over the past two years. Our first cover story was an upbeat piece on German assets (equities have soared 30 per cent since). Twelve months ago the cover of issue #07 argued that inflation was not really dead (turned out it wasn’t). And hopefully some readers sold their prime London properties when Konzept told them to back in October 2015 (best not to look).

This issue is packed with original investment ideas too, including summaries of three completely new research products launched since January. Our feature article by Martin Brough, Lucas Herrmann and Rineesh Bansal introduces the Deutsche Carbon Alignment Framework – a new approach to thinking about the transition to a low-carbon world. DeCAF is based on the fact that volume goals and value creation are not necessarily aligned. Understanding the relationship between them makes picking winners from decarbonisation much easier.

Also inside is an article about a revolutionary improvement to consensus forecasts that adjusts for behavioural biases. According to Nicholas Weng, a trading strategy using his so-called Persona model would have returned 25 per cent over the past decade. Likewise we take some guesswork out of accounting. Luke Templeman’s article on changes to lease accounting – with serious implications for many sectors – is based on yet another new research product. Accounting Lifeguard aims to help investors navigate the murky waters of tax and accounting by explaining these important concepts using plain English. So many new and original products show that investment research is in rude health – a point we made strongly in a recent Financial Times op-ed, which is also reproduced here.

Returning to decarbonisation, a second feature goes into more detail about the volume assumptions behind our DeCAF methodology. Will gas replace coal or does the world jump straight to renewables? Are electric cars really the enemy of oil producers? Find out on page 28. Another article by Martin Brough asks specifically whether Germany is ready to deliver a second wave of its ambitious energy transformation, while a related piece by Eric Heymann looks at the chilling effect energiewende has had on capital spending.

Ever wanted to know where the cloud actually is? Or what is inside one? Karl Keirstead, Deutsche’s internet software and services analyst explains. There is even an article about the cross-currency swap and interest rate swap markets. John Tierney writes that readers need to know about these less-visible but essential markets because they will tell us whether Donald Trump’s mooted reforms of financial regulation are working or not.

As usual our resident spy has managed to sneak into an industry leading event – this time Deutsche Bank’s auto conference in Detroit, hosted by Rod Lache. And finally our book review is a must read for anyone involved in negotiating for a living – which I guess means all of us.

Stuart Kirk
Head of Thematic Research

To send feedback, or to contact any of the authors, please get in touch via your usual Deutsche Bank representative, or write to stuart.kirk@db.com.
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Energiewende—the next wave

The next German government must set out a vision for a renewed decarbonisation of the economy. This seems daunting. The first wave drove energy prices to record high levels, saw carbon reductions mitigated by the nuclear phase out, led to a boom and bust in solar, and drove energy utilities close to financial collapse. (See our feature story on page 38 for more details on the high prices industrial companies are paying for energy and how this is hurting investment.)

But the reality is conditions are pretty favourable for a second wave of energiewende. Consumers, corporates, utilities, debt markets, equity markets and technology drivers are all ready to push for a greener future. The private sector, not the government, can do the heavy lifting. To be successful, however, consumers, producers and investors need the right pricing signals.

Why are the conditions favourable? For a start green energy remains popular with the German public, despite the burden borne by households from the early push for renewable energy. This ensures a notional consensus against any prospective u-turn. Voters are also consumers, and there is a willingness to pay a premium for green products, with retail markets becoming better at providing these products.

Such a green brand premium can drive the decarbonisation of consumption, from phones to cars to supermarkets, as well as the direct retail sales of green energy. Furthermore, German consumers are already paying high energy prices. Therefore as past investments are amortised, room opens up in existing bills to pay for additional green infrastructure.

Corporates are also primed. Companies are increasingly willing to pay a premium for renewable energy because their customers and investors demand it. The German auto sector, for example, has never been keener on being green. Utilities have restructured themselves over the last 18 months, addressing legacy nuclear liabilities, impairing fossil capacity and focusing business models on infrastructure, customers and clean energy.

Debt markets are favourable too. Recent rises notwithstanding, German bond yields remain near record lows. So the next wave of energiewende can be financed at lower cost, over longer periods, than the first wave. No need for government handouts here. Appetite for green finance is growing rapidly. This is partly driven by institutions but ultimately by the wider public, who are investors as well as voters and consumers.

Likewise stock markets can play their part as public equity in Germany is making a comeback. Energy utility RWE raised over €4bn last year by listing innogy, the country’s largest initial public offering in 16 years. Indeed all German utilities have traded higher this year and equity finance is available to companies with attractive investment opportunities.

Technology trends are also supportive. The cost of solar, offshore wind and onshore wind is plummeting just as the perceived consumer and corporate value of going green is rising. German consumers are paying as much as €200 per megawatt hour for offshore wind today. But the cost of the next wave of offshore wind could be half this level. And beyond wind and solar, there has been an explosion of diversity in clean tech, ranging from generation to storage, smart devices and electric vehicles.

It is this diversity, complexity and rapid change that makes flexible market pricing signals

Martin Brough
so important. Top down planning simply is not up to the task of delivering the next wave of decarbonisation while managing transition costs, mitigating regional impacts, and the distributional and social consequences of the energiewende.

Are pricing mechanisms in Germany’s energy markets up to the task? Remember that decentralised, emergent clean energy systems rely on consumers, producers and investors responding to pricing signals that convey real information about underlying cost and value. Energy pricing systems, however, are a regulatory construct and often fail to appreciate the complexity of the product. Hence pricing simplifications or distortions can drive costly misallocation of capital, as well as inefficient consumption and production.

In this regard the German energy pricing system is flawed. Across most areas of production and consumption, prices do not reflect costs. The system urgently needs fixing in five broad areas of the German energy markets.

The first is wholesale power. Here the value of electricity generation depends on where and when it is produced. Power generated close to consumers at the time they want to use it is far more valuable than power produced at a distance and at the wrong time. This is particularly true for electricity given the challenges of storage and long distance transmission.

The German planning system, however, gives local communities considerable power to block infrastructure deployment, including new transmission wires. This is a reasonable political choice. The consequence though is bottlenecks in the electricity transmission system, with rapid growth of wind in north Germany, compared with customer load which is often concentrated in the south.

Ideally, the marginal price of wholesale power should reflect these physical realities. But it does not as Germany is still a single unconstrained power market. A centralised top-down planned system is not flexible enough to find the right mix of local versus low cost generation at a distance from demand, new wires, battery and storage deployment, and investment in flexible demand.

As more wind and solar generation enters the mix, time of day pricing becomes important. During some hours spot power prices are even negative and power stations pay to generate for a few hours to avoid the costs of having to turn off and restart later. Yet intermittent renewable generation is not exposed to these short-term price signals. This mutes incentives to develop flexibility or integrated storage solutions alongside renewable power.

If wholesale energy pricing leaves a lot to be desired, pricing at the retail level is even less reflective of costs. Energy bills are still largely based on unit pricing even though most system costs are fixed. This lack of time-of-use pricing within a day or week underplays the value to the energy system of consumers having more flexible demand. And it gives household and business customers an exaggerated view of the value of generating their own power.

Signalling is also awry for carbon emission pricing. While emissions from power generation are an acknowledged externality, the European Union’s Emissions Trading Scheme has such a large surplus of allowances that pricing remains very low at €5 per tonne compared with €25 a tonne in Britain based partly on a levy. Recent ETS reforms are unlikely to address the scale of the surplus.

A proper carbon price must be reflected in generation. This matters, for instance, in the debate on whether the optimal decarbonisation route goes directly from coal to renewables, or alternately uses gas as a bridge fuel. With the correct price signals, markets could optimise this transition rather than relying on government models and forecasts.

The fourth area where pricing mechanisms need to improve is transportation. Considerable progress could be made on carbon emissions via fuel efficiency, but more radical decarbonisation needs electrification of the transport system. Yet the current approach to road and fuel pricing may not cope with scenarios of radical change. For example, taxes on gasoline are an incentive to switch to electric vehicle. But what happens when tax revenues drop? Should the co-ordination of electric vehicle charging be done by regulation or via prices that vary by time of day and location? Transport is even further from marginal cost pricing than power.

Finally, heat. The decarbonisation of heat may prove the biggest challenge of all for Germany with its cold and dark winters. The current policy to subsidise efficient gas-fired district heating could distort the power market if done through combined heat and power, undermining the economics of other gas-fired power stations. Tariffs for heating, just like for electricity, are over-reliant on unit pricing while much of the infrastructure is fixed-cost. Households spending large sums on heat pumps or efficiency measures to save on heating bills may be disappointed if tariff structures for gas move towards fixed cost recovery and bills are no longer based on units used.

Germany has the opportunity to reap the rewards of being an early mover on green energy. Reforming pricing in power, carbon, transport and heat can allow markets to deliver a sustainable future, and provide a showcase for Europe and the world.
Do not write off investment research

Investment research faces the biggest challenge to its business model since Eliot Spitzer, the pugnacious former attorney-general of New York, jammed a mile-high wedge between analysts and bankers 15 years ago. New European regulation stipulates that from January, clients must pay for research directly rather than via commission. A horrible shock is predicted as analysts such as me discover what they are really worth. Many say research is in terminal decline regardless.

Such doom and gloom is not shared by the so-called sellside, however — and we are a cynical bunch. We see a bright future where newly unbundled content is king and clients are happy to pay for it. Outsiders are too pessimistic because they do not have the data we do. This is not their fault. Indeed, it is exactly because the economics of research is mixed up with sales and trading that regulators want to untangle the mess so clients can see what they are paying for.

Why are the naysayers wrong? Take readership. Low click-through rates are often cited as a sign of disengagement, but analysts are now encouraged to summarise their ideas into the body of emails so clients do not have to download whole reports. On average, about a third of these emails are opened — a significant number. More encouragingly, openings skyrocket when original work is presented in an attractive way. Our best content is often more widely read than much paid-for financial commentary.

It has also recently been claimed that research must be suffering because headcount is down a tenth since 2012. But that is slightly better than for investment banking overall with an 11 per cent decline, according to Coalition data. New technology has reduced employees in publishing and distribution but areas of importance remain covered. For example, the top eight global research houses analyse the same number of companies as they did a decade ago — 3,150 each on average.

The snub that investment research is not valuable is even flakier. Clients fight over meetings with our best analysts and the media ask us for 300 reports a quarter. And, while the sellside’s forecasts are no worse than other professions, analysts are not paid to pick. When I was a portfolio manager in the late 1990s we charged one per cent in management fees. Sellside research by contrast costs a fraction as much, around five to ten basis points. That is a bargain given the unrivalled knowledge on offer — not to mention the corporate access, conferences, models, positioning data and much more we throw in as well.

Stuart Kirk

This article ran as an op-ed in the Financial Times on February 14th.
How much of a bargain we cannot prove under a bundled model. But clients tell us how valuable we are, and they tell independent consultants, too. An annual Greenwich Associates survey asks the buyside — the fund managers and other investors — to apportion its commission payments according to the services received. Year after year, the responses show that clients allocate 45 per cent of commissions for research, 35 per cent for execution and 20 per cent for sales.

Sure, research can improve. There is still too much volume versus quality (Deutsche Bank publishes about 50,000 research reports a year). We must also be better at embracing technology to make our content easier to use. Some clients have already given up on us, building their own analyst teams instead. But, again, this is not so bad from where we sit. Ironically, large buyside research platforms end up consuming even more sellside content.

Does providing research make sense for bank shareholders, though? Consider that in the past decade every investment bank has reviewed its operations and made tough decisions, including closing entire business lines. Yet not one has ceased doing investment research. That is because every part of a bank benefits from research, either directly or indirectly. Traders see that commissions are two times higher when a stock is covered by an analyst. Bankers know the success rate of getting on a deal is five times greater. Plus, we do everything from giving speeches at wealth management conferences to providing briefings for senior management. It is also nice that we do not require capital.

Research has always generated revenues, if it is sometimes hard to see. That is about to change and with luck these revenues will soar. We know from data on readership, meeting requests and phone calls that demand for research more than doubles during periods of uncertainty such as Brexit or Donald Trump’s election victory. And the sellside has suffered alongside active management as the dispersion of total returns declined after the crisis — the world was too boring, too uniform. Expect a renaissance in research now things are hotting up again.
Clairvoyance is overrated. Making good investment decisions does not require paranormal insights into the future. Instead, investors can gain an edge merely by correcting for the altogether predictable shortcomings that afflict the views of other market participants.

Take macroeconomic data such as the monthly US unemployment rate, eurozone industrial production or Japanese inflation. Prior to a data release, various analysts publish their estimate for the upcoming number. The collective market opinion is formed from the wisdom of crowds and hence the median of these individual analyst contributions becomes the consensus forecast. Deviations of actual data from the consensus then drive various asset prices immediately following the data release.

However, analyst estimates, and by extension consensus forecasts, are riddled with systematic biases. This offers investors the opportunity to improve upon the market consensus by adjusting for these known deficiencies. Modifying consensus forecasts results in a powerful indicator of the direction in which the actual data release is likely to surprise relative to the original market consensus.

The recently published Deutsche Bank Persona framework does exactly that by adjusting for three behavioural biases namely, anchoring, rational and attention biases.

Start with anchoring bias, which skews forecasts towards recent values of the same data indicator. Imagine an analyst coming up with a completely unbiased estimate for a future data release. If the last known actual value of the same data variable was lower than this unbiased estimate, the analyst is likely to bring down his final estimate before submission. Therefore the actual estimate submission tends to lie somewhere between the unbiased estimate and the last actual release.

For certain surveys such as the German ZEW or the UK manufacturing PMIs, the anchor of the previous release weighs so heavily that submitted analyst forecasts tend to be tilted more towards the last known value than to an unbiased estimate. As well as surveys, inflation data is particularly prone to anchoring bias. Consider the monthly release of the eurozone and Japanese consumer price inflation. The distortion of consensus from anchoring bias was meaningful on 93 occasions over the last 20 years. In 90 of these instances, adjusting for the bias predicted the direction of the eventual data surprise.

Attention bias is next. Certain related data indicators are released at different times. While an obvious assumption would be that analyst forecasts take into account all available information, in reality analysts’ attention is selectively focused on some events while ignoring others with useful information content.

For instance, the aggregate eurozone industrial production data are released a few days after the corresponding numbers for Italy and Germany. While analysts usually update their forecasts for the eurozone data to reflect the closely-watched German numbers, they are less diligent in incorporating the Italian figures. Therefore surprises in the Italian industrial production tend to be an unexpectedly good predictor for surprises in the aggregate eurozone data.

Rational bias is the third shortcoming that is tackled by Persona. This bias refers to analysts potentially submitting forecasts other than their most accurate estimates. Market participants often point to the fact that analyst forecasts have fatter tails than the normal distribution – that is, analysts tend to forecast extreme outcomes more often. Indeed, previous research by the New York Federal Reserve has shown that even if all analysts had the same forecasting models and data, this can still result in their forecasts being different from each other.

Standard consensus calculations take the median of all available analyst forecasts irrespective of their past accuracy. Persona modifies the consensus by varying the importance attached to analyst forecasts based on their track performance.
For the US unemployment rate and consumer price inflation data releases, for instance, these adjustments meaningfully affected the consensus forecasts on 140 occasions over the past twenty years. Adjusting for the bias helps predict the direction of eventual surprise with a 95 per cent success rate.

Persona adjusts the consensus for all these three biases for 27,000 data releases of 152 economic indicators from across countries over the last 20 years. The modified consensus was meaningfully different from the original over half the time or in over 15,000 instances. And in 70 per cent of these 15,000 cases the new consensus correctly predicted the direction of data surprise.

Can this impressive success rate in predicting the direction of macro data surprises be harnessed into a viable trading strategy?

The first consideration is transaction costs, which are elevated around the time of important macro data releases. For trading a particular asset class in anticipation of a data surprise to be viable, the bid-offer spread around the time of the data announcement should be smaller than the price reaction to the data surprise. For instance, moves in the euro-dollar exchange rate in reaction to non-farm payrolls are nine times larger than the bid-offer spread at the time, offering plenty of scope to trade data surprises. Most emerging market data announcements, on the other hand, are not tradable for this reason.

A second potential pitfall is the possibility that while a Persona forecast is sufficiently different from the analyst consensus, the gap has already been priced in by the market. That could happen due to the presence of a ‘whisper number’ – an implicit market expectation that is significantly different from the analyst consensus forecast. Our framework screens for these cases using the historical asset price reaction to Persona surprises.

How good are the potential returns?
A multi-asset short-term trading strategy exploiting this framework would have returned 25 per cent after transaction costs over the past decade with a Sharpe ratio, a measure of risk-adjusted returns, of 1.3.

It is a myth that investing is always about predicting the future using clever people and even cleverer models. Instead, it is our contention that by focusing on the behavioural biases that beset the formation of market estimates investors can systematically beat consensus forecasts on macroeconomic data with a 70 per cent success rate.

The future itself is unknowable but that should not deter investors from exploiting presently available information to generate attractive returns.


Please go to gmr.db.com or contact us for our in-depth report, “A Behavioural Approach to Event Forecasting – Introducing the Persona Model”
To non techies the “cloud” sounds like a mysterious and amorphous place. Most people know that it is growing like crazy but probably don’t care where software systems run or data reside – so long as everything works. A general ignorance is furthered by the extreme secrecy of the big cloud service providers. For those keen to learn something more however, we recently wrote a report all about data centres. Hopefully a few facts and figures from that report will make the cloud seem a little less fluffy.

The first thing to know is that if the cloud had a headquarters it would be Seattle – not least because that is where Amazon and Microsoft are based, the two giants of the industry along with Google. But if the cloud were to reside anywhere physically, it would be in northern Virginia. Data is sketchy but reports say that up to 70 per cent of global internet traffic passes through Loudoun County in Virginia. Moreover, Greenpeace has estimated the power capacity of Amazon’s data centres by region, and Virginia is by far the largest. Industry checks suggest the company has 25 data centres in the state, while Microsoft and Oracle have also built data centres there. Northern Virginia is now called “Data Centre Alley”.

Why the concentration here? Our sources point to a few things. The first reason is because of the property, equipment and wage tax breaks from government entities. These can include state tax incentives, sales tax exemptions, income tax credits, real estate tax abatements, wage tax rebates and permit fee waivers. Second, Virginia is a central region for the so-called internet backbone, anchored by the EQIX interconnection hub, with a rich supply of fibre optic networks. Proximity to US federal government agencies and large east coast enterprises is a third reason. Another is inexpensive land and electricity/power prices. Regarding the latter, Google once said that its data centres and offices now use as much energy as all of the city of San Francisco.

According to our sources, a typical data centre costs about $300-$400m to build. Back in 2013, Amazon revealed that its data centre facilities cost about $11 per watt of critical power (peak power that can be provisioned to the servers and other equipment). This measurement makes sense given that the primary cost elements (space, power, cooling) scale roughly linearly with watts. Over half of the initial total construction cost might go towards power and cooling equipment.

For competitive reasons very few people are given physical access to an Amazon, Microsoft or Google data centre. Photographs typically show no humans in sight, just racks and racks of servers and other equipment, connected by brightly-coloured networking cables and protected by an elaborate cooling system. Microsoft says its newest and largest cloud data centre could house approximately one million servers. If investors ever wondered what Microsoft can be doing spending more than $9bn per year on capital expenditure – there is one answer right there.

Meanwhile, we estimate that Amazon now has 84 data centres, in 14 different regions...
around the world, each with an average of about 50,000 servers – over 4m servers in total. Adding roughly 3,000 new servers per day gives the likes of Amazon incredible buying power when it comes to equipment. Microsoft also probably has well over 1m servers dedicated to cloud services (as opposed to those supporting its own products), with Google on a similar number for its cloud platform.

Mostly the big cloud providers have such scale that it pays them to design servers to their own specification and then use ODMs (original design manufacturers) to build them. Amazon helps design its own routers, chips and network infrastructure as well. How much memory are we talking about these days? Amazon, which is now putting its most advanced storage servers in production, reckons that each server has 1,110 disks, adding up to 11 petabytes (that is 11m gigabytes) of data per rack.

A data centre’s cost is also a function of power. Amazon has recently said that it prefers to build new data centres with a 25-32 megawatt capacity footprint. Assuming the high end of that range, its three new data centres in Ohio would have a combined 96 megawatts of critical power, bringing the total build cost to $1.1bn. Checks have revealed that Microsoft paid $500m for its Chicago data centre in 2009 and Google paid $600m for its Oregon data centre in 2015. Larger new cloud data centres might therefore run as high as $1bn. This level of expenditure means very high barriers to entry.

And these big numbers also suggest that cost savings in the cloud may be driving the impressive margin gains recently shown by Amazon, Microsoft and Google. All three cite “internal data centre efficiencies” as reasons they have exceeded guidance on costs. We have tried to peer into the cloud to see where the major costs lie. For investors this is also important as understanding trends in expenditure may point to the opportunities opening and closing for third party suppliers.

Our analysis shows that server costs (including the motherboard, chip and DRAM components) are the largest single expense item and hence we should expect Amazon, Microsoft and Google to remain relentless in terms of bringing this cost item down. They can do this via more efficient servers and rack designs, greater use of the ODM model as well as price pressure on the key component vendors, including Intel.

A big shock to us was that the relative cost of power and cooling turned out to be far higher than we imagined. This is an under-analysed source of potential cost saving and margin improvement. While cloud data centre managers obsess over power and cooling, most technology analysts and investors have not spent a lot of time thinking about electricity rates, wind power and hardware cooling techniques. We need to start.

On the other hand the cost of networking is relatively small when compared with the cost of servers and associated gear. One source argued that networking capex is roughly one-tenth the size of server equipment capex. Indeed, Amazon said years ago that “economising on network power draw provides little relative impact”. This is starting to change, with Amazon, Microsoft and Google becoming increasingly focused on the network layer.

Finally, the image of cloud data centres as being devoid of humans is relatively accurate. The staff-to-server ratio is such that a cloud data centre with 100,000 servers might have only 20-25 employees inside. Tasks such as server administration are highly automated in large cloud data centres, more so than for private data centres that run heterogeneous applications. However, employee costs outside the physical data centres can be material. The big cloud vendors have many support staff to remotely monitor, reboot or repair equipment, operations staff to monitor the performance of apps and analyse log data as well as developers to build new services and engineers to design hardware. One source told us that Amazon might now employ 3,000-plus sales and marketing employees.

Don’t expect this super fast growing industry to support millions of workers in safety glasses and white coats. But at the same time, more and more technology suppliers are targeting the hyperscale cloud vendors as new end markets for their products. As the likes of Amazon, Google and Microsoft increasingly point to “internal data efficiencies” to explain the profitability in their cloud businesses, some of these suppliers will win big, others will lose.

What we can be sure about from our attempt to peek under the hood of a data centre, however, is that the barriers to entry are far higher than we imagined, given the scale, money and technological innovation involved.
It is less than two years from perhaps the biggest single addition of debt companies will ever take on. Indeed, one survey of 1,000 global firms estimated their liabilities will jump by one-quarter or $1.5tn once operating leases are brought on balance sheet because of new lease accounting rules. Yet most finance managers are unsure how to even calculate the amount. Most have been watching their peers for guidance. The difficulty under the new lease accounting rules relates to the grey areas involved in selecting the discount rate.

A little-noticed anecdote may help. In a new note, the International Accounting Standards Board revealed that three-quarters of accountants at a recent conference they held hoped to use their company’s appropriate incremental borrowing rate to discount future lease payments. That the IASB endorses this is extremely helpful as it means the discount rate can be estimated with a greater degree of accuracy. So too, the impact on company balance sheets and leverage.

To do this, we looked at S&P 500 companies and used their pre-tax weighted average cost of debt as a discount rate. While this may differ from a company’s theoretical incremental cost of debt, given that the most frequently leased items are buildings and other tangible items, the marginal cost of...
debt for these items should be closer to the company’s weighted average cost of debt. More importantly, companies can most easily justify this rate to their auditors as being ‘reasonable’.

Using the notes in the financial accounts, future lease payments can be discounted to estimate each company’s total lease liability. That figure can then be compared with that derived under the commonly-used ‘Rule of Eight’ model – that is, taking the current lease expense and multiplying it by eight.

The results show a wide difference. In fact, the median company saw its capitalised lease obligations halve using the new discounted method compared with estimates made under the ‘Rule of Eight’. Meanwhile, just a few companies will see their lease liabilities rise.

More important than the absolute extent of a company’s lease obligation, though, is how it will change as the discount rate changes over time. This occurs because under the new rules, the discount rate is set when the lease is first signed. Therefore, leases agreed in the future will be discounted at a different rate if central banks alter base rates. This has the potential to cause confusion between companies that renew otherwise similar leases at different time intervals to their peers.

Take, for example, two retail companies that lease their stores on identical ten-year terms. The only difference is the first renewed its lease in 2007 when base interest rates were five per cent. The second renewed its lease in 2010 when rates were almost zero. The first will report a lease liability one-quarter lower than the second. In turn, this lower liability could cause other creditors to offer more favourable terms for future borrowings to the company.

We can estimate how companies might be affected by increases in US interest rates. To do this, we assume that, on average, a company’s lease expiry schedule will be maintained in the future as its various leases are renewed on a rolling basis. If we further assume that corporate borrowing costs rise and fall directly with the Fed Funds rate, we can then use the Fed’s dot plot of rate expectations to estimate each company’s future cost of debt. For now, we assume the borrowing cost for companies will increase by 200 basis points over the next three years, in-line with current Federal Reserve forecasts.

Of course, a higher discount rate mathematically leads to a lower liability. In four years’ time the median company will have a liability seven per cent lower than today. But it will affect them quite differently and the standard deviation across the set is eight per cent. Indeed, several companies will see their liability fall more than 30 per cent below the current level.

The logical extension is to estimate how companies’ leverage will change over time and how that compares to estimates made under the ‘Rule of Eight’. First, we take a firm’s existing non-current liabilities, add the discounted lease payments (excluding the portion due in the next 12 months) and compare that with the company’s equity. Then we do the same thing but substitute the discounted lease payments for the lease liability estimated using the ‘Rule of Eight’.

The results show that the majority of companies exhibit a better debt to equity ratio in four years’ time under the discounted method compared with the ‘Rule of Eight’. For some companies, the change is material. In fact, 50 firms will have a debt to equity ratio more than 20 per cent better in four years’ time compared with expectations under ‘Rule of Eight’ metrics. Meanwhile, a handful of firms will see their ratio deteriorate.

Of course, it is easy to dismiss all this as a mere paper change. True there is no cash flow effect, but there are very tangible implications. First, and perhaps most importantly, the actual cost of borrowing for many firms is likely to rise. This is something even the regulators have admitted themselves. The reason is that creditors will gain greater clarity on the full extent of a company’s liabilities. For some, they may be lower than expected. Others, however, will throw up a negative surprise of higher liabilities. As debt facilities are renewed with lenders, the newly-disclosed liabilities will certainly factor into the discussion.

Even before debt facilities are renegotiated, the change in many financial ratios will impact the covenants of existing facilities. Some lenders may ignore the changes but where a company discloses an unexpected surprise they may be in for a tough time.

Finally, the good news. Negotiating a lease may become easier as currently, some companies are willing to accept more onerous terms from a lessor in order to create a lease that can be legally defined as ‘operating’ and thus kept off-balance sheet. Without this need anymore, those onerous terms will be scrapped.●

Please go to gmr.db.com or contact us for our in-depth report, “Accounting Lifeguard - The unexpected impact of lease accounting”
Trump and the cross-currency basis swap

Financial markets in the post-crisis world bear scant resemblance to pre-crisis times. The prospect that President Trump might restore the old-world order has, not surprisingly, sparked rallies in US equities and the dollar – and a fall in the bond market.

Beneath the surface, however, less visible but essential markets have yet to respond in a material way. Ever since the crisis, the cross-currency swap and interest rate swap markets and term LIBOR have traded at dislocated levels relative to long-standing pre-crisis norms. They continue to do so. While lacking the marquee status of equities and government bonds, these are not niche markets; on the contrary they are deep, liquid and global.

Why did they never recover? The short answer is some combination of central bank policy, stringent financial regulation and constrained bank balance sheets. If the Trump administration pursues a financial sector deregulation agenda, these market dislocations should start to correct, perhaps even converging to pre-crisis levels. In turn, reducing regulatory pressure on the financial sector would help achieve the administration’s overall objective of faster economic growth.

Hence these underlying markets are worth watching as a barometer of scepticism about what Trump can accomplish. How the cross-currency basis, interest rate swap, and LIBOR markets fare in the coming months and years may say much about whether his policies will put the US and perhaps global economy on a path of sustainably higher growth and push equities, bonds and currencies out of their recent trading ranges.

Take the cross-currency basis swap from euros, pounds and yen into dollars (lend the former; borrow dollars). Before the crisis it traded in a narrow band near zero. During the crisis the cross-currency basis (or cost of borrowing dollars) turned sharply negative due to a lack of dollar funding and heavy demand for dollars. But rather than return to normal as things settled down it remained negative. Today the five-year euro-dollar cross-currency swap is about minus 40 basis points; the yen-dollar basis is about minus 75 basis points.

The primary reason for the negative basis swap into dollars is relentless strong demand for dollar funding by banks and institutional investors in Europe and Japan. Further, whereas before the crisis US banks used their balance sheets to bring markets into balance when the basis swap moved too far from zero, in the post-crisis era banks have been balance sheet constrained and unable or unwilling to lend dollars.

Aggressive quantitative programs by the European Central Bank and Bank of Japan have exacerbated these problems. Notably, both the euro and yen basis swaps eased significantly as the ECB started letting its securities portfolio run off in late 2012 and 2013. But as the ECB resumed buying bonds again in late 2014 the euro and yen cross-currency basis turned negative again due to low rates and tight supply of local currency bonds.

Likewise, dollar interest rate swaps nearly always traded at a positive spread to comparable maturity government bonds before the crisis, reflecting an element of counterparty and bank credit risk. During the crisis swap spreads widened considerably due to credit concerns, then collapsed again as central banks responded with quantitative easing programs. In the US the swaps curve up to the ten year tightened from roughly 40 basis points to about 15-20 basis points, and the 30 year swap spread went – and stayed – negative. The ten year swap spread went negative in the second half of 2015.

The primary explanation for negative swap spreads in the US is strong demand for duration in a falling interest rate environment. Again, balance sheet constraints have kept banks from...
taking the other side of these trades as they did before the crisis. Still that leaves open the question of why swap spreads have been so slow to recover during the recent bond market selloff.

One key factor is the cross-currency basis. When the ECB was letting its portfolio run off in 2013, the 30 year swap spread moved with the cross-currency basis, going from minus 40 basis points to near zero, then steadily more negative again as the euro and yen cross-currency basis swap turned negative. This was probably largely due to changes in dollar demand as the ECB eased then tightened. Preliminary regressions show a strong correlation between central bank activity, and the cross-currency basis and interest rate swaps.

And then there is one-year LIBOR, particularly in the US. Before the crisis, one-year LIBOR traded in line with the one year swap yield, as both were a proxy for bank credit risk. Since the crisis, term LIBOR tended to trade at a 10-15 basis point premium to the one year swap across the US, UK, Europe and Japan, but has widened in the US in the past year, to near 50 basis points recently.

One explanation is that since the crisis interest rate swaps have been subject to more rigorous collateral requirements than previously, thus reducing the counterparty credit risk component. LIBOR on the other hand represents the cost of unsecured loans between banks, or a pure bank credit risk premium. There is also an ongoing reluctance to extend term funding, which has been particularly acute during crisis periods.

The recent significantly wider LIBOR/swap spread in the US, however, is a direct consequence of money market reforms introduced in October 2016. Under these new rules, US money market funds can guarantee a one dollar redemption price only if they invest in short maturity government securities. The intention is to prevent a repeat of the run on money market funds that ensued after the Reserve Primary Fund “broke the buck”, in that the value of its shares fell below one dollar, after the Lehman default in 2008. The US Treasury Department had to respond with a temporary program to backstop money market funds with a government guarantee.
As a result of the change in rules over a trillion dollars has moved from prime money market funds (or about 75 per cent of mid-2015 balances) to government funds. Prime funds had been a key source of funding for banks, mostly by buying bank commercial paper and certificates of deposit. As this source of funding evaporated, the rates on unsecured loans to banks (that is, LIBOR) rose sharply, especially for longer maturities, reflecting the scarcity of term funding.

In short, the standard explanations for dislocations in all three markets (cross-currency basis swap, term US interest rate swap and term LIBOR) revolve around some combination of central bank policy, supply and demand forces, and constrained bank balance sheets that cannot offer the degree of liquidity they did before the crisis. On the plus side these stressed market conditions have been in place for a long time now, and markets do appear to clear. So while there may be little reason for immediate concern, these chronic imbalances could exacerbate problems during the next crisis.

So how might potential regulatory reform under a Trump administration affect these markets? Big shifts in corporate tax and trade policies could have major implications for the dollar and cross-currency basis swap – although the impact could be to tighten rather than ease conditions. If there is a tax repatriation holiday, over $1tn could flow from offshore banks to the US, eliminating a major source of dollar funding for foreign investors and banks. More restrictive trade policies aimed at reducing imports from Asian countries could reduce the flow of dollars to many Asian countries, forcing them to turn to the forex market to borrow dollars, and pressuring the cross-currency basis.

On the other hand, moves to ease some of the regulatory constraints on banks to give them more leeway to make markets and manage risk could have the opposite effect. This requires an overhaul of the Dodd Frank Act, in particular, rolling back the Volcker Rule. Given the lack of movement in these markets since the election, it appears that investors in the cross-currency, interest rate swaps and term LIBOR markets see little prospect for change any time soon.

Investors should keep an eye on the markets highlighted above, first for clues as to how extensive any regulatory changes may be for anything that affects these markets will be significant indeed) and second, for potential convergence trades.

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1 Investors can swap forex in two ways. First, they can exchange currencies and agree to unwind at a future date at the current forward rate. These transactions are typically less than a year. Longer term transactions are usually done in the form of a cross currency basis swap. Here, investors swap currencies and agree to unwind at a future date at today’s spot rate. However, they also exchange ongoing payments based on LIBOR. If a euro-based investor wants to borrow dollars, he pays the dollar lender dollar LIBOR, while receiving euro LIBOR, typically every three months. If demand for dollars is strong, the euro borrower/dollar lender may receive a premium in the form of paying a sub-euribor rate (or alternatively receiving a dollar LIBOR plus a spread. Note: these are hedged transactions as opposed to outright purchases sales of forex. This is the cross-currency basis. Note that the cross-currency basis represents the cost of hedging an forex transaction. For a good explanation of how forex swap pricing please see Borio et al.
3 See Asia Macro in 2017: Year of Fatter Tails, Emerging Markets Research, Deutsche Bank, January 2017

> Please go to gmr.db.com or contact us for our in-depth report, “The multi-asset essay: Forget Dow 20,000 – here are the markets to watch”
DeCAF your portfolio—from volume to value in decarbonisation

Imagine an investor with a crystal ball that accurately predicts the volume of goods each industry will sell in the future. How would they have fared over the past two decades relying only on this remarkable gift to make investment decisions?
If investors took volumes as a proxy for returns, the answer, perhaps surprisingly, is their portfolios would have been decimated. That is because over the past two decades investors have been better served by favouring industries with the biggest declines, rather than increases, in sales volumes. For example, despite global tobacco consumption shrinking steadily, tobacco companies delivered a remarkable 13 per cent annualised total returns since 1997. Not only does this overshadow the 4.5 per cent the overall market managed, it also trounces the 2.3 per cent the telecommunication services sector managed despite enjoying a tail wind of volumes tripling across G7 countries.

Correlation, of course, does not imply causation. But the performance pattern of the past 20 years does serve a useful note of caution to investors about the perils of confusing volume with value. This is particularly pertinent today as investors peer ahead into the next two decades to gauge how the impending decarbonisation of the global economy will affect their investment portfolios.

This is an appropriate time for investors to engage with the decarbonisation question. For many years the climate change debate was dominated by scientists finessing climate models and discussing degrees centigrade of warming. Growing acceptance of the underlying argument that man-made climate change is real and dangerous moved the debate on from scientists into the purview of policymakers with the focus on how to address it.

The Paris agreement last year delivered a key breakthrough with policymakers agreeing to restrict global warming to less than two degrees centigrade this century. This translates into curbing global carbon emissions to less than 20 gigatonnes by 2040, one-third lower than today and half the projected level based on current trends.

These are ambitious targets and meeting them will not be straightforward. There are bound to be bumps along the way, such as the new US administration which is more sceptical of climate change. However, we believe that following the Paris agreement the longer-term secular trend of decarbonisation is well established and here to stay.

So what does halving carbon emissions by 2040 imply? It implies global oil production falling to 70m barrels per day, one-quarter lower than current levels. It implies coal use halving, with 20 per cent of China’s coal generation capacity needing to close early. It implies increasing the pace at which solar and wind power generation capacity is being added from the current 140 gigawatt per year by one-half. It implies a massive proliferation of electric vehicles – perhaps 700m of them or one-third of the total
light vehicle fleet in 2040. [See our next feature - Lay of the post-carbon land - on page 28 for a detailed analysis of the various volume implications of decarbonisation]

Hence, Paris offers investors a roadmap of where various industries are headed in terms of their volumes over the next 25 years. However, even with this hypothetical crystal ball to aid them, investors should heed the lessons of the previous two decades and not assume that volume and value are aligned.

Unlike traditional carbon risk analysis, DeCAF – Deutsche Bank’s Carbon Alignment Framework – explicitly sets out the relationship between volumes and value. Importantly, this relationship is not necessarily aligned. For example, falling fossil fuel volumes do not inevitably lead to stranded carbon assets and investor losses. Instead, these traditional energy businesses could deliver sparkling returns by transforming themselves into cash cows. Likewise, embracing growing renewable energy volumes does not assure unbridled green growth for investor portfolios. It is possible that in the scramble for volume growth renewable companies pose the risk of a green bubble. [For a visual depiction of DeCAF please refer to the infographic on page 50]

Clearly it is critical for investors to identify whether the decarbonisation inspired changes in volume are aligned with value. But how to do this? There are three factors that are crucial in determining if value and volume are aligned: Policy instruments, company actions and the pace of technology innovation. We explain all three in detail below with examples.

Start first with policy instruments. When thinking of volume changes it is not just how much but also the how that matters for investors. The Paris agreement spells out how much volumes need to change but not how those changes are brought about. However, in assessing the value implications for companies the policy instruments employed can be just as important as the objective they seek to achieve.

In particular, the critical difference is whether policymakers pursue their volume objectives by influencing the supply or demand side of the market. The two approaches have opposite implications for the market clearing price of the underlying commodity and hence contrasting effects on the value of the producers involved.

Take, for instance, the policy objective of driving down fossil fuel volumes with coal a particular focus. One option is to achieve this by imposing outright supply restrictions, say through forced government closures of some coal mine capacity. This shifts the coal supply curve leftwards, which not only lowers volumes but also increases the market clearing price of coal.
Hence, the remainder of the operational coal supply, for which the marginal production costs remain unaffected, enjoys better margins. Falling volumes thus lead to higher value for some players here – a case of misaligned volume and value.

An alternate policy approach to achieve the same objective of curbing coal use is to reduce demand, say by imposing a hefty carbon tax on coal use. The IEA pathway to halving emissions by 2040, for instance, assumes steadily rising carbon taxes approaching $140/tonne of carbon dioxide by 2040. That is equivalent to $300 per tonne of coal compared with the current coal price of less than $100 per tonne. This shifts the coal demand curve downwards, leading to lower volumes and also a lower market clearing price. In this policy approach, the entire gamut of coal producers is negatively affected and suffers from lower volumes as well as lower margins – falling volumes and value being aligned in this scenario.

The important difference between supply and demand-led policy approaches is just as relevant for the green industries where volumes are due to increase rather than shrink. A demand-led volume increase, for example driven by consumer subsidies for renewables for instance, would see prices increasing along with volumes thereby ensuring volume and value growth are aligned. A supply-driven volume increase, on the other hand, risks misaligning volume and value by driving future returns down below the cost of capital.

For policymakers the goal is achieving a reduction in emissions. However, the means they adopt to this end have consequences for returns on private investment. Poor policy choices might improve returns for fossil fuel companies making capital in those industries stickier. Meanwhile, it may prove counterproductive to drive emissions down while undermining returns for green companies. Decarbonisation is a hugely capital intensive process and allowing returns in excess of the cost of capital is essential to attract the necessary capital investment. Thus policymakers must also be conscious of the dichotomy between volume and value and choose mechanisms that lead to the two being aligned.

The second factor, after policy instruments, that will determine if the value offered by companies is aligned with their projected volume profile is the pace of change. It not only matters how much volumes will change but also how quickly.

Take natural gas. Under the IEA pathway to achieving the halving of carbon emissions by 2040, gas comes out to be a growth fuel with consumption peaking in 2030 about 20 per cent higher than current volumes. This is because in the pathway
DeCAF your portfolio – from volume to value in decarbonisation
gas serves as a transition fuel following a quick and early ramp down of coal before renewable capacity is fully up and running.

However, gas growth could find itself under pressure if coal’s demise becomes extended and/or if renewables penetration comes along faster than anticipated. In this hypothetical gas squeeze scenario, which still meets the overall emissions reduction criteria in 2040, gas goes from being a growth fuel to a flat fuel with volumes peaking in 2025 just ten per cent higher than now. The implied revenue shift between the two scenarios is $2tn.

While investors usually associate the risk of stranding with fossil fuel companies, even low carbon companies are not immune to the threat. The rapid pace of renewable capacity expansion coupled with the long life of these assets makes past investments vulnerable to rapid technological progress shifting the cost curve down. Such a scenario would represent a serious misalignment of volume growth and investor value.

The first two factors, policy instruments and the pace of innovation, which influence the alignment of volume and value, are exogenous for companies. However, the third and final determinant is how management responds to the potential upcoming volume changes.

High carbon companies with shrinking volumes will need to concentrate on margins from existing production rather than looking to create incremental value on new investment. The nightmare scenario is if these companies are slow to redeploy capital while weighed down by leverage even as lower marginal costs drive market prices ever lower. That would imply falling volumes do indeed destroy value.

Instead, there is the prospect of a carbon cash cow scenario where these companies adjust to a world of shrinking production by embracing both supply and capital discipline. This involves chief executives diverting focus from new investments and recognising that greater value may be tied up in sunk capital. High dividend payout ratios follow and these companies deliver investor value amid falling volumes.

On the other hand, for green companies that find themselves in a high growth environment, ensuring returns on new investments in excess of their cost of capital will be critical. The recipe sounds simple and obvious but history is littered with examples of companies caught up in the irrational exuberance sweeping their industry and chasing volume growth to the detriment of shareholder value. A green bubble would see over optimism driving a rapid build-up of excess capacity, leading to lower margins even as volume grows.
In conclusion, taking action on climate change is clearly a volume game in the sense that success will be determined by drastically reducing the volume of carbon dioxide released into the atmosphere. However, traditional carbon risk analysis usually implicitly assumes volumes and value are aligned. We have presented here a more explicit framework for setting out the relationship between volumes and value, which highlights important implications for investors, chief executives and policymakers.

Investors in particular care about value and not volume. It is high time their involvement in the climate change debate moved the language from degree centigrade and gigatonnes of carbon to percentage points of investment returns. The Paris agreement to curb emissions lays out a road map of drastic volume changes in key industries over the next 25 years. Investors need to take cognisance of these upcoming changes but more importantly employ the conceptual framework described here to ascertain if volume and value are aligned. It is time to wake up and smell the DeCAF.
Public policy pressure is on institutional shareholders to engage with corporates. Meanwhile, the environmental lobby wants companies to drive energy transition and institutions to divest ownership of certain sectors. Thus the interests of policymakers and lobbyists are by definition not driven by shareholder returns. This is the volume-value gap. Investors must question companies to make sure they understand whether they operate in an aligned or misaligned world and hence know how to maximise shareholder value. The key questions to ask company managements are:

- What are your expectations for energy demand and supply over the next 10-15 years? How do these vary from the IEA benchmarks?
- How do you embed transition thinking in investment decisions? Who has responsibility for energy transition at board level?
- What is your energy transition future? What products and services will you sell? What products or geographies will you now avoid?
- To what extent is the business ready to apply growth capital to new opportunities as opposed to replacement capital to existing ones?
- How do you assess the prospects for comparative financial returns? What is the appropriate pace of capital reallocation? How is this influencing your decisions on shareholder payouts?
- How are the markets or companies you sell into changing? Are your major customers becoming more fragmented?
- How do you expect energy prices to move as a result of the transition trends over the next ten years? To what extent will that impact margins?
- What level of financial disclosure can we expect about new business streams? Will we see an “energy transition” division that enables us to track capital and returns?
• Do you disclose your direct greenhouse gas emissions? Do you provide information on indirect emissions embedded in the ultimate use of your products?

• Do you have a carbon dioxide price/tax assumption? How do you apply that to the business? Does it cover indirect emissions as well as direct emissions? Would a global carbon pricing regime be positive?

• What assumptions do you make about abandonment and remediation of production facilities? How do you provide for these future liabilities?

• How do you assess the likelihood of physical damage to your facilities, or liability for damage caused to others by your greenhouse gas emissions?

• What are your priorities in discussions with regulatory authorities? Where would you like to see change or greater clarity?
Lay of the post-carbon land

Caroline Cook, Rineesh Bansal
“Drill for oil? You mean drill into the ground to try and find oil? You’re crazy.” That is how associates of Edwin Drake – the first American to successfully drill for oil – supposedly reacted to his radical business proposition in the 1850s. Half a century later, a bank president infamously declared “the horse is here to stay, but the automobile is only a novelty – a fad”. Historical failures of foresight make for amusing anecdotes. But are current assessments of the energy landscape in coming decades similarly oblivious to changes enforced by climate change mitigation? >
The need to undertake serious efforts to curb climate change is becoming increasingly apparent with each passing year. The hottest ever year has been declared with alarming regularity recently. Indeed, 2016 was the third year in a row to break the record and all 15 hottest years of the past century and a half have occurred in the past two decades. Meanwhile, the weight of scientific evidence leaves the link between carbon emissions and global warming effectively beyond dispute.

Temperature data shows the planet is already more than one degree centigrade warmer than in pre-industrial times. Left unchecked to grow at current trends, carbon emissions are on course to cause warming in excess of five degrees centigrade by the end of this century. The last time temperatures were that high, 250m years ago, 95 per cent of the planet’s species were wiped out. Clearly the status quo is not an option.

Hence, policymakers reached an international agreement in Paris in December 2015 to limit global warming this century to below two degrees centigrade. Scientists have translated this temperature objective into a carbon dioxide emissions target. Annual carbon dioxide emissions grew from 20 gigatonnes to 32 gigatonnes over the past 25 years and are on course to reach 40 gigatonnes over the next quarter of a century. Instead, the two degrees Paris target requires emissions to fall below 20 gigatonnes by 2040, effectively halving them from their current trend.

However, even two degrees of warming has some pretty unpleasant consequences, so a review of the Paris agreement next year will explore adopting a more stringent 1.5 degree target. On the other hand, with a more climate change sceptic administration taking over in the US, there are fears the process could be abandoned altogether. Nevertheless, while short-term political, macroeconomic and market factors might alter the trajectory, the secular trend of decarbonisation has been established and will remain intact.

Each possible permutation of the eventual extent of emissions reduction – and the pace at which each is achieved – leads to a new potential decarbonisation pathway. An article in Nature, a science journal, two years ago identified 1,089 separate scenarios for future carbon emissions, each plotted against a future outcome for global warming to the end of this century.

Rather than add to the confusion with yet another scenario, therefore, let us consider the implications of the International Energy Agency’s benchmark pathway designed to meet the Paris target of halving emissions by 2040. This is no central business-as-usual case, but an ambitious projection of...
a decarbonising world. Reinforced by the recommendations of the G20-sponsored Taskforce on Climate-related Financial Disclosure, it is highly likely to become the default in financial and industrial scenarios and risk assessments.

The first point to address regarding decarbonisation is it does not necessarily entail slower economic growth. Developed world carbon emissions today are the same as in 1990, despite significant output growth since then. The IEA benchmark pathways assume strong global output growth averaging 3.4 per cent to 2040. What is more, this output growth comes despite slowing population growth. The IEA uses United Nations estimates of annualised global population growth below one per cent to 2040, one-third lower than the past quarter century. The upshot is per capita output projected to grow at 2.5 per cent, twice the rate since 1990.

Therefore, amazingly, the IEA scenario posits the world can add 2bn people and, quicken the pace of improvement in global living standards while still halving annual carbon emissions over the next 25 years. How is this possible? If economic growth and decarbonisation are to go hand-in-hand, the burden of adjustment must be borne by reducing the carbon emissions produced in generating each dollar of output.

Carbon dioxide emissions per dollar of output fell by over one-quarter from 1990 through 2015. It needs to fall another by three-quarters between now and 2040 in order to meet the Paris agreement while also doubling economic output. This, in turn, requires a halving of both the energy intensity of output and the carbon intensity of energy from now to 2040 as per the IEA pathway.

What does it take in practical terms to halve both energy intensity of output and carbon intensity of energy? Are these assumptions reasonable? What levers are policymakers likely to reach for in order to achieve them?

Global energy intensity has declined by almost a third over the last 25 years. However, the most efficient economies generate about 16 times more gross domestic product per unit of energy than the least efficient, which highlights the scope for further improvement. Hence the IEA pathway projects a continuation and slight acceleration in energy intensity reduction to 50 per cent over the next 25 years.

The two key factors driving energy intensity are structural changes in the economy and improvements in efficiency. A shift in economic activity from industry to services helped advanced economies reduce energy intensity in the last 25 years. Data already show China is beginning the same shift helping it
The Paris climate change agreement requires annual carbon emissions in 2040 to be half their level as per current trends. To achieve this the share of fossil fuels in overall energy supply needs to fall from 80 per cent today to below 60 per cent.
The IEA assumes 700m electric vehicles by 2040, that is one-third of the global light vehicle fleet.

Oil demand is projected to fall from the current 95m barrels per day to 70m barrels by 2040 – a $500bn annual revenue hit for the oil industry.
reduce its energy intensity over the coming years. On the flip side, a big open question is the nature of development in India and Africa over the coming decades.

The IEA estimates that the world’s energy consumption covered by efficiency standards has doubled since 2005 to one-third currently. The continuation of this trend including the push into relatively untouched areas such as heavy freight and air and water temperature regulation should improve energy efficiency gains. The adoption of advanced energy technologies, everything ranging from smart grids, dimmer switches, LED bulbs and variable speed drives for motors should accelerate the progress on efficiency in the coming years.

While the reduction in energy intensity of output is an ongoing trend, reducing the carbon intensity of energy will be a completely new one. The share of fossil fuels in overall energy supply today is 80 per cent, unchanged from 25 years earlier. Most major oil companies continue to forecast fossil fuels to remain around the 75-80 per cent mark by 2040 despite the Paris target requiring it to fall well below 60 per cent. The big leaps in terms of decarbonisation of energy sources need to occur in transport and power generation with electrification and renewables the key.

Start with transport, which largely runs on oil right now and is responsible for one-quarter of global emissions. The IEA pathway to meet Paris targets is built on transport emissions falling by one-quarter to 2040. In this scenario transport energy demand peaks around 2030 and by 2040 is roughly back to current levels. But while transport energy demand is forecast to be unchanged over 25 years, it requires the share of non-fossil fuel to increase from five per cent currently to one-third.

Take passenger cars and light vehicles, in particular, which account for half of overall transport energy demand. There is already an established trend of at least one per cent annual improvement in the efficiency of internal combustion engines since the start of this millennium. New OECD sales are already averaging fuel efficiencies of 7-8 litres per 100km and the IEA pathway requires four litres per 100km by 2040. While these targets are not unfeasible, the marginal efficiency improvements are getting technically complex and increasingly expensive.

The result is that by 2025 the potential for further gains in combustion engine efficiency could become more costly than the electric vehicle alternative. The electric power train is also far simpler than the advanced combustion engine allowing rapid adoption by manufacturers across the globe. The IEA pathway to achieving Paris targets assumes 700m electric vehicles by 2040,
one-third of the projected global light vehicle fleet.

What does this mean for future oil demand? Assuming progress towards the four litres per 100km and the 700m electric vehicles target, oil demand from light vehicles would peak within the next decade. Simultaneous improvements across shipping, aviation, heavy road and other transport sectors mean the IEA pathway projects oil demand from the whole of transport peaking as early as 2020 at 50m barrels per day and falling under 40m barrels by 2040. Indeed, overall oil demand is projected to fall from 95m barrels today to 70m barrels by 2040 – at current prices that is an annual revenue hit of half a trillion dollars for the oil industry.

Power is the other major sector that needs to deliver for decarbonisation to be successful. There are two critical targets for the power sector in the IEA pathway. First, the share of electricity in total final energy consumption should continue to increase. This has doubled to 18 per cent in the past 40 years and is targeted to reach 24 per cent by 2040. Global generation capacity needs to almost double as a result.

Second, low-carbon power’s share of overall generation needs to more than double from one third currently to three quarters by 2040. Hence the entire net increase in global generation capacity over the next 25 years should come from non-fossil sources.

The biggest increases here are expected from solar and wind, which combined reach a 30 per cent share of overall generation, up from less than five per cent today. The volume leaders in terms of low-carbon power additions are clearly China, India and the Middle East. Even these are not particularly aggressive forecasts. Indeed, the IEA estimates for solar capacity addition in the next five years are still lower than Deutsche Bank analysts’ forecasts.

Nuclear capacity is also anticipated to double in the IEA assumptions for halving emissions by 2040. While the incremental capacity is added in China and India the assumptions also include the replacement of US and European capacity facing forthcoming retirement. The challenge here is lack of appetite for private capital going into developed world nuclear power.

The biggest challenge, however, is displacing cheap domestic coal out of the mix sooner rather than later. Global coal-fired capacity needs to shrink by about a third as its share of the power mix drops from 40 per cent to below ten per cent. Some of this, particularly in the US and Europe, can be met through end of life retirements. However, up to one-fifth of China’s coal generation capacity would require early closure including relatively recent capacity additions. The corollary is that well over a third
of the current coal mines under production need to shut down by 2030.

While oil and coal volumes are clear losers from decarbonisation, the position of natural gas is nuanced. Under current IEA assumptions gas is a beneficiary because it acts as a transition fuel between a rapid shut down of coal capacity and when renewables come on stream in full force. Indeed, the IEA expects gas demand to increase by 15 percent over the coming two decades. However, gas is susceptible to a squeeze scenario. A slower decline in coal and a faster uptake of non-fossil fuel capacity would send gas from a growth fuel to a flat fuel. The implied revenue hit to the gas industry would be $2tn.

It is apparent that the desired level of decarbonisation requires massive volume shifts in the fossil fuel industry. Achieving these requires policymakers to put in place the right incentives. Take the near half a trillion dollars of annual subsidies offered on fossil fuels across the world. The IEA assumptions are built on the complete elimination of fossil fuel subsidies everywhere except the Middle East by 2040.

Even more critical is the lever of carbon pricing. Today, just under 15 per cent of global emissions are taxed in some form with the current average implied tax only $7 per tonne of carbon dioxide. In recognition of the policy trend towards higher and more pervasive carbon taxes, an increasingly large number of companies use and report assumptions around future carbon dioxide taxes of around $40 per tonne.

However, the IEA pathway to halving emissions assumes the steady adoption of high carbon taxes on a near global basis from the late 2020s. By 2040 the assumed rate is $140 per tonne of carbon dioxide in 2015 dollars. This translates into $45 per barrel of oil and $300 per tonne of coal. Carbon pricing at these levels offers a significant incentive for encouraging substitution but would it be politically feasible? Is outright fuel prohibition, or some dislocating policy change, a more likely jump ten years from now?

Another challenge the decarbonisation pathways pose comes from the shifts required in capital investment. Reducing carbon intensity of energy is a supply side fix that means the redeployment of significant blocks of capital. IEA estimates for the two degree warming path are for a cumulative investment of $75tn in 2015 dollars in the energy sector between now and 2040. This is $10tn higher than the failure path that leads to five degrees of warming.

And underneath these top line figures massive redeployments of capital expenditure are assumed. Over the next 25 years, for example, $15tn less is required for fossil fuel
production and power capacity. Meanwhile spending on low carbon energy sources would rise by $5tn and investment in end-use efficiencies by $20tn, with transport the single largest component especially upgrading the efficiency of combustion engines plus the widespread penetration of electric vehicles. In annual terms the requirement for fossil fuel investment would halve to $700bn while low carbon power and grid would rise to $800bn.

On paper the most straightforward way to achieve such big shifts in capex is for the energy incumbents to use their existing systems, knowledge and employees to reinvest free cash flows in transition. In reality there are tremendous institutional barriers to this – not least a perception that these companies have no competence to do so and run the risk of severely diluting near-term returns.

The practicalities of pricing and investment are one thing, but the biggest enabler of the energy transition could also pose its biggest threat. The internet-of-things, intelligent controls and, big data analysis lie at the heart of future efficiency improvements and the optimal penetration of new power sources. Could this revolution be derailed by a massive cyber failure or artificial intelligence over-reach? Who will take responsibility for understanding and mitigating these risks?

To sum up it is clear that the coming two decades are a critical phase of the climate change mitigation effort. The pathway to restrict global warming exists but the actions needed to progress will cause radical shifts for the energy industry and beyond. Investors need to be aware of what the assumptions behind policymakers’ targets mean for volumes in various sectors. Ignorance, or poor foresight, risks becoming the subject of amusing anecdotes for future generations.
Is Germany’s energy policy slowing down investment?

Eric Heymann
Energiewende, Germany’s massive push for a switch to renewable energy sources, is a once-in-a-lifetime project. There is uncertainty concerning both the eventual outcome and the way to get there – in terms of the necessary political measures and instruments, the economic impact for consumers and companies, and technical progress. This uncertainty is already having a significant effect on the investment behaviour of companies in Germany, especially those in the industrial sector. >
It is clear that the energy transition has pushed up German electricity prices for both households and business customers in recent years. Last year, electricity prices – including all taxes and charges – for industrial customers in Germany using between 500 and 2,000 megawatt hours per year exceeded the European Union average by 36 per cent. At the start of the millennium, however, electricity prices in Germany were only three per cent above the EU average.

If taxes and charges were excluded, electricity prices for this industrial customer group were actually six per cent below the EU average last year. It is clear that government measures are largely to blame for the disproportionately high rise in electricity prices in Germany.

Industrial customers in Germany saw their electricity costs – including taxes and charges – rise by more than 140 per cent between 2000 and 2016. By comparison, the average increase across the EU was ‘only’ 83 per cent. The rise has slowed recently, partly because the prices for resources used to generate electricity (coal and gas), have fallen. However, the fluctuating prices for oil, coal and gas affect companies throughout the EU in a similar way. The price paid by end users for electricity (or fuel at the filling station), on the other hand, is significantly affected by fiscal measures.

The Renewable Energy Sources Act, or EEG in German, levies an eponymous surcharge on electricity consumers to fund the expansion of renewable energy in the electricity sector. This EEG surcharge is a key reason for the disproportionate rise in German electricity prices over recent years. In 2016, the surcharge accounted for 40 per cent of all taxes, charges and levies on the price of electricity paid by private households. In 2005 the figure was only nine per cent.

Earlier this year, the EEG surcharge rose to 6.88 cents per kilowatt hour. This surcharge alone is now significantly above the average spot electricity price in recent years, which essentially reflects the costs of pure power generation by the power plant operators.

Such a sharp rise in electricity prices affects German companies’ ability to compete on the global stage and consequently their willingness to invest. To avoid making businesses with particularly high energy needs, such as chemicals or metal production industries, too uncompetitive, German legislators have always allowed generous exemptions for such companies. They benefit from a significantly lower renewable energy surcharge, for example, or pay lower network charges.

It might be argued that these exemptions negate the effect of the high absolute level of electricity prices and hence, German companies receiving these benefits are not at a disadvantage vis-à-
vis international competition. However, this argument is flawed as it overlooks the aspect of uncertainty.

No one knows how long these exemptions will continue to apply. The concessions are intermittently – or in some cases constantly – criticised by the EU, certain politicians and some scientists. Among the arguments propounded is that if the costs of energy transition (the EEG surcharge, for example), were borne more fairly by all companies, including the large energy users, the corresponding increase in electricity prices and the renewable energy surcharge would be better held in check.

Supporters of this argument apparently have little interest in ensuring the long-term viability of energy intensive companies in Germany. Certain production processes would immediately or gradually disappear from Germany if the companies concerned had to pay the full renewable energy surcharge, given the surcharge alone would be significantly higher than the overall electricity price in other countries. It is absurd to assume that such a cost difference would have no impact on capital spending decisions.

The lifetime of plant and equipment, especially in energy intensive sectors, may span several decades. The uncertainties outlined above that are highlighted in the political discussion surrounding the exemptions are therefore toxic for decisions on capital expenditure, particularly since in many sectors such as the steel industry the current underutilisation of global capacity is squeezing returns.

Currently about 96 per cent of all industrial enterprises pay the full levy. Even for companies that are not particularly energy intensive, these costs are already adversely affecting their ability to compete and there is uncertainty about what will happen in the future.

The costs and uncertainties associated with the switch to renewable energy sources has been reflected in capital spending decisions and the changes in the capital stock in energy-intensive industries for a number of years. This trend has continued up to the present day and is borne out by the statistics.

The level of net fixed assets – effectively the result of earlier investing activities – in real terms has been steadily declining in recent years for all energy-intensive industrial sectors such as paper, chemicals, construction materials and, metal production. Across the industrial sector as a whole, however, and in the service sector, there was a small increase. This trend is alarming because net fixed assets also include the capitalised R&D expenditure of the industry concerned.

The most recent figures available show nominal net fixed assets, including capitalised R&D spending, were just three per cent above their level two decades ago. In the less energy-intensive sectors, by contrast, this figure has risen by 31 per cent.
Electricity prices – including taxes and charges – for some industrial customers in Germany exceeded the European Union average by 36 per cent last year. For energy-intensive industries capital spending has trailed depreciation for six years in a row.
For energy intensive sectors the modernity ratio, defined as nominal net fixed assets as a percentage of gross fixed assets, was three percentage points lower than for industries with lower energy consumption in 2014, the latest available figures. Focusing on the net capital expenditure – that is total capital expenditure minus depreciation – alone shows it was negative for energy-intensive industries in six successive years leading to 2014. Indeed, the net capital expenditure for these sectors has been positive in only five years since 1995. This implies that capital spending in the energy intensive sectors has fallen short of the depreciation for many years now.

Of course the trend of weak capital investment outlined above cannot be attributed purely to the costs and uncertainties surrounding German energy policy. However, the clear discrepancy in investment activity between the energy-intensive and the non-energy-intensive sectors, and the overwhelmingly negative assessment of the energy transition by industrial enterprises suggest that the uncertainties surrounding energy policy will remain a factor in these industries’ reluctance to invest in Germany. This trend is not new and in the current circumstances there is no prospect of it being reversed.

At the same time, these sectors have maintained their capital spending in other countries in recent years and have explicitly cited low energy prices and good (that is certain) energy policy as the reason for their decision to do so.

The current pattern of investment behaviour is worrying for Germany, which has a high degree of vertical integration in its industrial supply chain. Companies with particularly high energy consumption are often the first link in this chain. They supply the intermediate products for sectors such as the automotive, mechanical engineering and electrical engineering industries that are not themselves energy intensive but represent the bedrock of Germany’s export sector. The companies benefit from the close physical proximity to their suppliers, as well as a tightly integrated research community that is complemented by the involvement of universities and other research facilities. This integrated supply chain is a key factor in Germany’s success as an industrial hub. If one link is weakened, it will have a detrimental effect on the rest of the chain.

If energy-intensive companies stop investing in Germany, their ability to innovate may suffer in the medium term, which would also have negative consequences for consumers. There are no simple solutions on the horizon. German policymakers should therefore at least think at a more European level when formulating energy policy, and carefully examine any uniquely German solutions in respect of their economic efficiency and environmental impact.
Despite the marketing hype, love of the environment, and generous incentives, electric cars and hybrids represented less than two per cent of new passenger car registrations in Germany last year. Green vehicles therefore remain a niche market. When asked, the average buyer says they steer clear of electric cars because of their high purchase cost, uncertainty about resale value and battery life, limited range, a lack of charging stations and lengthy charging times.

This reluctance to buy presents the auto industry and the German government with a dilemma. Strict carbon dioxide limits for new vehicles means that the industry has to invest heavily in electric car technology, but automakers cannot expect an equivalent payback in terms of revenue in the foreseeable future. Meanwhile, for policymakers in Berlin there is a straight choice between granting expensive subsidies and failing to reach climate change targets.

The reality is sobering. According to Germany’s Federal Motor Transport Authority, 11,410 purely electrically driven cars were registered in 2016, a decline of eight per cent versus the year before. And indeed, even this overstates demand firstly because the bulk of purchases were made by the commercial and public-sector car buyers. In addition, a €4,000 incentive for electric vehicles was introduced in the spring – half of which is paid by the government and half by the auto industry.

Hybrids are faring better, with 48,000 sold last year, 40 per cent more than 2015. But even these sales were powered by a new €3,000 buyer’s incentive for plug-in hybrids.

Certainly a reticence on the part of buyers cannot be explained by a lack of supply. Lots of automakers have launched electric cars and plug-in hybrids in recent years. The choice of vehicles is now considerable. What is more there is a drive to champion electromobility from politicians, industry, academia, NGOs and the media. But the benefits of electric driving just do not seem to yet outweigh the downsides of owning these vehicles.

Nor is this problem uniquely Germany’s. The reality is that electric cars only have a higher and faster increasing market share in countries such as Norway, the Netherlands and China, where governments subsidise the purchase of electric vehicles more heavily. In some cases, policy actively prevents or disincetivises the purchase of conventional cars. In certain regions of China, for example, only a limited number of licenses are issued for the purchase of new combustion engine cars. There is not one
automotive market in the world in which electric vehicles are making inroads without state assistance.

This reliance on state assistance was demonstrated earlier this year as electric vehicle sales in China plunged 66 per cent in January 2017 from the previous year after an abrupt announcement to cut government subsidies by 30 per cent.

However, carmakers do not have the option of decreasing supply in response to lower demand. This is because ramping up the electrification of new models is the only way industry can achieve the overall fleet limits on carbon emissions imposed in the EU and other automotive markets. There are also discussions about potential regional bans on cars with certain types of combustion engines or (for example in China) on quotas for electric vehicles that have to be met. Hence car makers have no choice but to invest to improve the technology and bring down costs. However, this requires a vast commitment of financial resources at a time when natural demand is limited.

It is not just the automotive industry that is in a quandary. The German government and others have set climate targets that directly or indirectly include the transport sector. Electric cars are seen as a key to achieving carbon-neutrality. The implicit assumption is that the requisite electricity will come from renewable sources – in itself an ambitious target. Ultimately, subsidies for electric vehicles in many countries are motivated by overall climate policy. The fact that electric cars produce low levels of local pollution is, of course, also important.

But there is a dilemma: if subsidies for electric cars are generous enough to rapidly increase market share, it will quickly become onerously expensive for the state. Yet, if the programme of incentives is not attractive enough for the average car buyer, as is evidently the case right now in Germany, it is likely that the ambitious climate protection targets will not be attained.

This problem is shared by other green or low carbon technologies. Without state subsidies they are often not sufficiently attractive for the average consumer or commercial investor to the extent that is desired politically. In addition, as a technology, electromobility represents a particularly expensive means of avoiding carbon emissions. In fact, climate protection might benefit more if the financial resources currently being pumped into electric cars were used for other low carbon technologies.

A policy turnaround in the regulation of carbon emissions in road traffic is not expected any time soon. For now, the hope in Germany and elsewhere must be that technology will advance quickly to a point where buyers no longer need to be incentivised by the state to choose an electric vehicle, but do so because it represents the best option for them.
As a Federal Bureau of Investigation hostage negotiator turned consultant, author Chris Voss has plenty of stories about life and death negotiations. Each chapter of his new book begins with one. Some have successful outcomes, others end in bloodshed. Reading them, one cannot dismiss the notion that the stories themselves are a negotiation trick to keep you reading.

If so, they work. Knowing Voss haggled for people’s lives without compromising makes you take his framework seriously. Its applicability to corporate life is obvious. After all, as Voss writes, “Kidnappers are just businessmen trying to get the best price.”

For those sceptical that rational business lessons can be learned from negotiating with terrorists and kidnappers, consider this game that the author writes about. It works particularly well with supposedly value-maximising business school students. Everyone in the room pairs up. The first person in each pair is given ten dollars. That person then makes one, and only one, offer of some of the cash to the second person. If the second person accepts, both keep their respective split of the money. If the second person accepts, both keep their respective split of the money. If the second person declines, both lose all the money. On average, Voss reckons a deal is reached only when the first person offers half the cash. Anything less and the second person will turn down the ‘unfair’ offer. But that is clearly stupid. Logically, the second person should accept a mere one cent and let the first keep $9.99. After all, something is better than nothing. And yet this rarely happens. The point is that even in a silly but still competitive game, people are hostage to their emotions. Imagine how much more irrational they are in real life.

That is why an effective negotiation, be it with kidnappers or bankers, runs contrary to standard business school theory. It always starts with empathetic listening. The goal is to establish trust with your partner (remember, they are not an opponent) and let them know you understand their motivations.

Information can then be gleaned using calibrated, open-ended questions that start with the words “how” or “what”. And do not be scared of hearing the word “no.” In fact, Voss suggests phrasing questions in a way that allows the counterparty to say “no”. This gives them the illusion of control. So too does letting them talk, by which they merely bleed information. Listening, not talking, gives the negotiator leverage and power.

When it comes to talking price, Voss contradicts the standard theory, such as the idea you should be the first to anchor the price. Never make the first offer. And once your counterparty submits theirs, do not immediately counter, rather, ask open-ended questions. When Voss finally needs to counter an unacceptable offer, his favourite response is: “How am I supposed to do that?” This leads the counterparty to try and determine a solution by negotiating against themselves.

Other pointers include using non-round numbers and non-financial offerings. These helped Voss negotiate for a woman snatched in Haiti. The kidnappers originally asked for $5m but eventually accepted $4,751 plus a stereo system. The ‘carefully calculated’ final price and non-financial kicker was meant to indicate the woman’s family had reached their absolute limit. The kidnappers happily made the exchange thinking they had squeezed out every last drop.

Dominating every page is the book’s title highlighting Voss’s distaste for compromise. In his line of work compromise means letting a terrorist kill half the hostages. This ‘failure is not an option’ narrative would seem tacky in another context but here it resonates because if the worst happened to your family, Voss is the guy you would call.
Conference spy—auto makers

Notes from the Deutsche Bank global auto industry conference

Having eaten heartily over the holiday break it was harder than usual for your spies to sneak into Deutsche Bank’s Global Auto Industry Conference in Detroit this year. But somehow we managed to slip security to bring Konzept readers the best nuggets from manufacturers and participants alike. Thanks to Rod Lache and his team for vetting our intelligence.

On the general mood: In line with the general pick up in sentiment across the globe, industry expectations for this year are pretty sprightly. A racier US market is being pencilled in, for example, with support from cheap credit being augmented by a stronger overall economy. Meanwhile, suppliers have considerable order backlogs. In terms of margins for auto makers themselves, we also detected that cost performance would impress investors this year. Concerns about border taxes were less evident than suspected – either because participants have considerable US exports, which mitigate any input controls, or because makers would be shielded by continuing net operating losses.

On General Motors: We listened to many presentations and overheard plenty of discussions with manufacturers. One of the most bullish presentations was by General Motors. The company provided a strong earnings outlook for the year, with flat to higher earnings before interest and tax (which is way above consensus). GM hints at even more upside from a slew of new products (primarily SUVs) and cost savings. We were most impressed by evidence of GM’s capital deployment and spending discipline, which is increasingly allowing it to offset technology spending. This management team seems to be the one to beat.

On Fiat Chrysler: Given the cold weather outside it was great to join the ‘fireside chat’ with Fiat Chrysler boss Sergio Marchionne. He focused on the potential for significant earnings/free cash flow improvement over the next couple of years. For Fiat, the North American market accounts for 85 per cent of earnings before interest and tax. And he said the stable outlook for this market would help the company execute its aggressive transformation of 600,000 units of car capacity to trucks and SUVs. This could add about $2bn to ebit by 2018. Mr Marchionne also said Fiat intends to grow its China Jeep volumes by 350,000 units, and that earnings from Europe, Middle East and Africa should also improve.

On Ford: The tone was less upbeat at Ford, the third of Detroit’s big three car makers. As expected, the company suggested its 2017 pre-tax profit would actually decline year on year, from a $10.2bn profit in 2016. This is because while Ford is also spending big on growth opportunities such as advanced technology, unlike competitors it is not mitigating these costs as well. That said, Ford reckons earnings will recover in 2018 as underperforming businesses turn around (small cars, emerging markets, luxury cars). Deutsche Bank’s analysts remain somewhat more cautious however.

On suppliers: There were generally positive noises from the various suppliers that presented at the conference. American Axle had a solid 2016 and expects this year to be strong as well. This will be an interesting one to watch given its considerable presence in Mexico and the closing this year of its Metaldyne Performance Group acquisition. Meanwhile, the outlook should be robust for the vehicle electrification and active safety business of $20bn market cap supplier Delphi, although management was keen to moderate expectations at the conference. On the other hand, executives at Magna, Visteon and Tenneco didn’t bother hiding their bullishness. Finally the second half of the year will be pivotal according to tyre companies Goodyear and Cooper Tire. They acknowledge that raw material costs have ballooned – up 20 per cent year on year. But selling prices are already eight per cent higher in North America, and with lags more is expected to be passed through to customers in the second half.
Infographic—Deutsche Carbon Alignment Framework

DeCAF – Volume and value in an aligned world

Stranded carbon
- excess capacity
- high sunk costs
- low marginal costs
- demand constraints
- slow redeployment of capital
- deteriorating tax/policy framework
- problems with excessive debt

Green growth
- supply constraints
- excess demand
- fixed price with cost deflation
- barriers to entry
- improving tax/policy framework
- opportunities to take on more debt
DeCAF – Volume and value in an misaligned world

Green bubble
- irrational exuberance
- overbuild
- stranding by technology cost curve and price deflation
- low barriers to entry
- winners curse in competitive auctions
- over-leverage

Carbon cash cow
- supply discipline
- capex cuts
- high dividend payouts
- output restrictions (e.g. China coal limit, OPEC agreement)
- compensation for capacity closure
- free carbon allowances