

#climatechange

German Utilities

Scoping the 'Tragedy of the Horizon'

Busy autumn ahead for E.ON and RWE: This autumn will see the realisation of the strategic restructuring of E.ON and RWE, with both companies splitting themselves into two separate entities to focus on the 'new' and the 'old' parts of the energy value chain. E.ON plans to spin off 53% of Uniper in mid-September (and ultimately, at a later date, to divest its residual 43%), while RWE plans to bring its subsidiary Innogy to market later this autumn via an IPO. At the same time, the German government is expected to provide final clarity on the size of the nuclear over-funding premium in the next couple of months, and on the timing of and modalities for transferring the utilities' waste-and-storage provisions into a state-administered fund. Finally, the German government is expected to release its Climate Action Plan 2050 (CAP 2050), its blueprint for achieving the emissions reductions required to achieve its ambitious long-term climate targets. In this report, we update our base-case valuations for E.ON and RWE after their H1 results and take an in-depth look at the implications of the issues underlying the CAP 2050.

E.ON update: PT cut to €9.2 from €10.2, OW rating retained: Following the H1 results we retain our earnings forecasts for the FY2016 and beyond, but cut our Group SOTP by €1/share. This reflects positive changes to our valuation of E.ON's renewables and networks businesses, but negative changes to global commodities, E&P, and Russia.

RWE update: PT cut to €12.2 from €12.4, EW rating retained: Following the H1 results we retain our earnings forecasts for the FY2016 and beyond, but trim our Group SOTP by €0.2/share. This reflects the net impact of a higher valuation for the RWE Group's networks business, but a lower valuation for its Trading-&-Gas Midstream business.

The tragedy of the horizon: scoping sensitivities to low-carbon policy scenarios: In his 'The Tragedy of the Horizon' speech last year, Bank of England Governor Mark Carney set out the case for an orderly transition to a 2°C world from the standpoint of financial stability. With the German Government expected to release its CAP2050 this autumn, and with COP-22 this November set to focus attention on climate change once more, we take an in-depth look at the potential impact of any future climate-policy tightening in Germany and the EU of the 2030 targets on E.ON's and RWE's fossil-fuel generation assets. Given the greater exposure of RWE to lignite, and E.ON's greater relative exposure to gas-fired plant, our analysis suggests that E.ON's portfolio of FF assets would have upside of €500m under a 2°C policy trajectory (€0.3/E.ON share), whereas RWE's portfolio would have downside of €1.8bn (€2.9/share).

Risks to thesis and valuation: Failure to conclude a final deal with the German government on the funding of nuclear waste-and-storage liabilities in the next couple of months, or any sign that the terms of such a deal could be more negative than we are currently assuming would be negative for both E.ON and RWE. A decline in forward German power prices would also be negative for both companies, and especially RWE.

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PLEASE SEE ANALYST CERTIFICATION(S) AND IMPORTANT DISCLOSURES BEGINNING ON PAGE 72.

INDUSTRY UPDATE

European Utilities

NEUTRAL

Unchanged

For a full list of our ratings, price target and earnings changes in this report, please see table on page 2.

European Utilities

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Summary of our Ratings, Price Targets and Earnings Changes in this Report (all changes are shown in bold)

Company	Rating		Price	Price Target			EPS FY1 (E)			EPS FY2 (E)		
	Old	New	30-Aug-16	Old	New	%Chg	Old	New	%Chg	Old	New	%Chg
European Utilities	Neu	Neu										
E.ON (EOAN GY / EONGn.DE)	OW	OW	8.31	10.20	9.20	-10	0.85	0.85	-	0.76	0.76	-
RWE (RWE GY / RWEg.DE)	EW	EW	14.75	12.40	12.20	-2	1.03	1.03	-	1.13	1.12	-1

Source: Barclays Research. Share prices and target prices are shown in the primary listing currency and EPS estimates are shown in the reporting currency.

FY1(E): Current fiscal year estimates by Barclays Research. FY2(E): Next fiscal year estimates by Barclays Research.

Stock Rating: OW: Overweight; EW: Equal Weight; UW: Underweight; RS: Rating Suspended

Industry View: Pos: Positive; Neu: Neutral; Neg: Negative

Valuation Methodology and Risks

European Utilities

E.ON (EOAN GY / EONGn.DE)

Valuation Methodology: We value E.ON on a SOTP basis. Our SOTP is largely DCF-based, with the exception of Global Commodities which we value on EV/EBITDA, E&P which we value at \$6/boe of 2P reserves and Germany, where we use EV/EBITDA for distribution and €280/customer for supply. Our DCF valuation is based on a post tax nominal Group WACC of 5.6% with specific activity/country risk premia applied. For foreign currencies we use the average YTD rate weighted by the spot rate for the remainder of the year. We mark-to market all wholesale commodity prices for their length of their liquid forward curves. Post this mark-to-market period for German power we assume a €10.5/MWh long-term baseload clean dark spread (equals historical ave); also assuming that the long-term peak generation price premium over baseload will stay at 2015 levels. For the UK, we assume a modest £4/MWh clean spark spread, but peak premium over base falls to around half near-term levels, as distributed generation will reduce network demand. Capacity payments for the UK are set at £35/KW in W20/21 and £25/KW going forward (2014 prices).

Risks which May Impede the Achievement of the Barclays Research Valuation and Price Target: E.ON is exposed to wholesale energy commodity prices, interest rates, regulatory and political intervention/risks, economic factors, corporate activity & competition.

RWE (RWE GY / RWEg.DE)

Valuation Methodology: We value RWE on a SOTP basis. Our SOTP is largely DCF-based, with the exception of Germany networks & supply, where we use EV/EBITDA for distribution and €280/customer for supply as well as for Benelux supply where we use €360/customer. We also value Trading/gas midstream on a EV/EBITDA basis. Our DCF valuation is based on a post tax nominal Group WACC of 5.6% with specific activity/country risk premia applied. For foreign currencies we use the average YTD rate weighted by the spot rate for the remainder of the year. We mark-to market all wholesale commodity prices for their length of their liquid forward curves. Post this mark-to-market period for German power we assume a €10.5/MWh long-term baseload clean dark spread (equal to the historical average); also assuming that the long-term peak generation price premium over baseload will stay at 2015 levels. For the UK, we assume a modest £4/MWh clean spark spread, but peak premium over base falls to around half near-term levels, as distributed generation will reduce network demand. Capacity payments for the UK are set at £35/KW in W20/21 and £25/KW going forward (2014 prices).

Risks which May Impede the Achievement of the Barclays Research Valuation and Price Target: RWE is exposed to wholesale energy commodity prices, interest rates, regulatory and political intervention/risks, economic factors, corporate activity & competition.

Source: Barclays Research.

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E.ON: PT cut to €9.2 (from €10.2), OW rating retained

Price target cut after H1 results but Uniper spin-off should re-focus interest: The market reacted badly to E.ON's H1 results on 10 August, and the stock is down by 12% versus its close the day before on 9 August. We think the main issues that troubled the market in the H1 results were the increase in pension provisions by €2.3bn, and comments from management on the H1 results call suggesting that the timing of any capital increase to pay for the nuclear-overfunding premium seems no longer linked to the outcome of the Constitutional Court's ruling on the nuclear fuel tax (NFT): in essence, E.ON is now saying that it will proceed quickly with a capital increase in the range of €2-2.4bn (the range it has given for the overfunding premium it expects) as soon as a final outcome on the nuclear-overfunding deal is known (i.e. without waiting for the Court's verdict on the NFT). Following the H1 numbers our earnings estimates for 2016-17 are unchanged, but our PT is lower by €1/share, mainly reflecting the net impact of positive changes to our valuation of the Group's renewables and networks business (+€2.4/share), but negative changes to the Group's global commodities, E&P, and Russian businesses (-€3.3/share). With 10% upside potential to our revised PT, likely supportive newsflow as the Group demerges into two separate companies, and a free option on a positive outcome to the NFT, we retain our OW rating with a revised PT of €9.2/share.

Strategic transformation should be a supportive narrative: The Uniper prospectus is expected to be issued any day now, with a separate stock-market listing likely a couple of weeks thereafter. We think this could provide a catalyst for investors to revisit the E.ON story after the recent sell-off in the stock, and to value the different profiles of E.ON and Uniper with a fresh eye. In particular, we think that the new E.ON – with its combination of stable earnings from regulated networks, growth potential in renewables, and large customer base in different EU markets – offers an appealing defensive-growth story. Following the H1 results, E.ON Group CFO Michael Sen re-emphasised the mid-term financial framework ("E.ON Focus") as the touchstone for its decision-making. This commits the new E.ON (i.e. post the Uniper spin-off) to a capital structure of BBB+/Baa1, a cash-conversion ratio of ≥80%, a ROCE of 8-10%, EPS growth of ≥5-10%, and a dividend-payout ratio of 40-60% of underlying net income. Uniper by contrast will be run for cash.

Clarity on the funding of nuclear provisions should come soon: On 1 June, the German Cabinet adopted the recommendation of the Nuclear Financing Commission (NFC) on the nuclear waste-and-storage liabilities. According to CFO Michael Sen's most recent comments, the overfunding premium for these liabilities equates to a range of €2-2.4bn for E.ON. We expect more newsflow on this topic and a final deal in the next couple of months.

Balance-sheet issues more manageable with a capital increase: For the time being we continue to assume that E.ON issues new debt to fund its nuclear-overfunding charge (we now assume €2.4bn versus €2bn previously), but in reality a capital increase of up to €2.4bn now looks more likely, and would also provide more comfort on growth capex in renewables. Under our sensitivity analysis of a capital increase of €2.4bn in 2017 (assuming the new equity is raised at €7.8/share, a 6% discount to the 30 August closing price), E.ON would in our view be able to continue funding growth capex in the renewable business with a stable BBB+ rating. The capital raise would be ~16% dilutive to earnings on our estimates.

Relative valuation looks reasonable: E.ON trades on a 2017E P/E multiple of 10.8x, versus integrated peers on 13.3x. Even assuming a capital increase of €2.4bn, which would be 16% dilutive on our numbers, E.ON trades on a 3% discount to peers at 12.9x P/E. The shares are also slightly cheaper than the sector on a 2017E EV/EBITDA basis, trading at 7x versus 7.6x for peers. While not compelling versus peers, E.ON's dividend yield of 3.6% in both 2017E and 2018E is well above that of RWE. The 40% payout ratio we assume looks comfortable, with scope for an uplift from 2019.

RWE: PT cut to €12.2 (from €12.4), EW rating retained

Price target trimmed, Innogy float will be main focus in Q4: The market reacted less negatively to RWE's H1 results on 11 August than it had to E.ON's, with the stock currently down by 6% versus its close on 9 August. We think that even though RWE suffered a similar increase in its pension provisions in H1 to E.ON of c.€2bn, the market continues to like the RWE story ahead of the IPO of Innogy. We, too, like the strategic restructuring of RWE, and the financial flexibility offered by the capital increase at Innogy, but in our view the supportive narrative offered by the strategic transformation is already largely priced in. RWE remains very operationally geared to power prices – on an unhedged basis we estimate that each €1/MWh increase in German power prices benefits net income by €77m (or +9% on our 2019E EPS) – but the recovery in German prices from their February lows appears to have run its course for now. Following the H1 numbers our earnings estimates for 2016-17 are unchanged, but our SOTP valuation is lower by €0.2/share, reflecting the net impact of positive changes to our valuation of the Group's networks business (+€0.9/share), but negative changes to the Group's Trading & Gas Midstream business (-€1.0/share). There is a free option on a positive outcome to the NFT case, but the expected publication of the Government's CAP2050 climate plan in the autumn could focus renewed attention on the Group's lignite exposure. We retain our EW rating with a revised PT of €12.2/share.

Strategic transformation is positive but in our view already largely priced in: We think RWE's strategic restructuring via the forthcoming separate listing of Innogy (comprising the group's networks, renewables, and customer-services business) represents a major strategic restructuring, and that Innogy's commitment to a 70-80% dividend-payout ratio has heightened investor interest in its planned flotation in the autumn. That said, the shares have performed strongly in recent months, and much of the benefit has in our view been priced in. Nonetheless, the increased transparency that will come with the listing of Innogy could yet provide scope for a further re-appraisal of its profile, and hence a potential further expansion in the multiples used to value it.

Clarity on the funding of nuclear provisions: On 1 June, the German Cabinet adopted the recommendation of the Nuclear Financing Commission (NFC) on the nuclear waste-and-storage liabilities. The adopted recommendation requires Germany's nuclear operators to pay a premium of c.35% to the book value of the provisions they have made for these liabilities. The overfunding premium equates to ~€1.7bn (~€2.8/share) for RWE. We expect newsflow on this topic to intensify and a final deal in the next couple of months.

Balance sheet is stretched, risk now looks more manageable: S&P and Moody's rate RWE BBB- and Baa- (with a Negative and Stable Outlook respectively). RWE is highly geared to the forward power curve, which in our view makes the earnings profile more volatile than that of E.ON. Still, we assume that RWE can stay above the 16% FFO/ND threshold required to maintain its current investment-grade rating whilst paying off the required €1.7bn nuclear-overfunding premium in instalments over three years from free cash flow, but that either capex or dividends or both would have to take a hit. Innogy has said it will target a dividend-payout ratio of 70-80% on underlying net income.

Cheap on multiples, but with a riskier earnings profile: We consider RWE's discounted multiples (13.1x 2017E P/E versus 13.3x for integrated peers, and 7.3x 2017E EV/EBITDA versus 7.6x for integrated peers) are justified by its greater exposure to commodity prices and its lower credit rating relative to E.ON. Whilst any further rally in power prices would likely prompt a further appreciation in the share price, on current commodity prices we see the stock as fairly valued, especially as we assume only a modest dividend over 2017-19 (on our updated numbers RWE offers a dividend yield of 1.5% in 2017E and 2.5% in 2018E). On our estimates a favourable outcome of the NFT case could see upside of €2.9/share.

EXECUTIVE SUMMARY

This report takes a detailed look at the potential implications of tighter climate policy in Germany and the EU on E.ON/Uniper and RWE beyond 2020, and is divided into three main sections. We also provide company sections at the back with our updated SOTP valuations for E.ON and RWE.

1. The ‘Tragedy of the Horizon’ and the policy response

In this first section we look in detail at Governor Carney’s framing of the inter-generational impact resulting from climate change he describes in his ‘The Tragedy of the Horizon’ speech, given on 29 September 2015, and the first dimension of his solution, namely the policy response. Specifically we look at three different levels of governmental policy response: (i) the UN level (as contained in the Paris Agreement reached at the COP-21 climate-change conference last December, with its objective to limit the average global temperature increase to “*well below 2°C*” versus pre-industrial levels); and (ii) the EU level (both in terms of the EU’s existing emissions-reduction targets for 2030 and what a target consistent with 2°C would like); (iii) the German level (again, both in terms of Germany’s existing emissions-reduction target for 2030 and what a target consistent with 2°C would look like).

As far as the German utilities are concerned, we conclude that they do not face a threat of steeper emissions reductions for 2020 as the 2020 targets at both the EU and German levels now look well set and would be difficult to alter from a political point of view. However, beyond 2020 we see greater pressure, in terms of both (i) Germany’s domestic emissions target for 2030 (which we think implies a hard emissions cap, rather than the soft emissions cap in the EU-ETS implied by current EU targets); and (ii) the EU’s 2030 target (which we think, in keeping with the logic of the Paris Agreement, could be tightened in the 2020s in a way that takes it towards, if not all the way to, a level consistent with 2°C).

2. Climate disclosure and the German utilities

The second part of the solution to the ‘Tragedy of the Horizon’, as conceived by Governor Carney, is to foster greater transparency from companies around the financial risks related to climate change. As a result as Chairman of the Financial Stability Board (FSB), Governor Carney announced at COP-21 the establishment of the *FSB Task Force on Climate-related Financial Disclosure (TCFD)*.¹

This section looks both at the brief of the TCFD and the disclosure practices of E.ON and RWE around climate change. In our view, E.ON and RWE are already amongst the most transparent companies when it comes to disclosing key metrics around financially sensitive climate indicators. On the other hand, we think that given their sensitivity to EU and German-government climate policy both companies could be saying more about how they think about the risks associated with the potential tightening of climate policy in the future, and how they would respond under different low-carbon scenarios.

3. Scoping the sensitivity to tighter 2030 caps

This section examines the potential valuation implications for E.ON’s and RWE’s fossil-fuel (FF) generation assets of the two carbon-constrained scenarios outlined in Section 1, namely: (i) a full 2°C policy framework at the EU level and (ii) Germany’s 2030 target to reduce emissions by 55% versus 1990 levels, assuming that the power sector faces a hard cap.

¹ Please note that the lead author of this report, Mark Lewis, has been a member of the TCFD since it began Phase-2 of its deliberations in May of this year ([see the TCFD press release of 20 May here](#)). Please also note that any and all analysis of the work of the TCFD in this report is based exclusively on publicly available information on the TCFD’s website. The views and analysis in this report are exclusively those of the Barclays analysts listed on the front and do not in any way reflect the views or analysis of the TCFD.

Under these two scenarios, the much tighter carbon constraint versus our base-case scenario means a much higher CO₂ price, higher power prices, and a radical change in the merit order as gas has to run ahead of coal and lignite so that the cap can be met.

Under the 2°C scenario in particular, both lignite and coal are much more constrained, falling to 20TWh and 30TWh, respectively, by 2030 compared with 90TWh and 100TWh, respectively, in our base case. By contrast, gas output reaches 150TWh by 2030 (compared with only 30TWh in our base case) so that the hard cap of 115Mt can be met.

These changes in the merit order required to meet the tighter caps under our more carbon-constrained scenarios have clear implications for the valuation of the different FF power-plant portfolios of E.ON/Uniper and RWE.

Given RWE's greater exposure to lignite in particular and E.ON's younger fleet of more efficient gas-fired plants, our analysis indicates that the value of E.ON's portfolio of FF assets would have upside of €500m under a 2°C policy trajectory (€0.3/E.ON share), whereas RWE's portfolio would have downside of €1.8bn (€2.9/share).

The impact under our Germany 2030-hard-cap scenario is less negative for lignite and coal, and less positive for gas. That said, our analysis suggests that there would still be a modest uplift to the valuation of E.ON/Uniper's FF-generation assets versus our base case of €200m (which would equate to €0.1/E.ON share) and a smaller though still material hit to the valuation of RWE's FF-generation portfolio of -€1bn (€1.6/share).

Conclusion: gazing towards the horizon

Our 2°C scenario and our Germany 2030-hard-cap-scenario are of necessity highly stylized, and given the number of assumptions we have had to make for what are all very dynamic variables we should probably not read too much into the absolute values for E.ON's and RWE's fossil-fuel generation assets that we have derived under these scenarios at this stage.

Nonetheless, we think that what these stylized low-carbon scenarios do illustrate well is the relative sensitivity of E.ON and RWE to a policy framework premised on delivering a low-carbon pathway for the power sector at both the EU and German levels, where the risk is skewed firmly towards a tightening of this policy framework as and when the economics allow, and as and when the politics dictate. In this respect, RWE is clearly more at risk, while E.ON/Uniper is better hedged with their portfolio of gas-fired plant.

The key point, though, is that with or without a formal revision of the EU's 2030 climate-and-energy targets in line with a 2°C trajectory, both the economics (in the form of continuing cost reductions for renewable relative to conventional generation), and the politics (in the form of ever-increasing scrutiny of the extent to which coal and especially lignite generation are compatible with this pathway) suggest that over the next decade and beyond we will only see a further acceleration away from the more carbon-intensive forms of fossil-fuel generation.

This is precisely why Governor Carney set out the need for greater disclosure from companies around their climate-related financial risks in his 'Tragedy of the Horizon' speech. It is also why we think power utilities should be disclosing more information about how they are thinking about the risks of tighter climate policy in future, and what they are doing to prepare for and/or pre-empt these risks. In this way, as Governor Carney puts it, *"a 'market' in the transition to a 2-degree world can be built"*.

1. THE ‘TRAGEDY OF THE HORIZON’ AND THE POLICY RESPONSE

On 29 September last year, two months before the COP-21 climate-change summit in Paris, Bank of England Governor and FSB Chairman Mark Carney gave a speech to Lloyd’s of London entitled *Breaking the Tragedy of the Horizon – Climate Change and Financial Stability*. This speech highlighted his concern over the potential impact of climate change on global financial stability and emphasized the disconnect between (i) the long-term impact of climate change and the cost this will impose on future generations, and (ii) the shorter time horizons of today’s generation of actors in business, politics, and finance who have no direct incentive to address this future cost.

The Governor’s central point was that as a result of this disconnect, “*once climate change becomes a defining issue for financial stability, it may already be too late*”. In other words, the ‘tragedy of the horizon’ dictates that while today’s generation might not have to bear the full and direct impact of climate change, the longer action to address it is delayed the greater the risk that today’s generation will face the indirect impact of climate change in the form of financial instability. In the absence of action today, markets will start to anticipate the impact of climate change tomorrow, re-pricing assets in response to the physical, liability, and transition risks associated with it (and the longer meaningful policy action is delayed, the more violent such re-pricing is likely to be).

The solution to the ‘tragedy of the horizon’, Governor Carney suggested, is twofold. First, governments should establish a policy framework informed by the science, and in particular by the concept of carbon budgets. Second, financial regulators should encourage transparency in the disclosure of the financial risks associated with climate change, thereby enabling capital to be allocated as efficiently as possible as the world transitions to a low-carbon future. In this way, as Governor Carney puts it, “*a ‘market’ in the transition to a 2-degree world can be built*”, enabling governments and financial regulators to address both the direct and indirect impacts of climate change.

In this first section we look in detail at the first dimension of the solution as conceived by Governor Carney, namely the policy response. Specifically we look at three different levels of governmental policy response: (i) the UN level (as contained in the Paris Agreement reached at the COP-21 climate-change conference last December, with its objective to limit the average global temperature increase to “*well below 2°C*” versus pre-industrial levels); (ii) the EU level (both in terms of the EU’s existing emissions-reduction targets for 2030, and what a target consistent with 2°C would look like); (iii) the German level (again, both in terms of Germany’s existing emissions-reduction target for 2030, and what a target consistent with 2°C would look like).

As far as the German utilities are concerned, we conclude that they do not face a threat of steeper emissions reductions for 2020, as the 2020 targets at both the EU and German levels now look well set and would be difficult to alter from a political point of view. However, beyond 2020 we see greater pressure in terms of both (i) Germany’s domestic emissions target for 2030 (which we think implies a hard emissions cap, rather than the soft emissions cap in the EU-ETS implied by current EU targets); and (ii) the EU’s 2030 target (which we think, in keeping with the logic of the Paris Agreement, could be tightened in the 2020s in a way that takes it towards, if not all the way, to a level consistent with 2°C).

Whether we are right or not about the potential tightening of climate policy in Germany and the EU beyond 2020, the logic of Governor Carney’s argument is that investors will be able to make informed capital-allocation decisions only if they know what the varying impacts of potential policy scenarios are. As a result, having set out our detailed analysis of policy scenarios in this first section, we then pursue the implications of these scenarios for the German utilities in Sections 2 and 3 below.

Climate change as the ‘Tragedy of the Horizon’

In his bold intervention last September, Governor Carney has opened up a new dimension to the policy debate around climate change.

The ‘Tragedy of the Horizon’: what is it and how can it be solved?

In this speech, Governor Carney stated that *“there is a growing international consensus that climate change is unequivocal”,* and that *“many of the changes in our world since the 1950s are without precedent not merely over decades but over millennia”.*

The main focus of Governor Carney’s remarks was the future impact of climate change and the resulting inter-generational problem. He referred to this inter-generational problem as ‘The Tragedy of the Horizon’:

“The challenges currently posed by climate change pale in significance compared with what might come. The far-sighted amongst you are anticipating broader global impacts on property, migration and political stability, as well as food and water security. So why isn’t more being done to address it? Climate change is the Tragedy of the Horizon. We don’t need an army of actuaries to tell us that the catastrophic impacts of climate change will be felt beyond the traditional horizons of most actors – imposing a cost on future generations that the current generation has no direct incentive to fix.”

In referring to *‘the traditional horizons of most actors’*, Governor Carney identified these as the horizons of *“the business cycle, the political cycle, and the horizon of technocratic authorities, like central banks, who are bound by their mandates”.*

Yet this disconnect between the shorter-term horizons of business, politics and finance on the one hand, and the direct impact of climate change over the longer term on the other, entails its own more immediate risk for today’s generation in the form of financial instability:

“The horizon for monetary policy extends out to 2-3 years. For financial stability it is a bit longer, but typically only to the outer boundaries of the credit cycle – about a decade. In other words, once climate change becomes a defining issue for financial stability, it may already be too late.”

As to precisely how the failure to prepare for the longer-term impact of climate change might have a destabilizing effect on the financial system in the shorter to medium term, Governor Carney identified three main transmission mechanisms:

- 1) **Physical risks:** these are *“the impacts today on insurance liabilities and the value of financial assets that arise from climate- and weather-related events, such as floods and storms that damage property or disrupt trade”.*
- 2) **Liability risks:** these are *“the impacts that could arise tomorrow if parties who have suffered loss or damage from the effects of climate change seek compensation from those they hold responsible. Such claims could come decades in the future, but have the potential to hit carbon extractors and emitters – and, if they have liability cover, their insurers – the hardest”.*
- 3) **Transition risks:** these are *“the financial risks which could result from the process of adjustment towards a lower-carbon economy. Changes in policy, technology and physical risks could prompt a reassessment of the value of a large range of assets as costs and opportunities become apparent”.*

Governor Carney’s primary point as a central banker and financial regulator is that *“risks to financial stability will be minimised if the transition begins early and follows a predictable path, thereby helping the market anticipate the transition to a 2-degree world.”*

Accordingly, Governor Carney sees two inter-related solutions to the ‘tragedy of the horizon’: (i) government policy to drive the transition to a low-carbon economy informed by the concept of a carbon budget consistent with a 2°C world; and (ii) enhanced financial disclosure from companies, banks, and investors on the physical, liability, and transition risks they face so that capital flows in the most efficient way consistent with this low-carbon transition.

Indeed, the two solutions are inter-related, because as Governor Carney says: “A carbon budget – like the one produced by the IPCC – is hugely valuable, but can only really be brought to life by disclosure, giving policymakers the context they need to make choices, and firms and investors the ability to anticipate and respond to those choices.”

With this in mind, the rest of this section looks at a hypothetical carbon budget consistent with a 2°C world and what this could imply for the EU and Germany out to 2030, and hence the emissions targets the German utilities may ultimately have to comply with.

Budgeting for a 2°C world: the global policy objective

Concerted international action to address the issue of climate change dates back to the setting up of *the Intergovernmental Panel on Climate Change* (IPCC) in 1988. This was then followed by the establishment of *the United Nations Framework Convention on Climate Change* (UNFCCC) in 1992.

The IPCC was established in 1988 by the World Meteorological Organisation and the United Nations Environment Programme with a view to assessing all the scientific, technical and socio-economic information relevant for the understanding of climate change, and of the options for adapting to and mitigating its effects.

The IPCC and the carbon budget for a 2°C world

Since it was founded, the IPCC has published *five comprehensive studies on the science of climate change*, known as assessment reports. The IPCC’s first Assessment Report (AR1) was published in 1990, and its fifth and most recent (AR5) in 2014. In summary, the IPCC approach as developed via these periodic assessment reports notes the empirical link between the increase in the concentration of greenhouse-gas (GHG) emissions in the earth’s atmosphere since pre-industrial times on the one hand, and the average increase in the earth’s global temperature over the same period on the other.²

The IPCC rates six GHGs/groups of GHGs in terms of an index that measures their global warming potential (GWP) relative to carbon dioxide (emissions are therefore often measured in terms of tonnes of carbon-dioxide equivalent, or CO₂e).

So, carbon dioxide has a GWP of 1, methane of 23, and so on, all the way up to sulphur hexafluoride, which is 22,200 times more powerful than carbon dioxide in terms of its impact, when released into the atmosphere, on the earth’s temperature (Figure 13 below).

² The evidence compiled by the IPCC over the last 25 years is extremely comprehensive but it is not within our scope in this report to review the IPCC literature. For our purposes here it is enough to note that the IPCC’s very detailed reporting on the science of climate change as set out in its periodic assessment reports since 1990 has informed global policy action through the UNFCCC by establishing the link between increasing concentrations of greenhouse gases in the atmosphere since the onset of industrialization and a rise in the average global temperature over the same period. For those interested in a more detailed review of the science behind climate change, and how the IPCC’s approach has evolved over time, the best starting point is the *IPCC’s own website on its assessment reports*.

FIGURE 1

Global Warming Potential of Greenhouse Gases

Greenhouse gas	GWP
Carbon dioxide (CO ₂)	1
Methane (CH ₄)	23
Nitrous oxide (N ₂ O)	296
Hydrofluorocarbons (HFCs)	120-12,000
Perfluorocarbons (PFCs)	5,700-11,900
Sulphur hexafluoride (SF ₆)	22,200

Source: UNFCCC

And the IPCC conclusion is that the required policy response is first slowing the rate of increase in, and then reducing the absolute level of, annual global emissions of these greenhouse gases.

The IPCC published its *Assessment Report 5 (AR5)* over the course of 2013-14, and the findings were then summarized in the *Synthesis Report of AR 5*, which included a *Summary for Policymakers* to help inform policy decisions both ahead of COP-21 and beyond.

AR5 concludes that GHG emissions from human activities have been the main driver of observed increases in the average global surface temperature since pre-industrial times, and especially since the mid-20th century. This is clear from page 4 of the *AR5 Summary for Policymakers*:

*“Anthropogenic greenhouse-gas emissions have increased since the pre-industrial era, driven largely by economic and population growth, and are now higher than ever. This has led to atmospheric concentrations of carbon dioxide, methane, and nitrous oxide that are unprecedented in at least the last 800,000 years. Their effects, together with those of other anthropogenic drivers, have been detected throughout the climate system and are **extremely likely** to have been the dominant cause of the observed warming since the mid-20th century.”* (Emphasis in original)

The Fifth Assessment Report goes on to say that in order to limit the worst impacts of climate change, substantial reductions in GHG emissions will be needed (Ibid, page 8):

*“Continued emission of greenhouse gases will cause further warming and long-lasting changes in all components of the climate system, increasing the likelihood of severe, pervasive and irreversible impacts for people and ecosystems. **Limiting climate change would require substantial and sustained reductions in greenhouse-gas emissions which, together with adaptation, can limit climate-change risks.**”* (Our emphasis)

At *COP-16 in December 2010 in Cancun, Mexico*, all member countries of the UNFCCC – i.e. every member country of the United Nations – committed to restricting the increase in the average surface global temperature “to a maximum 2°C above pre-industrial levels, and to consider lowering that maximum to 1.5°C degrees in the near future”.

The reasons underlying the choice of a 2°C target (with the possibility of reducing this to 1.5°C at some future point) ultimately dates back to the 1970s and encompasses political as well as scientific considerations, but the commitment to a 2°C target signed up to by all UNFCCC member states in 2010 has meant that every COP since Cancun has ultimately been intended to advance the policy framework to achieve this outcome.

The Fifth Assessment Report then posits a carbon budget consistent with achieving this 2°C world. The calculation starts from the total amount of cumulative emissions of all GHGs consistent with this target and then deducts the amount already emitted since 1870. After

allowing for the emissions of other GHGs, the IPCC estimates the total amount of cumulative CO₂ emissions from 1870 onwards that is likely compatible with a 2°C outcome³ at 2,900Gt, of which 1,900Gt were already burned over 1870-2011, thereby leaving a residual budget of 1,000Gt from 2012 onwards.⁴ Under a scenario with only a 50% chance of achieving a 2°C outcome, the IPCC gives a higher remaining carbon budget of 1,300Gt.

And this concept of a 2°C carbon budget is central to the argument Governor Carney makes in his *Tragedy of the Horizons* speech:

“As risks are a function of cumulative emissions, earlier action will mean less costly adjustment. The desirability of restricting climate change to 2 degrees above pre-industrial levels leads to the notion of a carbon ‘budget’, an assessment of the amount of emissions the world can ‘afford’. Such a budget - like the one produced by the IPCC - highlights the consequences of inaction today for the scale of reaction required tomorrow.”

Governor Carney gave his ‘Tragedy of the Horizons’ speech two months before the COP-21 conference in Paris and explained that it would be for the governments gathering in Paris to decide whether or not to endorse the IPCC’s 2°C world, and if so how to achieve it:

“These actions will be influenced by policy choices that are rightly the responsibility of elected governments, advised by scientific experts. In ten weeks representatives of 196 countries will gather in Paris at the COP21 summit to consider the world’s response to climate change. It is governments who must choose whether, and how, to pursue that 2-degree world.”

So, what was agreed at COP-21 subsequent to Governor Carney’s speech, and what are the implications for energy companies in general, and the German utilities in particular?

The Paris Agreement: committing the world to staying “well below 2°C”

The COP-21 summit in Paris last December produced a breakthrough climate-change accord known as [the Paris Agreement](#). The Paris Agreement commits the UNFCCC’s 195 member countries (“Parties” in the UN jargon) to stronger targets than ever agreed previously, declaring its ultimate objective as being “to hold the increase in the global average temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5 °C” (Article 2, paragraph 1a).

As achieving this temperature goal will require emissions to peak and then start falling sharply well before 2050, the text then states that “parties aim to reach global peaking of greenhouse gas emissions as soon as possible (...) in accordance with best available science, so as to achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century” (Article 4, paragraph 1).

In other words, Article 4 paragraph 1 effectively commits the world to becoming carbon neutral after 2050 (i.e. to zero net emissions), albeit without specifying a precise date by which this should happen.

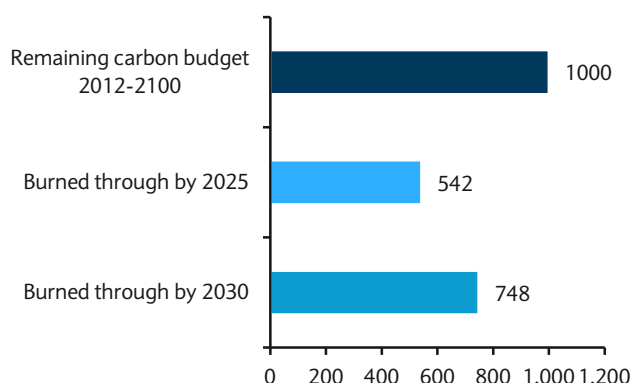
As we explained in our report [Climate Change: Warming Up for COP-21](#) (24 November 2015), it was already clear ahead of Paris that the national plans for emissions reductions submitted by UN Member States ahead of COP-21 – known as Intended Nationally Determined Contributions, or INDCs – were insufficiently ambitious to put the world on a 2°C trajectory, as can be seen from Figures 2 and 3 below.

³ In the IPCC terminology, ‘likely’ is taken to mean having a >66% chance.

⁴ For those interested in a more detailed analysis of the IPCCs carbon-budget calculations, the [Stockholm Environment Institute’s detailed analysis](#) is extremely useful.

FIGURE 2

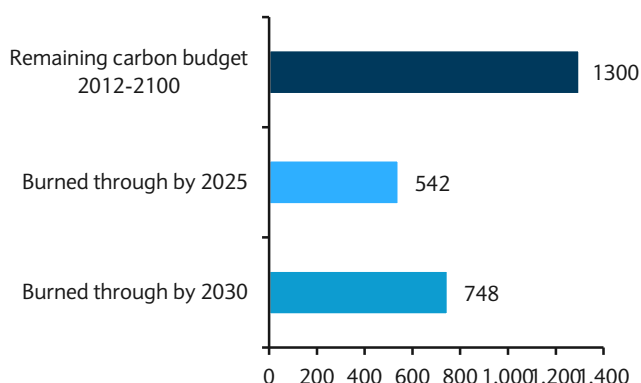
Communicated INDCs implied consumption of IPCC carbon budget likely consistent (>66% chance) with 2°C



Source: UNFCCC, IPCC

FIGURE 3

Communicated INDCs implied consumption of IPCC carbon budget with 50% chance of being consistent with 2°C



Source: UNFCCC, IPCC

Figures 2 and 3 show the UNFCCC's estimates of the extent to which the IPCC's 2°C budgets over 2012-2100 are consumed by 2025 and 2030 under the INDCs submitted and validated at COP-21. As can be seen from Figure 2, under the tighter scenario that is likely consistent with a 2°C world (i.e. >66% chance), 54% of the remaining carbon budget (542Gt/1,000Gt) is consumed by 2025, and 75% by 2030. Under the looser scenario consistent with only a 50% chance of achieving a 2°C outcome (Figure 3), the INDCs consume 42% of the remaining budget by 2025 (542Gt/1,300Gt), and 58% by 2030 (748Gt/1,300Gt).⁵

As a result, COP-21 in itself was more about keeping the possibility of achieving a 2°C trajectory at a later date alive. That is why we said in *Warming Up for COP-21* that the key criterion for judging COP-21 a success or failure would be the extent to which it provided for a credible mechanism enabling increased ambition in the future.

And crucially, the Agreement did provide for just such a mechanism, namely a monitoring-and-review process of all parties' national emissions plans – INDCs in the UN jargon – every five years. The Agreement states that there will be a 'facilitative dialogue' in 2018 to take stock of progress subsequent to Paris, with those countries that have submitted INDCs covering the period only as far out as 2025 then urged to communicate a new INDC by 2020 and to do so every five years thereafter, and those that have submitted INDCs for the period out to 2030 requested to communicate or update their plans by 2020 and to do the same every five years thereafter.

The Agreement provides for a collective stock-stake of progress every five years, with the first one set for 2023, five years after the facilitative dialogue in 2018. These stock-stakes provide the background against which parties will then be required to update their INDCs, as set out in Article 4, paragraph 9:

"Each party shall communicate a nationally determined contribution every five years in accordance with the decision 1/CP.21 and any relevant decisions of the Conference of the

⁵ Note that the carbon budgets shown here are for CO₂ only, as the IPCC's carbon budgets in AR5 are calculated after already adjusting for the impact of the other greenhouse gases shown in Figure 1 above. The United Nations Environment Programme (UNEP) has a useful explanation of this in its *Emissions Gap Report 2014*: "In the hypothetical case that carbon dioxide was the only human-made greenhouse gas, the IPCC estimated a total carbon dioxide budget of about 3,670Gt of CO₂ for a likely chance of staying within the 2°C limit. Since emissions began rapidly growing in the late 19th century, the world has already emitted around 1,900Gt CO₂ and so has used up a large part of this budget. Moreover, human activities also result in emissions of a variety of other substances that have an impact on global warming and these substances also reduce the total available budget to about 2,900Gt. This leaves less than about 1,000Gt CO₂ to "spend" in the future."

Parties serving as the meeting off the Parties to the Paris Agreement and be informed by the outcomes of the global stock-take referred to in Article 14.”

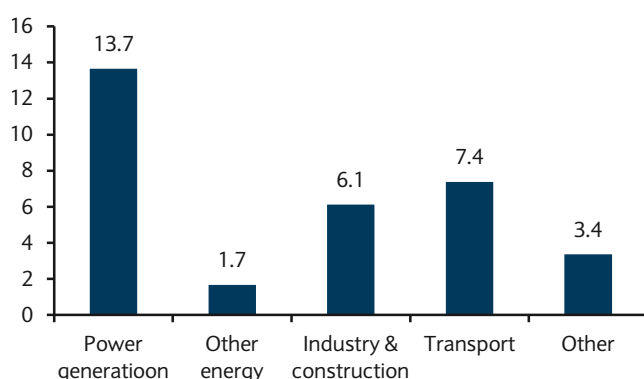
In short, the Agreement provides for a mechanism to ratchet up emissions reductions that will be activated every five years, thereby keeping the door ajar to an emissions trajectory consistent with a 2°C world at some point in the future.

So, what are the implications of the Paris Agreement for energy markets and companies?

The IEA's 2°C carbon budget for energy

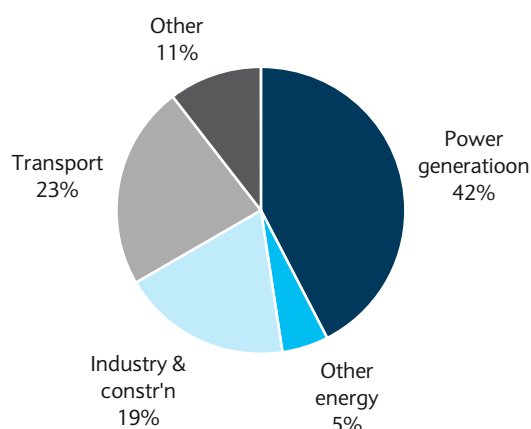
As detailed in the IEA's *2015 CO₂ Emissions from Fuel Combustion*, CO₂ emissions from energy in 2015 came to 32.2Gt (Figure 4) and accounted for 60% of total anthropogenic GHG emissions.⁶ Looking at the breakdown of CO₂ emissions from energy, power generation and transport are the two most important categories, accounting for 42% and 23%, respectively (Figure 5).⁷

FIGURE 4
2015 CO₂ emissions from fuel combustion (Gt)



Source: IEA

FIGURE 5
2015 CO₂ emissions from fuel combustion (%)



Source: IEA

Given this importance of the energy sector in total anthropogenic GHG emissions, it would be fair to say that reducing CO₂ emissions from energy is the single most important prerequisite to remaining within the IPCC's overall 2°C budget. So, what are the implications of the IPCC's carbon budget for the energy sector at a global level?

In its *World Energy Outlook 2015* (WEO 2015) published in November last year, the IEA set out its updated scenario for an emissions trajectory for the global energy industry consistent with the IPCC's 2°C budget.⁸ The IEA's modelling of a 2°C carbon budget for the energy industry takes the IPCC's budget with a 50% chance of achieving a 2°C outcome (i.e. the one shown in Figure 3 above), and after adjusting for expected future emissions from industrial processes and land use, land-use change, and forestry, derives a remaining carbon budget of 980Gt for the global energy industry over 2014-2100.

⁶ The IEA's definition of the energy sector encompasses energy supply, energy transformation (including power generation), and energy-consuming sectors (including buildings, industry, and transport).

⁷ It is important to remember that while the power and transport sectors are the two most important direct sources of emissions, the oil-and-gas and coal-mining sectors are the indirect source as coal and gas are widely used in power generation, and 95% of all transportation fuel is oil based. We develop this point in greater detail in the next main section of this report below when we look at Scope-1, Scope-2, and Scope-3 emissions for the power sector.

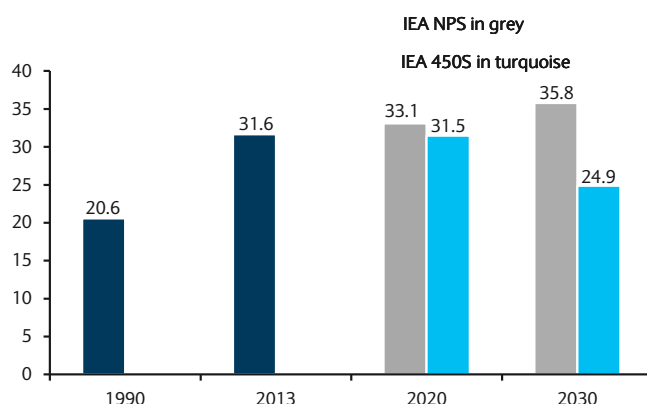
⁸ For the detailed background on the modelling in the WEO 2015 see the IEA's detailed special report published in April 2015, *Energy and Climate Change*.

Taking this remaining carbon budget for the energy sector, the IEA then develops its 2°C trajectory for energy emissions over coming decades (which it refers to as the 450-Scenario, or 450S),⁹ and compares this with its base-case scenario for energy emissions (which it refers to as its New Policies Scenario, or NPS). The NPS models “the policies and implementing measures that had been adopted as of mid-2015” (2015 WEO: p.31). This means it also incorporates the energy-related aspects of the INDCs that had been submitted by 1 October, “albeit in a cautious manner” (2015 WEO: p.57).

Figures 6 and 7 show the difference in CO₂ emissions from energy between the NPS and the 450S out to 2030.

FIGURE 6

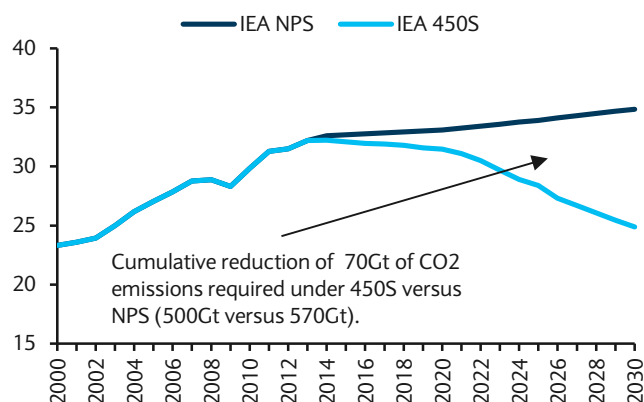
Historic and projected world CO₂ emissions from energy (Gt)



Source: Based on IEA data from the World Energy Outlook © OECD/IEA 2015, IEA Publishing. Licence: www.iea.org/t&c/termsandconditions.

FIGURE 7

Barclays estimate of world CO₂ energy emissions under NPS and 450S (Gt)



Source: Based on IEA data from the World Energy Outlook © OECD/IEA 2015, IEA Publishing. Licence: www.iea.org/t&c/termsandconditions. Also based on Barclays Research estimates

As can be seen from Figure 6, for the energy sector to be on a trajectory consistent with a 2°C outcome, emissions would need to be 1.5Gt lower by 2020 than the IEA is currently projecting they will be under its base-case scenario (31.5Gt versus 33.1Gt), and 10.9Gt lower by 2030 (24.9Gt versus 35.8Gt).

On our calculations, this means that on a cumulative basis over 2015-30 emissions from the energy sector would need to be lower by 70Gt (500Gt versus 570Gt), as shown in Figure 7. In short, based on the IEA’s numbers we calculate that the 2°C carbon budget for the energy sector is 70Gt lower out to 2030 than it is under the IEA’s base-case projections.

As a result, if the world is to stand a realistic chance of meeting the goal that all UN member states committed themselves to under the Paris Agreement, then the global energy industry in general, and the global power-generation industry in particular, are going to have to decarbonize at a much quicker rate than currently projected.

So, what does this mean for the EU energy sector in general, and for the EU power sector in particular?

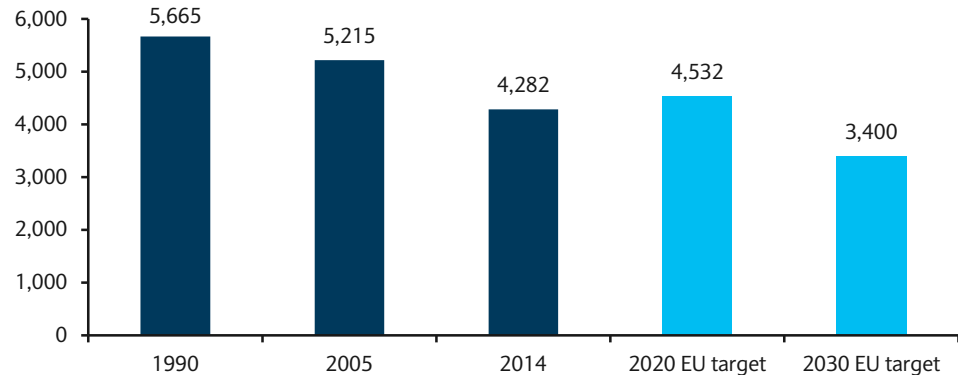
⁹ The 450S is so called because the IPCC estimates that the concentration of greenhouse-gases in the atmosphere consistent with restricting the increase in the average global temperature to no more than 2°C above pre-industrial levels is 450 parts per million (ppm) in CO₂ equivalent.

The EU's current 2030 target and the 2°C challenge

The EU submitted a joint emissions-reduction plan to the UNFCCC ahead of COP-21, reflecting the overall targets that the EU had already approved for itself in its *2030 Climate and Energy Framework* formally adopted in October 2014. The EU's 2030 target is to reduce GHG emissions by 40% versus 1990 (3,400Mt versus 5,665Mt). Figure 8 shows the trend in total EU emissions since 1990, together with the 2020 and 2030 targets. 2014 emissions were already 6% below the 2020 target (-20% versus 1990), and this puts the EU in a very strong position to achieve its 2030 target of a 40% reduction versus 1990 levels (3,408Mt).

FIGURE 8

EU total GHG emissions 1990-2014, and 2020 & 2030 targets (Mt)

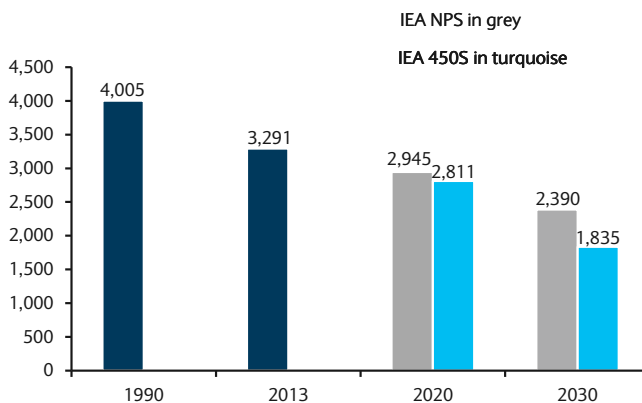


Source: European Environment Agency, European Commission.

However, and as can be seen from focusing on the EU's energy-sector emissions, the bloc's 40% emissions-reduction target for 2030 still falls some way short of a 2°C trajectory.

FIGURE 9

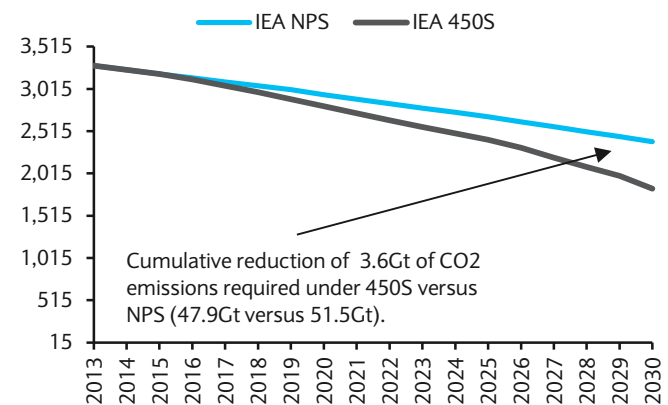
Historical and projected EU CO₂ emissions from energy (Mt)



Source: Based on IEA data from the World Energy Outlook © OECD/IEA 2015, IEA Publishing. Licence: www.iea.org/t&c/termsandconditions.

FIGURE 10

Barclays estimate of EU CO₂ energy emissions under NPS and 450S (Mt)



Source: Based on IEA data from the World Energy Outlook © OECD/IEA 2015, IEA Publishing. Licence: www.iea.org/t&c/termsandconditions. Also based on Barclays Research estimates

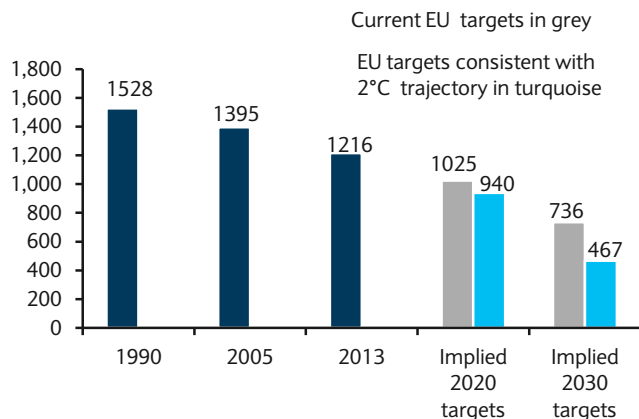
Looking again at the IEA's modelling of a 2°C energy pathway compared with its base-case projections, it can be seen that the EU's CO₂ emissions from energy would need to be 150Mt lower than its base-case projections by 2020 and 555Mt lower by 2030 (Figure 9).

On our calculations, this means that on a cumulative basis over 2015-30 emissions from the EU energy sector would need to be lower by 3.6Gt (47.9Gt versus 51.5Gt), as shown in Figure 10.

And as shown in Figures 11 and 12, more than two-thirds of this emissions gap would have to be made up by the power sector. As per Figure 11, the IEA's 2°C trajectory for the EU power sector requires emissions to fall by 70% by 2030 (467Mt versus 1,528Mt), whereas the EU's energy sector overall would have to reduce emissions by 55% (1,835Mt versus 4,005Mt, as shown in Figure 9 above).

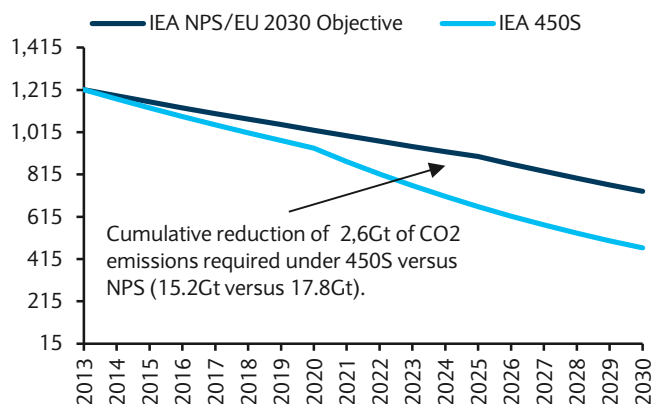
On our calculations, this means that on a cumulative basis over 2015-30 emissions from the EU energy sector would need to be lower by 2.6Gt (15.2Gt versus 17.8Gt), as shown in Figure 12. In other words, 70% of the cumulative emissions difference over 2015-30 between the IEA's base-case trajectory and 2°C trajectory for EU energy emissions would have to be covered by the power sector (2.6Gt/3.6Gt).

FIGURE 11
Barclays estimate of cumulative CO₂ emissions from EU power sector under IEA NPS and 450S, 2013-30 (Mt)



Source: Based on IEA data from the World Energy Outlook © OECD/IEA 2015, IEA Publishing. Licence: www.iea.org/t&c/termsandconditions. Also based on Barclays Research estimates.

FIGURE 12
Barclays estimate of cumulative CO₂ emissions from EU power sector under IEA NPS and 450S, 2013-30 (Mt)



Source: Based on IEA data from the World Energy Outlook © OECD/IEA 2015, IEA Publishing. Licence: www.iea.org/t&c/termsandconditions. Also based on Barclays Research estimates.

On one level, the fact that the power sector would have to reduce its emissions by more under a 2°C scenario than the energy sector overall reflects the greater burden already placed on those sectors that are part of the EU-Emissions Trading Scheme (EU-ETS) compared with those that are not. The EU-ETS covers sectors that together account for 42% of all EU GHG emissions,¹⁰ with the most important being power, iron-and-steel, cement/construction, refining, and aviation (intra-EU flights only). This means that a significant proportion of energy emissions – most notably those from transport (except intra-EU flights) and the residential/commercial sectors – are not covered by the EU-ETS.

Already under the EU's 2020 and 2030 emissions-reduction targets the EU-ETS has to reduce emissions by more than the non-ETS sectors. For 2020, the bloc-wide emissions reduction of -20% versus 1990 levels is to be achieved via a reduction of -21% for the EU-ETS versus 2005 levels, but of only -10% for the non-ETS sector versus 2005 levels.¹¹

¹⁰ According to *the latest data from the European Environment Agency*, EU-ETS emissions totalled 1,787Mt of CO₂ equivalent in 2014, equating to 42% of total EU GHG emissions.

¹¹ Although the 2020 and 2030 targets are both measured against a 1990 baseline, the targets for the EU-ETS and non-ETS sectors are measured against a 2005 baseline (but that together achieve the 2020 and 2030 targets for overall EU emissions versus 1990).

For 2030, the bloc-wide emissions reduction of -40% versus 1990 levels is to be achieved via a reduction of -43% for the EU-ETS versus 2005 levels, and of -21% for the non-ETS sector versus 2005 levels.

On top of this, though, the burden for reducing emissions even within the EU-ETS itself is greater on the power sector than it is on other ETS sectors. As can be seen from Figure 11, the notional cap for the power sector within the ETS represents a cut of -26% versus 2005 levels (1,025Mt versus 1,395Mt), compared with -21% for the EU-ETS as a whole. For 2030, the notional cap for the power sector within the ETS represents a cut of -47% versus 2005 levels (736Mt versus 1,395Mt), compared with -43% for the EU-ETS as a whole.

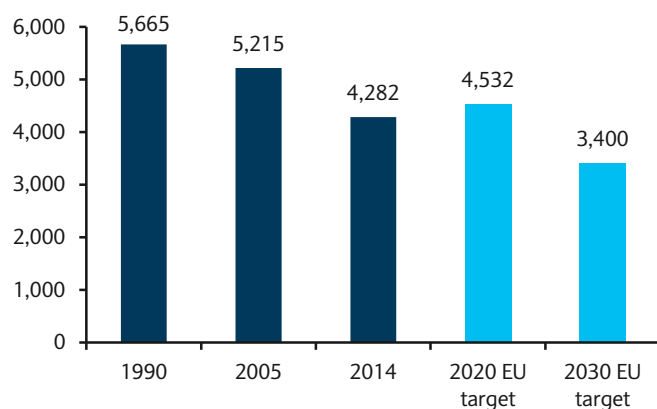
And what is more, the burden for reducing total EU emissions falls unequally not only on different sectors (particularly the power sector), but also on different countries within the EU. In particular, Germany bears a disproportionately large share of the overall burden for reducing emissions by 40% by 2030.

Germany's share of the EU's 2030 target

Figures 13 and 14 show the trend in EU and German GHG emissions since 1990, respectively, together with the targets for 2020 and 2030 under current policies. The targets for individual member states reflect the reductions required in their industries covered by the EU-ETS, together with individually agreed targets for the non-ETS parts of their economies.

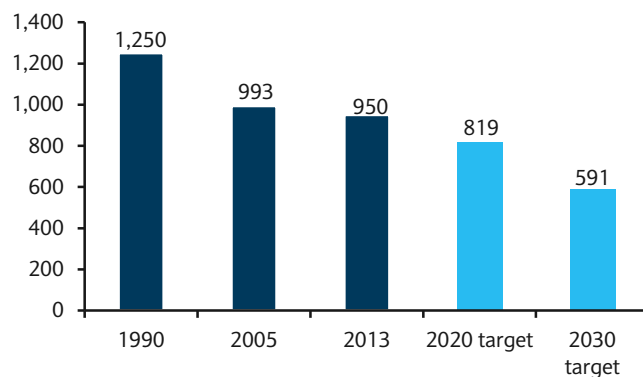
In Germany's case, the required reduction in the non-ETS part of the economy for 2020 was set at -14% versus 2005 (compared with an average of -10% for the EU non-ETS as a whole) and for 2030 at -37% versus 2005 (compared with an average of -21% for the EU non-ETS as a whole). Combining these numbers with the required reductions in Germany's EU-ETS sectors gives an overall 2020 emissions target for Germany of 819Mt, and for 2030 of 591Mt (Figure 14). This means that under the EU's burden-sharing agreement, Germany has to achieve an overall reduction versus 1990 of 34% by 2020 (819Mt/1,250Mt), and 53% by 2030 (591Mt/1,250Mt), in both cases considerably more than the overall EU targets of -20% and -40%, respectively.

FIGURE 13
EU GHG emissions 1990-2013, and 2020 & 2030 targets (Mt)



Source: European Environment Agency, European Commission.

FIGURE 14
Germany's GHG emissions 1990-2013, and 2020 & 2030 EU-determined targets (Mt)



Source: European Environment Agency, European Commission, Barclays Research estimates

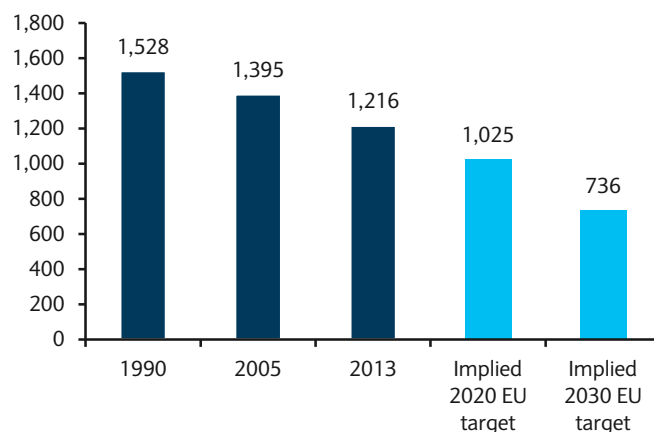
So, what does all this mean for Germany's power-sector emissions?

Implications of current EU targets for German power-sector emissions

Figure 15 and Figure 16 below show the trend in EU and German power-sector emissions, respectively, over 1990-2013, together with the implied emissions targets – in effect the notional caps – for 2020 and 2030.

FIGURE 15

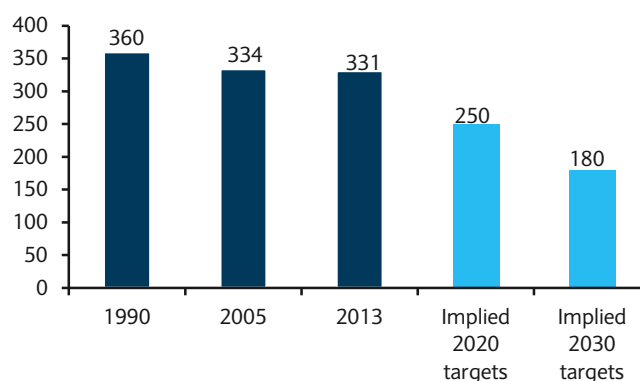
EU power-sector CO₂ emissions 1990-2013 and implied 2020 & 2030 targets under current EU policy* (Mt)



Source: European Environment Agency, IEA, Barclays Research. *There is not an explicit target for the power sector under the EU's 2020 and 2030 targets, but the power sector has to reduce emissions by more than the EU-ETS as a whole, and by imputing from the allocations to the other sectors covered by the scheme we estimate the notional cap on power-sector emissions for 2020 and 2030 to be 26% and 47% lower, respectively, versus 2005 levels (our 2020 and 2030 assumptions here are in line with those of the IEA under its NPS).

FIGURE 16

Germany's power-sector CO₂ emissions 1990-2013 and implied 2020 & 2030 targets under current EU policy* (Mt)



Source: European Environment Agency, European Commission, German Environment Ministry, Agora Energiewende, Barclays Research. *We assume a target of -47% relative to 2005 (versus -43% for the EU-ETS as a whole). Again, by imputing from the allocations to the other sectors covered by the EU-ETS we estimate the notional cap on power-sector emissions for 2020 and 2030 to be 26% and 47% lower respectively versus 2005 levels.

We say 'implied targets' or 'notional' caps on power-sector emissions because the whole point of the EU-ETS is to set an overall limit on emissions for all of the sectors covered by the scheme, and then let the price mechanism determine, which individual installations across all sectors actually get to use the carbon credits – known as European Allowances or EUAs – that make up the cap.

This means that power companies are able to exceed the implied limit on their own emissions set by the EU-ETS sectoral allocations by purchasing EUAs in the market if there are sufficient surplus EUAs available to purchase, and if it is economically rational to do so.

In short, whether the power sector's physical emissions are ultimately in line with its implied sectoral allocation or not will in large measure depend on the supply-demand balance in the system overall, i.e. on how cheaply EUAs can be acquired in the market versus the cost of abatement in the power sector itself.¹²

And the problem is that according to the European Commission's most recent estimate, the current supply-demand balance in the EU-ETS shows an EUA surplus in excess of 2,000Mt, and the Commission itself has estimated this could reach 2,600Mt by 2020.¹³

¹² In turn, the balance in the system overall will depend not only on the supply-demand balance in the power sector, but also in the other sectors covered by the scheme, as well as on how many EUAs have been banked from previous trading periods (see box on next page *Current EU targets mean a soft EU-ETS cap for power sector out to 2030*).

¹³ See the *European Commission's press release* of 18 May 2015 commenting on the verified 2014 EU-ETS emissions for the size of the current surplus, and the Commission's *Impact Assessment* on the reform of the EU-ETS published in January 2014 for the analysis concluding that projected surplus would reach 2,600Mt 2020. *Some third-party analyses available on the European Commission's website* project the surplus could exceed 3,000Mt by 2020.

Current EU targets mean a soft EU-ETS cap for power sector out to 2030

Under EU-ETS rules, where a given operator's or a given sector's physical emissions in a given year of a trading period are below the quota of EUAs allocated for that year, the surplus EUAs can be (i) sold on the market, (ii) saved for use in a subsequent year of the same trading period, or (iii) banked for use in a future trading period (EUAs are bankable in perpetuity).

During Phase-2 of the EU-ETS (covering the period 2008-12), a significant surplus of EUAs – estimated at 2.6Gt-3Gt by 2020 before taking into account the impact of the Market Stability Reserve – was accumulated by the non-power sectors covered by the scheme. This surplus was then banked into Phase 3 and came about for two main reasons:

1) The global financial crisis of 2008-09 caused a recession in the EU that saw a severe contraction in demand across all sectors of the EU-ETS, and especially the cement, iron-and-steel, and pulp-and-paper industries, thereby creating a surplus of EUAs as actual emissions over 2008-12 came in significantly below the cap for this period, and the resulting surplus was banked into Phase-3.

2) Over the course of Phase-2, all sectors of the EU-ETS were allowed to use carbon offsets generated by the UN's Kyoto-related mechanisms (the Clean Development Mechanism and the Joint Implementation mechanism), which enabled them to substitute these credits for EUAs and bank the EUAs thus saved into Phase 3, thereby adding further to the EUA glut caused by the recession.

As a result of the significant surplus of Phase-2 EUAs banked into Phase 3, the implied EU-ETS caps for the power sector for both Phase 3 (2013-20) and Phase 4 (2021-30) are soft rather than hard caps.

What is a soft cap? Under a soft cap, the actual level of physical emissions for a given sector or all sectors can exceed the level at which the cap is set for a given trading period (i.e. the total quota of credits allocated to the scheme or a sector) if surplus credits accumulated in previous trading periods are used to offset emissions above the cap for the given trading period in question. This is precisely the situation in the EU-ETS today in that although the power sector faces a structural deficit of EUAs in Phase 3 it can simply buy EUAs from other sectors that have accumulated surplus allowances and thereby offset physical emissions above its own allocated quota for 2013-20.¹⁴ Moreover, the aggregate accumulated surplus is so large that we think it will allow the power sector offset emissions above its allocated quota over 2021-30 as well.

What is a hard cap? Under a hard emissions cap, the CO₂ constraint is such that there is a shortage of allowances relative to the business-as-usual level of emissions and physical emissions must therefore be aligned with the level at which the cap is set. This is achieved via the bidding up of carbon-credit prices to the marginal cost of industrial abatement at which the market clears (i.e. at which the CO₂ constraint is met).

Conclusion: If the EU-ETS as a whole remains in surplus out to 2030 and the rules are not changed at the EU level, then the only way for any EU country to ensure that its power-sector emissions are in line with its allocated quota – i.e. to ensure a hard cap for generators – would be to implement supplementary domestic measures. We discuss what this means with specific reference to the German power sector below (see *Germany's domestic targets and the 2°C challenge*).

¹⁴ Note that the power sector is the only sector in the EU-ETS that whose allocated quota of EUAs for 2013-20 is below its current emissions.

With such a large surplus of EUAs in circulation, this makes it very cheap for coal and lignite generators to purchase EUAs in the market, thus enabling them to offset emissions above their quota. We estimate that the introduction of the *Market Stability Reserve* in 2019 will take between 1.3-1.4Gt of the EUA surplus out of the market immediately, and thereafter will lower the surplus by roughly 150Mt per year until the surplus in the market reaches 833Mt, at which point there will be no more mopping up of excess allowances.¹⁵

Nonetheless, this still means that in the absence of further policy intervention on the part of the European Commission, and based on the current outlook for coal and gas prices, we do not see EUA prices recovering to levels that make internal abatement in the power sector via fuel switching from coal to gas a cheaper option (at least not before 2030).

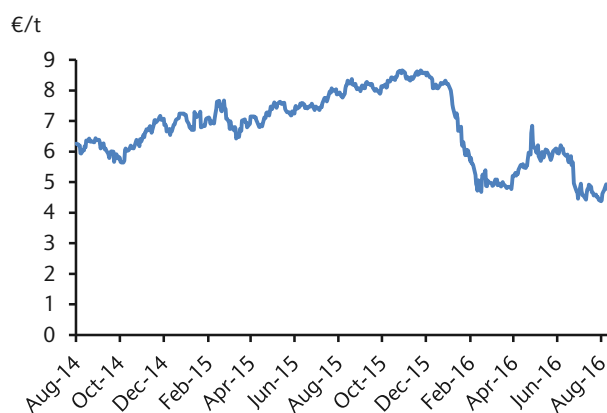
Figures 17 and 18 show the weakness in EUAs over the last seven and two, years respectively.

FIGURE 17
EUA price (Dec-16 contract), 2009-to date



Source: Datastream

FIGURE 18
EUA price (Dec-16 contract), August 2014-to date



Source: Datastream

In short, the carry-over of the significant EUA surplus accumulated over 2008-12 means that both the overall EU-ETS emissions caps for 2020 and 2030 and the corresponding implied limits for individual sectors are 'soft' caps rather than 'hard' caps in that in each case physical emissions do not need to fall to the actual level implied by the level at which the cap is set – emissions in excess of this cap can be offset by purchasing EUAs from the accumulated surplus in the market.

Current EUA surplus incompatible with 2°C

As already seen above, if the EU is to play its part in ensuring that the world meets the IPCC's 2°C budget, then at some point well before 2030 it will have to ensure that the current 'soft' cap on EU-ETS emissions becomes a 'hard' cap consistent with a 2°C trajectory against which actual physical emissions have to be aligned.

¹⁵ The MSR will take 12% of the total EU-ETS over-supply out of the market every year until the total surplus reaches 833Mt. After this point, the annual reduction in the ETS cap of 2.2% per year from 2021 is expected to reduce the annual surplus organically, although once the surplus of EUAs in circulation drops to 400m per year 100m allowances per year will be released to the market until the MSR is emptied. As a result, our conclusion is that the EU-ETS supply-demand balance will not be sufficiently tight to create meaningful price tension until at least 2025, if not 2030. This is not least because the impact of the annual 2.2% reduction in the cap after 2021 will be offset if not outweighed by continuing increases in renewable-power capacity and further measures with regard to energy efficiency.

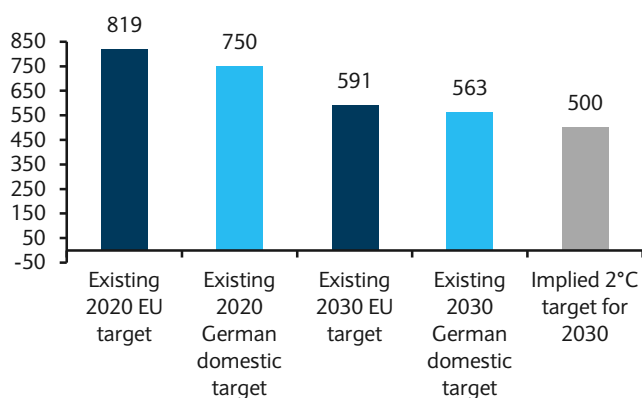
Moreover, Germany itself already has its own domestic emissions target for 2030 that while not fully consistent with a 2°C trajectory nonetheless goes beyond the 2030 target it has signed up to at the EU level and that clearly implies a hard cap on power emissions (and on the emissions of other sectors), rather than the soft cap the current EU target represents.

Germany's domestic targets and the 2°C challenge

Figure 19 shows Germany's 2020 and 2030 emissions targets under both the current EU and German policy frameworks, as well as our estimate of the 2030 target for Germany implied by the 2°C policy objective signed up to by the EU under the Paris Agreement.¹⁶

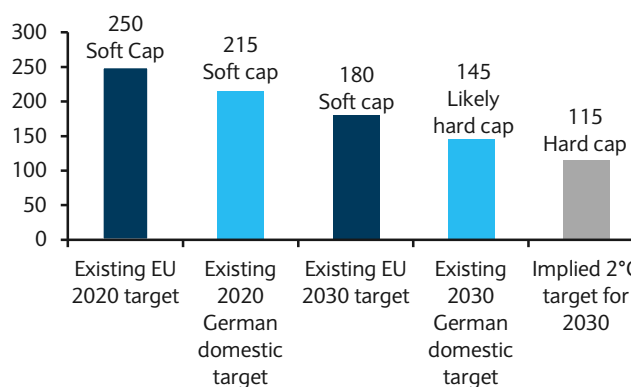
Figure 20 then shows the corresponding 2020 and 2030 emissions targets for the German power sector under these three different policy objectives, and our interpretation of what these targets mean in terms of the nature of the cap (i.e. whether it is hard or soft).

FIGURE 19
Germany 2020 and 2030 GHG emissions targets under different scenarios (Mt CO₂e)



Source: European Commission, German Government, Barclays Research.

FIGURE 20
Germany 2020 and 2030 power-sector CO₂ emissions targets under different scenarios (Mt)



Source: European Commission, German Government, IEA, Barclays Research

EU targets achievable but imply soft cap for German power out to 2030

Under the EU burden-sharing agreements Germany must reduce its overall GHG emissions to 819Mt in 2020 and 591Mt in 2030 (Figure 19). The German government's most recent detailed modelling¹⁷ projects 2020 emissions of 837Mt with current policy measures in place (-33% versus 1990).

In our view, this puts Germany well on track to achieve its 2020 EU-burden sharing target (-34% versus 1990, compared with only 20% for the EU as a whole) and we also think its 2030 target of 591Mt should be achievable (-53% versus -40% for the EU as a whole).

However, while these EU-determined targets are legally binding on Germany, they nonetheless allow for considerable flexibility regarding the emissions of Germany's EU-ETS sectors, not least the power sector. As explained above, we think that owing to the size of the accumulated surplus of EUAs in the market today, power generators in Germany and across the rest of the EU will be able to purchase EAUs in the market to offset emissions above and beyond the quota allocated to the power sector all the way out to 2030.

¹⁶ Note that the EU targets are legally binding on Germany, but the German government's more demanding domestic targets are not. Rather these domestic targets represent a policy aspiration. However, and as we explain in greater detail below, we think that the policy pressure around emissions reduction will make Germany's 2030 domestic target more of an imperative, while technology advances will also make it more achievable.

¹⁷ See the Federal Environment Ministry's *Climate Action Programme 2020*, December 2014.

In other words, the implied limits on German power-sector emissions under the EU's 2020 and 2030 targets – 250Mt in 2020 and 180Mt in 2030 if calculated in line with the German generators' share of the total EU power-sector quota – are soft caps (Figure 20) in that they do not limit the German generators' physical emissions in 2020 and 2030 to these levels.

Germany's domestic targets: implied caps for 2030 and beyond

As shown in Figures 19 and 20, Germany's domestic targets for 2020 and 2030 are more demanding than those it has assumed under the EU burden-sharing arrangements. Indeed, it is hard to see how Germany can now meet its own domestic 2020 target of 750Mt (-40% versus 1990), as we think the gap to that level from current levels appears simply too great to bridge in such a short space of time in a politically acceptable manner (total German GHG emissions in 2015 were 912Mt *according to the German Environment Agency*).¹⁸

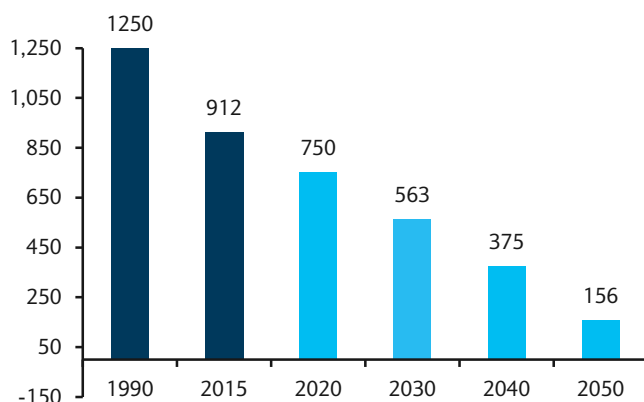
As a result, we see no incremental pressure on the German power sector at a domestic policy level for 2020 beyond the measures already announced, which means that in effect the cap for power generators under Germany's domestic 2020 target will also be a soft cap.

However, the more interesting question for the German utilities is what Germany does with regard to achieving its domestic target for 2030. Here, the target is to reduce GHG emissions by 55% versus 1990, a goal that was first set under the *German Government's Energiekonzept* in 2010.

As shown in Figure 21, the *Energiekonzept* laid out intermediate targets for 2030 and 2040 emissions versus 1990 levels (-55% and -70%, respectively) as a way of ensuring that Germany can meet its 2050 target (between -80% and -95% versus 1990).

FIGURE 21

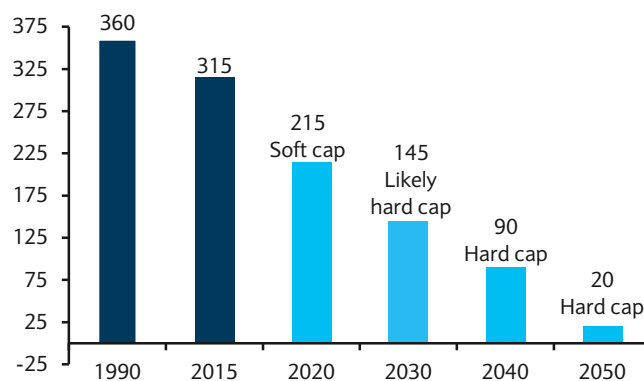
Germany 1990 and 2015 GHG emissions, and domestic GHG targets 2020-2050* (Mt CO₂e)



Source: German Government, Barclays Research. * Note that for 2050 we have assumed a required reduction of 87.5%, mid-way between the German Government's declared range of between 80% and 95%.

FIGURE 22

Germany 1990 and 2015 power-sector CO₂ emissions, and implied power-sector targets 2020-2050 (Mt)



Source: German Government, Agora Energiewende, Barclays Research.

At the moment, the German Cabinet is finalizing the Climate Action Plan 2050, which is meant to set out the implementation measures for achieving the targeted reductions out to 2050, and hence the measures for achieving a 55% reduction by 2030.

¹⁸ As a result, we think the only way that the German government will ultimately be able to signal at least notional compliance with its own 2020 GHG target will be by offsetting all emissions above 750Mt in 2020. It could do this either via the purchase and cancellation of EUAs in the market, or via the cancellation of the EUAs it would otherwise auction to the power sector in 2020.

Media reports over the last few months have indicated a softening of the original draft CAP2050 implementation paper, in particular as these relate to the power sector and the transport sector, with the final version of the Plan expected in the autumn.¹⁹

With the next federal election in Germany due in September 2017 it is perhaps not surprising that contentious policy measures around power and transport should be watered down at this stage. However, it is important to note is that there is no suggestion that the 55% emissions-reduction target itself will be diluted either before or after the election.

As a result, what really matters for the German utilities is not what the government says in its CAP 2050 paper to be published this autumn, but rather whether the 2030 target of -55% for German GHG emissions ultimately implies a hard or soft cap for the power sector.

And in this respect, the key difference between Germany's 2030 target and its 2020 target is that the ratcheting-up mechanism in the Paris Agreement will start to take effect beyond 2020, such that national targets for 2030 will come under increasing scrutiny.

And in our view, this means that if Germany wants to retain its position as a global leader in the fight against climate change, it will have to make sure that its emissions in 2030 are physically aligned with its domestic target of 563Mt (Figures 19 and 22). In turn, we think this means that the German power sector's 2030 will likely have to fall in real physical terms to 145Mt.

We derive this 2030 cap of 145Mt for the German power sector by assuming that the power sector will have to reduce emissions at a faster rate than the country as a whole (-60% versus 1990, compared with a reduction of -55% for Germany as a whole). In turn, if we assumed no tightening of the EU-ETS cap before 2030,²⁰ this would require the German government to implement supplementary measures domestically so that power generators could not simply purchase EUAs in the market to offset emissions above this level.

This could take the form of a German 'top-up' price for carbon above the market price of EUAs to bring the total cost of CO₂ emissions for German generators up to the level required to achieve the internal abatement necessary to align their physical emissions with the German government's target for the sector (this would most likely be the cost required to make hard gas cheaper than coal and/or hard coal cheaper than lignite).

This is exactly what the UK government put in place in 2013 with its *Carbon Price Support Rate*, and *the French Government has signalled its intent to introduce a similar measure* to penalize coal-fired generation from next year.

Alternatively, it could take the form of mandated closures of the oldest and most polluting coal and lignite plants in Germany.²¹

However, the German government might ultimately choose to do it, we think the logic of its long-term emissions-reduction plan dictates that its 2030 target will have to be met physically, implying a hard cap for the power sector of 145Mt by 2030. Given that German power-sector emissions in 2015 were 315Mt, this means, in our view, that by 2030 power-sector emissions will likely have to fall by more than 50% from current levels.

¹⁹ See the reports on *Clean Energy Wire* in particular for the way in which drafts of the CAP 2050 show a watering down since the initial draft of early May. We discuss the CAP 2050 in more detail later in this report (see Section 3, *Scoping the sensitivity to tighter 2030 targets*).

²⁰ Of course, it may well be that given the dynamic of the Paris Agreement and the impact of the ratcheting-up mechanism, the EU as a whole might increase its emissions-reduction targets at some point in the 2020s, thereby tightening the EU-ETS cap in any case. We discuss this below under the 2°C scenario, but here we are concerned with how Germany ensures that its own already existing domestic target for 2030 has international credibility even without any further tightening of the EU's current 2030 target.

²¹ Indeed, the German government has in effect already gone down this route once with the agreement reached in November 2015 *to set up a 2.7GW lignite reserve*. This will see eight of Germany's oldest lignite units taken out of the market and placed on standby mode for use only at times of severe capacity shortfalls before being taken out of service completely after four years.

It is also worth noting that whether Germany's domestic 2030 target for the power sector ends up being a hard cap or not, we think the targets for German power-sector emissions in 2040 and 2050 shown in Figure 22 will definitely be hard caps.

We say this because beyond 2030 it is, in our view, fair to assume that both (i) global and EU policy will have tightened in line with the logic of the Paris Agreement and the ratcheting-up mechanism, and (ii) technology advances in renewable energy and storage will have made emissions reductions much cheaper.

As a result, we assume that the German power sector will face a hard cap of 90Mt by 2040, and 20Mt by 2050 (Figure 22). Again, this assumes a faster rate of reduction in power-sector emissions than for Germany as a whole: our 2040 numbers imply a 75% reduction in power emissions against 1990 versus 70% for Germany as a whole, and for 2050 a 95% reduction versus 87% for Germany as a whole).

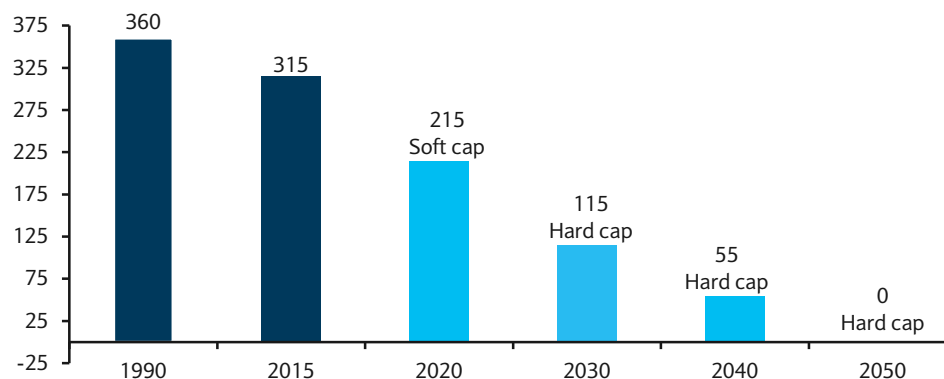
The 2°C targets: hard caps at the country and power-sector level

If the EU and/or Germany were ultimately to align their 2030 targets with a 2°C world, then the cap on Germany's power-sector emissions would be even tighter. Figure 23 shows our estimate of what the cap on Germany's power-sector emissions would be out to 2050 under a 2° policy framework.

We derive these numbers based on two sources: (i) the UK's Committee on Climate Change (CCC), in its *November 2015 report proposing the UK's Fifth Carbon Budget*, and (ii) the IEA's 2015 WEO modelling of the 2°C trajectory for the EU power sector.

FIGURE 23

Implied trajectory for German power CO₂ emission under a 2°C policy trajectory (Mt)



Source: Agora Energiewende, IEA, Barclays Research

The CCC points out that for the EU as a whole, the range of emissions reductions required by 2030 versus 1990 levels is between -45% and -71%, but that for the UK the range is higher at between -53% and -80%. As the CCC explains (p.44 of the report mentioned above), *“The UK takes on a slightly higher reduction than the EU as a whole, given its status as one of the wealthiest nations and high historic emissions.”*

Using the same logic for Germany, and therefore bracketing it with UK in terms of the emissions reductions, that would be consistent with a fair contribution to a 2°C trajectory for the EU as a whole, we derive a 2030 2°C target for Germany of -65% versus 1990 (65% being near the mid-point of the range -53 to -80%) and then assume that the power sector would have to reduce its emissions by a slightly greater amount of 70%.

This is consistent with the IEA's modelling of the 2°C trajectory for EU energy emissions, which requires the EU power sector to reduce its emissions by 70% by 2030 and by 85% by 2040.

On this basis, we derive a hard cap for the German power sector of 115Mt in 2030 and 55Mt in 2040, falling to zero by 2050.²²

In short, under a 2°C scenario, the German utilities would face a very steep emission reduction curve beyond 2020, and caps on emissions would by definition be hard caps.²³

Conclusion: first solution is steeper emissions cuts

As Governor Carney set out in his speech last September, the first part of the solution to what he calls the 'tragedy of the horizon' is for governments globally to agree a target for reducing emissions in line with a carbon budget consistent with a 2°C outcome.

As we have seen above, this is exactly what happened under the Paris Agreement at COP-21 last December; what needs to happen over the next decade or so is for governments around the world to put in place policies consistent with achieving the 2°C outcome they have all signed up to do – indeed, this is the logic of the ratcheting-up mechanism in the Paris Agreement.

That will take time, and there can be no guarantee that it will actually happen, but as shown above it is already possible today to estimate the volume of emissions reductions required from the global energy industry under a 2°C policy framework. And as our analysis above has also shown, it is already possible at this stage to estimate what volume of emissions reductions would be required from the German utilities out to 2030 and beyond under both Germany's existing domestic targets, and a target consistent with 2°C.

With this in mind, we turn next to the second part of Governor Carney's solution to the 'tragedy of the horizon', namely the need for greater transparency on the part of companies generally – and the German utilities specifically – with regard to their climate-related financial disclosures.

²² Note that the 2020 cap implied by a 2°C scenario is in line with Germany's existing target to reduce emissions by 40% versus 1990 levels (215Mt, as shown in both Figures 22 and 23), but as already explained above we think it is politically impossible for the German government to make this into a hard cap now.

²³ The caps under a 2°C trajectory would have to be hard caps because the whole point is that they are calculated in keeping with an absolute carbon budget globally.

2. CLIMATE DISCLOSURE AND THE GERMAN UTILITIES

As explained above, if the first part of the solution to ‘tragedy of the horizon’ is for policymakers to set credible medium- and long-term emissions-reduction targets in line with scientifically determined carbon budgets, the second, in Governor Carney’s view, is to foster greater transparency from companies around the financial risks related to climate change. It is for this reason that in his capacity as Chairman of the Financial Stability Board (FSB), Governor Carney announced at COP-21 the establishing of the *FSB Task Force on Climate-related Financial Disclosure (TCFD)*.

The idea behind the TCFD is to enhance the degree of transparency around corporate climate risk via improved disclosure with a view to enabling investors and other financial stakeholders to allocate capital more efficiently in the transition to a low-carbon world. Improved decision-making resulting from greater transparency should help pre-empt the risk to financial stability that would otherwise likely increase over time. On completion of Phase-1 of its work at the beginning of April the TCFD launched a public consultation “to solicit meaningful and substantive input” into Phase-2 of its work, which elicited just over 200 detailed responses.

The feedback from the consultation showed that respondents view the energy and utility sectors as the most relevant in terms of which industrial sectors should be covered by the disclosure recommendations that the TCFD ultimately makes in its final report, due in nearly 2017. It was also striking that an overwhelming majority of respondents stated that scenario analysis should be a key component in enhanced climate-related financial disclosure.

With this in mind, this section looks in more detail at the work of the TCFD before examining more closely the disclosure practices of E.ON and RWE around climate change. In our view, E.ON and RWE are both already amongst the most transparent companies when it comes to disclosing key metrics around financially sensitive climate indicators, with very thorough disclosure on a historical basis of what we think in their case is the most important climate indicator: their absolute levels of direct CO₂ emissions (technically known as Scope-1 emissions). They also provide detailed disclosure on their indirect emissions (Scope-2 and Scope-3), and set themselves carbon-intensity targets out to 2020 (RWE) and 2025 (E.ON).

On the other hand, we think that given their sensitivity to EU and German government climate policy both companies could be doing more to scope out the potential impact of possible future policy frameworks for emissions reduction that we reviewed in Section 1; they should also explain – at least in broad qualitative terms – how they would respond under these potential policies. This would enable investors better to assess the impact that different policy scenarios might have on their businesses.²⁴

It is for this reason that having examined the disclosure practices of E.ON and RWE in this section we then attempt our own scenario analysis of the impact that different 2030 targets might have on the value of their fossil-fuel generation assets in Section 3 below.

²⁴ Moreover, and although it is not our focus in this report, we would emphasize that the risk of tougher emissions targets on the value of the German utilities is not necessarily all to the downside – for example, there are opportunities for them in the higher levels of electrification associated with tougher emissions targets.

Climate Disclosure and the FSB-TCFD

In a widely reported intervention at the World Bank in October 2014, Mark Carney stated that the vast majority of hydrocarbon reserves are unburnable if the world wants to avoid the worst effects of climate change.

The Governor's remarks were made in the context of a discussion on *integrated reporting*, i.e. in addition to disclosing information on current issues impacting their operating and financial performance companies should also analyse and disclose their exposure to longer-term risks that might have an impact on their future performance, especially where policy is likely to change over time. The Governor gave climate change as a prime example of such a long-term risk where policy would likely become tighter over time.

“The challenges currently posed by climate change pale in significance with what might come. Once climate change becomes a defining issue for financial stability, it may already be too late.” Mark Carney, Bank of England Governor, September 2015

In September 2015, Governor Carney then gave his ‘Tragedy of the Horizon’ speech reviewed in the previous section, and then on 9 November 2015 the FSB put out a press release announcing a ‘*Proposal for a disclosure task force on climate-related risks*’.

In its proposal, the FSB explained the need for such an initiative – and in particular how it would build on but differ from the very significant work that has been done on climate disclosure over the last decade and more by CDP and others²⁵ – as follows:

“Much good work has been done in recent years to strengthen disclosures on climate-related issues. However, it has been estimated that there are almost 400 information disclosure schemes relating to climate or sustainability in existence, which approach climate-related disclosure from a variety of different perspectives and may be intended for different stakeholders.

These range from industry or NGO initiatives to set out guidance, through national laws or government-led schemes, to principles set out by international organisations. The scope of the disclosures that are encouraged or required also varies – from narrow greenhouse-gas emissions disclosure through to requirements to consider material risks and opportunities from climate change, business strategies, or mitigation and divestment actions. Many of these schemes focus on a broader set of environmental, social and governance issues rather than specifically on climate-related data.

(...) The disclosure task force should not add to the already well developed body of existing disclosure schemes. Instead it should develop a coordinated assessment of what constitutes efficient and effective disclosure for financial markets and for other stakeholders, drawing on the experience both of the implementation of existing initiatives and of lenders, insurers, investors and other stakeholders. (...) This could include a set of disclosure principles, supported by detailed recommendations and examples of leading practices drawn from current annual reports and from company disclosures and informed by users’ expectations.”

²⁵ We think that CDP – formerly the Carbon Disclosure Project – has done more to raise both the profile on this issue, and the standard of reporting around it, than anybody else.

A month after its proposal, *the FSB announced the formal launch of the Task Force* on 4 December 2015 at the COP-21 conference in Paris. Governor Carney and former mayor of New York City Michael Bloomberg held a public session at the COP to discuss the aims of the TCFD, with Mayor Bloomberg taking on the role of the Task Force's Chairman.

As explained in the same press release, the work of the TCFD was planned in two stages, with the work to be completed by the end of 2016:

"During the first stage, the Task Force will consist of about 10 individuals, who will determine the scope and high-level objectives for its work. It is expected that this first stage will be completed by end-March 2016. During the second stage, the Task Force's work is likely to be expanded to include up to 30 individuals, focused on delivering specific recommendations for voluntary disclosure principles and leading practices, if appropriate, with a view to completing its work by end-2016. As part of its work the Task Force will conduct public outreach."

"It is critical that industries and investors understand the risks posed by climate change, but currently there is too little transparency about those risks. Increasing transparency makes markets more efficient, and economies more stable and efficient." Michael R. Bloomberg, Chair, TCFD

So, what has been the focus of the TCFD's work so far?

Phase-1 findings: principles, objectives for Phase-2, and consultation results

On conclusion of its Phase-1 work, *the TCFD published a report on 1 April* setting out its fundamental principles for effective disclosures, and the scope and objectives of its Phase-2 work. It also launched a consultation exercise on the Phase-1 report to help guide its Phase-2 work and ensure that its final recommendations are as useful as possible to end users.

The seven fundamental principles for effective climate-related financial disclosure listed in the Phase-1 report (p.4) are as follows:

- "1. Present relevant information*
- 2. Be specific and complete*
- 3. Be clear, balanced, and understandable*
- 4. Be consistent over time*
- 5. Be comparable among companies within a sector, industry, or portfolio*
- 6. Be reliable, verifiable, and objective*
- 7. Be provided on a timely basis."*

In terms of the timeframe over which the TCFD aims to recommend disclosures be made, and which kinds of companies it will target, the Phase-1 report says (p.4):

“The Task Force’s recommendations in Phase-2 will target climate-related financial disclosures pertaining to near-, medium-, and long-term physical and non-physical impacts faced by both non-financial companies and the financial sector, with the goal of furthering market understanding and evaluation of relevant financial risks and opportunities. (...) The Task Force will focus primarily on developing recommendations for issuers of public securities, listed companies, and key financial-sector participants.”

In terms of what kind of information the TCFD will seek improved disclosure on in its Phase-2 work and final report, the Phase-1 report says (p.4):

“The Task Force will consider the features and characteristics of information to be disclosed—including quantitative, qualitative, historical, and forward-looking metrics.”

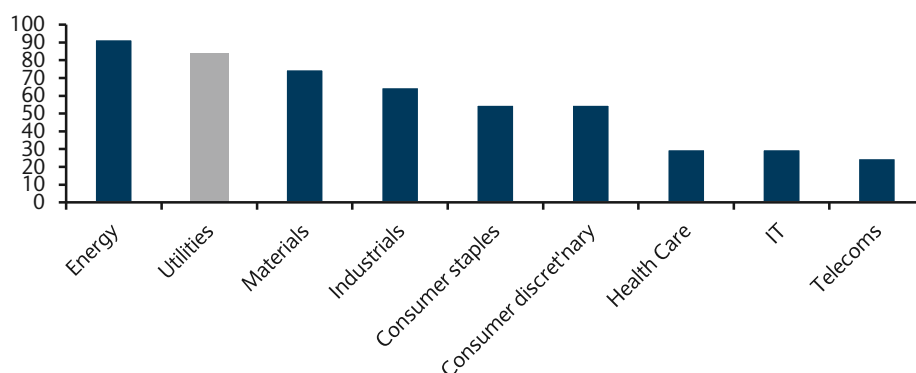
And in terms of the force its recommendations will have and the targeted geographical range, the TCFD explained in its Phase-1 report that adoption of its final recommendations would be voluntary and focused on the G-20 countries (p.4):

“The Task Force will seek to promote and drive voluntary adoption by ensuring that its recommendations reflect a consensus view of leading practices for disclosure; advance principles of good governance, fiduciary duty, and stewardship; and provide a basis for consistent and comparable application by firms in countries throughout the G20.”

Following publication of its Phase-1 report, the TCFD launched a public-consultation exercise soliciting feedback from interested parties via a detailed questionnaire on the progress that had been made over Phase-1, and what the focus and priorities should be over Phase-2. [The findings are available on the TCFD website](#), and with regard to the industrial sectors that should be covered by the TCFD’s final recommendations it is notable that the energy and utilities sectors ranked highest.

FIGURE 24

TCFD Phase-1 consultation, % of respondents’ highlighting which sectors should be covered by TCFD’s final recommendations



Source: FSB-TCFD

Over 90% of respondents identified the energy sector as being a key target for the TCFD’s recommendations, and close to 90% also highlighted the utility sector in this regard.

The Phase-1 consultation feedback also revealed that 96% of respondents see scenario analysis as a key component of climate-related disclosure, although this number was not further broken down by sector. However, and as already explained in Section 1 above, CO₂ emissions from energy account for 60% of total anthropogenic GHG emissions, with power generation accounting for 25% on its own (Figure 5 above).

As a result, it seems a fair assumption that all respondents to the TCFD's Phase-1 consultation who highlighted scenario analysis as a key component of disclosure would see it as important for the utility sector. The Phase-1 feedback also states (p.8) that *"the majority of respondents were in agreement that disclosures should be forward-looking, considering short-, medium-, and long-term horizons"*, and that disclosures *"should align with material risks"*.

Investor-led responses to climate change: decarbonisation initiatives

The increasing focus on the risks surrounding the impact of climate change on the incumbent energy sector have prompted an increasing focus on the part of institutional and sovereign investment funds on the carbon intensity of their portfolios.

These initiatives centre on three main activities:

- **Measuring portfolio carbon risk:** A good example of this is the *Montreal Pledge*, an initiative supported by the United Nations Environment Programme Finance Initiative (UNEPPFI) and the Principles for Responsible Investment.
- **Decarbonising portfolios:** A good example of this is the *Portfolio Decarbonisation Coalition*, a joint initiative between the UNEPPFI and institutional investors.
- **Divesting from fossil-fuel holdings:** Calls for and decisions to proceed with, the outright divestment of fossil-fuels have been led by academic, faith-based, and charitable foundations (*Divest-Invest* being a good example), but *institutional* and *sovereign investment funds* are also starting to divest from fossil fuels, especially coal.

In addition, the *Institutional Investor Group on Climate Change* in Europe (with partner organisations in Asia and Australia), the *Asset Owners Disclosure Project*, and the *Ceres investor network* in the United States each represent large numbers of some of the world's biggest and most influential asset managers and asset owners concerned about the risks to their portfolios posed by climate change. The scale and scope of the total Assets Under Management represented by these various different initiatives continues to grow, and as the policy response to climate change intensifies and the technology response accelerates in line with ongoing cost reductions in renewable energy and storage, we would expect portfolio decarbonisation to become an increasingly mainstream issue over the next few years.

In terms of the key challenges to effective disclosure, respondents highlighted three main areas, namely (i) technical barriers (e.g. the fact that there is no universal price on carbon risk), (ii) policy barriers (e.g. inconsistency in policy standards across the G-20 countries), and (iii) behavioural barriers (e.g. short-termism, and low awareness of or scepticism about the impact of climate change on business risks and opportunities).

In short, the feedback indicates that while there are clearly a number of obstacles to achieving a standardized global reporting framework on climate-related financial risks, there is an overwhelming consensus amongst respondents that the utility sector should be a key area of focus for the TCFD. There is also consensus that disclosures should be forward looking and should align with material risks, while scenario analysis – at least for certain sectors – is seen as a key component of disclosure by 96% of all respondents.

Phase-2 timeline from here

According to *the timeline shown in the Phase-1 consultation feedback* (p.12), the TCFD's work continues into the autumn, with a draft of its final report due to be delivered to the FSB and made available for public consultation in December and the definitive report to be published by the end of Q1 2017.

With all this in mind, it is instructive to look at the German utilities' current climate disclosure practices before considering the possible impact of the tougher potential emissions targets they might be faced with in future for 2030 and beyond.

German utilities: transition risk is key climate-related threat

E.ON and RWE both publish a wealth of data on the environment, with climate-related issues featuring very prominently in these disclosures. However, the question here is what they disclose relating to the climate-related *financial* risks associated with their businesses.

There are many ways in which utility companies, and more specifically power generators, face climate-related financial risks in their activities, but our purpose here is not so much to provide an exhaustive list as rather to pick out the most material risks that E.ON and RWE face, and to ask whether the disclosure is sufficient or whether they could be doing more.

In particular, if we think about Governor Carney's categorization of climate-related financial risk into physical risk, liability risk, and transition risk, we would say as a starting point that most of the risks for E.ON and RWE are related to transition risk.²⁶ In other words, the main climate-related financial risks they face come from the fact that as the world adjusts to a low-carbon pathway changes in policy and technology could, as Governor Carney puts it in his 'Tragedy of the Horizon' speech, "*prompt a reassessment of the value of a large range of assets as costs and opportunities become apparent*".

Indeed, the experience of E.ON and RWE over the last decade is a prime example of how transition risk can radically alter the value ascribed by the equity market to the assets and activities of even the most well established of companies. Figures 25 and 26 show the trend in share prices of E.ON and RWE, respectively, over the last decade. Both companies' share prices peaked in January 2008 (at €50 for E.ON and €100 for RWE), and against these respective peaks both are down by 85% today (vs 29% for the SX6P).

FIGURE 25
E.ON share price over, August 2006-to date



Source: Datastream

FIGURE 26
RWE share price, August 2006-to date



Source: Datastream

Of course, the dramatic decline in both companies' share prices is not exclusively attributable to the loss of value in their fossil-fuel generation business over this period (after all, the change in German nuclear policy has also been very detrimental to both), but we

²⁶ This is not to suggest that they do not also face physical and liability risks (for example, water-related questions and the potential for litigation with regard to the impact on the climate of their power-generation activities also pose medium- to long-term risks). However, in our examination of the issue here we are most concerned with what we see as the more material risks they face from policy and technology developments.

think the majority of the decline in both cases is attributable to what Governor Carney calls transition risk: tougher climate policy in general, and the impact of renewables in particular.

So, to what extent and where do E.ON and RWE disclose climate-related financial risks in general, and transition risk in particular?

Climate-related risk disclosures: what and where to report?

E.ON and RWE have both been publishing very comprehensive sustainability reports for many years (*see E.ON's 2015 report here*, and *RWE's here*), with extensive and detailed information on a range of climate-related data and KPIs. Such information is very useful for investors and other stakeholders keen to understand above all the German utilities' impact on the climate, but the underlying logic of Governor Carney's argument concerning climate-related disclosures is that companies should also be disclosing, where relevant, the *financial* risks associated with such data, and how these risks are being measured and managed.

In other words, shareholders and other financial stakeholders should be able to understand what the climate-related financial risks associated with a given company's business model and strategy are, and how material these risks are. As Governor Carney said in his *Tragedy of the Horizon* speech (p.13, the bold type is our emphasis):

*"A framework for firms to publish information about their climate-change footprint, **and how they manage their risks and prepare (or not) for a 2-degree world**, could encourage a virtuous circle of analyst demand and greater use by investors in their decision making. (...) A carbon budget – like the one produced by the IPCC – is hugely valuable, but can only really be brought to life by disclosure, giving policymakers the context they need to make choices, and firms and investors the ability to anticipate and respond to those choices. (...) The right information allows sceptics and evangelists alike to back their convictions with their capital. It will reveal how the valuations of companies that produce and use fossil fuels might change over time. It will expose the likely future cost of doing business, paying for emissions, changing processes to avoid those charges, and tighter regulation."*

In our view, given that E.ON and RWE provide very extensive data on their respective carbon footprints in their sustainability reports (along with clear explanations of the methodology used to measure and present them), the raw material for a serious financial analysis of their exposure to climate-change-related risk in general – and transition risk in particular – is certainly there.²⁷

However, the data itself is only part of the story, and as Governor Carney says, what investors and other stakeholders are also interested in is how climate-related risks are being managed, and, if these risks are sufficiently material, how the overall strategy of the company in question is being re-calibrated to take account of these risks.

Of course, to the extent that both E.ON and RWE have decided to split themselves up into two separate entities focusing on distinct parts of the energy and electricity industries and value chains, it is clear that they have both recognized that the most fundamental re-think of their business strategies was necessary in response to the long-standing but still ongoing transition risks they face.²⁸

We think this strategic re-structuring of their business models is unequivocally positive in and of itself, but at the same time does not liberate them from these risks – instead, it re-

²⁷ Indeed, in Section 3 below we use this raw material – together with our analysis of the implications of tighter EU and/or German climate policy on the German power sector as a whole set out in Section 1 above – to analyze the potential impact that more ambitious climate targets would have on the valuation of their fossil-fuel assets.

²⁸ We say long-standing because we think the signs that a fundamental re-shaping of the German and European electricity landscape were already visible from 2000 onwards, and were then formalized in the setting-up of the EU-ETS in 2005 and the 2020 EU policy framework for emissions, renewables, and energy efficiency passed in 2007.

distributes where the ongoing transition risks will in future be located within these companies (in the case of E.ON, mainly within Uniper, and in the case of RWE, mainly with the parent company RWE AG, rather than with Innogy).

And, we would rank the transition risks faced by E.ON and RWE as follows in order of importance:

- **Direct emissions (Scope-1):** These are technically known as Scope-1 emissions, and for E.ON and RWE these are the emissions from the combustion of lignite, coal, and gas for the production of electricity in their own power stations.²⁹
- **Asset Retirement Obligations (AROs):** AROs are the provisions that E.ON and RWE have on their books for the costs associated with the closure, dismantling, and site-remediation of power plants and other assets. For climate-related AROs, the relevant provisions are those relating to fossil-fuel power stations.
- **Indirect emissions (Scope-3):** For E.ON and RWE Scope-3 emissions relate mainly to power purchased from third parties for onward sale, and the end consumption of the gas they supply. While these emissions are not their direct responsibility, the absolute numbers are very large, so increased climate-policy ambition and/or competition from renewables could pose a risk to their businesses in these areas.
- **Indirect emissions (Scope-2):** These are the indirect emissions from purchased electricity and heat for running their own facilities. As such they are very small for E.ON and RWE, and do not in our view pose a material financial risk.

So, what information do E.ON and RWE disclose on these elements, and where? Below we look first at the information disclosed in the sustainability reports, as this is where most of the raw data is to be found – both companies' measuring of the actual data is extensive. We then look at what management says about the risks associated with this data in their annual reports to shareholders – here we find the discussion of the risks less extensive.

Climate disclosure in the E.ON and RWE sustainability reports

Here we look at the first three elements identified above in terms of the information disclosed on them in the E.ON and RWE sustainability reports.

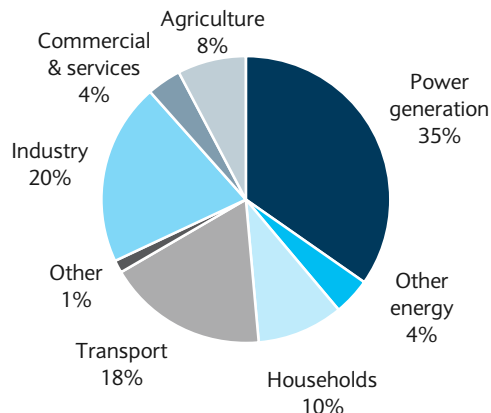
Scope-1 emissions: still the biggest single transition risk for E.ON and RWE

Figure 27 shows German power emissions as a share of total emission in 2015, and Figure 28 the share of E.ON and RWE in Germany's 2015 power-sector emissions.

²⁹ The categorization of emissions according to Scope-1, Scope-2, and Scope-3 was developed by *the GHG Protocol* and is now the most widely accepted global standard for understanding, quantifying, and managing GHG emissions.

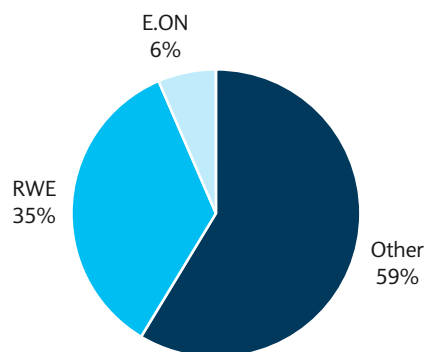
FIGURE 27

Germany GHG emissions by sector, 2014



Source: German Federal Environment Agency, Agora Energiewende

FIGURE 28

Germany power-sector CO₂ emissions, 2015 (Mt)

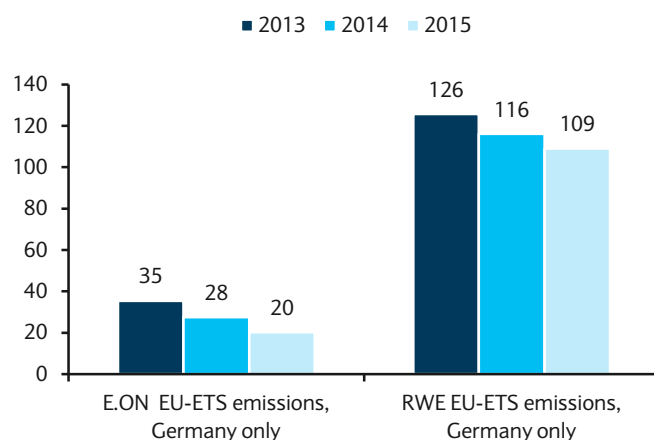
Source: Company 2015 sustainability reports, Agora Energiewende

As the largest single source of emissions in Germany and the EU, fossil-fuel power generators will face ongoing pressure from policymakers to reduce their emissions over time, while also facing increasing competition from renewable-energy sources as the costs of renewables continue to fall and energy-storage technologies evolve and mature.

Figure 27 shows that the power sector accounted for 35% of Germany's GHG emissions in 2014, while Figure 28 shows the share of E.ON's and RWE's direct emissions in Germany over 2013-15.³⁰ Between them, E.ON and RWE accounted for 41% of total German power emissions in 2015, with RWE on its own accounting for 35%.

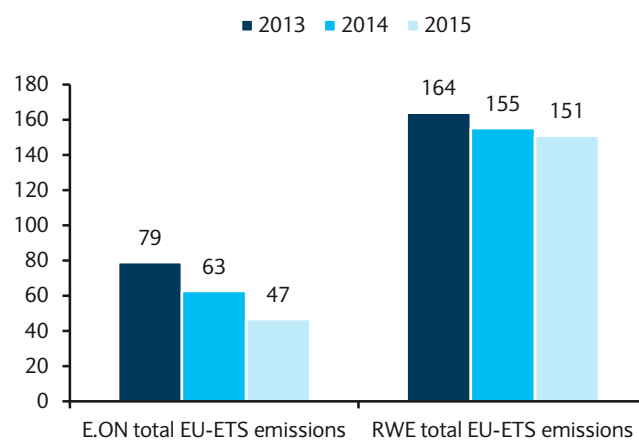
Figures 29 and 30 show E.ON's and RWE's absolute emissions in Germany and across the EU as a whole over 2013-15.

FIGURE 29

E.ON and RWE CO₂ emissions, Germany, 2013-15 (Mt)

Source: Company 2015 sustainability reports

FIGURE 30

E.ON and RWE, EU-ETS CO₂ emissions, 2013-15 (Mt)

Source: Company 2015 sustainability reports

Both companies' emissions have been falling over the last few years, but RWE remains the single largest emitter of CO₂ not only in Germany but in the EU as a whole. As a result, RWE's Scope-1 emissions are, in our view, by far the greatest climate-related financial risk facing the company.

³⁰ Numbers here from E.ON's 2015 Corporate Sustainability Report, and RWE's 2015 Corporate Responsibility Report.

E.ON's exposure in both Germany and the EU-ETS as a whole is much lower than that of RWE, although we would emphasize that E.ON's Scope-1 emissions here do not include the significant output from their Russian power business. Adding E.ON's Russian power emissions in the numbers shown in Figure 30 would increase their total Scope-1 power emissions to 114Mt in 2013, 96Mt in 2014, and 77Mt in 2015.³¹

In short, both companies still have very significant Scope-1 emissions, and preparing for and managing the increasing policy and competitive pressure their fossil-fuel generation businesses will face over the next two decades is in our view the key climate-related challenge they face.³² Moreover, given RWE's much greater absolute exposure to Scope-1 emissions than E.ON's (and the fact that all of RWE's exposure is in the EU), the scale of this challenge is much greater for RWE than it is for E.ON.

So, what do E.ON and RWE say about the risks associated with their Scope-1 emissions in their sustainability reports, and about their strategies for reducing emissions in future?

Acknowledgement of the science and of the international political consensus

The first thing to say about the approach of E.ON and RWE to managing their Scope-1 emissions risk as detailed in their 2015 sustainability reports is that both accept the IPCC's findings on the science of climate change and the political momentum to fight it. As a result, both acknowledge that as large emitters they have a particular responsibility to reduce their carbon footprint.

E.ON states in its *2015 Sustainability Report* (p.38):

"There is broad consensus among scientists that global warming must be limited to 2°C at the most. Only in this way can risks be contained that are associated with the climate change. (...) At the Paris Climate Summit (COP21) in December, for the first time, 195 states committed themselves to climate protection. The agreement entails the ambitious goal of limiting the Earth's warming to a value clearly under 2°C. (...) As a company that supplies energy, we have been aware that a particular responsibility rests with us with regard to climate protection." (Our emphasis)

RWE states in its *2015 Sustainability Report* (p.42):

"According to the assessment by the Intergovernmental Panel on Climate Change (IPCC), climate change can modify the living conditions of people and the environment across the world. It can also lead to high macroeconomic costs. The resolutions passed by the Paris Climate Conference (COP 21) have jointly committed all the countries to limiting the global temperature increase to significantly below 2 degrees Celsius compared with the preindustrial level. RWE welcomes the climate change treaty. A broadly-based international consensus is the only way of bringing about genuine structural change throughout the world to create a more sustainable economic model. (...) Our stakeholders, including environmental organisations, customers and politicians, regard the reduction of CO2 as the biggest challenge for RWE in order to become more sustainable." (Our emphasis)

So, how does this acceptance of the *need* to act translate into concrete *plans* to act?

Carbon-intensity targets versus absolute emissions-reduction targets

Both E.ON and RWE emphasize in their sustainability reports their plans to increase further the size of their renewable-energy businesses, and to help all their customers improve the efficiency of their energy consumption. As a result, both have set themselves carbon-intensity targets.

³¹ That said, of course, the policy pressure to reduce emissions in Russia is much lower than in Germany and the EU.

³² It is for this reason that when looking at both companies' sensitivities' to tighter emissions targets (see Section 3 below) we concentrate on their Scope-1 emissions in Germany and the EU.

In E.ON's case, the goal is to reduce the amount of CO₂/MWh generated by 50% by 2025 versus the 1990 level of 0.63t/MWh, and in RWE's case to reduce it to 0.62t/MWh by 2020 compared with the current level of 0.71t/MWh (Figure 31).

FIGURE 31

E.ON and RWE carbon-intensity targets (tCO₂/MWh generated)

	2014	2015	2020	2025
E.ON	0.43	0.40	n/a	0.31
RWE	0.79	0.71	0.62	n/a

Source: Company sustainability reports

For E.ON, the 2025 target now looks undemanding, and the company effectively acknowledges this by saying (p.42 of its 2015 Sustainability Report) that *“the new companies E.ON and Uniper (...) will develop new goals”*. For RWE, the target of reducing its carbon intensity 0.62t/MWh also looks very achievable given that it will be putting 1.5GW of its lignite capacity into a standby reserve over 2017-19 for four years before final closure.

However, while carbon-intensity targets for power generators are very important in showing commitment to reducing their impact on the climate, they are not the same thing as targets for absolute emissions reductions. And in the end, as Governor Carney's 'Tragedy of the Horizons' speech makes clear, it is absolute reductions within the framework of scientifically determined carbon budgets that are required to ring the world onto an emissions trajectory consistent with a 2°C outcome. As a result, the risk that E.ON and RWE should be securing their businesses against is that absolute emissions targets in Germany and the EU might tighten significantly in future.

So, do E.ON and RWE set themselves absolute emissions-reduction targets over the medium and long term?

For E.ON, as far as we can ascertain from its 2015 Sustainability Report, the only reference of any kind it makes to an absolute target for its Scope-1 emissions is on p.42:

“Back in 2007 we set the goal of reducing our specific carbon emissions. In 2009, we reinforced this commitment by joining other companies in our industry in a pledge that 95% of the power we supply will be zero carbon by 2050.”

Taken at face value this is a very interesting and bold statement in that it would seem to commit E.ON to the upper end of the EU's 2050 target of 80-95% decarbonisation by 2050. However, in our view, there are two important caveats to recognize:

- (i) E.ON does not state whether it is unilaterally committed to this target, or whether the pledge it has given is only valid within the context of the industry as a whole.
- (ii) In order to be credible, such a long-term plan would require a trajectory to be set between now and 2050 with interim targets. As far as we are aware, E.ON has no such interim targets in place.

For RWE, as shown above, the scale of the challenge for reducing its absolute emissions is much greater, and on this subject it has this to say (2015 Sustainability Report, p.42):

“The ambition of the EU is a 40% reduction in the emission of GHGs by 2030 compared with the baseline year of 1990. Germany has already made a commitment to this target for 2020. As a major energy utility and Europe's biggest single emitter of CO₂, RWE intends to make a substantial contribution and support these targets.” (Our emphasis)

It then goes on to spell out what this means in practice (Ibid):

“Depending on the further expansion of renewable energies, an additional fall in the area of conventional energy generation is anticipated. The associated further reduction of full-load hours will combine with the depletion of lignite supplies at the Inden opencast mine, and the consequent decommissioning of the Weisweiler power plant will lead to further CO₂ reductions. Overall, the CO₂ emissions from lignite will therefore be reduced by 40% to 50% compared with the present day by 2030.” (Our emphasis)³³

In short, we conclude that E.ON and RWE take the need to reduce their absolute Scope-1 emissions much further over time very seriously. At the same time, we see a gap in their reporting as neither company discloses what it thinks about the potential impact of a 2°C target on their business, or what the impact of Germany’s existing 2030 target to reduce emissions by 55% would be if this were to entail a hard cap for generators.

Asset-retirement obligations for fossil-fuel power-generation assets

E.ON and RWE are currently finalizing discussions with the German government on the question of a ring-fenced, state-administered fund for their nuclear waste-and-storage provisions. On the basis of what we know about this at the moment, the nuclear operators in Germany will have their liabilities for these provisions taken over and capped by the state fund, but in exchange for having these liabilities capped they will have to pay a premium in the order of 35% to the book value of their provisions.

We do not think that the asset-retirement obligations for the fossil-fuel generation businesses that E.ON and RWE have on their balance sheets are at risk of being subject to a similar initiative from the German government to place them in a ring-fenced, state-administered fund, as both the size and political sensitivity of these obligations are much lower than those relating to nuclear waste and storage. Indeed, even after the transfer of the waste-and-storage provisions, E.ON and RWE will retain their provisions relating to the closure and dismantling of their nuclear power plants on their balance sheets.

However, we would make the point that if Germany’s existing 2030 target for emissions reductions ultimately implies a hard cap for the power sector (as we believe in time will be the case), or if the EU were ultimately to put in place a 2°C policy framework after 2020, the AROs relating to lignite and coal would likely be crystallized earlier than is currently assumed for the level of provisioning on both companies’ balance sheets.

In its 2015 annual report E.ON showed AROs relating to fossil-fuel power generation of €0.8bn, and RWE of €2.3bn. As a result, we think there would be upside risk to these numbers under both of the low-carbon scenarios we outlined in Section 1 above, and that more disclosure around this topic would therefore be useful.

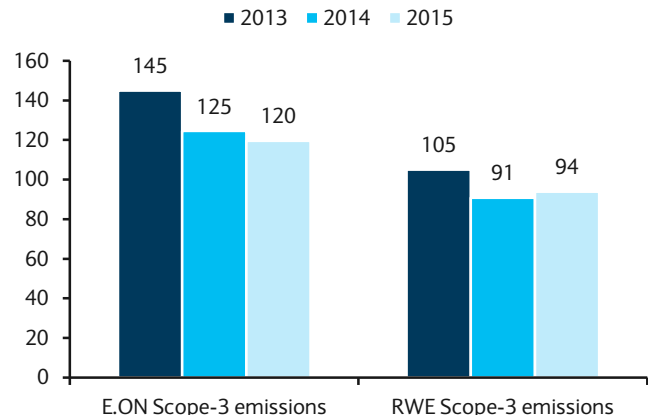
Scope-3 emissions: often overlooked, but worth thinking about

Figure 32 shows E.ON’s and RWE’s Scope-3 emissions, while Figure 33 shows the breakdown of E.ON’s Scope-3 emissions in 2015 (we could not find a similar breakdown for RWE’s Scope-3 emissions, but we think it would be very similar to that of E.ON).

³³ Such a reduction in RWE’s absolute emissions from lignite generation is consistent with our own base-case modelling of RWE’s power business (we assume a reduction in RWE’s lignite-fired emissions in Germany from 82Mt in 2015 to 43Mt in 2030, a reduction of 48%). However, and as we also show in Section 3 below, we think such a level of emissions from lignite power plants in 2030 is inconsistent with both Germany’s existing 2030 target of a 55% emissions reduction versus 1990 (assuming this means a hard cap), and an EU target for 2030 consistent with a 2°C trajectory.

FIGURE 32

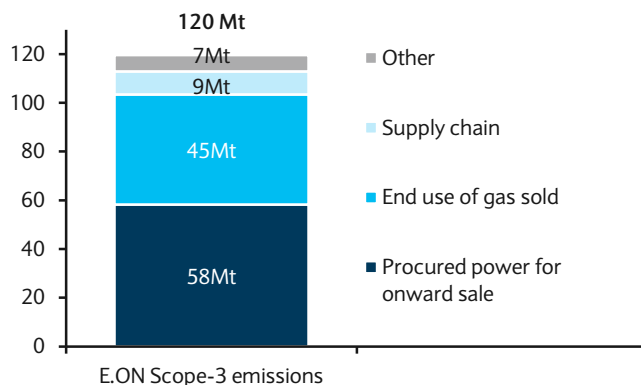
E.ON and RWE Scope-3 emissions, 2013-15 (Mt)



Source: Company 2015 sustainability reports

FIGURE 33

E.ON Scope-3 emissions, 2015 (Mt)



Source: Company 2015 sustainability reports

As can be seen by comparing Figure 32 with Figure 30, E.ON's Scope-3 emissions are significantly greater than their total Scope-1 emissions across the EU, while for RWE Scope-3 emissions are about two-thirds the level of their EU Scope-1 emissions.

If we then look at the breakdown of E.ON's 2015 Scope-3 emissions in more detail, we find that emissions from the generation of power procured from third parties for onward sale to E.ON's end customers represent c.50% of the total (58/120Mt), and emissions from the end consumption by E.ON customers of gas procured from third parties represent c.40% (45/120Mt).

In terms of the potential financial risks these Scope-3 emissions present, we would argue that any future tightening of climate policy ambition in Germany and the EU and/or any acceleration in the deployment of renewable energy compared with current expectations would likely reduce E.ON's and RWE's sales to their end customers of the fossil-fuel-based energy sources that they purchase from third parties.

We think that the risk in the short to medium term is greater for their electricity-supply businesses than their gas-supply businesses (renewable energy is currently used overwhelmingly for electricity rather than heat), but that over the long term, as Germany and the EU aim to decarbonize their energy systems as much as possible, the gas-supply business will be vulnerable, too.

Accordingly, diversifying their third-party energy purchases away from fossil-fuel sources to renewables and encouraging their customers to use energy more efficiently would seem to be the rational response to this risk, as E.ON says in commenting on the rationale for reducing Scope-3 emissions (2015 Sustainability Report, p58):

"We accomplish an important social task and improve our market opportunities. Therefore, we are developing new products and services with which we support our customers to emit a lower amount of greenhouse gases."

Climate disclosure in the annual management reports

As we have seen, the sustainability reports of E.ON and RWE already provide comprehensive data on the key climate indicators of their businesses – so what do the annual reports to their shareholders then have to say about the transition risks inherent in this data, and/or the physical and liability risks this data suggest they might also be exposed to over time? Looking at the 2015 annual reports of both companies, we find the discussion around climate-related risks rather limited and generic in nature.

E.ON's climate disclosure and analysis in the annual report

E.ON's 2015 annual report contains a detailed nine-page *Risk Report* section (pages 60-68). In this section, management explains its overall risk-management system, and then lists and discusses numerous specific risks it thinks worth highlighting (*External risks, Technological risks, Operational risks, Market risks, Strategic risks, and Counterparty risks*).

There is no separate category for climate risk. Indeed, we only found two references to risks that are clearly climate-related in nature, both under the *External risks* category. The first highlights the risk of government intervention to phase out specific generation fuels, and its blanket nature would seem to be aimed as much at the German government's decision to phase out nuclear as much as to any potential future risk associated with their exposure to fossil fuels:

"The political, legal, and regulatory environment in which the E.ON Group does business is also a source of external risks, such as decisions by governments to phase out power generation using certain fuels. Changes to this environment can lead to considerable uncertainty with regard to planning and, under certain circumstances, to impairment charges."

The second refers much more specifically to climate policy and the risk to coal (p.64):

*"In response to discussions about international climate policy, a number of EU member states began debating the future of coal-fired power generation."*³⁴

Less obviously, there is a paragraph on the risks relating to the commissioning of the new and highly efficient Datteln coal power plant. This project has suffered legal setbacks and long delays around permitting issues related at least in part to climate issues (land-use, water, and emissions). However, E.ON states (p.64) that *"in principle, these types of risks also attend other power and gas new-build and conversion projects"*, without referencing climate concerns specifically as a motive for any of the challenges the project has faced.

Otherwise, the risks around carbon pricing is limited to a discussion of hedging strategies in the *Market risk* section, with no discussion or analysis of potential scenarios under which carbon prices might increase in future relating to tougher climate policy, or of the structural impact this could have on the markets E.ON/Uniper operates in.

RWE's climate disclosure and analysis in the annual report

RWE's 2015 annual report also contains a detailed nine-page risk section (*Development of Risks and Opportunities*, pages 78-87).

Again, management explains its overall risk-management system and then lists and discusses specific risks that it thinks worth highlighting. RWE enumerates five such categories: *Market risks, Framework risks* (sub-divided into *Regulatory and political risks, and Legal risks*), *Operational risks, Financial-market and credit risks, and Other risks*.

Again, there is no separate category for climate risk.

³⁴ This proved prescient in that in their H1 results published on 10 August, E.ON/Uniper recorded impairment charges on coal-fired generation assets of €1.8bn (see *Uniper H1 results presentation, slide 13*).

In terms of specific reference to climate-related risks, we again find the disclosure and analysis rather limited and generic. However, before the specific section detailing risks, the RWE 2015 annual report does acknowledge the impact of climate policy on coal (p.21):

“Coal also remains an important source of energy for us, but it will lose significance. This is partly due to regulatory requirements regarding the reduction of greenhouse-gas emissions. For example, within the framework of the ‘German Climate Action Programme 2020’, we will take five 300 MW lignite blocks off the market early (see page 34). We plan to shut down additional 300 MW units in the coming decade.”

In the *Framework risks* section, there is then a more detailed comment on the German government’s climate policy, but only out as far as 2020 (p.82):

“The risks associated with the ‘German Climate Action Programme 2020’ have been defined. It is envisaged that part of the additional emission reduction targeted by the Programme for electricity generation will be achieved by gradually putting lignite-fired power plants with a total net installed capacity of 2.7 GW on stand-by and shutting them down four years later. The German Federal Ministry for Economic Affairs and Energy reached an agreement with the energy companies MIBRAG, RWE and Vattenfall on the details of the stand-by operation and the compensation that would be paid for it. (...) Another risk arises from the possibility that the new arrangement will not result in the envisaged emission reduction being achieved. To resolve the issue, the German lignite industry has committed to take further measures before 2020 if this occurs. However, we do not believe that this will be necessary.”³⁵

As explained in Section 1 above, we agree with RWE’s assessment that any further change to the German government’s policy with regard to the 2020 target is now very unlikely, but we find it strange that there is no reference to the Germany’s 2030 target to reduce emissions by 55% and what impact this might have on the group’s business.

Otherwise, the risks around carbon pricing is limited to a discussion of hedging strategies in the *Market risk* section, with no discussion or analysis of potential scenarios under which carbon prices might increase in future relating to tougher climate policy, or of the structural impact this could have on the markets RWE operates in.

In short, for both E.ON and RWE, we find the discussion in their 2015 annual reports around the risks associated with their exposure to fossil fuels rather limited, with a lack of discussion regarding Germany’s and the EU’s long-term emissions targets.

Conclusion: more discussion of low-carbon scenarios needed

We think that E.ON’s and RWE’s sustainability reports provide comprehensive disclosure of the key data relating to the climate impact of their businesses. In particular, we find their disclosure around their direct and indirect emissions clear and extensive, and think this raw data is of great value to investors and analysts keen to assess the financial risks they might face in future from the potential tightening of climate-policy targets at the German and EU levels.

That said, we find the discussion around climate risk in both companies’ annual reports rather less detailed and more generic. In particular, we think the lack of any discussion about the potential impact of any future tightening of long-term emissions-reduction targets on their businesses is a gap in their disclosure.

³⁵ As explained both in Section 1 above, we agree with RWE’s assessment that any further change to the German government’s policy with regard to the 2020 target is now very unlikely.

In this respect, we think that bringing together the numerous climate-related risks they face – primarily transition risks, but over time also the physical and liability risks – under a separate *Climate risks* category in the Risk Management section of their annual reports would be a good way of enhancing the conversation with their investors around climate-related financial risks they face.

Nonetheless, we think the extensive data on climate-related indicators that both E.ON and RWE make available in their sustainability reports already provides enough raw data for a reasonable attempt to analyse what the financial impact of tougher climate policy targets might be on their businesses in the future.

With this in mind, we now turn to our own attempt to make such an analysis, focusing on the two low-carbon scenarios that we highlighted in Section 1 above and the impact such scenarios could have on the value of E.ON's and RWE's fossil-fuel generation assets.

3. SCOPING THE SENSITIVITY TO TIGHTER 2030 TARGETS

Building on the logic of Governor Carney's argument in his 'Tragedy of the Horizon' speech about the need to start analysing the implications for asset valuations of the information disclosed by companies around climate risk, in this section we examine the potential valuation implications for E.ON's and RWE's fossil-fuel (FF) generation assets of the more carbon-constrained scenarios we outlined in Section 1 above,³⁶ namely: (i) a full 2°C policy framework at the EU level and (ii) Germany's 2030 target to reduce emissions by 55% versus 1990 levels, assuming that the power sector faces a hard cap.

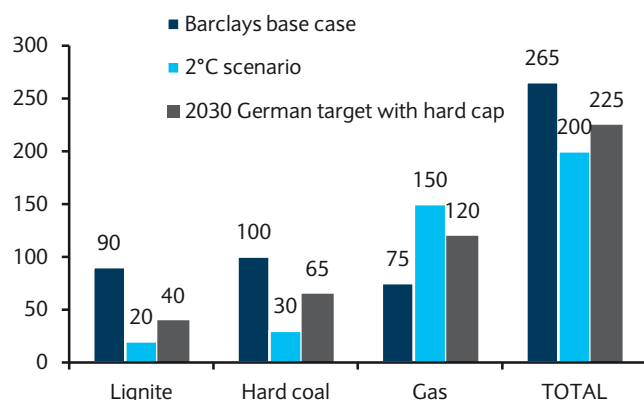
From the outset we would emphasize that we are mainly concerned here with E.ON's and RWE's FF generation businesses in Germany and continental Europe,³⁷ and the delta in the value of their FF assets under our more carbon-constrained scenarios.³⁸ We would also highlight upfront that all of E.ON's FF generation assets that we consider here will be part of the new company Uniper that is to be spun off by E.ON and separately listed soon. For the time being, though, as these assets are still 100% consolidated in our E.ON Group SOTP, we refer to them throughout below as belonging to E.ON or E.ON/Uniper.

Summary: tougher CO2 caps = small upside for E.ON, but downside for RWE

Figures 34 and 35 set out our assumptions for 2030 FF output and emissions in Germany under our three scenarios (our base-case and our two carbon-constrained scenarios).

FIGURE 34

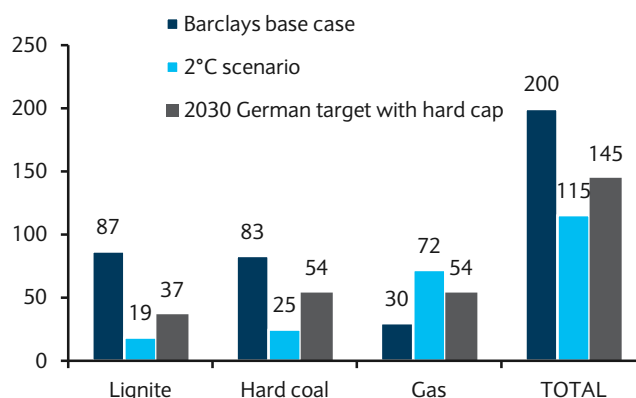
Breakdown of 2030 fossil-fuel output in Germany under our three different scenarios (TWh)



Source: Barclays Research

FIGURE 35

Breakdown of 2030 emissions from fossil-fuel generators in Germany under our three different scenarios (Mt)



Source: Barclays Research

Under our base-case valuation, lignite and coal continue to dominate the German merit order to 2030, with gas output limited to only 30TWh in 2030 under a soft emissions cap.

³⁶ We acknowledge that a fuller consideration of the impact of a 2°C policy framework and Germany's 2030 target with hard sectoral caps would also entail an analysis of the implications for the size of AROs, and for Scope-3 emissions, and the potential financial impact of these implications. We intend to revisit these subjects in future research.

³⁷ Owing to the way E.ON has traditionally broken down its operations for reporting purposes, we model Germany and its other continental European (CE) generation businesses as one discrete entity. By contrast, we model RWE's German generation business as a single segment.

³⁸ At the same time, of course, E.ON and RWE also have both (i) non-fossil assets in Germany exposed to wholesale power prices, and (ii) generation assets (both fossil and non-fossil) in neighbouring countries that would also benefit from higher wholesale prices. In particular, E.ON has significant hydro assets in Germany and nuclear assets in Sweden, both of which would benefit from the higher CO₂ and power prices entailed by our 2°C scenario. We discuss this below but it is not the central focus of our analysis. Note also that we do not here look at the German utilities' generation assets in the UK, but then the UK businesses of both E.ON and RWE are in any case less sensitive to a 2°C valuation as the UK's carbon-price support mechanism, combined with its plans to phase out coal by 2025, mean that they are already subject to a policy framework that is more geared towards a 2°C world than they are in Germany.

Under our two more carbon-constrained scenarios, however, the merit order has to flip because the emissions caps are much tighter and represent hard targets. The much tighter carbon constraint means a much higher CO₂ price, higher power prices, and a radical change in the generation merit order as gas has to run ahead of coal and lignite in order for the cap to be met.

Under the 2°C scenario in particular, both lignite and coal are much more constrained, falling to 20TWh and 30TWh, respectively, by 2030 compared with 90TWh and 100TWh, respectively, in our base case. By contrast, gas output reaches 150TWh by 2030 (compared with only 30TWh in our base case) so that the hard cap of 115MT can be met.

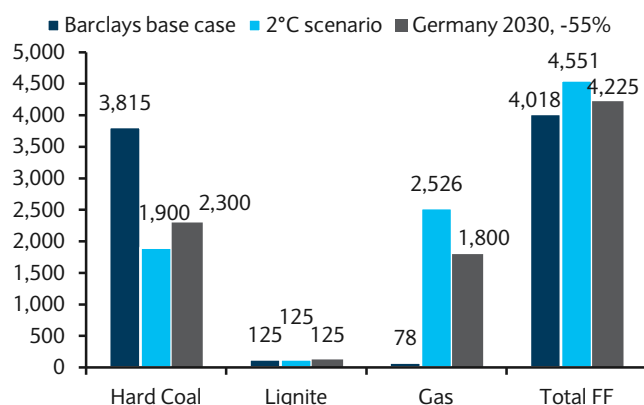
These changes in the merit order required to meet the tighter caps under our more carbon-constrained scenarios have clear implications for the valuation of the different FF power-plant portfolios of E.ON/Uniper and RWE.

We make the same assumptions for the merit order out to 2020 in all three scenarios, but thereafter, in both our 2°C scenario and our Germany 2030-hard-cap scenario, we assume an increasingly carbon-constrained merit order over the course of 2021-30 as FF generators are incentivized by a higher CO₂ price to prioritize gas over coal and lignite.

This has the effect of reducing the value of lignite and hard-coal generation assets under both of our carbon-constrained scenarios, and increasing the value of gas-fired assets. Given the greater exposure of RWE to lignite in particular, and E.ON's younger fleet of more efficient gas-fired plant, our analysis indicates that the value of E.ON's portfolio of FF assets could have upside of €500m under a 2°C policy trajectory, whereas RWE's portfolio could have downside of €1.8bn. The impact under our Germany 2030-hard-cap scenario is less negative for lignite and coal, and less positive for gas, but there is still a modest uplift to E.ON's valuation versus our base case (€200m), and smaller hit to RWE's (-€1bn).

FIGURE 36

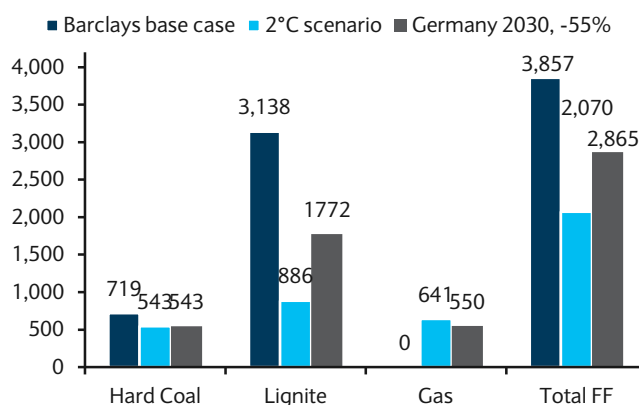
Valuation of E.ON's FF generation assets in Germany & CE under base-case and carbon-constrained scenarios



Source: Barclays Research estimates

FIGURE 37

Valuation of RWE's FF generation assets in Germany under base-case and carbon-constrained scenarios



Source: Barclays Research estimates

We now turn to a more detailed consideration of each of these three scenarios, and their implications for the valuation of E.ON/Uniper's and RWE's FF generation assets.³⁹

³⁹ We realize that both a 2°C target at the EU level and hard cap in Germany in 2030 would have implications not only for generation, but also for the rest of the electricity value chain: tighter CO₂ targets would likely accelerate the development and deployment of larger-scale energy storage technologies, smart grids, and demand-side responses, thereby potentially limiting the upside for gas-fired generation assets under a 2°C trajectory. Again, we intend to revisit these subjects in future research.

Our base-case scenario: soft cap in the EU and Germany to 2030

Our base-case valuation of E.ON's and RWE's fossil-fuel generation assets takes the EU's current 2030 Climate and Energy Framework as the policy backdrop that will drive power, gas, and CO₂ prices out to 2030. Our modelling of the supply-and-demand drivers for EU power and carbon markets indicates that both are heavily over-supplied, and that the outlook for a sustained long-term recovery in fossil-fuel generation spreads is therefore bleak.

As a result, we assume that the EU-ETS remains so over-supplied out to 2030 that EUA prices will remain at €5/t all the way out to 2030, and that the current merit order in Germany – with lignite generally running ahead of hard coal, and hard coal generally running ahead of gas – will essentially be retained out to 2030.

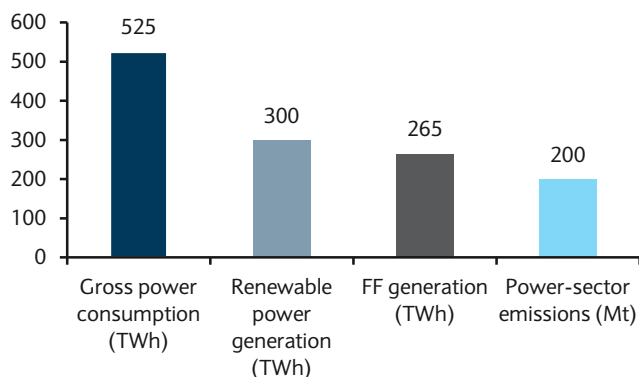
This means that we also currently assume in our base-case valuation that Germany's 2030 target to cut emissions by 55% implies a soft cap for the power sector. This is despite the fact that at some point after the next federal election in Germany (which is due in September 2017) we think Germany will clarify exactly how it will meet this 55% target by setting hard sectoral targets.⁴⁰ As explained in Section 1 above, the first draft of the CAP 2050 in May did make reference to specific sectoral targets, but press reports indicate that subsequent versions have been watered down and sector-specific targets removed.

This being the case, the reason we do not at this stage assume a hard cap for 2030 for the German power sector in our base-case valuations of E.ON and RWE is that we do not think the market will price in a hard cap until the government has set out in detail sectoral targets for 2030. And in our view, that will not happen until after next year's federal election.

Figures 38 and 39 show our assumptions for the breakdown of German demand, output, and emissions in 2030 under our base-case scenario.

FIGURE 38

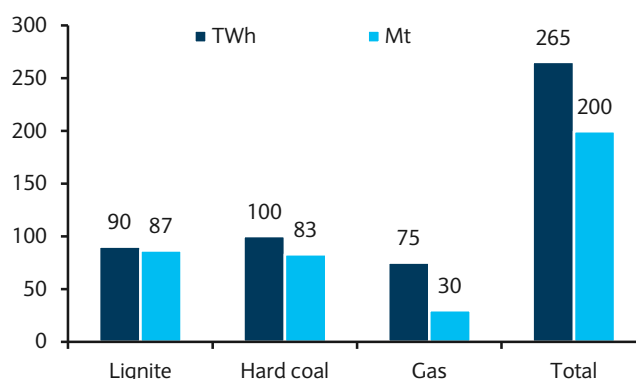
Barclays base-case scenario for German gross electricity consumption, renewable output, fossil-fuel output, and power-sector emissions in 2030



Source: IEA, German Environment Ministry, Barclays Research

FIGURE 39

German fossil-fuel output (TWh) and CO₂ emissions (Mt) in 2030 under Barclays base-case scenario



Source: IEA, German Environment Ministry, Barclays Research

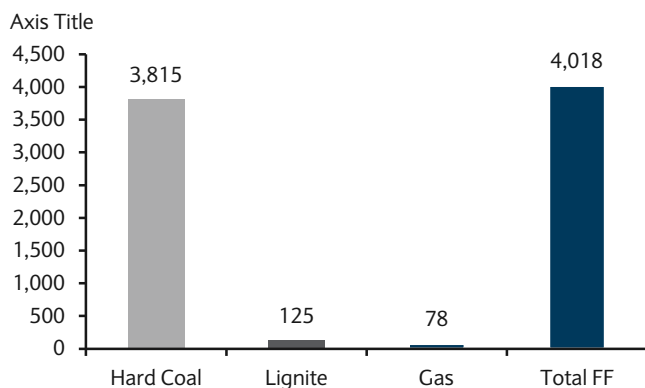
We assume that Germany meets its energy-efficiency target to reduce power consumption by 15% by 2030 versus 2008 levels (implying electricity demand of 525TWh) and that it slightly exceeds its target of generating 50% of domestic demand with renewable energy.

⁴⁰ As we explained in Section 1 above, this is because if Germany's 2030 target is ultimately not a hard target, we think it will lose a significant amount of international credibility on climate change, just at a time when the momentum after the Paris Agreement is towards increasing ambition over time, not reducing it.

Figures 40 and 41 then set out our base-case valuations for the FF generation assets of E.ON/Uniper and RWE, respectively. As can be seen, the valuation of both comes to €1.2bn (E.ON's comes to €4,018m and RWE's to €3,857m), but the breakdown in value in terms of coal and lignite is something of a mirror image: we have E.ON's coal assets valued at €3,815m, and lignite at only €125m, while we value RWE's lignite plant at €3,138m and its hard-coal assets at €719m.

FIGURE 40

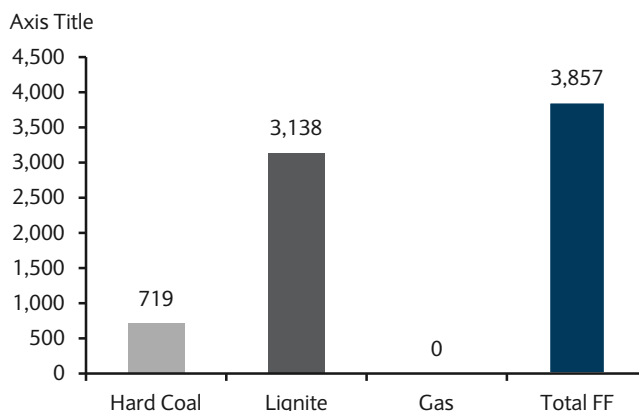
Barclays base-case valuation of E.ON/Uniper's FF generation assets in Germany and continental Europe (€m)



Source: Barclays Research

FIGURE 41

Barclays base-case valuation of RWE's FF generation assets in Germany (€m)



Source: Barclays Research

This reflects the fact that RWE's lignite fleet is the largest in Germany (10.1GW currently), and that the average age of E.ON's hard-coal plant is lower and hence the average efficiency rate of its hard-coal fleet higher than RWE's.

Our base-case valuations for the power assets of both companies are based on a three-stage analysis:

- (i) as far as 2017 we know the volumes and prices for hedged output (and for 2018 about 30% of both companies' output is already hedged as well);
- (ii) over 2018-19 we then mark to market against the forward curve;
- (iii) we then essentially roll the forward curve out in real terms to 2030, with an assumed clean dark spread of €8/MWh from 2021.

2°C implies much tougher CO2 target with hard cap

We first set out our analysis of a 2°C policy framework for the EU and German power sectors in our initiation report *Two degrees (2°C) of separation* (pages 97-107) on 7 March 2016. Since then, we have not seen anything to change our modelling of the carbon budget to 2030 that the EU power sector would have to comply with under a 2°C policy target.

As a result, we see the same need for fuel switching in the power sector under the 2°C policy target versus our base-case scenario as we did in *Two degrees (2°C) of separation*.

And while commodity prices, especially coal prices, have moved since we published our report, we nonetheless find that the carbon price required to achieve the volume of fuel switching necessary to remain within the 2021-30 carbon budget implied by our assumed 2030 EU-ETS cap is unchanged at €45/tonne (in constant 2019 €).⁴¹

Impact of 2°C target for E.ON & RWE: minimal lignite and coal over 2021-30

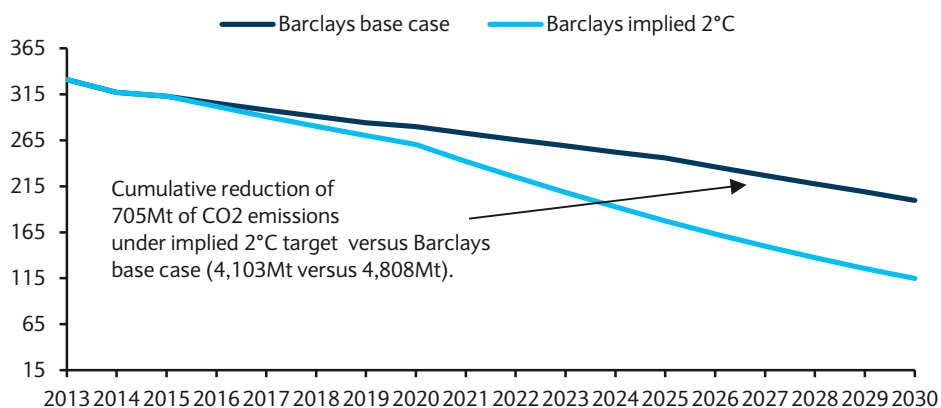
The implications of our analysis in Section 1 above concerning the carbon constraint for the German power sector under a 2°C EU policy framework are that much less coal and lignite would be able to run over 2021-30, and very little could run at all by 2030.

As shown in Section 1, we estimate that under a 2°C policy framework, the cap for the EU power sector as a whole in 2030 would be 467Mt compared with 736Mt under our base case (Figure 11 above), and that this implies a carbon budget over 2021-30, which is 2.6Gt lower than under our base case (15.2Gt versus 17.6Gt, as per Figure 12 above).

As also shown above, we calculate that a 2°C EU policy target would imply a 2030 emissions target for the German power sector of 115Mt (Figure 20 above). Moreover, this would be a hard cap compared with the soft cap of 180Mt under the current EU target. As a result, we estimate that the 2°C carbon budget for the German power sector over 2013-30 would be 705mt lower than under our base case, at 4,103Mt versus 4,808Mt (Figure 42).

FIGURE 42

Cumulative emissions from German power sector under Barclays base-case scenario and implied 2°C target, 2013-30 (Mt)



Source: IEA, German Environment Ministry, Barclays Research

Moreover, we think Germany's fossil-fuel generators would be further constrained under a 2°C policy framework by the likelihood, in our view, that under such a framework Germany would exceed its 2030 renewable energy target by even more than we assume in our base-case scenario.

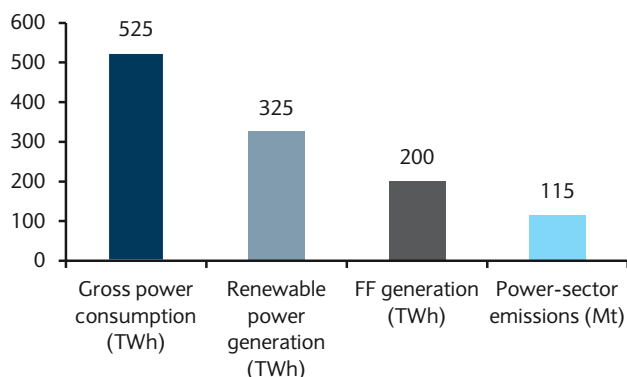
Figure 43 shows what this would mean for the breakdown of 2030 generation output in Germany. Assuming 2030 demand of 525TWh (the same as under our base case), but 2030 renewable output of 325TWh, this leaves a maximum of 200TWh available for fossil-fuel generation (there is no scope for exports under the 2°C target as the hard emissions constraint means that German generators are restricted to producing only the residual power needed to satisfy domestic demand).

⁴¹ Coal prices have moved sharply upwards since March, and are now trading at \$56/t for 2019 delivery into Europe compared with \$37/t back in March (2019 gas prices have moved much less). This is because although the fuel-switching price required to move the least efficient gas plants ahead of the more efficient coal plants is indeed lower than it was when we last conducted this analysis in March – €36/t versus €45/t (in constant 2019 €) – the price required to shift these gas plants ahead of lignite plants with an efficiency of 35% is still €45/t.

Figure 44 then shows how we think this 200TWh of 2030 fossil-fuel output would break down while still being able to meet the emissions cap of 115Mt: 20TWh of lignite (19Mt of emissions), 30TWh of hard coal (25Mt), and 150TWh of gas (115Mt).

FIGURE 43

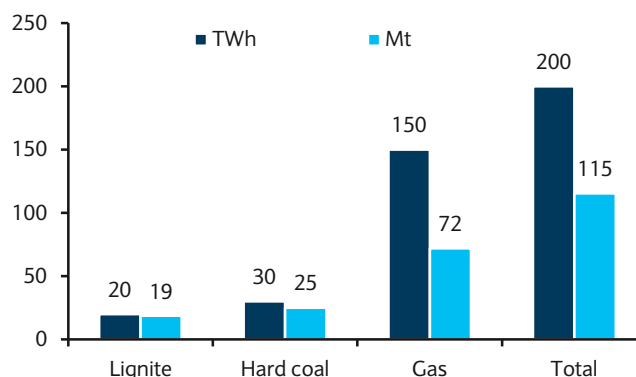
Barclays implied 2°C scenario for German gross electricity consumption, renewable output, fossil output, and power-sector emissions in 2030



Source: German Environment Ministry, Barclays Research.

FIGURE 44

German fossil-fuel output (TWh) and CO₂ emissions (Mt) in 2030 under Barclays implied 2°C target



Source: Barclays Research

2°C target implies EUAs ≥€45/t, baseload power c.€60/MWh

From all of our analysis above we conclude that the level of coal-to-gas fuel switching required under a 2°C scenario would dictate that the least efficient CCGT plant on the system (i.e. gas plant with a thermal efficiency of only 45%) would have to displace some of the most efficient coal plants (i.e. plants with thermal efficiency of 38% or higher) much of the time.. So, what CO₂ price would be required for this?

To answer this question we need to look at the relevant commodity prices as far out as the forward curves allow, which is calendar-year 2019 (Cal-19) for coal and gas (for coal we look at the ARA price, and for gas the price at the TTF hub in the Netherlands). The Cal-19 coal price is currently \$56/t, to which we add \$8/t for transportation costs to central Germany by barge. The current TTF gas price for Cal-19 is €15.6/MWh.

Based on these prices and the current Cal-19 EUA price of c.€5/t, the SRMC of coal plant with a thermal efficiency of 38% would be only €27/MWh (close to the current German baseload price for 2019), whereas for a gas plant with a thermal efficiency of 45% the SRMC would be €41/MWh.

This means we would need a much higher CO₂ price to push the 45% gas plant ahead of the 38% coal plant. Accordingly, Figure 45 takes the same forward prices for coal and gas but sets the CO₂ price at the level needed. As can be seen, at a CO₂ price of €37/t, the SRMC of gas (€55.1/MWh) is marginally lower than that of coal (€55.7/MWh), thereby enabling large-scale switching to the least efficient CCGTs from the more efficient coal plant.

FIGURE 45

SRMC of coal (38% efficiency) and CCGT (45% efficiency) with a CO₂ price of €37/t

	SRMC of coal plant	SRMC of CCGT
Fuel-input cost* (€/MWh th)	8.4	17.4
Thermal efficiency	38%	45%
Fuel cost of generation (€/MWh)	22.7	39.6
CO ₂ price (€/t)	37	37
CO ₂ intensity (t/MWh)	0.88	0.42
CO ₂ cost of generation (€/MWh)	32.6	15.5
SRMC of generation (€/MWh)	55.3	55.1

Source: Platts, Barclays Research. *For coal we take the Cal-19 ARA price of \$56/t and add \$8/t for transport using the current exchange rate of €1=\$1.11. For gas we take the Cal-19 TTF price of €15.6/MWh. As this is the price for the higher heating value (HHV) of gas, we then adjust for the lower heating value (LHV) to derive our fuel-input cost of €17.4/MWh.

However, at a CO₂ price of €37/t, a lignite plant with an efficiency of 35% would still be running ahead of a 45%-efficient gas plant. As shown in Figure 46, a CO₂ price of €45/t is required to push a 45%-efficient CCGT ahead of a 35% lignite plant. At €45/t, the SRMC of gas at just under €60/MWh is lower than that of lignite at just over €60/MWh, thereby enabling fuel switching to the least efficient CCGTs from relatively efficient old lignite plant.

FIGURE 46

SRMC of lignite (35% efficiency) and CCGT (45% efficiency) with a CO₂ price of €45/t

	SRMC of lignite plant	SRMC of CCGT
Fuel-input cost* (€/MWh th)	4.4	17.4
Thermal efficiency	35%	45%
Fuel cost of generation (€/MWh)	12.4	38.7
CO ₂ price (€/t)	45	45
CO ₂ intensity (t/MWh)	1.06	0.42
CO ₂ cost of generation (€/MWh)	48.6	20.3
SRMC of generation (€/MWh)	61.0	59.0

Source: Platts, Barclays Research. *For lignite we assume extraction and transportation costs of \$12/t and energy content of 9,750 kJ per Kg. For gas we use the same assumptions as in Figure 45.

Of course, this is a stylized analysis, and in reality the CO₂ price required to effect the necessary fuel switching under a 2°C scenario should be conceived of as a dynamic variable, one that will move around as coal and gas prices fluctuate, re-shaping the merit order at any given moment according to which gas plants are best positioned to displace coal and lignite plants. Nonetheless, we think our estimate of €45/t is a useful anchor in thinking about the CO₂ price required under a 2°C scenario over 2021-30.⁴²

2°C valuation: higher gas favours E.ON, but RWE would likely have downside

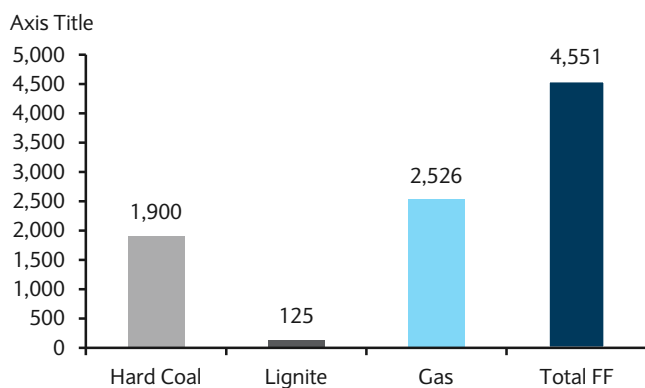
Figure 47 and Figure 48 show the valuations for the fossil-fuel generation assets of E.ON and RWE, respectively, under our 2°C scenario.

⁴² In one sense our estimate of €45/t as the CO₂ price that would clear the market under a 2°C scenario could be viewed as conservative in that the price required over the back-end of 2021-30 would likely need to be significantly higher than €45/t in constant 2019 € as ever more efficient coal and lignite plant would have to be displaced given that the required amount of switching per year over 2026-30 is greater on average than it is over 2021-25. That said, see our caveat at the end of this sub-section, which implies the opposite, namely that if prices ever were in fact to reach €45/t then this would accelerate the deployment of energy-storage technologies, thereby reducing the amount of fuel-switching required.

At €4.5bn, the value of E.ON's fossil-fuel plant in Germany and central Europe increases by €500m versus our base-case scenario, reflecting a fall in the value of E.ON's coal plant of €1.9bn and an increase in the value of its gas-generation portfolio of €2.5bn.

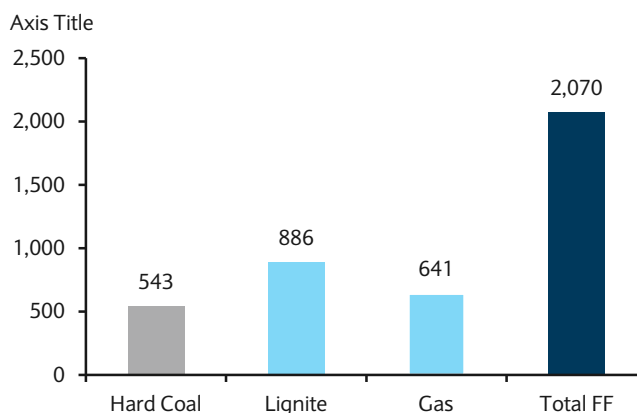
By contrast, the value of RWE's fossil-fuel assets falls under our 2°C scenario. At €2.1bn it is €1.8bn lower than our base-case valuation. The lignite assets are worth only €0.9bn under our 2°C scenario (a drop of €2.3bn versus our base case), while the coal assets drop in value by €200m. Against this, the gas assets are worth €600m more than under our base case.

FIGURE 47
Potential valuation of E.ON's FF generation assets in Germany and CE under a 2°C scenario (€m)



Source: Barclays research

FIGURE 48
Potential valuation of RWE's FF generation assets in Germany under a 2°C scenario (€m)



Source: Barclays research

In terms of explaining these changes versus our base-case scenario, the first thing to say is that over the period 2016-20 we make exactly the same assumptions as we do under our base case. It is therefore the period 2021-30 that is key to understanding our 2°C scenario.

And in this respect, as explained in our analysis above, the key difference is that we assume a much higher average EUA price over the 2021-30 period than we do under our base-case scenario.

Specifically, we assume an average EUA price of €45/t in constant 2019 € over 2021-30, which has the effect of raising our average baseload power price over the period to €59/MWh (in constant 2019 €) compared with €28/MWh under our base case. This gives us an average peakload price of €76/MWh, and an average baseload clean spark spread of €8/MWh⁴³ (again, both in constant 2019 €).

This reconfigures completely the structure of the fossil-fuel merit order, pushing gas further and further ahead of coal and lignite over the course of the decade in order to ensure that the cumulative emissions reductions required by 2030 under the 2°C carbon budget for the EU power sector are achieved.

As a result, both E.ON and RWE see higher utilization and longer average operating lives for their gas plants under this scenario, and as gas must increasingly displace coal and lignite over the decade, these plants capture an ever increasing clean spark spread.

By contrast, coal and lignite plants see lower average utilization rates and shorter average operating lives under our 2°C scenario, with what little plant is running by the end of the

⁴³ This assumes a 50% efficiency rate for CCGTs.

next decade pushed to the margin. Indeed, by 2030 E.ON and RWE would have very little coal and lignite generation left at all under our 2°C scenario.

In terms of hard coal, the only plants that E.ON would still be operating by 2030 under our 2°C scenario are Datteln 4 (1.1GW) and Maasvlakte 3 (1.1GW), both of which have very high efficiency rates for hard-coal plant of 46%. The only coal plant that RWE would still be running by 2030 would be Westfalen E (765MW), again a 46%-efficient plant.

In terms of lignite, the only plant that RWE would still be operating by 2030 under our 2°C scenario would be the BoA 2 and 3 units at Neurath (2.1GW), which have a very efficiency rate for lignite plant of 43%. By contrast, E.ON would not be running any lignite by 2030.

Caveat to our 2°C analysis

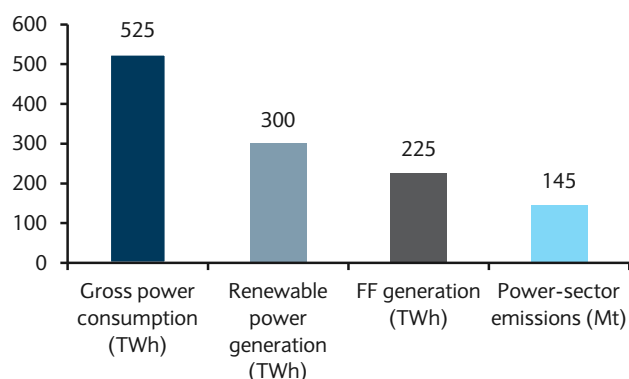
Our 2°C analysis above looked only at the extent to which a higher CO₂ price would drive large-scale fuel switching between gas and coal/lignite, when in reality higher CO₂ prices would also likely accelerate the development of larger-scale energy-storage and smart-grid technologies, as well as driving greater behaviour change in terms of demand response. In other words, higher CO₂ prices would likely reduce the total number of running hours for fossil-fuel generators under our 2°C scenario more quickly than shown in our analysis above. This means that the potential upside for E.ON under a 2°C scenario is likely lower than shown by our sensitivity analysis below (and RWE's potential downside likely greater).

Germany's 2030 target: a 55% cut with an assumed hard cap

Figure 43 sets out our assumptions for Germany's power demand, output, and FF power emissions in 2030 under our Germany 2030 hard-cap scenario. Assuming 2030 demand of 525TWh and 2030 renewable output of 300TWh (the same as under our base case), this leaves a maximum of 200TWh available for fossil-fuel generation (as with our 2°C scenario, there is no scope for exports under this hard cap).

FIGURE 49

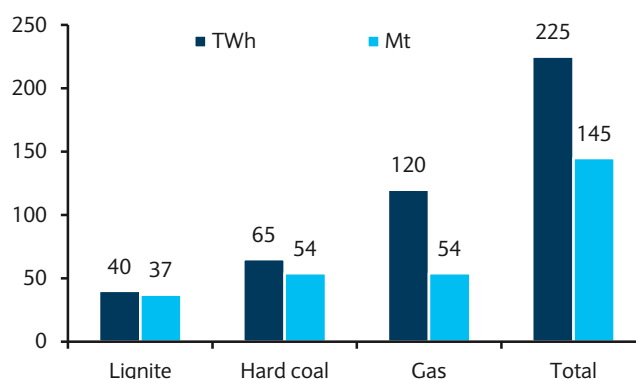
Barclays implied German gross electricity consumption, renewable output, fossil-fuel output, and power-sector emissions in 2030 assuming 55% target with hard cap



Source: German Environment Ministry, Barclays Research.

FIGURE 50

German fossil-fuel output (TWh) and CO₂ emissions (Mt) in 2030 assuming 55% target with hard cap



Source: Barclays Research.

Figure 50 then shows how we think this 200TWh of 2030 fossil-fuel output would break down while still being able to meet the emissions cap of 145Mt: 40TWh of lignite (37Mt of emissions), 65TWh of hard coal (54Mt), and 120TWh of gas (54Mt).

Although not as radical a change to the merit order as that implied under our 2°C scenario, Germany's 2030 target to cut emissions by 55% versus 1990 would nonetheless, in our view, still necessitate a significant re-ordering of the dispatch curve.

In turn, this would also imply higher CO₂ prices, albeit not as high as under our 2°C scenario. Assuming this time that less efficient gas plant (45%) had to displace less efficient old lignite plant with efficiency rates of only 33%, we calculate that a CO₂ price of €37/t would be enough to effect this fuel switching (Figure 46).

FIGURE 51

SRMC of lignite (33% efficiency) and CCGT (45% efficiency) with a CO₂ price of €37/t

	SRMC of lignite plant	SRMC of CCGT
Fuel-input cost* (€/MWh th)	4.4	17.4
Thermal efficiency	33%	45%
Fuel cost of generation (€/MWh)	13.4	38.7
CO ₂ price (€/t)	36	36
CO ₂ intensity (t/MWh)	1.16	0.42
CO ₂ cost of generation (€/MWh)	41.2	15.2
SRMC of generation (€/MWh)	54.7	54.0

Source: Platts, Barclays Research. *For lignite we assume extraction and transportation costs of \$12/t and energy content of 9,750 kJ per Kg. For gas we use the same assumptions as in Figure 45.

We would emphasize that under our Germany 2030-hard-cap scenario our assumption is that Germany implements this policy unilaterally, i.e. without expecting or waiting for other EU member states to put in place supplementary measures beyond those already implied by the current EU target to reduce emissions by 40% by 1990.

This is not as a radical an assumption as it might sound. After all, the UK has been operating a unilateral carbon-price support mechanism since 2013 known as *the Carbon Price Floor* – where the EUA price is topped up by a domestic price on carbon – in order at least in part to put the power sector's emissions on a long-term trajectory consistent with the UK's overall long-term emissions targets. Similarly, *the French Government intends to bring in a unilateral carbon-pricing measure* from next year as a top-up to EUA prices in order to make coal-fired generation more expensive. At the same time, the UK went one step further this last November ahead of the COP-21 climate-change conference in Paris *by announcing that it would phase out all remaining coal plants by 2025*.

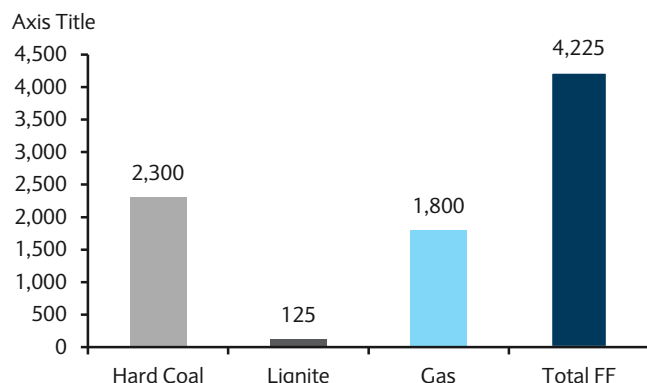
In short, if a given member state wants to increase its own level of climate-policy ambition without waiting for the EU-28 to agree to more ambitious EU-ETS caps, then it is perfectly at liberty to do so either via its own supplementary carbon-pricing measures as a top-up to the EUA price or via mandating specific plant closures. Indeed, in addition to the UK, Germany itself has also gone down this latter route *with its policy, announced last October, for putting 2.7GW of old lignite into reserve over 2017-21*.

Indeed, it might well be the case that if and when Germany were to put hard sectoral caps in place to achieve its 2030 targets to cut emissions by 55% some combination of a domestic carbon 'top-up' price to EUAs plus the mandated closure of specific lignite plants would be necessary.

For the time being, though, our modelling of the Germany 2030-hard-cap scenario assumes a CO₂ price of €37/t, and results in the valuation for E.ON/Uniper's and RWE's FF generation assets shown in Figures 47 and 48, respectively. The negative impact on lignite and coal generation assets is less negative than it is under our 2°C scenario, and the positive impact on the gas-fired assets correspondingly less positive.

FIGURE 52

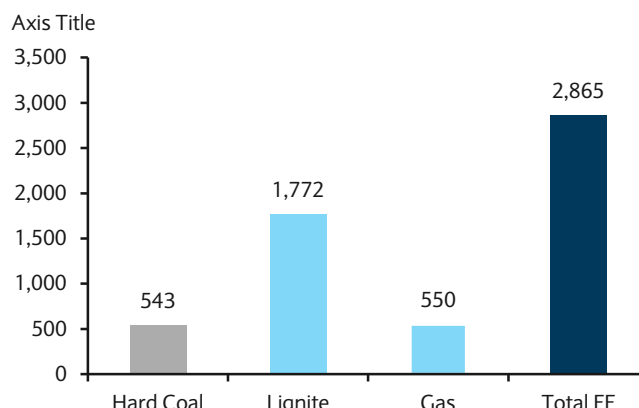
Potential valuation of E.ON's FF generation assets in Germany & CE under Germany 2030-hard-cap scenario (€m)



Source: Barclays Research

FIGURE 53

Potential valuation of RWE's FF generation assets in Germany under Germany 2030-hard-cap scenario (€m)



Source: Barclays Research

Overall, our modelling suggests that E.ON/Uniper's FF portfolio could be worth some €200m more than under our base-case scenario (€4.2bn versus €4bn under our base case), while RWE's could be worth €1bn less (€2.9bn in total, versus €3.9bn under our base case).

Conclusion: gazing towards the horizon

Our 2°C scenario and our Germany 2030-hard-cap-scenario are of necessity highly stylized and given the number of assumptions we have had to make for what are all very dynamic variables – and given also the caveat we indicated above about the extent to which a much higher carbon price over 2021–30 would drive faster take-up of energy storage, smart grids, and demand response – we do not think it would be advisable to read too much into the absolute values for E.ON's and RWE's fossil-fuel generation assets that we have derived under these scenarios at this stage.

Nonetheless, we think that what these stylized low-carbon scenarios do illustrate well is the relative sensitivity of E.ON and RWE to a policy framework premised on delivering a low-carbon pathway for the power sector at both the EU and German levels, where the risk is skewed firmly towards a tightening of this policy framework as and when the economics allow, and as and when the politics dictate. In this respect, RWE is clearly more at risk, while E.ON/Uniper is better hedged with their portfolio of gas-fired plant.

The key point is that with or without a formal revision of the EU's 2030 climate and energy targets in line with a 2°C trajectory, both the economics (in the form of continuing cost reductions for renewable relative to conventional generation), and the politics (in the form of ever increasing scrutiny of the extent to which coal and especially lignite generation are compatible with this pathway), suggest that over the next decade and beyond we will only see a further acceleration away from the more intensive forms of fossil-fuel generation.

This is precisely why Governor Carney set out the need for greater disclosure from companies around their climate-related financial risks in his 'Tragedy of the Horizon' speech. It is also why we think power utilities should be disclosing more information about how they are thinking about the risks of tighter climate policy in future, and what they are doing to prepare for and/or pre-empt these risks. In this way, as Governor Carney puts it, "a 'market' in the transition to a 2-degree world can be built".

E.ON – BUSY AUTUMN AHEAD WITH UNIPER SPIN-OFF IMMINENT

E.ON: PT cut to €9.2 (from €10.2), OW rating retained

Price target cut after H1 results but Uniper spin-off should re-focus interest: The market reacted badly to E.ON's H1 results on 10 August, and the stock is down by 12% versus its close the day before on 9 August. We think the main issues that troubled the market in the H1 results were the increase in the pension provisions of €2.3bn, and the comments from management on the H1 results call suggesting that the timing of any capital increase to pay for the nuclear-overfunding premium seems no longer linked to the outcome of the Constitutional Court's ruling on the nuclear fuel tax (NFT): in essence, E.ON is now saying that it will proceed quickly with a capital increase in the range of €2-2.4bn (the range it has given for the overfunding premium it expects) as soon as a final outcome on the nuclear-overfunding deal is known (i.e. without waiting for the Court's verdict on the NFT). Following the H1 numbers our earnings estimates for 2016-17 are unchanged, but our PT is lower by €1/share, mainly reflecting the net impact of positive changes to our valuation of the Group's renewables and networks business (+€2.4/share), but negative changes to the Group's global commodities, E&P, and Russian businesses (-€3.3/share). With 10% upside potential to our revised PT, likely supportive newsflow as the Group demerges into two separate companies, and a free option on a positive outcome to the NFT, we retain our OW rating with a revised PT of €9.2/share.

Strategic transformation should be a supportive narrative: The Uniper prospectus is expected to be issued any day now, with a separate stock-market listing expected a couple of weeks thereafter. We think this could provide a catalyst for investors to revisit the E.ON story after the recent sell-off in the stock, and to value the different profiles of E.ON and Uniper with a fresh eye. In particular, we think that the new E.ON – with its combination of stable earnings from regulated networks, growth potential in renewables, and large customer base in different EU markets – offers an appealing defensive-growth story. Following the H1 results, E.ON Group CFO Michael Sen re-emphasized the mid-term financial framework ("E.ON Focus") as the touchstone for its decision-making. This commits the new E.ON (i.e. post the Uniper spin-off) to a capital structure of BBB+/Baa1, a cash-conversion ratio of ≥80%, a ROCE of 8-10%, EPS growth of ≥5-10%, and a dividend-payout ratio of 40-60% of underlying net income. Uniper by contrast will be run for cash.

Clarity on the funding of nuclear provisions should come soon: On 1 June, the German Cabinet adopted the recommendation of the Nuclear Financing Commission (NFC) on the nuclear waste-and-storage liabilities. According to CFO Michael Sen's most recent comments, the overfunding premium for these liabilities equates to a range of €2-2.4bn for E.ON. We expect more newsflow on this topic and a final deal in the next couple of months.

Balance-sheet issues more manageable with a capital increase: For the time being we continue to assume that E.ON issues new debt to fund its nuclear-overfunding charge (we now assume €2.4bn versus €2bn previously), but in reality a capital increase of up to €2.4bn now looks more likely, and would also provide more comfort on growth capex in renewables. Under our sensitivity analysis of a capital increase of €2.4bn in 2017 (assuming the new equity is raised at €7.8/share, a 6% discount to the 30 August closing price), E.ON would in our view be able to continue funding growth capex in the renewable business with a stable BBB+ rating. The capital raise would be ~16% dilutive to earnings on our estimates.

Relative valuation looks reasonable: E.ON trades on a 2017E P/E multiple of 10.8x, versus integrated peers on 13.3x. Even assuming a capital increase of €2.4bn, which would be 16% dilutive on our numbers, E.ON trades on a 3% discount to peers at 12.9x P/E. The shares are also slightly cheaper than the sector on a 2017E EV/EBITDA basis, trading at 7x versus 7.6x for peers. While not compelling versus peers, E.ON's dividend yield of 3.6% in both 2017E and 2018E is well above that of RWE. The 40% payout ratio we assume looks comfortable, with scope for an uplift from 2019.

European Utilities	Industry View: NEUTRAL
E.ON (EONGn.DE)	Stock Rating: OVERWEIGHT

Income statement (€mn)	2015A	2016E	2017E	2018E	CAGR
Revenue	116,218	113,794	113,705	113,323	-0.8%
EBITDA (adj)	7,557	6,820	6,471	6,420	-5.3%
EBIT (adj)	4,369	4,148	3,806	3,738	-5.1%
Pre-tax income (adj)	2,797	2,690	2,375	2,354	-5.6%
Net income (adj)	1,648	1,664	1,483	1,446	-4.3%
EPS (adj) (€)	0.84	0.85	0.76	0.74	-4.3%
Diluted shares (mn)	1,952.0	1,952.0	1,952.0	1,952.0	0.0%
DPS (€)	0.50	0.34	0.30	0.30	-16.0%

Margin and return data	Average				
EBITDA (adj) margin (%)	6.5	6.0	5.7	5.7	6.0
EBIT (adj) margin (%)	3.8	3.6	3.3	3.3	3.5
Pre-tax (adj) margin (%)	2.4	2.4	2.1	2.1	2.2
Net (adj) margin (%)	1.4	1.5	1.3	1.3	1.4
ROIC (%)	3.6	3.7	3.4	3.4	3.5
ROA (%)	2.6	2.5	2.2	2.2	2.4
ROE (%)	7.2	8.5	7.3	7.1	7.5

Balance sheet and cash flow (€mn)	CAGR				
Net PP&E	38,997	39,984	40,508	40,158	1.0%
Total net assets	19,077	20,179	20,341	20,526	2.5%
Capital employed	79,127	79,093	78,498	77,063	-0.9%
Shareholders' equity	16,429	17,353	17,370	17,423	2.0%
Net debt/(funds)	-27,714	-27,788	-27,318	-25,950	N/A
Cash flow from operations	6,179	6,460	4,883	4,864	-7.7%
Capital expenditure	-4,174	-3,657	-3,189	-2,332	N/A
Free cash flow	1,864	2,655	1,539	2,371	8.4%

Valuation and leverage metrics	Average				
P/E (adj) (x)	9.8	9.8	10.9	11.2	10.4
EV/EBITDA (adj) (x)	6.1	6.7	7.0	6.9	6.7
EV/NOPAT (x)	15.0	15.8	17.1	16.9	16.2
Equity FCF yield (%)	12.4	17.3	10.4	15.6	13.9
P/BV (x)	0.9	0.8	0.8	0.8	0.8
Dividend yield (%)	6.0	4.1	3.7	3.6	4.3
EV/IC (x)	0.6	0.6	0.6	0.6	0.6
Net debt/EBITDA (adj) (x)	3.7	4.1	4.2	4.0	4.0

Selected operating metrics				
Payout ratio (%)	59.2	40.0	40.0	40.0
Baseload power price Germany (€/MWh)	35.1	28.1	27.7	27.6
Baseload power price UK (£/MWh)	43.4	37.4	39.7	42.4
Achieved CDS - Germany (€/MWh) (€)	16.6	10.0	9.4	8.9
Achieved CSS - Germany (€/MWh) (€)	-4.2	-0.7	-4.1	-4.9
Achieved CDS - UK (£/MWh) (€)	10.2	1.9	3.7	7.1
Achieved CSS - UK (£/MWh) (€)	5.6	4.9	5.6	9.0
Generation output (Twh)	188.5	188.4	202.5	209.0
CO2 intensity (kg/kwh)	0.35	0.30	0.32	0.35

Price (30-Aug-2016) EUR 8.31
Price Target EUR 9.20

Why Overweight? We like E.ON's relatively low exposure to conventional power and growth in (quasi)-regulated activities. The listing of Uniper could prompt a re-think of valuations and lead to appreciation of the assets. More clarity on the nuclear funding premium is imminent; even with a €2.4bn capital raise (16% dil. to our EPS) E.ON trades on a slight discount to peers.

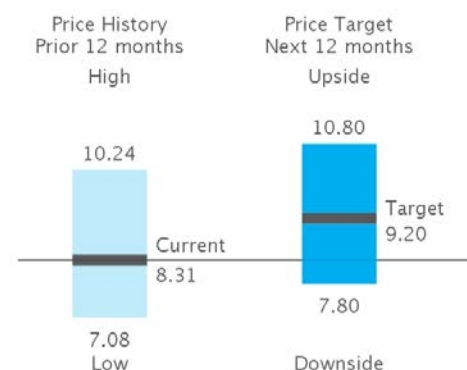
Upside case EUR 10.80

Our upside scenario of €10.8/share assumes a successful outcome of the NFT case. For the past taxes paid, the Group would receive back ~€3bn (€2.9bn plus 6% interest), amounting €1.6/share.

Downside case EUR 7.80

Assumes that the NFT will not be won (as per our base case). We further assume that the German liquid forward curve price drops by €3/MWh, that the nuclear overfunding premium amounts to €3bn and that €3bn will be raised at a 10% discount to the current share price.

Upside/Downside scenarios



Source: Company data, Barclays Research
Note: FY End Dec

Updating our SOTP Valuation: Now €9.2 (€10.2 previously)

Figure 54 shows our updated SOTP for E.ON, and Figure 55 summarises the changes we have made versus our previous valuation.

FIGURE 54
SOTP Group E.ON

E.On	€m	€/share	%EV	WACC	EV/EBITDA	Comment
					2017E	
Generation	5,568	2.9	10%	5.6%	6.1x	DCF by Technology
Renewables	12,619	6.5	23%	6.6%	9.9x	DCF, risk premium applied
Global Commodities	1,759	0.9	3%	-	3.9x	EBITDA Multiples: 7x Midstream, 3x Infrastructure, Zero for Power&Gas
Exploration & Production	1,081	0.6	2%	-	4.1x	NPV of remaining reserves
Germany	20,198	10.3	37%	-	10.7x	Dx: 11.5x EBITDA multiple. Supply: €280/cust
Other EU Countries	15,133	7.8	28%	6.6%	7.8x	DCF, risk premium applied
Russia	913	0.5	2%	16.0%	3.3x	DCF, risk premium applied
Brazil & Turkey	1,027	0.5	2%	8.6%	-	Turkey DCF; Brazil: Zero
Corporate Costs	(4,298)	(2.2)	(8%)		7.0x	7x EBITDA Multiple
Enterprise Value	53,999	27.7	100%		8.3x	
Share Investments	1,202	0.6				YE 2016 Book Value
Treasury Stock	477	0.2				At SOTP (fair value)
Financial Net Debt	(2,772)	(1.4)				YE 2016
Pension Provisions	(6,532)	(3.3)				YE 2016
Nuclear Provisions	(18,485)	(9.5)				YE 2016 Book Value
overfunding premium	(2,400)	(1.2)				Guidance: €2.0-2.4bn, to be paid over 2017-2020
Other Provisions	(3,501)	(1.8)				YE 2016 at 0.3x Book Value
Minorities	(3,960)	(2.0)				Valued at 10x P/E
Fair Value	18,028	9.2				
Price Target		9.2				

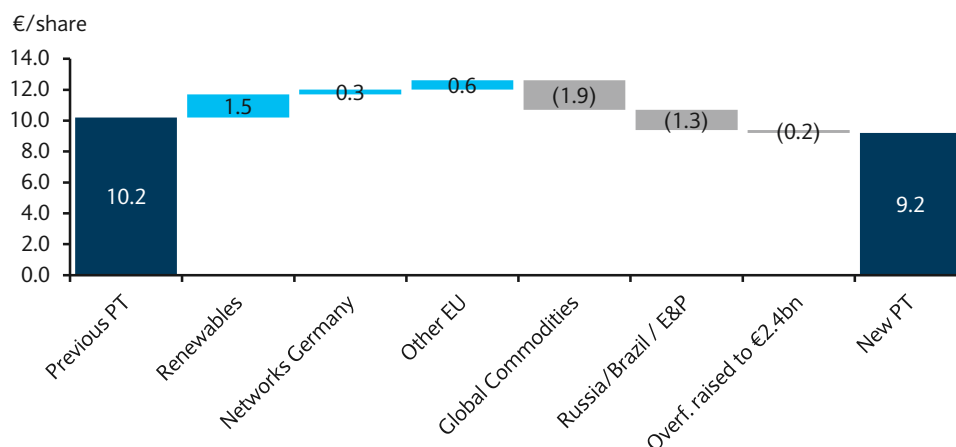
Source: Barclays Research estimates

For the Group, we retain our commodity-price levels but mark to market the GBP/EUR exchange rate. As the E.ON Group splits we feel our previous valuation of the Renewables business was too conservative and so we now lower our risk premium to derive our new fair value for the division. We value networks at 11.5x EV/EBITDA vs 11x previously (given enhanced visibility on the asset base).

We are less optimistic on the outlook for Global Commodities and now allocate zero value to E.ON's/Uniper's Power&Gas business (which might prove conservative). We assume Russian lignite plant Berezovskaya comes back online in October 2018 and we are more cautious on the overfunding premium for German Nuclear (we now assume €2.4bn vs €2bn previously).

Changes to our Group valuation

FIGURE 55
New PT vs latest published research



Source: Barclays Research estimates

Upside Case (€10.8/share): Our upside scenario of €10.8/share assumes a successful outcome of the NFT case. For the past taxes paid, the Group would receive back ~€3bn (€2.9bn plus 6% interest), amounting to €1.6/share.

Downside Case (€7.8/share): Our downside scenario assumes that the NFT will not be won (as per our base case). We further assume that the German forward power price curve drops by €3/MWh, that the nuclear overfunding premium amounts to €3bn, and that €3bn will be raised at a 10% discount to the current share price.

Valuation impact is neutral from a €2.4bn capital increase at €7.8/share

Our sensitivity analysis for a capital increase by E.ON (see our report [German Utilities: Power Lifting: Upgrading Price Targets and Ratings](#), 23 Jun 2016, for full detail) assumes that €2.4bn of new equity raised, at an issue price of €7.80, results in 308m new shares and dilution of c.16% to our current EPS).

The discount to our PT means that the capital raise itself shaves ~€0.2/share from our valuation⁴⁴. However, given that we assume a similar level of growth capex cuts in renewables in our base case scenario (which are not needed under a capital-increase scenario), we end up with the same fair value for the E.ON Group of €9.2/share.

Implied valuation for the new E.ON and Uniper derived from our Group SOTP

Our new SOTP valuation for the E.ON Group of €9.2/share implies a current EV/EBITDA trading multiple for the new E.ON of 9.2x 2016E EV/EBITDA and for Uniper of 5x 2016E EV/EBITDA.

Our revised SOTP valuation implies a 2016E EV/EBITDA of the new E.ON of between 8.7x-9.5x, suggesting a midpoint of 9.2x. This compares with SSE on 9.6x 2016 EV/EBITDA, Regulated Utilities on 11.6x, and Integrated Utilities on ~7.6x). We arrive at this valuation range by assuming company guidance and our own estimates derived from our E.ON Group model.

⁴⁴ $(9.2 - 7.8) \times 16\% = 0.2/\text{share}$ dilution effect.

FIGURE 56

SOTP valuation for the new E.ON using midpoint of net economic debt assumptions described above

Future E.ON	€m	/share
Preussen Elektra	911	0.47
Networks & Supply	35,331	18.10
Renewables	8,471	4.34
Turkey	1,027	0.53
O/Head	(2,149)	(1.10)
EV	43,591	22.33
Minorities	(2,960)	(1.52)
Economic net debt (range)	(24,411-25,411)	(12.5-13.0)
Overfunding	(2,400)	(1.23)
Equity Value (range)	12,821-13,821	6.6-7.1
Equity Value midpoint	13,321	6.82

Source: Company data, Barclays Research estimates, using share count of E.ON Group of 1,952m.

FIGURE 57

EBITDA and leverage factor estimates to derive our midpoint valuation for the new E.ON

Future E.ON	2016E	2017E	2018E
EBITDA Barclays (derived from Group E.ON)	4,726	4,900	4,782
EBITDA New E.ON Guidance	4,600-5,000		
ND/EBITDA range (5.2-5.4x), €bn	2.4-4-25.4		
Net Debt Midpoint Barclays, €bn	24.9		

Source: Company data, Barclays Research estimates

For Uniper, our revised SOTP valuation implies a 2016E EV/EBITDA of ~5x (using the ~€2bn EBITDA in 2016 derived from our E.ON model, and a net debt midpoint range of €4.7bn) with a prospective dividend yield of 4-4.5%. We arrive at this valuation range by assuming company guidance and our own estimates derived from our E.ON Group model.

FIGURE 58

SOTP Uniper valuation – based on E.ON Group Shares and using midpoint estimates for Net Economic debt

Uniper	€m	/share
Conventional Generation	4,656	2.39
Hydro	4,148	2.12
Global Commodities	1,759	0.90
Exploration & Production	1,081	0.55
Russia	913	0.47
Brazil	0	0.00
O/Head	(2,149)	(1.10)
EV	10,408	5.33
Minorities	(1,000)	(0.51)
Economic net debt (range)	(4,400-5,000)	(2.2-2.6)
Equity Value (range)	4,408-5,008	2.3-2.6
Equity Value midpoint, E.ON share count	4,708	2.41
Equity Value midpoint, Uniper share count	4,708	12.9

Source: Barclays Research estimates; Uniper total share count amounts to 365m shares after taking treasury shares into account.

FIGURE 59

EBITDA and leverage factor estimates to derive our midpoint valuation for Uniper

	2016E	2017E	2018E
EBITDA Barclays (derived from Group E.ON)	2,094	1,572	1,637
EBITDA Guidance	n/a		
ND/EBITDA range (2.1-2.4x), €bn	4.4-5.0		
Net Debt Midpoint Barclays, €bn	4.7		

Source: Company data, Barclays Research estimates

GROUP FINANCIALS E.ON

FIGURE 60

Commodity Price Assumptions

	2014	2015	2016E	2017E	2018E	2019E	2020E
Commodity Assumptions							
Achieved Power Price - Central Europe (€/MWh)	53.8	46.7	40.5	36.2	32.7	32.1	33.1
Achieved Power Price - UK (£/MWh)	63.1	60.0	46.0	43.7	49.8	51.8	57.6
Achieved Power Price - Nordic (€/MWh)	41.0	38.0	33.3	26.5	23.9	24.2	23.3
Baseload Power Price - Germany (€/MWh)	39.0	35.1	28.1	27.7	27.6	28.3	29.2
Baseload Power Price - UK (£/MWh)	51.3	43.4	37.4	39.7	42.4	42.0	41.5
Baseload Power Price - Nordic (€/MWh)	35.5	34.3	26.6	24.3	23.3	22.9	23.0
Achieved CDS - Germany (€/MWh)	24.6	16.6	10.0	9.4	8.9	13.1	15.6
Achieved CSS - Germany (€/MWh)	(7.0)	(4.2)	(0.7)	(4.1)	(4.9)	(4.2)	(3.3)
Achieved CDS - UK (£/MWh)	27.0	10.2	1.9	3.7	7.1	9.5	9.4
Achieved CSS - UK (£/MWh)	4.5	5.6	4.9	5.6	9.0	8.1	7.4
Coal (US/t)	63.5	54.9	54.0	54.5	55.3	44.8	40.3
Oil (US\$/bbl)	99.2	58.8	49.3	53.0	54.8	55.7	56.6
CO2 (€/t)	5.3	8.3	6.2	6.3	6.3	6.4	6.5
Gas - TTF (€/MWh)	24.3	20.1	14.9	16.3	16.6	16.6	16.7
Gas - UK (p/th)	65.7	46.3	37.4	39.6	40.1	40.7	40.0
Economic Assumptions							
Inflation - Europe (%)	0.5%	-2.6%	0.5%	0.5%	0.5%	0.5%	0.5%
Euro/US Dollar (US\$/€)	1.33	1.11	1.09	1.09	1.09	1.09	1.09
Euro/Sterling (£/€)	1.65	1.53	1.42	1.42	1.42	1.42	1.42

Source: Barclays Research estimates, Platts, Bloomberg

FIGURE 61

E.ON Group EBITDA

€m	2013	2014	2015	2016E	2017E	2018E	2019E	2020E
Generation	1,936	2,215	1,472	1,088	912	747	841	1,162
Renewables	1,464	1,500	1,346	1,274	1,273	1,251	1,284	1,273
Global Commodities	311	106	223	826	447	439	369	370
Exploration & Production	1,070	1,136	895	190	265	279	284	287
Germany	2,387	1,761	2,157	1,844	1,882	1,872	1,761	1,831
Other EU Countries	2,012	1,775	1,756	1,947	1,949	1,987	2,026	2,065
Russia	687	517	361	272	278	307	386	415
Turkey /Brazil	(154)	(78)	(39)	(6)	23	38	43	49
Group Management/Consolidation	(522)	(556)	(614)	(614)	(557)	(500)	(500)	(500)
Adjusted EBITDA	9,191	8,376	7,557	6,820	6,471	6,420	6,494	6,953
Growth (%)	-14.7%	-8.9%	-9.8%	-9.7%	-5.1%	-0.8%	1.2%	7.1%
Margin (%)	7.7%	7.4%	6.5%	6.0%	5.7%	5.7%	5.7%	6.1%

Source: Company data, Barclays Research estimates

FIGURE 62

E.ON Group EBIT

€m	2013	2014	2015	2016E	2017E	2018E	2019E	2020E
Generation	1,017	1,201	745	456	251	61	172	496
Renewables	1,014	1,044	924	862	863	856	907	897
Global Commodities	192	10	109	712	333	325	255	256
Exploration & Production	560	498	389	89	209	223	228	232
Germany	1,667	1,099	1,537	1,217	1,250	1,237	1,122	1,187
Other EU Countries	1,436	1,166	1,119	1,309	1,307	1,338	1,366	1,394
Russia	492	371	266	189	194	222	297	325
Turkey /Brazil	(154)	(78)	(39)	(6)	23	38	43	49
Group Management/Consolidation	(600)	(616)	(681)	(681)	(624)	(560)	(560)	(560)
Adjusted EBIT	5,624	4,695	4,369	4,148	3,806	3,738	3,829	4,277
Growth (%)	-19.8%	-16.5%	-6.9%	-5.1%	-8.2%	-1.8%	2.4%	11.7%
Margin (%)	4.7%	4.2%	3.8%	3.6%	3.3%	3.3%	3.4%	3.8%

Source: Company data, Barclays Research estimates

FIGURE 63

E.ON Group Income Statement

€m	2013	2014	2015	2016E	2017E	2018E	2019E	2020E
External Revenue	119,688	113,095	116,218	113,794	113,705	113,323	113,508	113,854
Costs	(110,751)	(104,975)	(109,057)	(107,652)	(107,716)	(107,402)	(107,471)	(107,410)
Income from Operating Investments	254	256	396	678	483	499	457	509
Adjusted EBITDA	9,191	8,376	7,557	6,820	6,471	6,420	6,494	6,953
Depreciation and Amortisation	(3,567)	(3,681)	(3,188)	(2,673)	(2,665)	(2,681)	(2,665)	(2,677)
Adjusted EBIT	5,624	4,695	4,369	4,148	3,806	3,738	3,829	4,277
Net Interest	(944)	(638)	(579)	(536)	(477)	(448)	(392)	(311)
Interest Accretion on Provisions	(930)	(975)	(993)	(922)	(954)	(937)	(920)	(904)
PBT	3,750	3,082	2,797	2,690	2,375	2,354	2,517	3,062
Tax	(1,256)	(1,406)	(527)	(715)	(607)	(627)	(694)	(828)
Minority Interests	(368)	(30)	(622)	(311)	(285)	(280)	(287)	(321)
Adjusted Net Income	2,126	1,646	1,648	1,664	1,483	1,446	1,536	1,914
Growth (%)	-49.2%	-22.6%	0.1%	1.0%	-10.9%	-2.5%	6.2%	24.6%
Margin (%)	1.8%	1.5%	1.4%	1.5%	1.3%	1.3%	1.4%	1.7%
EPS - Basic	1.10	(1.64)	(3.60)	0.79	0.76	0.74	0.79	0.98
EPS - Adjusted	1.11	0.85	0.84	0.85	0.76	0.74	0.79	0.98
Growth (%)	-49.3%	-23.6%	-0.9%	1.0%	-10.9%	-2.5%	6.2%	24.6%
DPS - Ordinary	0.60	0.50	0.50	0.34	0.30	0.30	0.31	0.39
DPS - Special	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DPS - Total	0.60	0.50	0.50	0.34	0.30	0.30	0.31	0.39
Growth - Ordinary DPS (%)	-45.5%	-16.7%	0.0%	-31.8%	-10.9%	-2.5%	6.2%	24.6%
Payout Ratio (%)	53.8%	58.7%	59.2%	40.0%	40.0%	40.0%	40.0%	40.0%

Source: Company data, Barclays Research estimates

FIGURE 64

E.ON Group Cash Flow Statement

€m	2013	2014	2015	2016E	2017E	2018E	2019E	2020E
Income from Operating Activities	5,281	(339)	(4,501)	3,113	3,092	3,007	3,140	3,536
+ Depreciation and Amortisation	5,205	8,667	11,984	2,673	2,665	2,681	2,665	2,677
- Net Interest Paid	(756)	(1,049)	(756)	(294)	(235)	(206)	(150)	(69)
- Net Tax Paid	(961)	(918)	(150)	(153)	(148)	(144)	(159)	(199)
+ Dividends Received	623	292	240	411	292	303	277	309
+/- Changes in Provisions	1,312	1,260	1,014	1,113	(383)	(378)	(379)	(381)
+/- Changes in Working Capital	(540)	2,948	1,587	0	0	0	0	0
+/- Changes in Other Receivables	(2,047)	(4,059)	(3,455)	0	0	0	0	0
+/- Reversal of Gains/Losses	(2,050)	(946)	(553)	(3)	0	0	0	0
+/- Other Non-Cash Income/Expenses	382	622	769	(400)	(400)	(400)	(400)	(400)
Operating Cash Flow	6,449	6,478	6,179	6,460	4,883	4,864	4,995	5,472
- Capital Expenditure	(7,992)	(4,637)	(4,174)	(3,657)	(3,189)	(2,332)	(2,411)	(2,757)
Free Cash Flow	(1,543)	1,841	2,005	2,804	1,694	2,532	2,584	2,715
- Acquisitions and Disposals	7,010	2,568	4,522	0	0	0	0	0
- Change in Equity	0	305	270	0	(800)	(800)	(800)	0
- Dividends Paid	(2,330)	(1,039)	(859)	(747)	(807)	(742)	(734)	(776)
Net Cash Flow	3,137	3,675	5,938	2,056	88	991	1,050	1,939
Other Movements in Financial Net Debt	(469)	(2,453)	(1,763)	(218)	0	0	0	0
Financial Net Cash/(Debt)	(10,007)	(8,785)	(4,610)	(2,772)	(2,684)	(1,693)	(643)	1,295
Economic Net Cash/(Debt)	(32,218)	(33,394)	(27,714)	(27,788)	(27,318)	(25,950)	(24,520)	(22,200)
Net Debt/EBITDA	3.5x	4.0x	3.7x	4.1x	4.2x	4.0x	3.8x	3.2x

Source: Company data, Barclays Research estimates

FIGURE 65

E.ON Group Balance Sheet

€m	2013	2014	2015	2016E	2017E	2018E	2019E	2020E
Tangible Fixed Assets	50,083	41,273	38,997	39,984	40,508	40,158	39,904	39,985
Intangible Assets	19,314	16,694	10,906	10,906	10,906	10,906	10,906	10,906
Investments	15,612	14,896	14,033	14,300	14,490	14,687	14,867	15,068
Cash/Marketable Securities	7,814	6,067	8,190	11,834	11,008	11,967	11,900	13,034
Working Capital Assets	13,648	18,988	19,487	19,487	19,487	19,487	19,487	19,487
Other Assets	25,859	27,772	22,080	22,080	22,080	22,080	22,080	22,080
Total Assets	132,330	125,690	113,693	118,591	118,479	119,285	119,144	120,559
Short-Term Debt	(4,673)	(3,883)	(2,788)	(2,788)	(2,788)	(2,788)	(2,788)	(2,788)
Long-Term Debt	(18,051)	(15,784)	(14,954)	(16,541)	(15,628)	(15,596)	(14,480)	(13,675)
Working Capital Liabilities	(21,457)	(24,615)	(24,811)	(26,099)	(27,408)	(28,690)	(29,991)	(31,368)
Provisions	(32,506)	(35,496)	(34,935)	(36,048)	(35,665)	(35,287)	(34,908)	(34,527)
Other Liabilities	(19,005)	(19,199)	(17,128)	(16,936)	(16,649)	(16,398)	(16,162)	(15,928)
Total Liabilities	(95,692)	(98,977)	(94,616)	(98,412)	(98,138)	(98,759)	(98,329)	(98,286)
Shareholders' Equity	33,723	24,585	16,429	17,353	17,370	17,423	17,581	18,880
Minority Interest/Other	2,915	2,128	2,648	2,827	2,971	3,103	3,235	3,394
Total Equity	36,638	26,713	19,077	20,179	20,341	20,526	20,815	22,274

Source: Company data, Barclays Research estimates

RWE – RESTRUCTURING PRICED IN

Updating our SOTP Valuation: Now €12.2 (€12.4 previously)

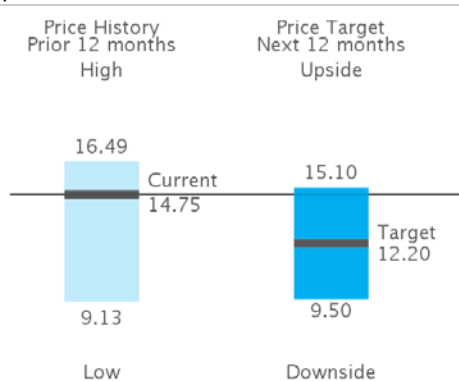
Price target trimmed, Innogy float will be main focus in Q4: The market reacted less negatively to RWE's H1 results on 11 August than it had to E.ON's, with the stock currently down by 6% versus its close on 9 August. We think that even though RWE suffered a similar increase in its pension provisions in H1 to E.ON of c.€2bn, the market continues to like the RWE story ahead of the IPO of Innogy. We, too, like the strategic restructuring of RWE, and the financial flexibility offered by the capital increase at Innogy, but in our view the supportive narrative offered by the strategic transformation is already largely priced in. RWE remains very operationally geared to power prices – on an unhedged basis we estimate that each €1/MWh increase in German power prices benefits net income by €77m (or +9% on our 2019E EPS) – but the recovery in German power prices from their February lows appears to have run its course for now. Following the H1 numbers our earnings estimates for 2016-17 are unchanged, but our SOTP valuation is lower by €0.2/share, reflecting the net impact of positive changes to our valuation of the Group's networks business (+€0.9/share), but negative changes to the Group's Trading & Gas Midstream business (-€1.0/share). There is a free option on a positive outcome to the NFT case, but the expected publication of the Government's CAP2050 climate plan in the autumn could focus renewed attention on the Group's lignite exposure. We retain our EW rating with a revised PT of €12.2/share.

Strategic transformation is positive but in our view already largely priced in: We think RWE's strategic restructuring via the forthcoming separate listing of Innogy (comprising the group's networks, renewables, and customer-services business) represents a major strategic restructuring, and that Innogy's commitment to a 70-80% dividend-payout ratio has heightened investor interest in its planned flotation in the autumn. That said, the shares have performed strongly in recent months, and much of the benefit has in our view been priced in. Nonetheless, the increased transparency that will come with the listing of Innogy could yet provide scope for a further re-appraisal of its profile, and hence a potential further expansion in the multiples used to value it.

Clarity on the funding of nuclear provisions: On 1 June, the German Cabinet adopted the recommendation of the Nuclear Financing Commission (NFC) on the nuclear waste-and-storage liabilities. The adopted recommendation requires Germany's nuclear operators to pay a premium of c.35% to the book value of the provisions they have made for these liabilities. The overfunding premium equates to ~€1.7bn (~€2.8/share) for RWE. We expect newsflow on this topic to intensify and a final deal in the next couple of months.

Balance sheet is stretched, risk now looks more manageable: S&P and Moody's rate RWE BBB- and Baa- (with a Negative and Stable Outlook respectively). RWE is highly geared to the forward power curve, which in our view makes the earnings profile more volatile than that of E.ON. Still, we assume that RWE can stay above the 16% FFO/ND threshold required to maintain its current investment-grade rating whilst paying off the required €1.7bn nuclear-overfunding premium in instalments over three years from free cash flow, but that either capex or dividends or both would take a hit. Innogy has said it will target a dividend-payout ratio of 70-80% on underlying net income.

Cheap on multiples, but with a riskier earnings profile: We consider RWE's discounted multiples (13.1x 2017E P/E versus 13.3x for integrated peers, and 7.3x 2017E EV/EBITDA versus 7.6x for integrated peers) are justified by its greater exposure to commodity prices and its lower credit rating relative to E.ON. Whilst any further rally in power prices would likely prompt a further appreciation in the share price, on current commodity prices we see the stock as fairly valued, especially as we assume only a modest dividend over 2017-19 (on our updated numbers RWE offers a dividend yield of 1.5% in 2017E and 2.5% in 2018E). We estimate a favourable outcome of the NFT case could lead to upside of €2.9/share.

European Utilities						Industry View: NEUTRAL	
RWE (RWE.G.DE)						Stock Rating: EQUAL WEIGHT	
Income statement (€mn)	2015A	2016E	2017E	2018E	CAGR	Price (30-Aug-2016)	EUR 14.75
Revenue	48,599	47,430	46,553	46,671	-1.3%	Price Target	EUR 12.20
EBITDA (adj)	7,017	5,371	5,359	5,233	-9.3%	Why Equal Weight? We see pressure on EPS from falling earnings in generation and a volatile trading business. Whilst we like the Innogy restructuring and the benefits it gives to the Group, current trading now reflects the risk from mark-to market, low visibility on shareholder returns or growth capex and a stretched balance sheet.	
EBIT (adj)	3,837	2,942	3,018	2,891	-9.0%		
Pre-tax income (adj)	2,925	1,338	1,414	1,336	-23.0%		
Net income (adj)	1,125	635	691	647	-16.8%		
EPS (adj) (€)	1.83	1.03	1.12	1.05	-16.8%		
Diluted shares (mn)	614.7	614.7	614.7	614.7	0.0%		
DPS (€)	0.13	0.21	0.22	0.37	41.5%		
Margin and return data					Average	Upside case	EUR 15.10
EBITDA (adj) margin (%)	14.4	11.3	11.5	11.2	12.1	Our upside case assumes that RWE receives back ~€1.8bn (€1.7bn plus 6% interest) from the German government, with which – if timed correctly – it could pay off the nuclear overfunding premium, adding €2.9/share to our base case valuation.	
EBIT (adj) margin (%)	7.9	6.2	6.5	6.2	6.7		
Pre-tax (adj) margin (%)	6.0	2.8	3.0	2.9	3.7		
Net (adj) margin (%)	2.3	1.3	1.5	1.4	1.6		
ROIC (%)	4.7	3.9	4.0	3.8	4.1		
ROA (%)	3.2	2.5	2.5	2.4	2.6		
ROE (%)	10.9	6.9	7.2	6.8	7.9	Downside case	EUR 9.50
Balance sheet and cash flow (€mn)					CAGR	Upside/Downside scenarios 	
Net PP&E	29,429	29,793	29,897	29,515	0.1%		
Total net assets	8,894	9,556	9,553	9,484	2.2%		
Capital employed	51,798	52,051	52,110	51,669	-0.1%		
Shareholders' equity	6,797	7,467	7,464	7,406	2.9%		
Net debt/(funds)	-25,126	-25,411	-24,904	-23,987	N/A		
Cash flow from operations	3,214	5,758	3,922	3,837	6.1%		
Capital expenditure	-3,303	-2,704	-2,446	-1,960	N/A		
Free cash flow	-544	2,486	910	1,311	N/A		
Valuation and leverage metrics					Average		
P/E (adj) (x)	8.1	14.3	13.1	14.0	12.4		
EV/EBITDA (adj) (x)	6.0	7.7	7.3	7.3	7.0		
EV/NOPAT (x)	15.9	20.4	18.8	19.3	18.6		
Equity FCF yield (%)	-1.0	33.7	16.3	20.7	17.4		
P/BV (x)	1.0	0.9	0.9	1.0	1.0		
Dividend yield (%)	0.9	1.4	1.5	2.5	1.6		
EV/IC (x)	0.8	0.8	0.7	0.7	0.8		
Net debt/EBITDA (adj) (x)	3.6	4.7	4.6	4.6	4.4		
Selected operating metrics (€)							
Payout ratio (%)	7.1	20.0	20.0	35.0			
Baseload power price Germany (€/MWh)	35.1	28.1	27.7	27.6			
Baseload power price UK (£/MWh)	50.4	48.1	42.1	38.7			
Achieved CDS - Germany (€/MWh)	16.6	10.0	9.4	8.9			
Achieved CSS - Germany (€/MWh)	-4.2	-0.7	-4.1	-4.9			
Achieved CDS - UK (£/MWh)	10.2	1.9	3.7	7.1			
Achieved CSS - UK (£/MWh)	11.7	3.4	5.3	8.6			
Generation output (Twh)	213.1	212.0	207.1	197.6			
CO2 intensity (kg/kwh)	0.71	0.68	0.67	0.70			

Source: Company data, Barclays Research
 Note: FY End Dec

Updating our SOTP Valuation: Now €12.2 (€12.4 previously)

Figure 66 shows our updated SOTP for RWE, and Figure 67 summarises the changes we have made versus our previous valuation.

FIGURE 66

SOTP Valuation RWE Group

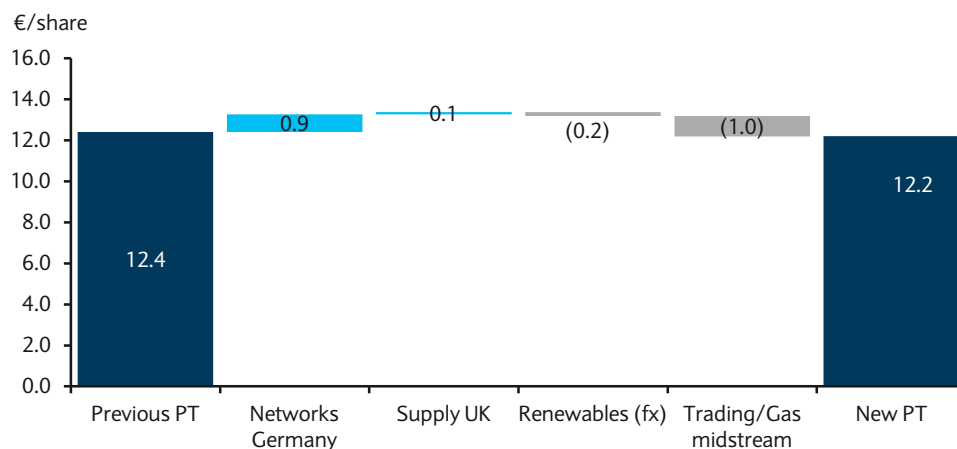
RWE	€m	€/share	%EV	WACC	EV/EBITDA	
					2017E	Valuation Methodology
Conventional Power Generation	5,747	9.3	14%	5.6%	4.9x	DCF by Technology
Of which Western Europe	4,734	7.7	12%	-	-	
Of which UK	1,013	1.6	3%	-	-	
Supply/Distribution Networks						
Germany	19,844	32.3	48%	-	8.7x	Dx: 11.5x EBITDA multiple. Supply: €280/cust
Supply Netherlands / Belgium	1,694	2.8	4%	-	7.7x	€360/customer
Supply United Kingdom	1,590	2.6	4%	10.0%	13.8x	DCF, risk premium applied
Central and Eastern Europe	6,408	10.4	16%	9.6%	7.1x	DCF, risk premium applied
Renewables	6,262	10.2	16%	8.3%	8.1x	DCF, risk premium applied
Trading/Gas Midstream	344	0.6	2%	-	2.1x	2.1x EBITDA Multiple
Corporate Centre	(1,750)	(2.8)	(4%)	-	7.0x	7x EBITDA Multiple
Enterprise Value	40,141	65	100%		7.5x	
Share Investments	646.0	1.1				YE 2016 Book Value
Treasury Stock	-	-				
Financial Net Debt (exc. Hybrid)	(3,131)	(5)				YE 2016
Hybrid Bonds	(3,939)	(6)				YE 2016
Pension Provisions	(7,828)	(13)				YE 2016 Book Value
Nuclear Provisions	(9,862)	(16)				YE 2016 Book Value
Overfunding premium	(1,700)	(3)				To be paid over 2017-2020
Other Provisions	(4,082)	(7)				YE 2016 at 0.3x Book Value
Minorities	(2,729)	(4)				Valued at 10x P/E
Fair Value	7,515	12.2				
Price Target	7,515	12.2				

Source: Barclays Research estimates

We update our Group estimates to reflect recent moves in the GBP/EUR exchange rate, and we are also taking into account new divisional guidance in Trading (earnings downside) and UK Supply (earnings upside). As with E.ON we are turning less optimistic with regard to RWE's power-optimisation business and henceforth value it on the same multiple as E.ON.

Changes to our Group valuation

FIGURE 67
New PT vs latest published research



Source: Barclays Research estimates

Upside Case (€15.1/share): Our upside case assumes that RWE wins the NFT case and receives back ~€1.8bn (€1.7bn plus 6% interest) from the German Government. Adding €1.8bn to our SOTP would equate to €2.9/share.

Downside Case (€9.5/share): Our downside case assumes that the NFT case will not be won (as per our base case) and it also assumes that power prices in Germany fall by €3/MWh across the forward curve and beyond.

Implied valuation for Future RWE and Innogy derived from our Group SOTP

Our new SOTP valuation for the RWE Group of €12.2/share implies a current EV/EBITDA trading multiple for Innogy of 8.6x 2016E EV/EBITDA.

Our estimates suggest that RWE could raise ~€1.7bn in the 10% Innogy IPO later this year, again relieving pressure on its balance sheet. Using the midpoint of company guidance, we estimate that Innogy would trade on 8.6x EV/EBITDA. We arrive at a capital-increase range using the midpoint of company guidance for ND/EBITDA (3.8x-4.2x).

FIGURE 68
RWE Innogy SOTP Valuation using midpoint estimates for EBITDA and ND/EBITDA

NewCo	€m	€/share
Supply/Distribution Networks Germany	19,844	32.3
Supply Netherlands / Belgium	1,694	2.8
Supply United Kingdom	1,590	2.6
Central and Eastern Europe	6,408	10.4
Renewables	6,262	10.2
Corporate Centre	(583)	(1)
Enterprise Value	35,216	57.3
Net debt (range)	(16,150-17,850)	(26-29)
Minorities	(1,638)	(3)
Capital increase (range)	1,573-1,743	2.6-2.8
Capital increase midpoint	1,658	2.7
Equity Value range	17,301-19,171	28.1-31.2
Equity Value midpoint	18,236	29.7

Source: Barclays Research estimates

RWE AG implied Equity Value would be negative by ~€7.4bn, but its market value, of course, remains positive given that it still holds 90% of Innogy.

FIGURE 69

EBITDA and Leverage factor estimates to derive our midpoint valuation for Innogy

	2016E	2017E
EBITDA Innogy Guidance	4,100-4,400	4,300-4,700
EBITDA Mipoint used	4,250	4,500
ND/EBITDA range (3.8-4.2x), €bn	(16,150-17,850)	
ND/EBITDA Guidance	4x	
Net Debt Midpoint Barclays, €bn	(17,000)	

Source: Company guidance, Barclays Research estimates

FIGURE 70

RWE AG rump valuation using the midpoint of Innogy estimates

RWE AG	€m	/share
RWE Market Cap	8,993	14.63
90% NewCo	(16,412)	(27)
Implied Equity Value RWE AG	(7,419)	(12)
ND/EBITDA	7.5x	-
ND RWE AG	(8,411)	-
Standalone Equity Value	(7,419)	(12.1)
Share of Innogy	16,412	26.7
Holding Premium (Barclays)	(1,478)	(2.4)
Equity Value Combined	7,515	12.2

Source: Company guidance, Barclays Research estimates

GROUP FINANCIALS RWE

FIGURE 71

Commodity Price Assumptions

	2013	2014	2015	2016E	2017E	2018E	2019E	2020E
Commodity Assumptions								
Achieved Power Price - Germany (€/MWh)	51.0	48.0	41.0	36.5	34.9	31.5	32.9	33.3
Achieved Power Price - UK (£/MWh)	-	51.9	42.8	42.7	41.2	43.3	46.0	48.0
Baseload Power Price - Germany (€/MWh)	49.2	39.0	35.1	28.1	27.7	27.6	28.3	29.2
Baseload Power Price - Netherlands (€/MWh)	51.9	47.5	43.1	34.0	33.5	33.4	33.6	33.7
Baseload Power Price - UK (£/MWh)		51.0	50.4	48.1	42.1	38.7	40.9	42.3
Achieved CDS - Germany (€/MWh)		24.6	16.6	10.0	9.4	8.9	13.1	15.6
Achieved CSS - Germany (€/MWh)		(7.0)	(4.2)	(0.7)	(4.1)	(4.9)	(4.2)	(3.3)
Achieved CDS - UK (£/MWh)		27.0	10.2	1.9	3.7	7.1	9.5	9.4
Achieved CSS - UK (£/MWh)		4.5	11.7	3.4	5.3	8.6	8.6	7.4
Coal (US/t)	71.0	63.5	54.9	54.0	54.5	55.3	44.8	40.3
Oil (US\$/bbl)	108.9	99.2	58.8	49.3	53.0	54.8	55.7	56.6
CO2 (€/t)	6.2	5.3	8.3	6.2	6.3	6.3	6.4	6.5
Gas - TTF (€/MWh)	26.6	24.3	20.1	14.9	16.3	16.6	16.6	16.7
Gas - UK (p/th)	66.0	65.7	37.4	39.6	40.1	40.7	40.0	43.2
Economic Assumptions								
Inflation - Europe (%)	1.5%	0.5%	-2.6%	0.5%	0.5%	0.5%	0.5%	0.5%
Euro/US Dollar (US\$/€)	1.32	1.33	1.11	1.09	1.09	1.09	1.09	1.09
Euro/Sterling (£/€)	0.85	0.81	0.73	0.78	0.86	0.86	0.86	0.86

Source: Barclays Research estimates, Platts, Bloomberg

FIGURE 72

RWE Group EBITDA

€m	2013	2014	2015	2016E	2017E	2018E	2019E	2020E
Conventional Power Generation	2,455	2,522	2,191	1,273	1,166	823	1,057	1,133
Of which Western Europe	2,274	2,412	2,010	1,173	1,166	754	842	885
Of which UK	165	90	168	87	(14)	56	202	235
Supply/Distribution Networks Germany	2,316	2,650	2,621	2,357	2,289	2,272	2,137	2,147
Supply Netherlands / Belgium	368	203	236	221	221	221	221	221
Supply United Kingdom	366	294	(65)	(26)	116	280	285	268
Central and Eastern Europe	1,281	913	1,163	906	904	901	899	897
Renewables	454	547	839	722	750	783	807	786
Upstream Gas & Oil	0	0	0	0	0	0	0	0
Trading/Gas Midstream	841	286	164	128	164	164	164	164
Other/Consolidation	(177)	(284)	(132)	(210)	(250)	(210)	(210)	(210)
EBITDA	7,904	7,131	7,017	5,371	5,359	5,233	5,360	5,406
Growth (%)	-15.1%	-9.8%	-1.6%	-23.5%	-0.2%	-2.4%	2.4%	0.9%
Margin (%)	15.1%	14.7%	14.4%	11.3%	11.5%	11.2%	11.4%	11.5%

Source: Company data, Barclays Research estimates

FIGURE 73

RWE Group Operating Profit

€m	2013	2014	2015	2016E	2017E	2018E	2019E	2020E
Conventional Power Generation	1,384	979	596	376	353	10	261	340
Of which Western Europe	1,451	1,362	624	464	458	46	149	196
Of which UK	(76)	(384)	(76)	(113)	(136)	(67)	80	113
Supply/Distribution Networks Germany	1,626	1,871	1,856	1,586	1,512	1,488	1,348	1,352
Supply Netherlands / Belgium	278	146	194	179	180	180	181	181
Supply United Kingdom	290	227	(137)	(93)	55	219	225	207
Central and Eastern Europe	1,032	690	871	662	662	663	663	664
Renewables	203	186	488	372	400	434	397	326
Upstream Gas & Oil	0	0	0	0	0	0	0	0
Trading/Gas Midstream	831	274	156	120	156	156	156	156
Other/Consolidation	(275)	(356)	(187)	(260)	(300)	(260)	(260)	(260)
Operating Result	5,369	4,017	3,837	2,942	3,018	2,891	2,971	2,966
Growth (%)	-16.3%	-25.2%	-4.5%	-23.3%	2.6%	-4.2%	2.8%	-0.1%
Margin (%)	10.2%	8.3%	7.9%	6.2%	6.5%	6.2%	6.3%	6.3%

Source: Company data, Barclays Research estimates

FIGURE 74

RWE Group Income Statement

€m	2013	2014	2015	2016E	2017E	2018E	2019E	2020E
External Revenue	52,425	48,468	48,599	47,430	46,553	46,671	46,962	47,209
Costs	(44,936)	(41,784)	(42,143)	(42,510)	(41,649)	(41,875)	(42,034)	(42,235)
Income from Operating Investments	415	447	561	451	456	438	433	431
EBITDA	7,904	7,131	7,017	5,371	5,359	5,233	5,360	5,406
Depreciation and Amortisation	(2,534)	(3,115)	(3,181)	(2,429)	(2,342)	(2,342)	(2,390)	(2,439)
Operating Result	5,369	4,017	3,837	2,942	3,018	2,891	2,971	2,966
Net Interest	(787)	(862)	(804)	(769)	(749)	(723)	(690)	(664)
Interest Accretion on Provisions	(953)	(1,114)	(821)	(835)	(855)	(832)	(808)	(783)
Other Finance Income/(Costs)	(165)	128	713	0	0	0	0	0
PBT	3,464	2,169	2,925	1,338	1,414	1,336	1,473	1,519
Tax	(1,717)	(790)	(1,380)	(383)	(396)	(374)	(412)	(425)
Income from Discontinued Operations	881	256	25	0	0	0	0	0
Minority Interests	(210)	(245)	(347)	(273)	(280)	(268)	(276)	(275)
Hybrid Capital	(104)	(108)	(98)	(47)	(47)	(47)	(47)	(47)
Recurrent Net Income	2,314	1,282	1,125	635	691	647	738	771
Growth (%)	-5.8%	-44.6%	-12.2%	-43.6%	8.8%	-6.3%	14.0%	4.6%
Margin (%)	4.4%	2.6%	2.3%	1.3%	1.5%	1.4%	1.6%	1.6%
EPS - Basic	(4.49)	2.77	0.28	1.08	1.12	1.05	1.20	1.25
EPS - Recurrent	3.76	2.09	1.83	1.03	1.12	1.05	1.20	1.25
Growth (%)	-6.0%	-44.4%	-12.4%	-43.6%	8.8%	-6.3%	14.0%	4.6%
DPS - Ordinary	1.00	1.00	0.13	0.21	0.22	0.37	0.42	0.44
DPS - Special	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DPS - Total	1.00	1.00	0.13	0.21	0.22	0.37	0.42	0.44
Growth - Ordinary DPS (%)	-50.0%	0.0%	-87.0%	58.9%	8.8%	63.9%	14.0%	4.6%
Payout Ratio (%)	26.6%	47.8%	7.1%	20.0%	20.0%	35.0%	35.0%	35.0%

Source: Company data, Barclays Research estimates

FIGURE 75

RWE Group Cash Flow Statement

€m	2013	2014	2015	2016E	2017E	2018E	2019E	2020E
Income from Operating Activities	(317)	3,550	468	2,520	2,562	2,453	2,538	2,535
+ Depreciation and Amortisation	7,311	3,083	5,628	2,836	2,689	2,689	2,737	2,786
- Net Interest Paid	(777)	(862)	(804)	(769)	(749)	(723)	(690)	(664)
- Net Tax Paid	(1,216)	(951)	(727)	(512)	(529)	(500)	(551)	(568)
+ Dividends Received	383	383	353	284	287	275	272	271
+/- Changes in Provisions	1,177	(696)	(3,235)	1,488	(337)	(359)	(359)	(359)
+/- Changes in Working Capital	(733)	(1,417)	(98)	0	0	0	0	0
+/- Income from Disposals	(400)	(472)	(580)	(90)	0	0	0	0
+/- Other Non-Cash Income/Expenses	148	3,750	2,209	0	0	0	0	0
Operating Cash Flow	5,576	6,368	3,214	5,758	3,922	3,837	3,947	4,001
Capital Expenditure	(3,976)	(3,440)	(3,303)	(2,704)	(2,446)	(1,960)	(3,034)	(2,823)
Free Cash Flow	1,600	2,928	(89)	3,055	1,476	1,877	912	1,179
Acquisitions and Disposals	1,430	(23)	3,884	0	0	0	0	0
Change in Equity	163	122	(1,523)	0	(567)	(567)	(567)	0
Dividends Paid	(1,611)	(1,061)	(1,070)	(620)	(740)	(751)	(837)	(868)
Net Cash Flow	1,582	1,966	1,202	2,434	170	559	(491)	311
Other Movements in Financial Net Debt	400	691	(74)	(182)	0	0	0	0
Financial Net Cash/(Debt)	(11,138)	(8,481)	(7,353)	(5,100)	(4,931)	(4,372)	(4,863)	(4,551)
Economic Net Cash/(Debt)	(30,727)	(29,120)	(25,126)	(25,411)	(24,904)	(23,987)	(24,119)	(23,449)
Net Debt/EBITDA	3.9x	4.1x	3.6x	4.7x	4.6x	4.6x	4.5x	4.3x

Source: Company data, Barclays Research estimates

FIGURE 76

RWE Group Balance Sheet

€m	2013	2014	2015	2016E	2017E	2018E	2019E	2020E
Tangible Fixed Assets	34,313	31,142	29,429	29,793	29,897	29,515	30,159	30,542
Intangible Assets	13,409	12,797	13,215	12,808	12,461	12,114	11,767	11,420
Investments	4,170	4,156	3,837	4,004	4,173	4,336	4,496	4,656
Cash/Marketable Securities	6,763	7,581	9,959	13,286	13,356	12,915	11,424	10,935
Working Capital Assets	11,339	10,843	8,634	8,634	8,634	8,634	8,634	8,634
Other Assets	11,387	19,797	14,260	14,260	14,260	14,260	14,260	14,260
Total Assets	81,381	86,316	79,334	82,786	82,781	81,773	80,740	80,448
Short-Term Debt	(2,149)	(3,342)	(2,362)	(2,362)	(2,362)	(2,362)	(2,362)	(2,362)
Long-Term Debt	(16,539)	(15,224)	(16,718)	(17,601)	(17,501)	(16,501)	(15,501)	(14,701)
Working Capital Liabilities	(6,440)	(6,309)	(6,122)	(6,122)	(6,122)	(6,122)	(6,122)	(6,122)
Provisions	(33,740)	(33,044)	(29,809)	(32,132)	(32,650)	(33,123)	(33,572)	(33,997)
Other Liabilities	(10,376)	(16,625)	(15,429)	(15,013)	(14,593)	(14,181)	(13,758)	(13,330)
Total Liabilities	(69,244)	(74,544)	(70,440)	(73,229)	(73,228)	(72,289)	(71,315)	(70,512)
Shareholders' Equity	10,439	10,093	6,797	7,467	7,464	7,406	7,351	7,864
Minority Interest/Other	1,698	1,679	2,097	2,089	2,089	2,078	2,075	2,072
Total Equity	12,137	11,772	8,894	9,556	9,553	9,484	9,426	9,936

Source: Company data, Barclays Research estimates

ANALYST(S) CERTIFICATION(S):

We, Mark Lewis and Jutta Unmuessig, hereby certify (1) that the views expressed in this research report accurately reflect our personal views about any or all of the subject securities or issuers referred to in this research report and (2) no part of our compensation was, is or will be directly or indirectly related to the specific recommendations or views expressed in this research report.

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Primary Stocks (Ticker, Date, Price)

E.ON (EONGn.DE, 30-Aug-2016, EUR 8.31), Overweight/Neutral, CD/D/E/FA/FB/J/K/L/M/N

RWE (RWEg.DE, 30-Aug-2016, EUR 14.75), Equal Weight/Neutral, CD/D/J/K/L/M/N

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RWE (RWE.G)	Severn Trent (SVT.L)	SSE Plc. (SSE.L)
United Utilities (UU.L)		

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IMPORTANT DISCLOSURES CONTINUED

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E.ON (EOAN GY / EONGn.DE)

EUR 8.31 (30-Aug-2016)

Stock Rating

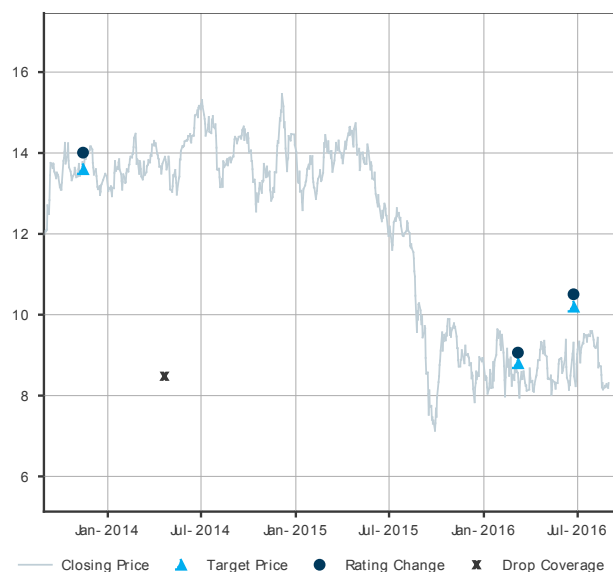
OVERWEIGHT

Industry View

NEUTRAL

Rating and Price Target Chart - EUR (as of 30-Aug-2016)

Currency=EUR



Publication Date	Closing Price	Rating	Adjusted Price Target
23-Jun-2016	9.31	Overweight	10.20
07-Mar-2016	8.56	Equal Weight	8.80
15-Apr-2014	13.49	Coverage Dropped	
14-Nov-2013	13.54	Equal Weight	13.60

Source: Thomson Reuters, Barclays Research

Historical stock prices and price targets may have been adjusted for stock splits and dividends.

Source: IDC, Barclays Research

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IMPORTANT DISCLOSURES CONTINUED

RWE (RWE GY / RWE.G.DE)

EUR 14.75 (30-Aug-2016)

Stock Rating

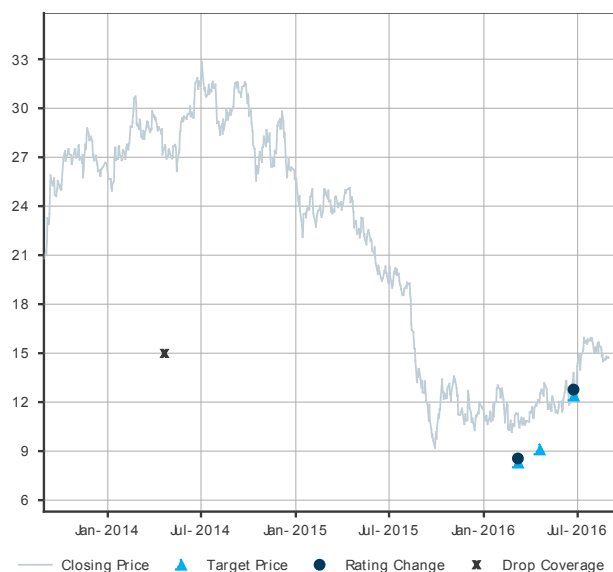
EQUAL WEIGHT

Industry View

NEUTRAL

Rating and Price Target Chart - EUR (as of 30-Aug-2016)

Currency=EUR



Publication Date	Closing Price	Rating	Adjusted Price Target
23-Jun-2016	13.80	Equal Weight	12.40
18-Apr-2016	11.97		9.10
07-Mar-2016	11.29	Underweight	8.30
15-Apr-2014	28.44	Coverage Dropped	

Source: Thomson Reuters, Barclays Research

Historical stock prices and price targets may have been adjusted for stock splits and dividends.

Source: IDC, Barclays Research

[Link to Barclays Live for interactive charting](#)

CD: Barclays Bank PLC and/or an affiliate is a market-maker in debt securities issued by RWE.

D: Barclays Bank PLC and/or an affiliate has received compensation for investment banking services from RWE in the past 12 months.

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Valuation Methodology: We value RWE on a SOTP basis. Our SOTP is largely DCF-based, with the exception of Germany networks & supply, where we use EV/EBITDA for distribution and €280/customer for supply as well as for Benelux supply where we use €360/customer. We also value Trading/gas midstream on a EV/EBITDA basis. Our DCF valuation is based on a post tax nominal Group WACC of 5.6% with specific activity/country risk premia applied. For foreign currencies we use the average YTD rate weighted by the spot rate for the remainder of the year. We mark-to-market all wholesale commodity prices for their length of their liquid forward curves. Post this mark-to-market period for German power we assume a €10.5/MWh long-term baseload clean dark spread (equal to the historical average); also assuming that the long-term peak generation price premium over baseload will stay at 2015 levels. For the UK, we assume a modest £4/MWh clean spark spread, but peak premium over base falls to around half near-term levels, as distributed generation will reduce network demand. Capacity payments for the UK are set at £35/KW in W20/21 and £25/KW going forward (2014 prices).

Risks which May Impede the Achievement of the Barclays Research Valuation and Price Target: RWE is exposed to wholesale energy commodity prices, interest rates, regulatory and political intervention/risks, economic factors, corporate activity & competition.

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