

Balancing capacity market concerns:

Setting the record straight on fuel

**Putting a spotlight on the utilities sector
and the new energy reality**

Brian Worrall, Corporate Affairs Director, Certas Energy



Your **fuel** partner

Foreword

Just prior to this report going to press the UK made the democratic decision to leave the European Union. The upshots of this remain to be seen in the weeks, months and even years ahead but as we grapple with the reality of unravelling decades of EU direction the issues that are shaping the emerging energy ecosystem remain unchanged.

The aim of this report is to bring a balanced argument to the fore by dealing with only the fuel facts surrounding the participation of large energy users in STOR and related capacity market schemes. In the interests of staying true to this premise, we can only deal with what we know at this moment in time. And what we know is that the Government has just announced the 5th Carbon Budget (2028-32) and the UK has long been at the forefront of much of the legislation surrounding air emission standards.

Given that it's not in any political leader's interests to back-track on something that is so fundamental to the health, well-being and living standards of the nation, we can only progress on a positive trajectory and remain as committed as ever to finding new ways to combat air quality concerns while maintaining security of supply.

In the face of coal-fired plant closures and a growing need for virtual networks to 'plug the gap' between supply and demand, together we must find the balance between an over-reliance on traditional fuels and a currently unattainable vision of a sole-reliance on renewable sources. Here we acknowledge only part of the problem but, in setting out the current energy reality and exploring the latest generation fuel compositions with the capability to tackle at least some of these issues, we hope to support utilities organisations in keeping momentum in light of 'vote leave'.



Brian Worrall,
Corporate Affairs Director, Certas Energy

Executive summary

■ ■ Our aim by 2020 is to provide access to 50MW of demand side response for National Grid – enough to displace a peaking power station. I think that is a very tangible ambition and it shows there's real potential for industry to help build a sustainable future UK energy market. ■ ■

United Utilities, Energy Manager, Andy Pennick (speaking to Power Responsive)

As potential brokers, facilitators and participators in demand side response (DSR) schemes, the utilities sector is in a unique position of strength when it comes to leveraging the opportunities this new energy balancing model delivers.

For forward-thinking organisations, already offsetting rising operational costs, while making in-roads to address the ongoing energy crisis, it's a clear win-win. But for the non-expert energy buyer it can be hard to justify – let alone actively encourage – the ongoing use of fossil fuels for our future energy requirements.

The National Grid needs diesel generators to manage the critical balance between supply and demand. FACT.

This report sets out to support the utilities market by exploring capacity market concerns and setting out the full facts, particularly from a fuel specification standpoint. Aligning the technical and commercial considerations, the author draws on tangible evidence and published sector insights to understand the perceived obstacles and opportunities from an expert and non-expert view. In doing so, sponsor, Certas Energy, hopes to challenge uninformed and unrealistic views on the current energy situation – putting a spotlight on the positive contribution 'power responsive' pioneers are making to one of the current day's most pressing issues.

Importantly, the report outlines recommended strategies to help counteract some of the concerns that have limited STOR's uptake. These include the suggestion that fuel type should indeed be part of the assessment criteria when tendering to participate in the capacity market.

Introduction

Readers will be familiar with the capacity market referred to as a catch-all for a variety of initiatives aimed at addressing the single most important issue in the energy market today: continued security of supply.

The simple fact is that without encouraging more large-scale energy users to take a more intelligent, flexible approach to meeting their own - and indeed the nation's - growing power demands we already face a very worrying scenario that could soon reach tipping point in the form of frequent power outages.

Utilities businesses understand the ongoing challenges of trying to manage the careful balance between supply and demand and all the technical, legal and regulatory complexities that come into play in trying to do so. Energy managers, procurement professionals and other director level decision makers are driving new ways to tackle what has been dubbed “the energy trilemma” (security, affordability and sustainability) day-in; day-out.

The challenges experts in the energy field face – and particularly from a provider perspective – are the barriers to participation that have held industrial end-users back from being a part of the balancing market. It’s largely a perception problem and one that’s been exaggerated by an uninformed, unrealistic view of the viability of renewable sources to solve the problem – they can’t; at least not alone and not yet.

This report, however, does not set out to educate end-users on the pros and cons of a continuing reliance (to some degree) on fossil fuels. **Its aim, rather, is to support utilities in taking a more balanced argument to market by presenting**

the fuel facts that are ultimately the key drivers in determining short to medium term strategies to ensure security of supply.

It also concentrates on initiatives demanding fast response back-up supply (sometimes within a 30-second window). There is a wealth of information already in the public domain regarding the various systems that comprise the capacity market (Power Responsive’s ‘Guide to profiting from demand side response’ and Open Energi’s ‘Demand response services for the water industry’ reports are both useful background reading) but the themes presented here lie squarely with the debate on the role of diesel generators in the current energy reality. This is because it is where the author’s expertise can add the most value but also where there remain notable opportunities across the utilities market.

You may be a water company with a bank of generators at your disposal looking to maximise under-used assets. You could be operating in the capacity market and you’re concerned about the potential repercussions of ongoing consultation regarding medium combustion plant (MCP) stacks. You may even be representing an electricity and/or gas provider and looking to support your large energy users in being a part of the balancing market. Whatever your agenda the issue is clear: getting internal and external stakeholders to buy-into the benefits of DSR when there is so much rhetoric relaying the downsides (especially in respect of diesel) is a communications challenge. And finding alternative, renewable sources with the same performance profile as diesel is a clear technical challenge.

Here we aim to address both dilemmas by delivering the fuel facts utilities need to affirm their position on DSR and determining the next generation of renewable fuels that could help shape our energy future.

Addressing the backlash: Why diesel is not so dirty

Diesel is without doubt a dirty word. So the backlash surrounding the use of diesel generators to resolve, in part, the ongoing capacity crisis is hardly surprising.

But the truth is that, as coal-fired power stations close and renewable energy sources remain unreliable as a failsafe alternative, there has to be a medium to long-term stop-gap that satisfies security of supply and sustainability concerns. And, the really uncomfortable truth is, that there is no utopian solution that completely satisfies either criteria.

By creating a network of virtual power stations we can achieve a cleaner, scalable, cost-effective and reliable infrastructure that is considerably 'less bad' than the current set-up. But still the backlash surrounding STOR and similar initiatives presents utilities companies with a corporate social responsibility dilemma. After all, to the bystander, using diesel generators to fill the energy void does seem extraordinary under increasing environmental pressure.

And besides the moral dilemma there are ambitious carbon reduction targets to be met (80% below 1990 levels by 2050). As it stands, the UK will not comply with the legal limits for air quality until 2025 and in London not until after 2030. So, while we maintain that diesel and non-renewables have to be a part of our energy mix, at least for the foreseeable, it is not enough to accept that to be the case without exploring other, cleaner burning fuel compositions.

The problem with diesel is the particulate matter (PM) and nitrogen oxide (NOx) that is emitted. Organisations, such as DEFRA, are concerned that energy market incentives are driving substantial increases in the number and the operating hours of diesel generators and the impact this will inevitably have on local air quality. Particularly because diesel generators produce NOx in high concentrations that can be carried down-wind, especially in the winter months when the generators will undoubtedly be most active.

What's more, off-road diesel engines tend to be old and with no after treatment in their exhaust systems, the exhaust emissions from generator equipment tend to be higher than diesel vehicles. It is especially concerning as these banks of generators are likely to be situated in urban and residential areas because this is where the power lines are available – very often on old factory sites.

Given these scenarios, it is reasonable for government bodies to intervene on the grounds of air quality concerns and actually the industry welcomes positive steps towards a more sustainable energy network – that is, after all, in everyone's interests.

The problem at the moment is the lack of evidence on which proposed laws are being based. As is the case with the DEFRA-led consultation regarding medium combustion plants (affecting engines with a rated thermal input of 1MW to 50MW). **Legislation is likely to come into force by January 2019, possibly sooner, that will dictate strict emission rules that most believe to be technically unattainable at present. Not even gas powered generators can get close to the current target.**

In the past, the use of biodiesels have been explored, which has helped to successfully reduce the levels of carbon dioxide but, at the same time, inadvertently, increased NOx readings. Up to now there has never been a drop-in biofuel that could deliver the performance attributes of a diesel and stay true to green credentials.

But advances in research and development have at long last harnessed a new generation of renewable diesels that can redress the balance between technical and environmental parameters. And one that holds exciting possibilities for capacity market companies that have contended with the dirty diesel position and can now counteract many of the damaging claims that have, for so long, dominated the national headlines.

Presenting the fuel facts: Accepting the energy reality

The National Grid needs diesel generators to manage the critical balance between supply and demand. FACT.

Only diesel powered engines can kick-in quick enough to feed into the grid at any given moment. Wind, solar and even gas are too slow to respond and renewable sources are too unpredictable and geographically dispersed to deliver a reliable service. Battery technologies are also under exploration but remain a long way off being market ready.

Diesel is, and will continue to be, an important part of our energy mix. In accepting this we need to ascertain what air emissions should we allow and what is acceptable and sustainable? By recommending realistic targets, informed by industry and the necessary modelling data, we can work together on lessening the impact and leveraging the opportunities that the capacity market presents.

A dual fuel approach has been taken by some in the interests of damage limitation. Diesel is used to start-up then the user will switch to another fuel type, typically gas, when the machine is up and running. There are concerns, however, that the methane produced from the gas is just as problematic as diesel emissions, with some policy makers calling for an outright ban on dual fuel technologies based on this argument.

So where do we go from here?
We start by accepting the energy reality. By embracing the capacity market as a positive step towards a more sustainable future – even when diesel is part of the equation.

The 'Power Responsive' movement is all about reducing the reliance on traditional power stations. Now that there are more renewable energy sources available and advances in technology to allow smart grid networks, we need to embrace the challenges and opportunities that come with progress.

DSR must grow if it is to make the positive impact intended. At the moment there are relatively low levels of participation, so part of the job is to understand what the barriers are, when the potential to earn revenue that offsets rising costs and contributes to a reduction in carbon footprint should be an attractive proposition to all pockets of industry.

Undoubtedly, part of the problem is the 'dirty diesel' dilemma.

But diesels with cleaner burning compositions are available. So why is fuel type not currently a consideration in, for example, the STOR assessment criteria?

If introducing more stringent parameters aids progress, then surely it's worth putting those additional hurdles in place. **Because wider adoption ultimately means ambitious carbon reduction targets being met and additional revenue being generated that can be re-invested in an improved, more efficient, more sustainable, energy infrastructure that's fit for future purpose.**

Moving forwards: Fuels of the future

Paraffinic renewable diesels and innovative fuel additives are particularly interesting for the capacity market.

Traditionally, biofuels were produced by the esterification process. These compositions achieved impressive greenhouse gas savings but resulted in more NOx emissions. They were also shown to be significantly less productive than diesel. Furthermore, problems were incurred because of the impurities in the product causing filter and fuel injection issues and, with a very low storage life, this first generation of biodiesel products were met with scepticism and saw little uptake (at least at 100% concentration).

Now, researchers and developers have defined a new generation of renewable diesels through a process of hydrotreating and isomerization.

This growing portfolio of paraffinic fuels have the potential to play an important part in addressing the UK's ongoing air quality problem with proven environmental benefits over earlier biodiesels. Premium solutions are made from raw materials including palm oil, waste from the food industry and rapeseed oil and blended with a performance additive to achieve unprecedented efficiency and allow for compelling sustainability claims.

Independent tests¹ have shown paraffinic fuels capable of achieving greenhouse gas savings of up to



reducing NOx emissions by up to



and reducing particulate matter by as much as



¹ Tests conducted at Leeds University's Energy Research Institute to evaluate the effect of a cerium dioxide based fuel additive package on exhaust emissions and fuel consumption for biodiesel (UCOME) and HVO (a paraffinic-based fuel). Exhaust emissions including gaseous and PM (Particulate Matter) were measured from a JCB G175QX diesel generator for five different fuels using a PEMS (Portable Emission Measurement System). The results were published in March 2015.

Moving forwards: Fuels of the future

Gas-to-liquid (GTL) formulations, based on the same chemistry, can achieve similar performance levels and deliver a strong value proposition. Though currently only used for on-road applications, there may be an opportunity for end-users to mix the two compositions in the interests of balancing environmental and budget concerns.

Whether leveraging the features and benefits of these stand-alone products or opting for a 'blend' of the two, paraffinic-based, drop-in solutions and/or certain performance additives offer exciting scope for researchers and developers in search of the fuel formulations of the future.

Indeed, as the industry finds new ways to perfect the careful balance between performance and pollutant concerns, companies like Certas Energy, are keeping an excited, watchful eye on forward-thinking strategic partners that can offer a genuine compromise between being cost-effective and addressing the all-important air quality issues that have marred the capacity market up to now.

But at what cost? Environmental savings are, of course, a welcome development but businesses want to know how they can offset investment in the next generation of problem-solving products.

Backed-by science, a growing body of independent data and widespread manufacturer acceptance it seems platforms based on paraffinic fuel technologies and multi-functional high performance fuel additives have a huge amount of potential as commercially viable, environmentally beneficial solutions to at least better the present day situation.



Commercial considerations: Recouping the costs of participation

Electricity can't be stored economically. That's why the capacity market has become so critical to managing the peaks and troughs.

Certainly, the business case for the balancing model is a strong one. But for organisations starting to explore the benefits, it can be difficult to get a full commercial picture because the upshots are highly dependent on all sorts of parameters and vary from project to project.

Stakeholders will want to ascertain whether it is financially worth participating in such schemes? What does the organisation stand to gain? What are the operational risks? Getting wider decision makers to understand the technical challenge in obtaining this evidence is a challenge in itself.

Prior to engaging with National Grid or a third party intermediary, companies need to be armed with data that tells them the capacity and availability in practice of any on-site generating plant. Businesses that are already on half hourly metering (HH) can get a good indication of their load profile. As well as allowing them to take stock of their overall load shape it will put them in a stronger position for negotiating their terms. What will also come into play is how technically challenging the system is that you're looking to participate in - firm frequency response (FFR), for example, is very technically challenging (demanding a 30 second response time) but it is one of the better revenue earners.

Consider also whether you tender for a committed or flexible contract. The former is the most lucrative but it means you need to make your capacity available for all windows.

Suffice to say, whichever route you go down, guaranteed revenue - for at least a two-year period - and the more attractive pricing structure applied to capacity market schemes in recent times can make initiatives that fall under the DSR banner a good earner and a plus point from

a reputational point of view too – especially if you specify fuel types that allow you to make a stronger environmental claim.

Despite National Grid's reluctance to make fuel type an eligibility factor, it should be a key consideration for companies on the verge, or indeed already participating in, the capacity market.

Electing to run your generators off a renewable diesel is not cost prohibitive and can pay off dividends from a CSR stance.

Government subsidies to encourage the use of renewables are making in-roads to encourage wider adoption as new technologies come to the fore. Renewable Obligation Certificates (ROCs) can be claimed by operators of static generators being used for the capacity market, if they burn renewable fuels. These are bought by the electricity distribution companies to cancel their carbon tax obligation. Sites have until March 2017 to register for the scheme, at which point it will be replaced with Contract for Difference (CFD) – an initiative that has been running in parallel since 2014.

Suddenly, significant greenhouse gas savings coupled with incentives to encourage investment in new innovations that can counteract air quality issues, allow socially responsible organisations to take a confident capacity market position. For, backed by initiatives like the ROCs scheme, the moral dilemma becomes less of a burden and the figures start to add up to a viable approach that adds value in more ways than one.

Conclusion

Compromise is the only way forward as we get to grips with the demand-side revolution.

There is no doubt that incentivising the use of thousands of diesel powered generators is a strange juxtaposition for a society turning its back on non-renewables. But with security of supply the number one priority the energy market has an immediate and ongoing need for this virtual network. It is the only way to meet the technical challenges of delivering additional capacity – and fast.

But a new generation of paraffinic renewable diesels and/or the development of multi-functional high performance additives are paving the way for a set of more environmentally sound solutions: innovative systems that can lessen the impact to Ambient Air Quality and deliver the performance required for a reliable and timely response.

Fuel suppliers and their strategic partners have a role to play alongside the capacity market to educate decision makers on the important benefits of cleaner burning fuel compositions.

By doing so we stand to compromise less and deliver more on the promise of cleaner air and an energy secure future.

About this report

This report intends to introduce the reader to the fuel considerations that could help support a business case for participating in the capacity market. Very often energy managers, sustainability directors and other professionals seeking to lead the organisation and convince wider stakeholders of a more cost-effective, more sustainable approach to energy management are faced with opposition based on an incomplete view of the current power situation.

At Certas Energy we are exploring a number of routes that show potential to counteract some of the concerns regarding capacity market incentives leading to an over-reliance on polluting non-renewables. Such solutions include paraffinic-based fuels and gas-to-liquid formulas. Advancements in the development of performance additives are also of particular interest.

Working with carefully selected strategic partners to strengthen our position as a supplier to end-users exploring, or already engaging with the capacity market, we're confident in our ability to support customers operating in even the most environmentally sensitive markets.

For further information on how Certas Energy can support utilities organisations in leveraging capacity market opportunities through responsible fuel choices, consult

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