Annex 7.4

DECARBONISATION UNCERTAINTY AND OFGEM UNCERTAINTY MECHANISMS

As set out in the managing risk and uncertainty section of our plan:

- the pace and pathway of the net zero transition is the biggest known uncertainty for our business; and
- uncertainty mechanisms will be put in place by our regulator to manage unexpected eventualities.

This annex covers these two points in more detail, in turn.

Its main focus is decarbonisation uncertainty, given the prominence of this among the range of uncertainties we face, the significant investment associated with that area, and the importance of the issue to society more generally. In summary:

- our plan sees us building assets that will be used soon under any credible pathway to net zero;
- future deliverability is a further reason for supporting higher investment over 2023-28;
- some of the reinforcement expenditure in our plan also offers substantial efficiency savings in the form of synergistic asset health benefits;
- reinforcement will also deliver benefits through lower losses;
- there are, however, some decarbonisation risks that we cannot control; and
- Ofgem must strike a balance in how it manages uncertainty in this area.

Beyond this, it gives a summary for stakeholders of the main uncertainty mechanisms that our regulator is proposing to put in place or retain for electricity distribution from 2023-28.

Decarbonisation uncertainty

This section of this annex provides more detail about how uncertainty over the decarbonisation pathway relates to the costs in our plan.

It also highlights the types of risks that we expect our regulator to accommodate within the eventual design of its mechanism(s) in this area.

Our plan sees us building assets that will be used soon under any credible pathway to net zero

When building long-lasting assets, there is always a risk that things might be built that are not used as quickly as expected when they were built, are simply never used, or that prove to be bigger (and therefore more costly) than was actually necessary. In network regulation, this is called ‘asset stranding’ risk, and it can lead to consumers paying more than they should ideally have had to. At a time of significant growth in investment, it becomes particularly important to be aware of this risk and make sure that the approach being taken deals with it.

We have done a lot of detailed work to put together a plan that does not involve a risk of material asset stranding under any realistic scenario.

This is primarily because the drivers of the decarbonisation road map in the 2020s are such that they demand solutions that are common to all of the pathways that could potentially be credible. This high continuity of network solutions translates to a high degree of confidence that the investments will be used and useful on the journey to net zero by 2050, despite the uncertainties around the speed and precise nature of the decarbonisation transition that actually unfolds.

Because the most significant drivers of decarbonisation are set to be the take-up of electric vehicles (EVs) and heat pumps, our analysis supports a high degree of confidence in predicting the nature and scale of network constraints that will manifest themselves. The specific timing and location of each one will of course vary, but we can already see areas where heat pump and EV uptake can most readily push demand to a point where some intervention, either additional flexibility or reinforcement, is required in the early years. As we increase our ability to monitor what is happening on the low voltage (LV) networks, we will be able to target our investment to make sure we optimise the timing.

Of course, investing further ahead of the curve requires careful forecasting of exactly which interventions to prioritise – but forecasting like this is almost always necessary for reinforcement (which should happen before problems become unmanageable). To the extent that new information means that there are changes to the investments needed over the 2023-28 period, we will be flexible to this, as described in the main section of our plan on decarbonisation.

We have translated these forecasts for uptake into forecasts for the number on interventions we would need to make. Based on our assessment that there is a high continuity of solutions across the different pathways, our current forecasts indicate that, even under the slowest pathway we have considered (the distribution future energy scenario (DFES) 2020 system transformation), we would need to undertake as many interventions on our network by the end of the 2028-33 period as our plan involves for 2023-28 (based on our planning scenario, the Northern Powergrid DFES planning scenario 2021).

So it is highly likely that the investments we have proposed in this plan will still be required within five years even under the slowest low carbon technology uptake scenario. This significantly limits the risk of stranded assets.

Future deliverability is a further reason supporting higher investment over 2023-28

Our plan has been set on the basis of the government achieving the pathway implied by its 10-point plan to net zero.

Of course it is possible that, in reality, society starts out at a slower pace towards decarbonisation than the 10-point plan pathway. In that case, our plan still makes sense – because of the high degree of continuity of solutions. In other words, delivering our plan not only keeps open the option of all the ‘further faster’ scenarios towards decarbonisation, but it efficiently reduces future deliverability risks that would occur as and when the pace of decarbonisation accelerates (or if the 2050 net zero deadline is brought forward).

The deliverability risk is a very significant factor. The reason for that is simple; if we allow ourselves to fall too far behind the pathway to decarbonisation that the government’s 10-point plan implies, then there is a real risk that we would be unable to keep pace with the eventual pathway if the government and society decide to get back onto that 10-point plan curve or beyond.

We do not think this is a risk that we, or society, should be asked to take.

Delivering a major investment programme at an efficient cost and with limited delivery risk is always a challenge. It involves taking time to scale up, so that skilled people and supply chain can be identified and mobilised effectively. In effect, an efficient pathway depends on:

- broadening our base of people with the right skills, many of which require close tuition and 'learning by doing', for example via apprenticeships, which limits the scalability of the training we can offer – particularly when combined with the obvious safety risks if our staff are not trained properly; and

- our suppliers making their own investments in the people, machinery or factories that they need to meet our requirements for services or materials.

If this approach is not taken, and a much quicker scale up is then needed, there are many potential delivery risks.

- making large increases in investments over a short space of time always carries deliverability risks – any unanticipated delays could quickly become critical;

- all companies would be likely to be scaling up significantly at the same time, which could create a supply chain crunch and mean that 'hiring in' the necessary skilled labour would become costly or effectively impossible; and

- upgrades to electricity distribution networks involve many dependencies, such as arranging wayleaves and putting in place permits for street works, each of which could create a bottleneck.

In this scenario, if we were not able to scale up fast enough, our electricity distribution network would become a constraint on the ability of our customers to power the EVs or heat pumps that government policies were successfully encouraging them to buy.

The chart below illustrates how this deliverability risk could materialise, by looking at how pathways for energy demand could potentially evolve over the next 15 years.

The solid red line in the chart underpins our asset investment plan and is consistent with the government's 10-point plan. The grey area shows the range of plausible scenarios we have used, based on:

- the lowest of last year's DFES scenarios (DFES 2020 system transformation), prepared before the 10-point plan; and

- the Climate Change Committee's (CCC) widespread engagement scenario at the top.

The dotted red line shows a scenario where:

- society continues to make gradual progress towards decarbonisation over the next seven years; and

- this trajectory steepens from 2028 onwards, for example because of technological breakthroughs or major government policy initiatives.

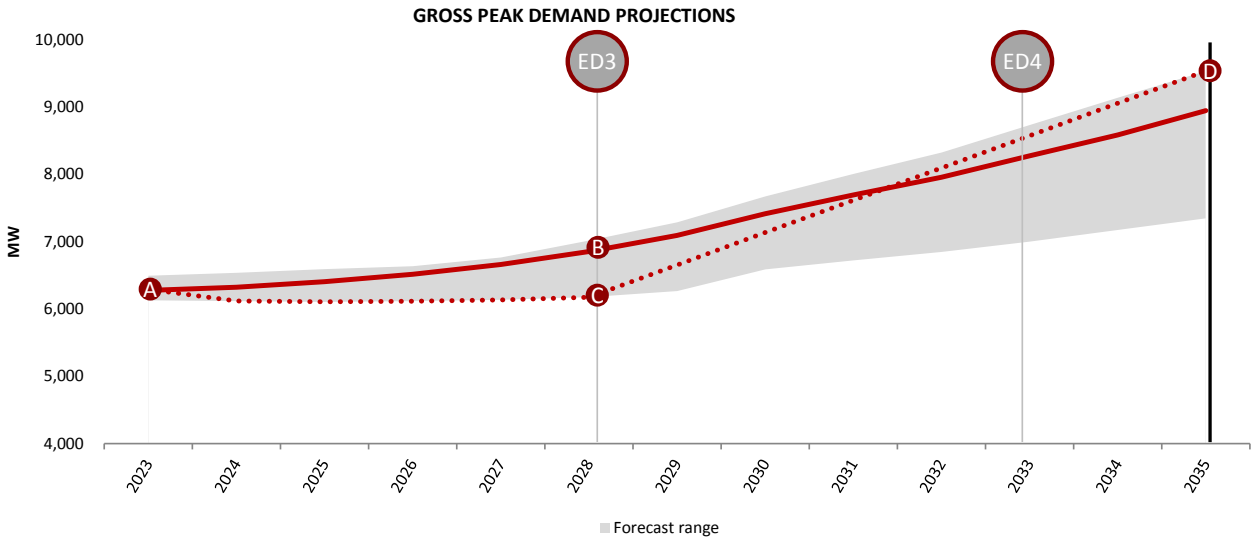

Figure 1: Gross Peak Demand Projections

As can be seen by the chart, our planning scenario involves a gradual curve starting from 2023, with the pace of uptake growing as time goes by. Delivering the investments that would be needed under this scenario would involve a significant but gradual increase in delivery capacity (in the form of people and supply chain). This scale of increase is not inconsistent with the cycles of investment we have already managed since 2010.

If instead we were to follow a curve where society moves from point A to point C during 2023-28, gross peak energy demand would fall behind our current planning scenario. In that short-term period, fewer investments would be needed, and we could save money by avoiding these investments, at least for a while.

However, if society then corrects course in 2028, moving from point C to point D, demand would outstrip our current planning scenario around 2031. Rather than taking ten years to build the necessary skills and supply chain and to make all the associated investments, starting today, we would have only three years – between 2028 and 2031. The potential risks to deliverability are obvious.

To illustrate the scale of the challenge this would involve, we just need to look at the costs of the investments required:

- At present we are spending approximately £20m per annum on reinforcement expenditure.
- Our planning scenario involves expenditure of £117m per annum to connect approximately 1.1m heat pumps or EVs over 2023-28.
- Our steady progression scenario, which sees the lowest and slowest rate of change, could allow us to spend as little as £48m per annum on reinforcement to connect fewer than 0.5m heat pumps or EVs.[1]
- If we invest according to this steady progression scenario over 2023-28, we would be well behind the curve implied by the government's 2035 target – and if we then needed to catch up in five years, by 2033, this would involve additional investment of about £70m per annum
- This would be on top of the investment needed to accommodate the heat pumps and EVs that our Planning Scenario would see installed over 2028-33. On our current assumptions, this would involve about £260m per annum in reinforcement before catch up, and the total including catch up could be around £325m per annum.

[1] Although overall network loading may be declining under the low scenario for low carbon technology uptake, the uptake itself would still trigger higher levels of reinforcement than our current expenditure.

Stepping up from about £30m at present to only £48m over 2023-28, then to approximately £325m per annum over 2028-33, is very likely to be impossible in practical terms. The cost of setting this impossible challenge would be even more acute in a scenario where there is also a strong imperative to catch up to current decarbonisation targets.

Stepping up progressively from £20m to £117m and then to £260m per annum (based on our current indicative estimates) is still challenging but is much more achievable; and wouldn't store up all of the delivery risk.

Some of the reinforcement expenditure in our plan also offers synergistic asset health benefits

Over the five-year period 2023-28, our plan includes reinforcement expenditure of £586m (excluding the costs of any entirely new connections).

Figure two shows how we estimate these pure reinforcement costs would vary over the plausible range for decarbonisation scenarios we have constructed for the purposes of our planning.

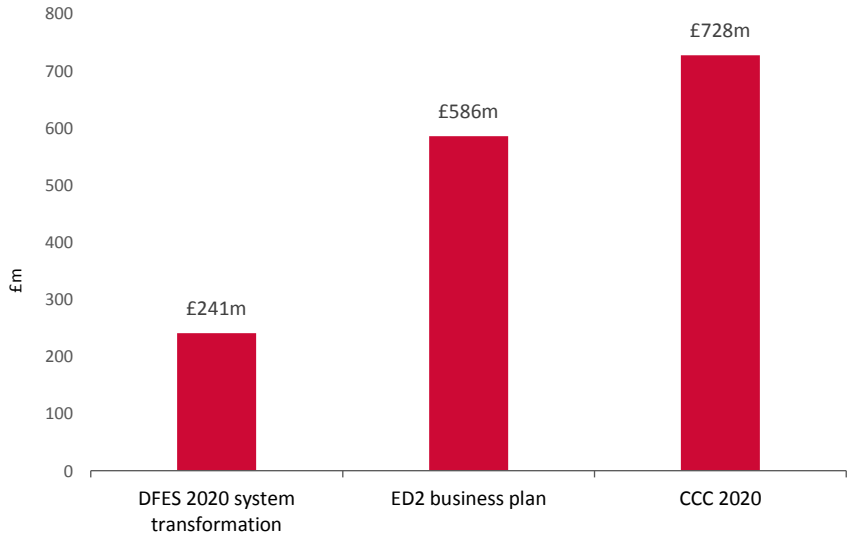

Figure 2: Illustration of how pure reinforcement costs would vary between scenarios

However, this does not mean that we could (or would) reduce our expenditure by £344m under the steady progression scenario. Part of the reduction would be offset:

- Our plan assumes £135m of reinforcement expenditure would displace essential asset replacement expenditure that we would need to undertake over 2023-28.
- We would still find some synergies if there was lower reinforcement; but fewer, which we estimate would be around £56m. This £79m reduction in synergies would add to the £947m of asset replacement currently in our plan, taking the estimated total to £1,027m.
- This asset replacement cost of £967m would still pay for the additional 'two for one' benefits by upsizing the assets as we replaced them, which would make sense to undertake thanks to the fairly low incremental cost.

Reinforcement will also deliver benefits through lower electrical losses

Electrical losses (referred to throughout simply as 'losses') are an unavoidable consequence of running an electricity network.[2] And as electricity has become more expensive over time, the cost of losses has risen.

This means that there will be a significant ancillary benefit to installing larger (or "lower-loss") assets, in the form of the financial savings from the resulting lower losses. This ancillary benefit will be achieved regardless of whether those larger assets are strictly necessary to meet growing demand on the system.[3]

This is not the basis on which we have justified the step up in our reinforcement plan for 2023-28. However it is a spin-off benefit that needs to be taken into account when considering the potential costs to society should assets be under-utilised for a period of time. In short, even if a proportion of the assets are never utilised more heavily than they are at present, there would still be benefits from upsizing them in the form of lower losses and therefore less generation being needed to meet electricity demand.

There are, however, some decarbonisation risks that we cannot control

Our regulator has decided that it will put in place uncertainty mechanisms for decarbonisation purposes, but it is still deciding how to specify some of the precise mechanism(s).

As set out above, in light of emerging government policies and having developed this plan, we think that the obvious uncertainty over whether society might follow one of the scenarios that sees a slower rate of societal change is rapidly becoming irrelevant.

However, there are some other risks that are beyond our control and which are highly relevant, which is precisely where our regulator's policies suggest an uncertainty mechanism should be put in place. These would include:

- the failure of price-driven flexibility to materialise at levels we have assumed in our plan;
- uncertainty over the number of shared connection cables (looped services) that will require replacement; and
- potential faster (or slower) uptake than our planning scenario.

We set out more details on each of these below.

Price-driven flexibility might not deliver customers the 'free' benefits we have assumed

Our plan is built on the assumption that customers will start to face and respond to price signals based on when they use electricity. This has the potential to reduce peak demand, and save substantial costs across the whole electricity supply chain, including generation, transmission and storage, as well as distribution. We are only a part of this picture – but reductions in peak loading that are justified to avoid generation costs would also help us to reduce our costs.

The decarbonisation section of our plan shows how we have factored the impact of customer-driven flexibility into a reduction in our planning scenario assumptions on maximum demand. Our assumption is that only a relatively small part of this flexibility would be tendered by us, with the rest in effect being delivered at no cost to us thanks to system-wide price signals. In other words, we are backing our customers to become more flexible in their use of energy in a way that gives them an additional benefit for free.

2. One reason for losses is that 'larger' assets offer less electrical resistance, and when electricity flows through them less energy will be dissipated in overcoming this resistance. For example, a small cable will warm up more than a large cable for the same amount of electricity passing through it. This conversion of electricity to heat represents a loss to the electricity system and society.

3. Further information on these benefits can be found in Imperial College London and Sohn Associates. *Management of electricity distribution network losses.* February 2014. https://www.westernpower.co.uk/smarter-networks/losses/losses-management

If this does not materialise, and if uptake of heat pumps and EVs is progressing according to our planning scenario, we could incur substantial additional costs – in the form of having to pay for more contracted flexibility ourselves, or ultimately in the form of additional investments if flexibility is not the cheapest solution. If there were no price-driven flexibility at all, we estimate £186m in additional costs.

Of course, if uptake is progressing more slowly than our planning scenario, it may be possible for us to accommodate a loss of customer-driven flexibility within the costs set out in our plan, depending on the balance of the two.

We may need to upgrade more looped services than we have assumed

Looped services are instances where part of the cable that connects our main electricity feeder to a home has been shared between multiple properties. This means that the power demands for each property all flow through a single, relatively small, service cable, at the point they all come together.

While this has been adequate until now, it is likely that EVs and heat pumps being installed will mean the shared part of the cable can no longer cope with the demands of multiple properties. Once this happens, we would have to upgrade the service arrangements to provide the connection causing the overload with its own cable.

The number of looped service upgrades will depend heavily on: the timing of EV and heat pump uptake; government policies that might influence where and when EVs tend to be charged; and whether there is clustering of uptake in areas that have looped service arrangements.

Our plan includes what we believe to be a relatively low volume of looped service upgrades at a cost of £35m. If the pathway our region ends up taking during the period requires us to remove significantly more looped services than we have assumed, there needs to be funding to ensure we can deliver this.

Our regulator recognised that this is one issue that may require an uncertainty mechanism in its methodology decision, and therefore we expect to revisit this part of our plan once the regulatory arrangements in this area become clearer.

Potential faster or slower ramp up in investment requirements

Our regulator has highlighted in its methodology decision that it is considering whether an automatic mechanism for adjusting allowances could be put in place, depending on requirements to add capacity within the period. The mechanism under discussion to date would not cover critical areas of expenditure (such as high and low voltage cables) but, even more problematically, could undermine our ability to efficiently scale up our delivery and investment. Having developed our plan, we do not think this mechanism would be appropriate.

This does not mean we think that there should not be an uncertainty mechanism to protect customers from paying for investments that are not taken ahead, and to protect companies from faster uptake of low carbon technologies than their plan has been set to accommodate.

For example, our regulator could continue the existing mechanism for adjusting allowances if efficient expenditure deviates significantly from those allowances. This is one of the mechanisms it is currently considering.

Ofgem must strike a balance in how it manages uncertainty in this area

Ofgem must strike the right balance in how it uses uncertainty mechanisms in this area and the extent to which it funds investment now (rather than deferring decisions to later). The balance is between:

- On the one hand:
    - the efficiencies that can be gained by planning now for a step up in reinforcement, through lower asset replacement costs and lower electrical losses;

- the future deliverability risk that can be mitigated, if we have certainty over our investments; and
- mitigation of the risk that underfunding (or delays to funding) could result in electricity distribution networks slowing down society's decarbonisation.

– On the other hand:

- the affordability of investments; and
- the risk of stranded assets.

We will work with Ofgem to optimise the design of these mechanisms and then we will factor the design of those uncertainty mechanisms into our final plan.

Ofgem's uncertainty mechanisms

Our regulator puts in place a range of uncertainty mechanisms as part of its regulatory framework, which it judges offers a good balance of risk protection versus cost exposure to customers. Some of these are likely to be common across all network sectors, including transmission and gas distribution; others are likely to be specific to our sector, electricity distribution.

We are not proposing any bespoke mechanisms in this plan. Therefore we would only be subject to the mechanisms that Ofgem puts in place more generally.

The table below sets out the main mechanisms that our regulator currently proposes will apply to our sector over 2023-28, so that stakeholders who may have an interest in them (such as credit rating agencies or financial analysts) can understand our plan in their context. We have not included those mechanisms Ofgem proposes to remove, which are set out in Ofgem's methodology decision.[4]

Some of these mechanisms are still under development; it is also possible that Ofgem may scrap some mechanisms, or adopt additional mechanisms, after business plan submission, if it identifies that this would be appropriate.

Mechanism	Overview
Strategic investment/load-related expenditure	As set out in our plan and in the first part of this annex, the biggest known uncertainty that our sector currently faces is the level of decarbonisation expenditure. Our regulator has decided there will be a mechanism, or several mechanisms, in this area. It has highlighted that it could include the existing load-related reopener mechanism, high-value projects mechanism, or new mechanisms to adjust allowances based on volumes. The design of the mechanism(s) is still under development. We set out in the section above the risks that we are exposed to but cannot control, and also where we think there is relatively more certainty over the appropriate level of investment.
Net zero reopener	A new reopener that would allow our regulator to reset the price control in line with net zero targets, should these change. This is proposed in addition to the other mechanisms relating to net zero and environmental legislation.
Environmental legislation	A new reopener that would allow adjustments to allowances if a change in legislation would have a material impact on a company's Environmental Action Plan.
Electricity system restoration (Black Start)	A new reopener for costs associated with any changes in requirements relating to system restart after a complete blackout. Networks have built-in equipment, such as batteries in substations that help with this. Changes to requirements are anticipated and this might mean additional costs.
Coordinated adjustment mechanism	A reopener that was recently introduced that can facilitated transfer of allowances between different RIIO sectors. There are already commercial and licence mechanisms that allow contracting between companies so this mechanism would probably only be triggered in fairly unusual circumstances.
Cyber resilience	A new reopener to cover 'new cyber resilience activities, new risks or threats, as well as new statutory or regulatory requirements'. Cyber resilience costs related to operational technology would also be allowed for on a 'use it or lose it' basis.
Rail diversion costs	Where our assets run across railway lines, it is sometimes necessary to divert them (for example when existing lines are being electrified). An existing reopener to cover electrification of existing railways is being expanded to cover diversion costs associated with all rail projects, for example including new railway build, where these costs cannot be recovered from the party in question.

4. Ofgem. *RIIO-ED2 Sector Methodology Decision: Annex 2 – Keeping bills low for consumers*. December 2020. Page 70, table 8.

Mechanism	Overview
Smart-meter volume driver	An existing volume driver mechanism that allows for the costs of remediating issues with meter points that are necessary so that smart meters can be installed, where we can demonstrate that there is a link between the work and smart meter installation.
Street works reopener	An existing reopener to cover additional costs associated with how street works are managed by local authorities (who have responsibility for this). The most material uncertainty for us relates to potential implementation of charges for renting lanes in roads when they need to be opened (rather than paying a smaller permit fee). Other uncertainties include local authorities amending, expanding, or changing how they operate existing permit schemes (for example because the guidance on how to run schemes is updated).
Enhanced physical site security reopener	An existing reopener is being maintained, to cover any costs incurred in complying with any special obligations we have about the security of specified sites, for sites that have not been catered to in our base allowances (if any).
Improved visual amenity	There is an existing mechanism to provide 'use it or lose it' allowances for improving visual amenity of the network. Ofgem has not signalled that this is likely to be removed.
Established pensions deficit repair mechanism	The existing mechanism to allow for the cost of our pre-existing defined benefit pension deficit obligations is being maintained, and runs every three years outside of the main price control. These costs are beyond our control because we closed our schemes to new entrants over two decades ago, well before most of the other groups currently operating in our sector, and because the pension benefits of existing scheme members are protected by legislation that was put in place at privatisation.
Inflation indexation of allowed revenues	It is necessary to cover inflation in the setting of any price control. Updating the price control formula with inflation is a well-established regulatory mechanism that links the prices that we can charge to movements in general prices. Ofgem has decided to move from the existing Retail Price Index (RPI) to the Consumer Prices Index including owner occupiers' housing costs (CPIH) and has committed to making this a value-neutral change.
Real price effects indexation	A new mechanism to update specific elements of our cost allowances, based on the evolution of a price index other than CPIH. These costs have previously been allowed for through base allowances. Ofgem is changing how it makes this allowance to an indexation mechanism.
Cost of equity indexation	A new mechanism to update the allowed cost of equity for changes in the risk free rate using a specific formula.
Cost of debt indexation	An existing approach to updating the allowed cost of debt is being maintained. The adjustment is made based on the evolution of a trailing average. Ofgem is updating the mechanism and making some adjustments but the general approach is unchanged.
Pass-through of various costs	Existing mechanisms to pass through specific costs are being maintained, for costs that are generally accepted to be beyond our control. These include Ofgem licence fees, business rate costs (subject to an established efficiency check process), the cost of existing transmission connection points, the fixed costs we are charged by the data communication company for the smart meter data system and potentially miscellaneous costs that Ofgem deems meet its requirements.
Tax trigger	The existing arrangements for dealing with changes in corporation tax will be retained, with some adjustments to how it operates, for example to ensure changes to corporation tax rates are always fully reflected.
Tax review	A new mechanism is being introduction to potentially review corporation tax allowances, if a company cannot reconcile its actual corporation tax payments to its corporation tax allowances.
Price control disapplication mechanism	There is a longstanding mechanism that allows energy networks to bring about a reference of their price control to the Competition and Markets Authority, which could for example be used if Ofgem fails to accommodate major costs that companies are required to incur due to new government legislation. The design of this mechanism has been updated for transmission and gas distribution to reduce the waiting period and allow for faster action if the mechanism is ever needed.
Return adjustment mechanism	A new mechanism is being introduced to adjust allowed revenue (and earned regulatory returns) if returns stray outside of pre-set thresholds around the allowed return on equity.

Table 1: The main uncertainty mechanisms our regulator currently proposes