



cleanearth

THE ENERGY TO DELIVER

**ENERGY REPORT
2016**

THE FUTURE IS STILL BRIGHT FOR SOLAR PV

AND THE RENEWABLE INDUSTRY

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FOREWORD

Despite an ever changing landscape creating market uncertainty, the sector has great cause for optimism. We're on the crest of a wave, fuelled by a groundswell of global confidence in renewable technologies, falling costs and a heightened desire to protect the future of this planet.

We stand on the edge of a new frontier for the renewable industry. What's most interesting is that future market evolution is no longer led by Government policy, but by progressive businesses who recognise a corporate social responsibility. This isn't just a new, hollow buzzword; we're seeing real, hard evidence that combatting climate change is a chief driver for businesses, irrespective of the financial benefits.

It isn't just global corporations; we can see that small and medium sized businesses here in the UK are firmly behind renewables. However, in light of the recent cuts to subsidies, we need to ensure that investment is not solely an option for larger companies, where only the rich can benefit from renewable investment.

This country has made ambitious pledges committing to decarbonisation, however there's a growing concern that

policy does not reflect this. If we are to achieve these targets then more should be done to support smaller companies because at this moment in time it is businesses who are driving the low carbon agenda and shaping how we power our world.

We commissioned this report, in part, to dispel some of the myths that currently cloud the market. It is true that this is an uncertain time for solar PV and renewables, having lost the safety net that subsidies provided, which has consequently made the environment far less predictable. However, the

scaremongering has stopped some of us from seeing the myriad of opportunities still apparent in the sector.

Solar PV is an established industry, with an established support structure. Wind turbines will thrive in high consumer, industrial locations. These technologies must be combined with storage solutions to develop products that meet a market need under the new conditions. This sector has found itself in uncharted territory before and recovered, and will do so again through the ingenuity and tenacity of UK businesses.



IT IS BUSINESSES THAT
ARE DRIVING THE LOW
CARBON AGENDA AND
SHAPING HOW WE
POWER OUR WORLD.

DEAN ROBSON **MANAGING DIRECTOR**



CLEANEARTH ENERGY 2016 REPORT EXECUTIVE SUMMARY

IN FEBRUARY 2016, SOLAR PV REACHED A CUMULATIVE INSTALL CAPACITY OF OVER 10GW; A LANDMARK ACHIEVEMENT, AND AN EXTRAORDINARY ONE GIVEN THAT THE SECTOR EMERGED FROM JUST 100MW IN 2010. RENEWABLE ENERGY NOW ACCOUNTS FOR 22.3% OF THE UK'S TOTAL ELECTRICITY CONSUMPTION, AND IN THE SECOND QUARTER OF 2016 OUTSTRIPPED COAL AS A SOURCE OF ELECTRICITY FOR THE FIRST TIME (DECC, 2016).

It would be fair to assume that this historic turning point would lead to a spike in new developments and a flourishing market, however since the Government made drastic cuts to its support for clean energy in a review at the end of 2015, market uncertainty is now rife and investor confidence has been severely impacted.

Whilst Government officials and global corporations have commented on the changes, smaller businesses in the UK have so far been under-represented in the debate. In light of these factors,

this report was commissioned to remove some of the confusion that surrounds the market, review the financial viability of investment in solar PV and assess the confidence of UK SMEs in both renewable technology itself, and the direction of Government policy.

In 2010, Feed in Tariffs (FIT) were established, later funded by the Levy Control Framework (LCF), which itself was introduced in 2011 and set a trajectory of annual budgets for renewable policies through to 2020. The FIT proved to be very popular and caused the government to

88% 0

of SME owners believe businesses should be environmentally responsible

immediately scale back on support, something that has been continued through to today. The most recent review, which came into play in Q1 2016, carried the biggest changes, cutting tariffs by a further 60% whilst introducing degression and deployment caps.

Despite this, there remains overwhelming support for green initiatives amongst UK small and medium-sized enterprises (SMEs). When polled, an overall majority (88%) of business owners or directors agreed that businesses ought to be environmentally responsible. However, just 33% of businesses believed that the renewable policies aimed at them supported a commitment to combatting climate change, and because of this over half (51%) had not been able to take action to adopt renewable energy. A picture begins to emerge of a market that has a desire, or at the very least a sense of obligation, to invest in renewable technology, but in many cases is unable to do so.

Given these findings, we can see evidence of the immense support for renewable technology. It is therefore concerning that the Government continues to invest heavily in onshore and offshore gas and oil production, which suggests an apparent disconnect between those in power and the businesses and people they represent. Meanwhile,

the Paris Agreement and the RE100 group continue to influence the landscape and move us closer towards a more progressive approach to environmental and corporate social responsibility.

Advances continue to be made in storage technology, and the sector could see yet another spike when the cost of this technology makes it widely accessible, negotiating the problem of having surplus energy when the import price continues to fall. Community-led projects also offer new opportunities, with many experiencing great success already, as other localities seek to take their energy supply into their own hands.

The market is there. Support for climate change has never been greater, but more must be done to support smaller businesses investing in renewables. What we are seeing now is a green agenda that is driven by private enterprise, more so than Government. The sector must come together to harness the demand and to take full advantage of the opportunities that have emerged, and ensure that renewable energy remains as accessible as possible for continued investment throughout the country. In doing so, renewables will thrive in spite of the knee-jerk, uncoordinated and political short-termism adopted by the government.

Renewable energy accounts for

22.3%

of the UK's electricity consumption

CLEANEARTH ENERGY 2016 REPORT HOW WE GOT HERE

THE UK RENEWABLE ELECTRICITY MARKET

THE UK RENEWABLE ELECTRICITY MARKET WAS ESTABLISHED IN 2007, FOLLOWING AN EU AGREEMENT TO GENERATE 15% OF ITS ENERGY CONSUMPTION FROM RENEWABLE SOURCES BY 2020, COMPARED WITH JUST 1.5% IN 2005.

THE RENEWABLE ENERGY DIRECTIVE (2009) SET OUT HOW THE UK WOULD ACHIEVE THE TARGET WITH AROUND 30% OF ELECTRICITY DEMAND, 12% OF HEAT DEMAND AND 10% OF TRANSPORT DEMAND COMING FROM RENEWABLE SOURCES BY 2020.

A RANGE OF NEW POLICIES AND MEASURES WERE DEVELOPED TO PROMOTE THE USE OF ENERGY FROM RENEWABLE SOURCES WITH THE PRIMARY FINANCIAL INCENTIVES FOR RENEWABLE ELECTRICITY GENERATION BEING THE RENEWABLE OBLIGATION (RO) AND FEED IN TARIFF (FIT) SCHEMES.

The Renewable Obligation was introduced in 2002 as the main support mechanism for large-scale renewable electricity projects (>5MWp). Originally the same level of support was offered to all renewable technologies, however this had the effect of encouraging growth only in the most developed, cheaper, forms of generation such as onshore wind. Because of this, the RO was updated in 2009 to provide more targeted levels of support to different renewables in a bid to promote generation from a wider selection of technologies.

In 2010 the Feed in Tariff was established to support small-scale renewable electricity projects (<5MWp). The scheme was an instant success and prompted the installation of over 220,000 systems in the first 2 years alone.

Subsidies for low carbon electricity generation (including both the RO and FIT) are financed by additions to consumer bills. These are controlled by the Department of Energy and Climate Change (DECC) through the Levy Control Framework (LCF), which was established in 2011 and set an annual limit on expenditure – arriving at a total figure of £7.9 billion by 2020.

Initially neither the RO nor the FIT included an effective means of controlling expenditure; if the cap is exceeded then the next year's budget is absorbed and so on. Less than a year into the FIT the new coalition Government announced that support for solar PV installations >50kWp would be cut by over 50%. Later the same year a second review of the scheme announced that rates for installations <50kWp would be reduced by a similar amount.

This stop-start approach has characterised renewable energy policy to date, and is also a significant contributing factor towards the forecast overspend of the Low Carbon Budget and subsequent scaling back of support for renewable energy from 2014, starting with the scrapping of the RO for >5MWp solar farms.

The UK is aiming to generate

15%

of its energy consumption from
renewable sources by 2020



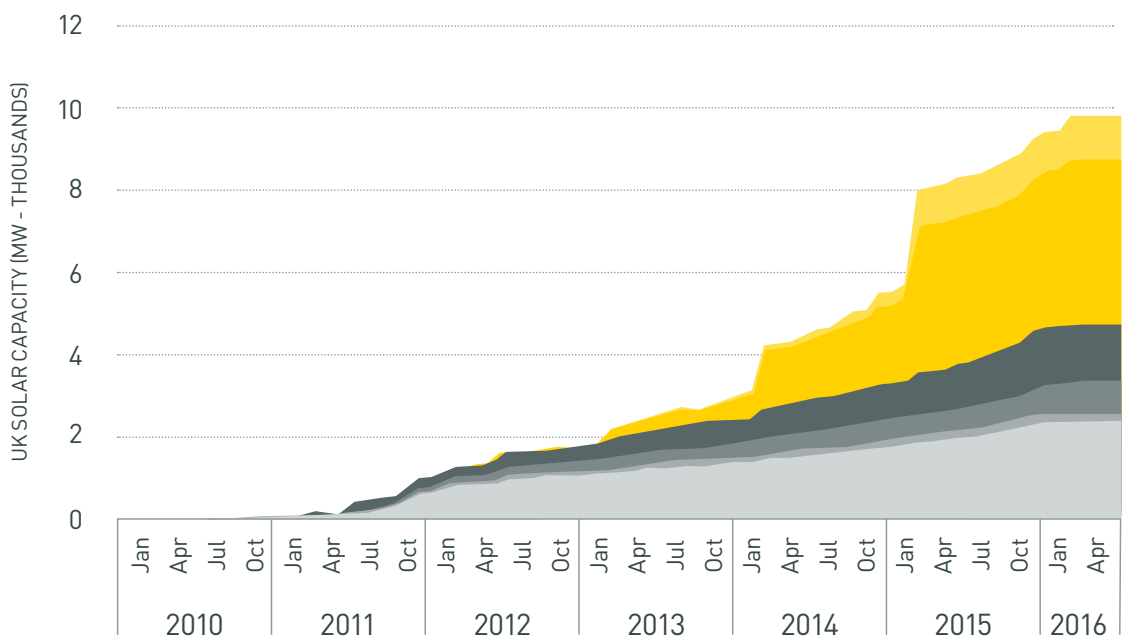
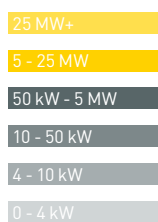
220k

small-scale renewable systems installed in the first 2 years

SOLAR PV

The cumulative deployment rate of solar in the UK has been exponential, unofficially culminating in just over 10GWp earlier this year.

UK SOLAR DEPLOYMENT BY CAPACITY



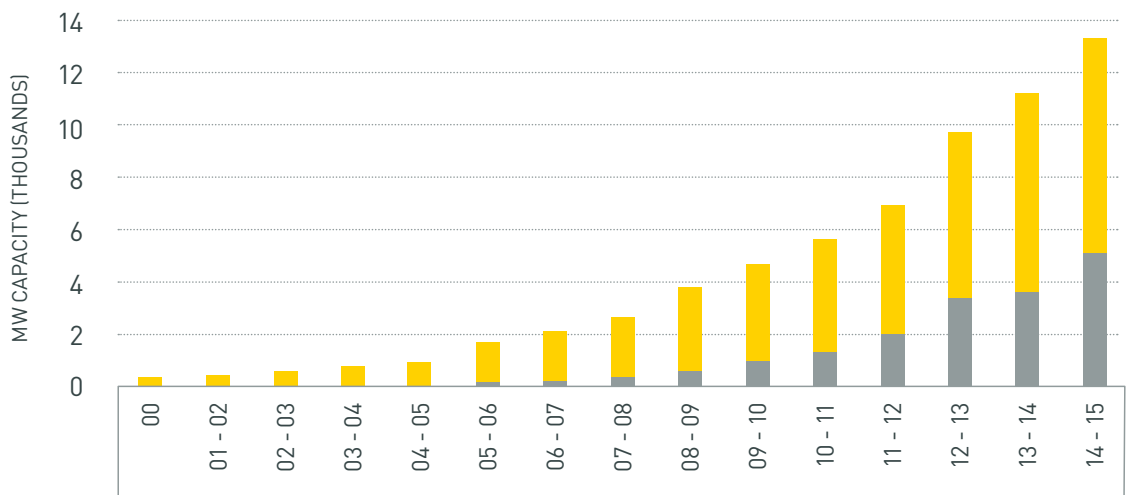


WIND POWER

Simultaneously the UK has also seen a steady increase in onshore and offshore wind capacity which, while significantly more expensive to develop, offers

significant advantages in both the size of wind turbine and generating capacity that can be installed within a single development.

UK OPERATING CAPACITY 2000 - 2015



CLEANEARTH ENERGY 2016 REPORT A STATE OF CHANGE

AT THE END OF 2015 THE UK'S RENEWABLE ELECTRICITY CAPACITY TOTALLED 30GWp, CONTRIBUTING 22.3% OF THE UK'S OVERALL ELECTRICITY CONSUMPTION (DECC, 2016) – A STAGGERING SUCCESS STORY. NONETHELESS, THE MOST RECENT PROGRESS REPORT TOWARDS THE UK'S OVERALL GOAL OF GENERATING 15% OF ENERGY DEMAND (WHICH INCLUDES HEAT AND TRANSPORT AS WELL AS ELECTRICITY) FROM RENEWABLE RESOURCES BY 2020 REVEALED THAT THE UK WAS STILL SOME DISTANCE FROM ITS TARGET AND TRAILING OTHER EU MEMBER STATES, HAVING ONLY SUPPLIED 7% OF UK ENERGY DEMAND IN 2014 (DECC, 2016).

In spite of this, not long after the May general election the UK Government continued to scale back support for renewable energy, citing forecast of cost overruns and the need to keep down household electricity bills.

Having already announced the closure of the RO to new solar generating capacity >5MWp in 2014, the scheme was promptly closed to both solar and onshore wind altogether. At the same time the FIT was cut by up to 68% across all technologies and new deployment caps were introduced, designed to severely curtail deployment to ensure that it fell within the remaining LCF budget.

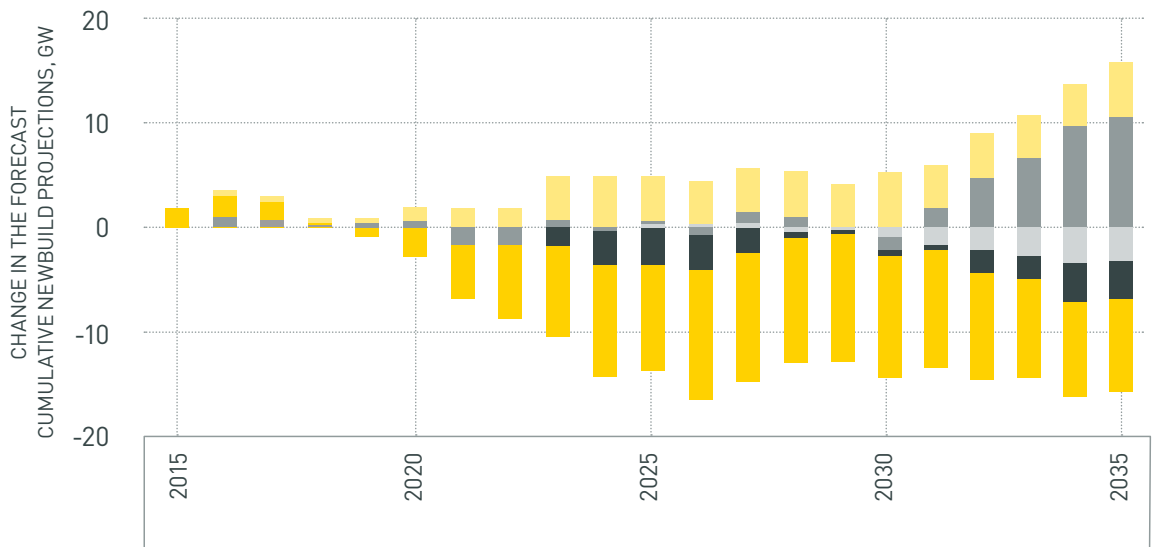
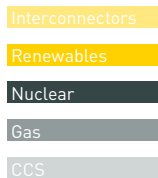
Questions remain over the legitimacy of the changes (the calculations were never made public), however the Government's intentions were made clear when official statistics showed that the DECC had slashed its forecast for renewable power by more than a third over the next decade, instead favouring gas fired generation and an increased reliance on electrical interconnectors (physical links that transfer electricity across borders).





RENEWABLE ENERGY IN THE UK HAS BEEN A STAGGERING SUCCESS

HOW NEWBUILD PROJECTIONS HAVE CHANGED (2015 VS 2014)



Change in forecast cumulative newbuild capacity projections, in gigawatts, between 2015 and 2014. Negative numbers show this year's forecast is lower than last year.

CLEANEARTH ENERGY 2016 REPORT THE MARKET TODAY

BOTH SOLAR AND WIND POWER IN THE UK ARE NOW AT A CROSSROADS. HAVING EITHER REMOVED OR SIGNIFICANTLY SCALED BACK THE LEVEL OF SUBSIDY ON OFFER THE MARKET HAS EXPECTEDLY TAKEN A DOWNTURN.

Provisions within the closure of the RO have enabled large-scale solar farms of greater than 5MWp and less than 5MWp to deploy until 2015/16 and 2016/17 respectively, however beyond this point large-scale solar will have no choice other than to compete without subsidy altogether.

Meanwhile solar and wind deployment under the FIT has been significantly curtailed such that at the end of Q1 2016 the market was operating at approximately 15% when compared with the same period the previous year.

NOW IS THE MOMENT OF TRUTH FOR RENEWABLES





CLEANEARTH ENERGY 2016 REPORT THE CHANGING TIDE

EMERGING TRENDS AND DEVELOPMENTS

CHANGING CONSUMER AND CORPORATE OPINION

THE PARIS AGREEMENT AND CORPORATE SOCIAL RESPONSIBILITY

IN LIGHT OF THE PARIS
AGREEMENT IN DECEMBER 2015,
THE CONSUMER OPINION ON
RESPONSIBILITY TO THE
ENVIRONMENT AND CLIMATE
CHANGE COULD BE CHANGING,
MAKING THE WIDER MARKET MORE
AWARE OF THE ACTIONS THEY
CAN TAKE TO PLAY THEIR PART.

The Agreement has committed 195 countries to report progress to a UN body on cutting carbon emissions every 5 years, starting in 2023. The aim is to limit global warming by below 2°C, or to 1.5°C if possible. This is a staggering position, especially since it was not long ago that the notion of climate change was denied.

Paris was a huge breakthrough for the global battle against climate change; never before have so many countries signed up to a single agreement. Not only did the scope of the agreement make it revolutionary, but also the way it captured media attention and influenced businesses as well as whole countries.

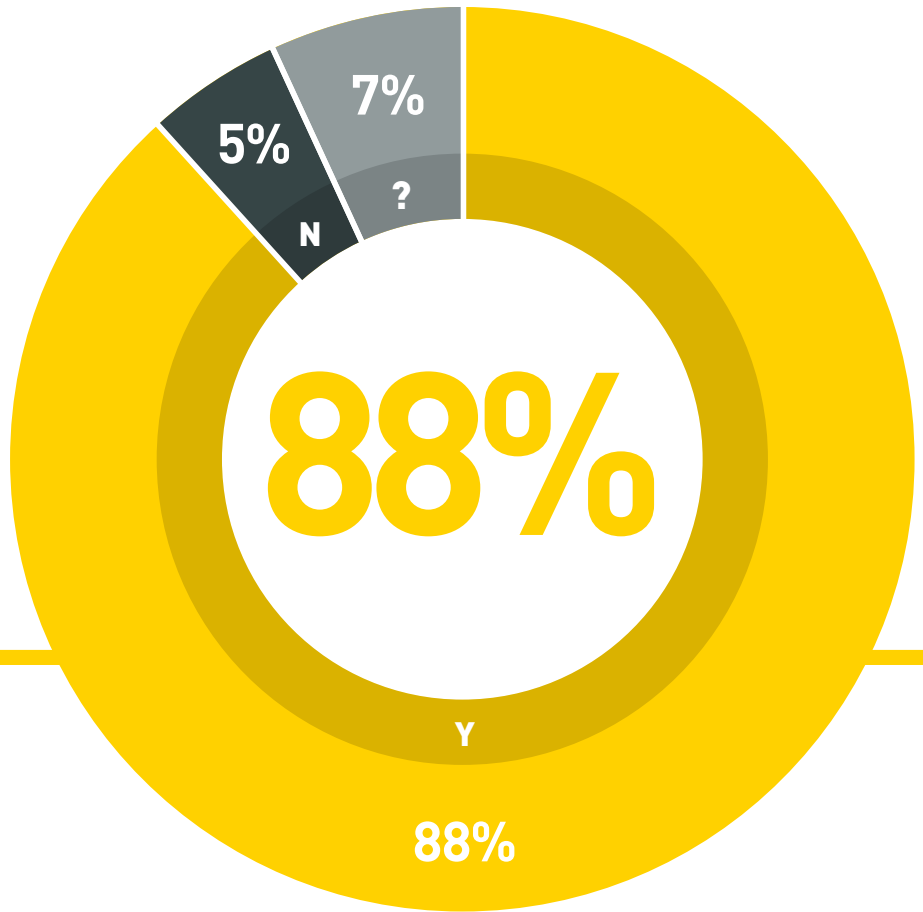
Even before Paris, Climate Week NYC 2014 saw the launch of the RE100 group, which brought together large corporations from around the globe and across a range of industries, all pledging to use 100% renewable energy.

The list of businesses committed to the initiative include BMW Group, Google, Coca Cola Enterprises and Nestle. The group has been increasingly influential and vocal, and many more businesses have joined since the Paris Agreement, stating that it gave them the confidence to make such a pledge.

This is an interesting scenario, where businesses are now more aware of their responsibilities to the environment, and importantly have the confidence to take action. This was also a trend that was found in our market research where 88% of the business owners or directors we polled believed that UK businesses should strive to be environmentally responsible.

The reason why respondents felt as though they had a responsibility was equally interesting. 79% believed it was important to combat climate change, which demonstrates a desire to strive towards a central goal post the Paris Agreement.

POLL OF BUSINESS OWNERS OR DIRECTORS
DO YOU BELIEVE THAT UK BUSINESSES SHOULD STRIVE TO BE ENVIRONMENTALLY RESPONSIBLE?

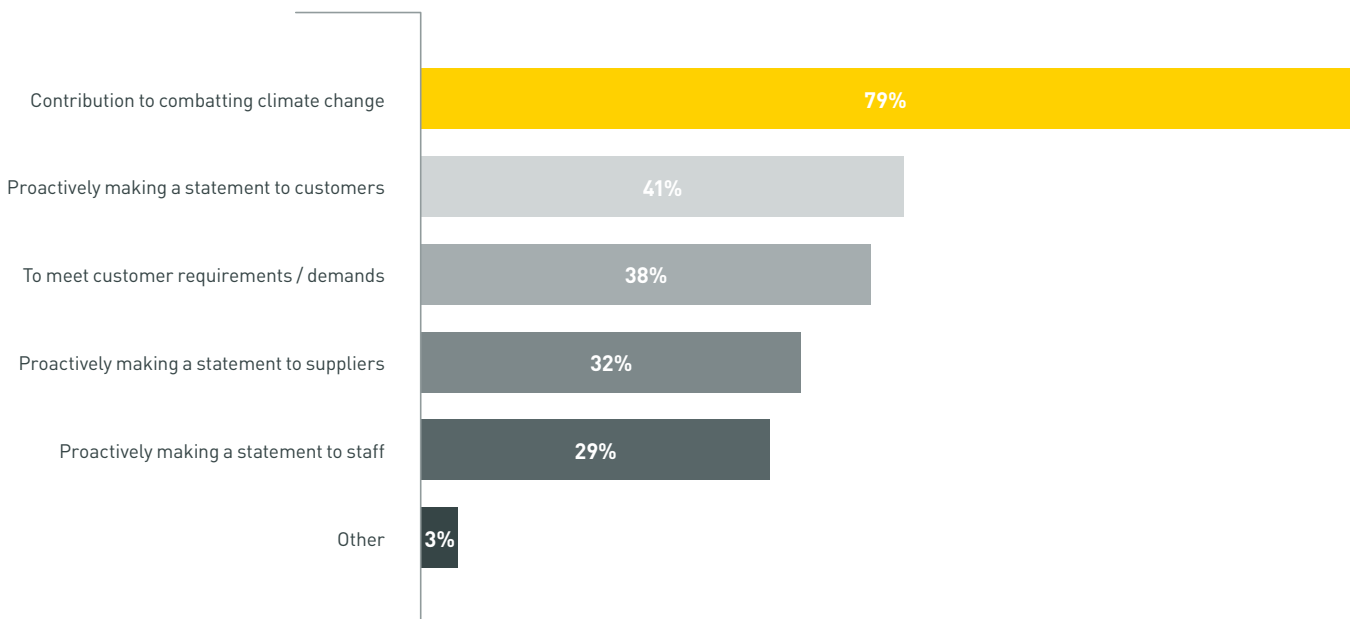


More fascinating still is that the second and third most popular opinions were 'Proactively making a statement to customers' (41%) and 'to meet customer

requirements/demands' (38%). This is evidence that environmental responsibility is also market-driven; as businesses become more responsible,

it makes them more environmentally responsible consumers, resulting in driving the market even further forward with a green conscience.

WHY DO YOU THINK IT IS IMPORTANT TO BE ENVIRONMENTALLY RESPONSIBLE?



GOVERNMENT POLICY DOES NOT MATCH UP WITH PUBLIC ASSERTIONS TO INVEST IN GREEN ENERGY

FOSSIL FUEL DIVESTMENT

WITH HEIGHTENED ATTENTION ON CLIMATE CHANGE AFTER THE PARIS AGREEMENT, IT IS UNDERSTANDABLE THAT THERE IS EVIDENCE OF DIVESTMENT TAKING PLACE IN THE FOSSIL FUEL INDUSTRY.

Last November, Climate Change Secretary Amber Rudd announced that all UK coal power plants will be closed by 2025. This is a considerable pledge to make, especially as coal currently provides around 30% of the UK's electricity. ¹

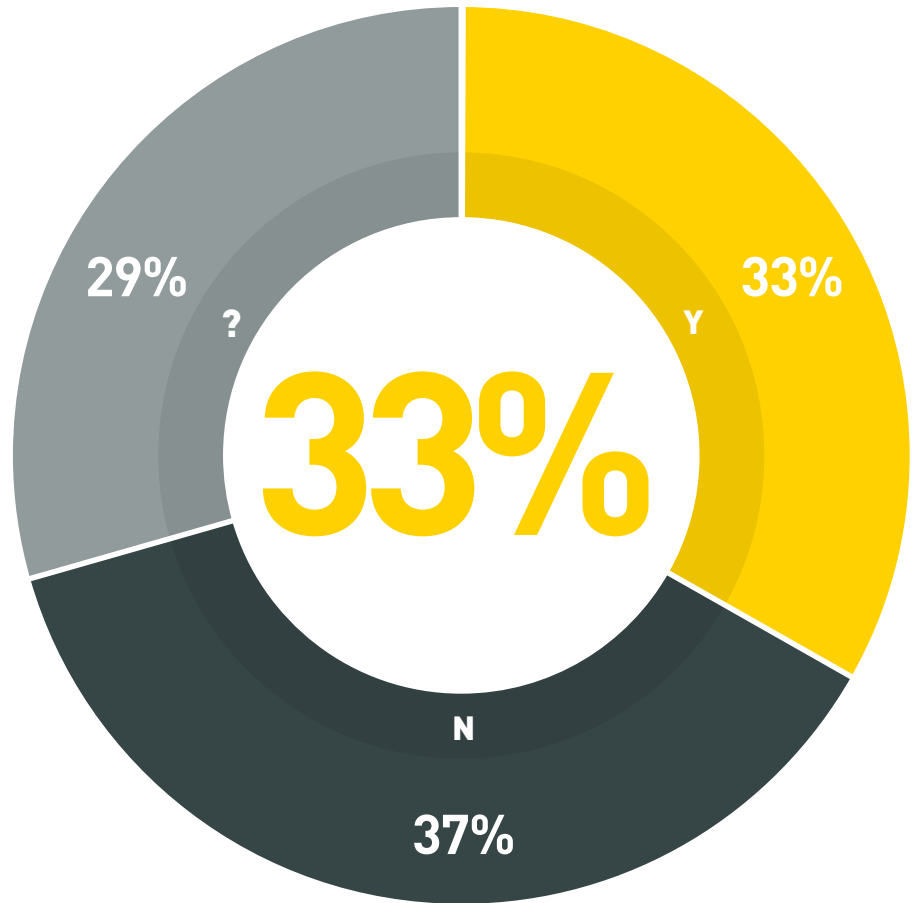
However, investment will be made in gas and nuclear to replace coal rather than renewable alternatives, which has been a major criticism of the current government.

It is not just governments that are taking action to divest in fossil fuels, but private enterprises as well. Go Fossil Free claim that the approximate value of institutions that have committed to fossil fuel divestment is around \$3.4 trillion, with over 500 organisations signed up ². Alongside those committed to the RE100, it's clear that it is corporations who are taking the lead in fossil fuel divestment.

Interestingly, around 60-80% of the oil, gas and coal resource that energy companies list publically as assets are 'unreachable' as they would cause global warming to rise above the 2 degrees threshold ³. This is known as 'stranded assets'. This will require a redistribution and rebalance of funds to prevent this capital being wasted and to protect shareholder interests. For example, this could explain why Shell has recently announced that it is creating a whole new green division to invest in renewable and low carbon power.

Despite national and international commitments by the UK Government to phase-out subsidies for fossil fuels, the country has recently ramped up support for on- and offshore oil and gas production. At the same time support for renewables and energy efficiency measures have been cut. The

POLL OF BUSINESS OWNERS OR DIRECTORS
DO YOU BELIEVE THAT UK GOVERNMENT POLICIES AIMED AT SME BUSINESSES SUPPORT A COMMITMENT TO COMBATTING CLIMATE CHANGE?



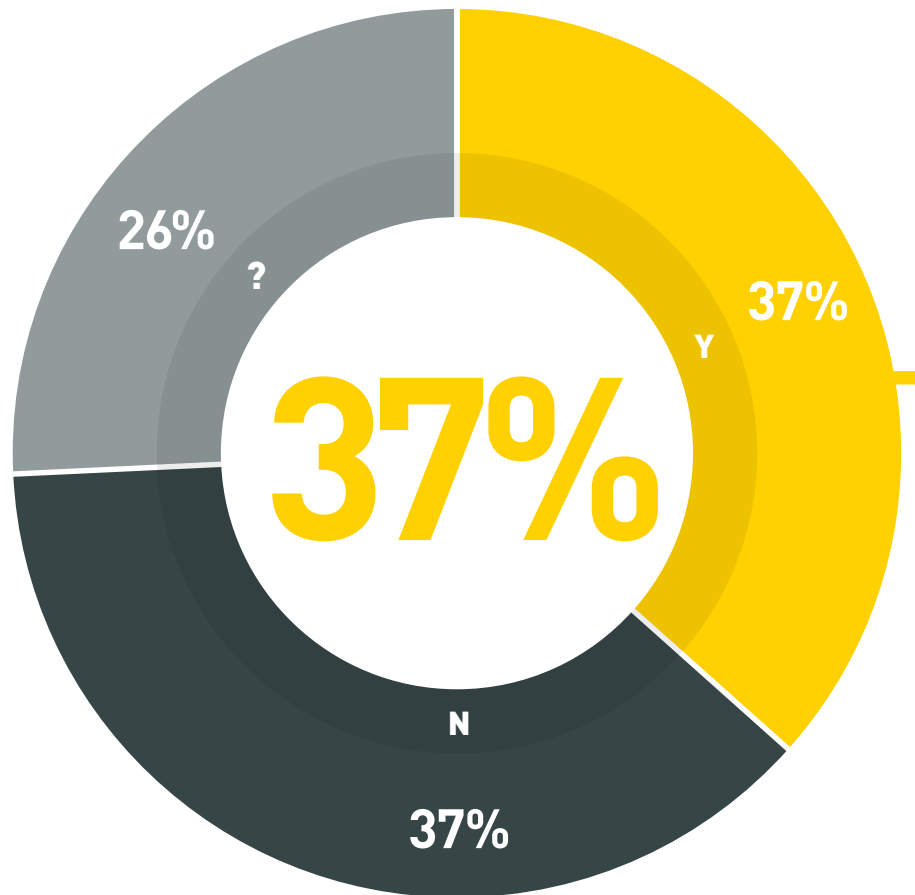
context for these reforms has been poor exploration results in recent years, and the industry reporting falling profits (Offshore Energy Today, 2015). Forecast to cost the UK government \$2.7 billion between 2015 and 2020, 'this package of measures will increase the post-tax profits for affected companies' and drive investment that 'is expected to increase oil production by around 15%' (HM Revenue & Customs, 2015a; HM Government, 2015).

There is therefore a significant inconsistency, whereby on the one hand the Government are announcing that the UK is moving away from coal power, yet on the other hand are increasing their investment in oil and gas production, whilst renewable investment has been all but abandoned.

How does this all line up? The UK Government have signed up to a global agreement to reduce carbon emissions, and yet are still heavily invested in fuel production, while UK businesses feel an obligation to combat climate change. With the corporate confidence at a high after Paris, lack of clarity in terms of strategy and intent could be counterproductive. This has led to a feeling of discontent amongst businesses, with just 33% agreeing that the renewable policies aimed at them supported a commitment to combatting climate change.

It would appear then, that businesses are taking the initiative in combatting climate change and helping to play their part. If the recent actions of the government towards renewables are anything to go by, then frankly it may be best left in the control of businesses after all.

POLL OF BUSINESS OWNERS OR DIRECTORS
DO YOU BELIEVE THAT LEAVING THE EU WILL BE A POSITIVE THING FOR YOUR BUSINESS?



EU REFERENDUM

IN JUNE 2016 THE UK WILL DECIDE WHETHER IT WANTS TO REMAIN PART OF THE EU IN A REFERENDUM, THE RESULT OF WHICH IS BOUND TO HAVE AN IMPACT ON THE FUTURE OF RENEWABLES IN THE UK. TO DATE, THE UK HAS RECEIVED OVER 24% OF THE €7.2 BILLION CLIMATE AWARENESS BONDS PROJECT FROM THE EUROPEAN INVESTMENT BANK, WHICH INVESTS IN PROJECTS SUCH AS WIND FARMS AND GRID UPGRADES. IT'S NOT CERTAIN WHETHER THIS RELATIONSHIP WOULD BE LOST SHOULD THE UK LEAVE THE EU, BUT IT WOULD CERTAINLY PUT IT IN JEOPARDY.

It is also thought that leaving the EU would risk the UK's ability to reach decarbonisation goals; as part of the EU, the UK has agreed to 15% renewables by 2020 and without such a relationship, the motivation to reach this target may falter.

Uncertainty seems to be a theme when it comes to whether the UK should leave the EU or not. On the whole SMEs were undecided on whether leaving the EU would be positive for their business and, as the results show, opinion was evenly divided amongst respondents.

However, when asked whether a withdrawal from the EU would pose a high risk to their business, 38% of larger companies (101-250 employees) agreed.

On the whole, it seems as though there is uncertainty and confusion when it comes to the EU debate. At this moment in time it is unknown what effect either decision will have on renewables and the wider business context.

TRANSITION TO A SUBSIDY FREE INDUSTRY

THE INDUSTRY WILL BE SUBSIDY-FREE IN 2019. ALTHOUGH THIS MAY SEEM DOOM AND GLOOM, WHAT IT DOES MEAN IS THAT THE INDUSTRY WILL STAND ON ITS OWN TWO FEET AND FUNCTION AS A REGULAR MARKET. HERE, WE CONSIDER SOME OF THE DEVELOPMENTS AND CHALLENGES THAT MAY BE ENCOUNTERED AS THE INDUSTRY MAKES THIS TRANSITION.

Prices for a 4KWp system fell by over

60%

between 2010-14

FALLING COSTS

Solar PV costs have been falling since their induction and are yet to stop. A recent study by Oxford University states that solar power costs have fallen by 10% every year and will continue to do so ¹. This kind of trend can be seen from the data created by Green Business Watch (2014), which stated that the cost of a 4KWp system reduced from £20,000 in April 2010 to £7,520 in April 2014 ².

It is predicted that solar PV will be the first renewable energy source to reach grid parity; this is when the cost of the technology falls below the alternative cost of supplying that power (e.g. fossil fuels). This would certainly help the transition into becoming a subsidy-free market, as solar would match the cost of alternative sources, if not be the cheaper option altogether.

However, falling costs are not something that seem to have been communicated to potential clients, with 42% of SMEs stating that they have not invested in solar PV because the upfront costs are too expensive. This may be because of the Minimum Import price. Depending on whether this is a dated opinion based on previous information, or if solar has never been considered properly, not all decision makers are aware that falling costs are making the technology as attractive as it ever has been.

MERIT ORDER EFFECT

The merit order effect is the act of renewables driving down the cost of wholesale electricity prices. The UK, at any point in time, must have enough capacity to meet energy demand, and this demand can fluctuate depending on the time of year and even the time of day. In order to make sure that this demand can be met, more energy must be produced, whether that be from fossil fuels or renewables. Attached to this additional production are added marginal costs; in the case of fossil fuels this tends to be the price of the fuel, but with renewables, this is zero.

To meet demand the grid will call on generators with the lowest marginal costs first, which would be renewables, working its way up the generator list until demand is reached. The cost of this extra energy will be the same as the highest marginal cost used (i.e. the last generator). The more renewables added to this list (with zero marginal costs), the quicker along the list demand is reached, therefore driving down energy prices. Good Energy estimated that in 2014, Merit Order reduced the wholesale cost of electricity by £1.55 billion ³.

As capacity of wind and solar grow, it will drive down energy prices, compounding the reduction in subsidies with lower energy bills, benefiting consumers.

MINIMUM IMPORT PRICES

One thing that has had an impact on the cost of solar and could continue to do so while transitioning into a subsidy-free market is the European Commission (EC) directed Minimum Import Price (MIP), levied on all Chinese imports. Currently Chinese solar modules must be sold for above €0.56/watt in the EU¹ or face a hefty tariff, in order to prevent China from 'dumping' modules on the EU market. Discussions are currently underway in the EC as to whether MIP is something that should be scrapped. Without it, solar panel costs would likely fall by 10-20%, reducing the expensive upfront costs that are currently discouraging SMEs.

MOVING TOWARDS A GEO-CENTRIC INDUSTRY

As the industry moves away from subsidy support, the considerations that take place when judging the viability of a project location will be even more vital because subsidy return will have to be replaced with adequate energy production.

Wind has always been something of a geo-centric industry, with the most efficient turbines being situated near the coast, atop rounded hills or on open plains, with most of the challenges coming from planning, legislation and visibility issues.

Solar is a bit of a different story. It can be generated from most rooftops, but it takes particular conditions to produce adequate returns, particularly, high levels of irradiance. Solar irradiance refers to the amount of power that the sun can produce per unit area, which is affected by the position of the solar cell in relation to the sun. By knowing the irradiance levels of a specific location, it is possible to accurately approximate the amount of energy that can be

produced. The higher the irradiance levels, the more energy can be produced. As a general rule, in the UK irradiance levels get higher the further south you are, with the South West averaging 30% higher than the Shetland Isles.

This means that projects that offer the best returns and savings for a business will be those in the higher irradiance levels, which could result in the development of a more geo-centric industry. This is shown in the following graph, which demonstrates the general rule of thumb that the majority of instalments tend to be concentrated in the south and west.

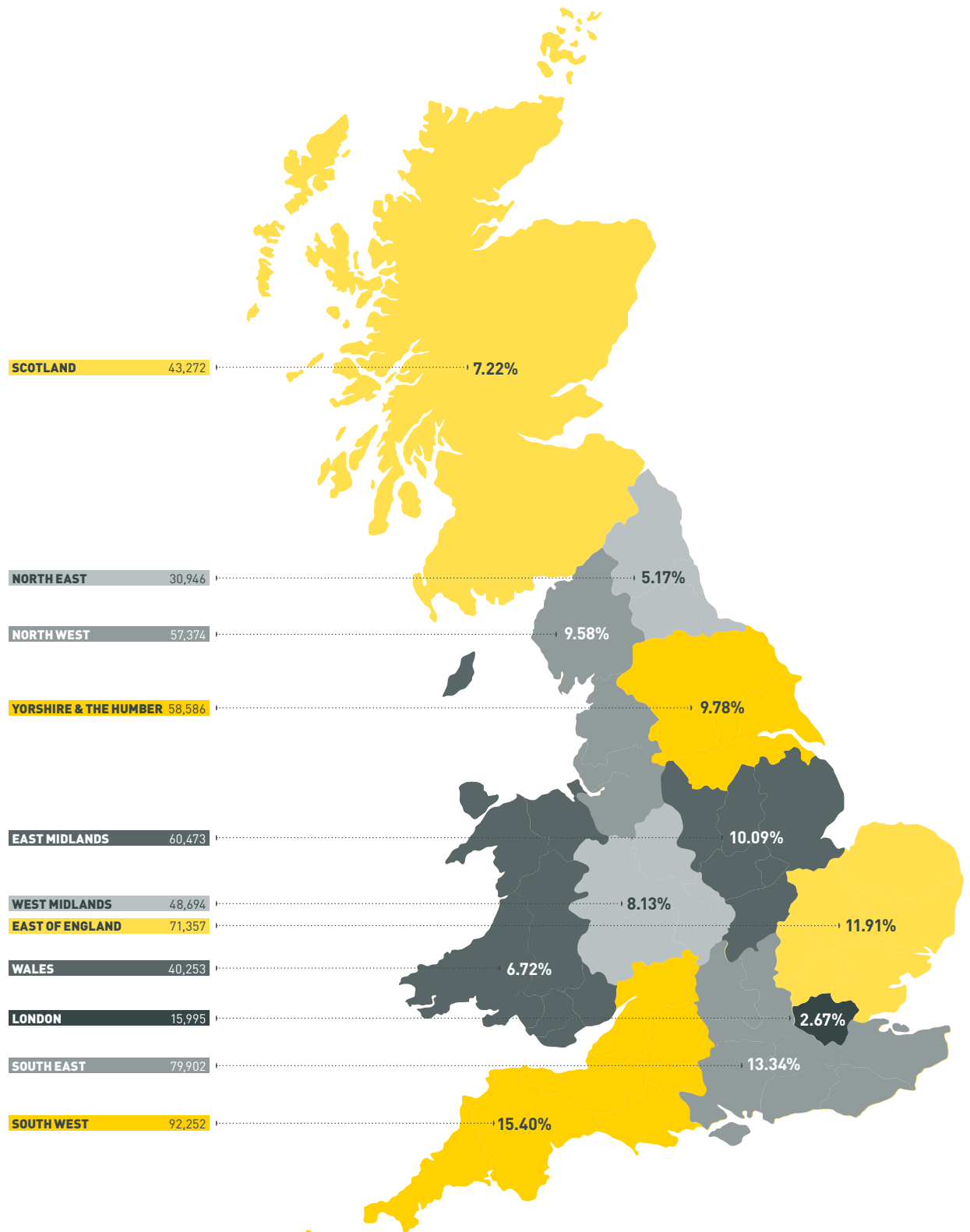
There are also other criteria that will come to the forefront when moving towards becoming subsidy free. First of all, without subsidy support, those that can utilise the vast majority of the energy generated will reap the biggest benefit through savings on their bills.

Costs of solar panels
could drop by up to

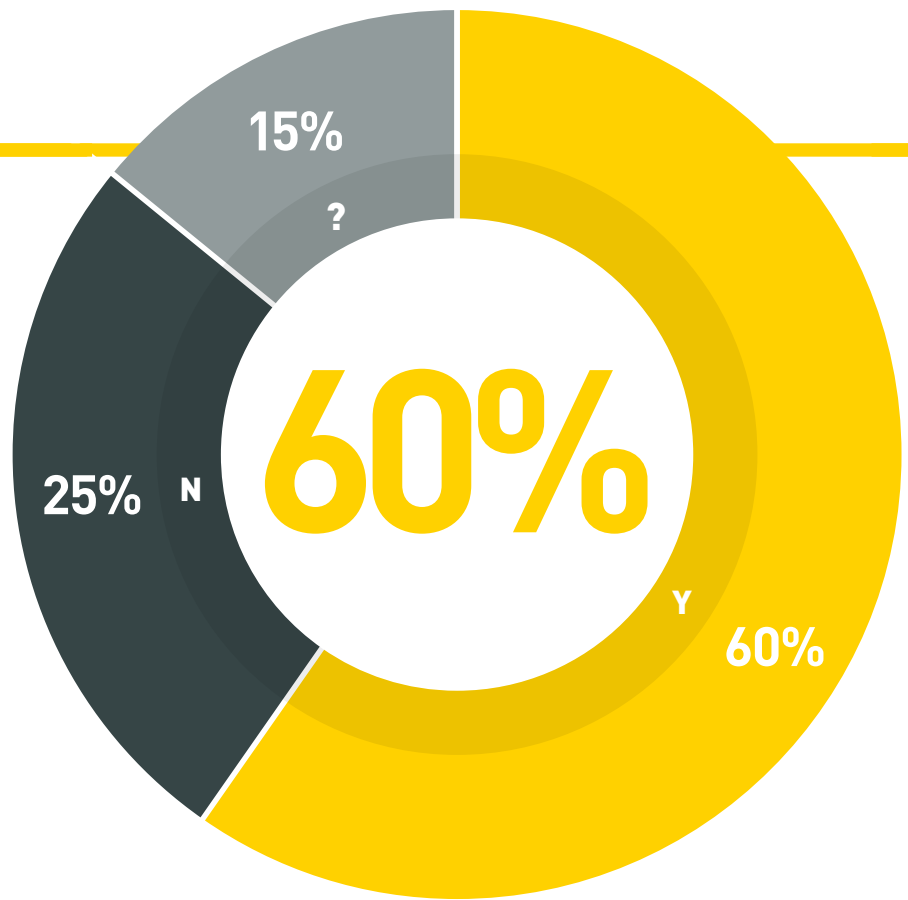
20%

if the MIP was removed

INSTALLATIONS BY REGION



POLL OF BUSINESS OWNERS OR DIRECTORS
DO YOU BELIEVE IT MAKES FINANCIAL SENSE FOR YOUR BUSINESS TO INVEST IN RENEWABLE ENERGY?



INVESTOR CONFIDENCE

Not surprisingly, installation capacity numbers have dropped dramatically following the most recent changes in tariff structure. This reduction in demand is entirely predictable; after all, anyone with resources and intent would have accelerated a 'build' decision to accommodate the previous tariff structure. In fact, such an 'acceleration' for demand has been a forecastable feature of tariff changes since 2010. Despite this slowdown, we found that 60% of businesses still believe it makes financial sense to invest in renewable energy.

What becomes apparent is that, even in micro organisations, businesses still believe that there is a financially viable future in renewable energy, despite the cuts. However, this is at odds with projected deployment for Q2 2016, which evidences a slowdown in investment.

Why then, are businesses holding off from investing, particularly at a time when the financial incentives will continue to fall in the future as depression rates are applied?

The questions on everyone's lips now are:

WILL THE MARKET RECOVER?

HOW LONG WILL RECOVERY TAKE?

WHAT WILL THE MARKET LOOK LIKE?

NEW BUSINESS MODELS

LOOKING AT THE CONDITIONS OF THE CURRENT MARKET, AND OPPORTUNITIES IN TECHNOLOGY GOING INTO THE FUTURE, THE DYNAMICS OF RENEWABLE BUSINESS MODELS ARE CHANGING.

OWNERSHIP MODELS

With prices falling and lower upfront costs, ownership models look ever more attractive to businesses. The advantage of owning a system is that all of the benefits can be reaped by the owner, including using the electricity generated for free and therefore reducing energy bills. This is in addition to receiving the full FIT (if still available) and getting paid for any electricity exported back to the grid. The obvious drawback to this is that 100% of the investment risk is taken by the owner.

Falling costs mean that owning an array has become an even more attractive investment in recent times, and with innovations such as battery storage and the possibility to retrofit in the future, even a system installed now can become a more profitable tool later on.

As support for environmental responsibility rises, the non-financial returns of owning a system will become a much more significant factor. This means that the upfront cost, which is a considerable hurdle to adoption, has to be considered alongside the benefits that will come from reducing a business' carbon footprint and making a statement to stakeholders.

POWER PURCHASE AGREEMENTS (PPA)

Power Purchase Agreements (PPA) were a significant driver of renewable growth up to this point. A PPA is where the land or roof-space required is leased out by the landlord/landowner to an investor who then installs renewables, selling the electricity back to the occupier and/or the grid.

The potential for PPAs has become far more limited for several reasons:

IN ORDER TO BE VIABLE, ELECTRICITY MUST NORMALLY BE SOLD AT A PRICE HIGHER THAN THE GRID EXPORT PRICE

INCREASED CREDIT RISK IS INTRODUCED OVER THE TERM

IRRADIANCE LEVELS ARE MUCH MORE IMPORTANT THAN IN THE PAST

However, where wind or irradiance levels and energy consumption are both high, PPAs can still be a viable option. Also, through the introduction of battery storage and smart grids in the future, thereby optimising energy use at the most profitable times, PPAs may get a new lease of life.

COMMUNITY OWNED SCHEMES

Community owned schemes are when community money is used to fund renewable projects in the area, usually controlled by a dedicated group. The main aim is to convert energy into a collective asset for the community; instead of the money spent on energy leaking out of the local area and going to large corporations, it is kept and invested close by.

Not only does this help investment in the local area, but it can also educate the community on the benefits of renewables, and can help the technology to be embraced. With institutions such as schools, science parks and leisure centres benefiting from community investment the remunerations can be felt on a large scale. Many groups use the investment to run activities in schools, exhibitions and advice days.

The idea is to decentralise energy supply and give the 'power' back to the local area when deciding how and where it's sourcing its electricity. This is alongside making positive environmental statements and reducing carbon emissions as well.

CLEANEARTH ENERGY 2016 REPORT THE FUTURE OF RENEWABLES, OPPORTUNITIES & INNOVATIONS

BATTERY STORAGE

RENEWABLE ENERGY ACCOUNTED FOR OVER HALF OF ALL NEW POWER GENERATING CAPACITY FOR THE FIRST TIME IN 2015, WHILST INVESTMENT IN GREEN ENERGY WAS MORE THAN DOUBLE THAT SPENT ON NEW COAL AND GAS FIRED CAPACITY (UNEP).

As the market share of renewables continues to grow, the question of how to match intermittent generation with the fluctuating nature of consumer demand will continue to grow with it.

One answer is to control demand through schemes such as demand side response, where consumers are incentivised financially to lower or shift their electricity use at peak times. However, the largest contribution is expected to come from storing energy in batteries when supply is plentiful and releasing it when needed.

Like solar, the cost of battery storage has fallen significantly in the last few years, primarily driven by research and innovation within the automotive industry, and will continue to do so as electric vehicles gain market traction.

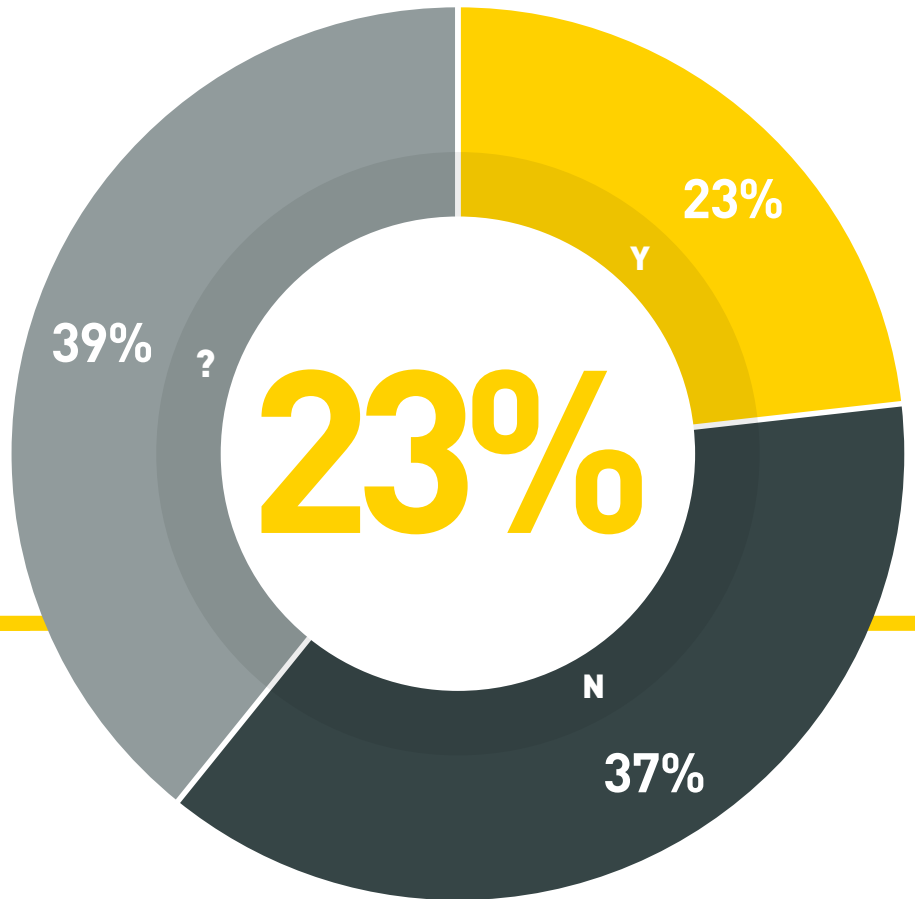
The cost of battery storage, however, is not yet low enough to warrant investment based on the economics alone. Nonetheless, the technology

promises to offer a number of interesting opportunities in the near future such as increased self-consumption, peak demand shifting and energy arbitrage, where electricity is stored during off peak periods for use during peak periods.

Similarly, it may also be possible to tender for various grid balancing services, such as fast frequency response and capacity reserve, however these opportunities are not necessarily guaranteed in the long term.

Whilst the technology has been eagerly anticipated by the industry, current market perception is still uncertain. Just 23% of businesses who did not believe solar PV to be viable said that the capability of storing energy would change their opinion on investment. This indicates that, initially at least, there will be a slow uptake in energy storage until businesses can see concrete evidence of the financial benefits and the reliability of the technology.

POLL OF BUSINESS OWNERS OR DIRECTORS
WOULD YOU CONSIDER INVESTING IN SOLAR PV IF BATTERY STORAGE ENABLED YOU TO STORE EXCESS ENERGY PRODUCED AT A LATER DATE?



**COSTS ARE STILL
A HURDLE FOR
BATTERY STORAGE,
BUT ARE FALLING
AS RESEARCH
AND DEVELOPMENT
CONTINUES**

SMART GRID

THE UK'S ELECTRICAL INFRASTRUCTURE IS ABOUT TO UNDERGO A MAJOR EVOLUTION, IMPROVING RELIABILITY AND REDUCING ELECTRICAL LOSSES, CAPITAL EXPENDITURE AND MAINTENANCE LOSSES.

For a century, utility companies have had to send out workers to gather much of the data needed to provide electricity and, believe it or not, most of the devices utilities used to deliver electricity have yet to be automated and computerised.

A smarter grid will help reduce peak demand and give us the tools to integrate more renewable power sources in an intelligent manner.

TECHNOLOGICAL INNOVATION

RENEWABLE TECHNOLOGY IS STILL IN ITS INFANCY WHILE RESEARCH AND DEVELOPMENT SPEND IS INCREASING IN LINE WITH GLOBAL DEPLOYMENT.

Conventional solar module efficiencies now range up to 22%, having averaged around 14% just a decade ago, whilst the scale and efficiency of wind turbines is constantly increasing.

As the cost of deployment continues to fall, the industry is finding new ways of integrating renewable energy in ever more challenging environments, exemplified by the installation of floating wind turbines in deep water and the integration of solar PV into building materials such as glass and roofing materials.

WHAT MORE CAN BE DONE?

THE ANSWER IS, A LOT MORE.

AT THE SAME TIME SUPPORT FOR RENEWABLE ENERGY AND OTHER ENERGY EFFICIENCY MEASURES WAS CUT, THE UK INCREASED SUPPORT FOR BOTH ON AND OFFSHORE OIL AND GAS PRODUCTION, REVEALING A NEW PACKAGE OF MEASURES THAT ARE EXPECTED TO INCREASE PRODUCTION BY AROUND 15% (HM REVENUE & CUSTOMS, 2015).

Further, the IMF's latest analysis estimates that the UK spent approximately £26 billion (equivalent to 1.37% of GDP) on subsidies for fossil fuels in 2015. The bulk of this total was due to fiscal policies that do not address externalities, such as global warming and local air pollution, caused by the consumption of oil, coal and gas (IMF, 2015).

The level of support afforded to fossil fuels is much greater than that given to renewable power, which is set to reach £9.1 billion in 2020/21 and seriously calls into question the UK's carbon reduction commitment.

Dedicated, predictable and long-term commitment is what is necessary, and at present this is simply not the case in Government policy.



CLEANEARTH ENERGY 2016 REPORT CONCLUSION

INITIALLY SUPPORTED BY GOVERNMENT SUBSIDY, THE UK RENEWABLE MARKET EXPERIENCED RAPID GROWTH FROM 2010. TODAY, WE HAVE AN ENERGY MIX WHERE RENEWABLE SOURCES HAVE OUTSTRIPPED COAL AND IN MAY CONTRIBUTED TO COAL-GENERATION HITTING ZERO, AS THE COUNTRY LOOKS TO PHASE OUT FOSSIL FUELS BY 2025. THOUGH THE GOVERNMENT HAS BEEN ERRATIC AND INCONSISTENT OVER THE PAST 5 YEARS, FUNDAMENTALLY THE AIM OF GOVERNMENT POLICY HAS BEEN ACHIEVED.

The market was quick to recognise the financial benefits of investing in renewables, and whilst subsidies have receded, falling costs of technology have meant that investors continue to gain generous returns on their investment.

However, a review in late 2015 has seen the most significant removal of support yet. There is a growing concern as the Government moves away from renewable sources and instead invests heavily in nuclear generation.

However, it is evident that incentives to invest in renewables remain and are widely recognised. Projects and investment must be diligently and methodically planned, but an efficient and stable supply infrastructure is in place.

The sector knew that it would have to transition to being subsidy-free eventually, where it would have to stand on its own two feet. The transition has come sooner than expected, but this industry is built upon progressive pioneers who saw the big picture long before anyone else. This has never been a 'stack 'em high sell 'em cheap' industry.

One of the greatest opportunities comes in the form of a new wave of public support. Never before has knowledge and backing of renewable technology been greater from the public. Whilst the Government may falter with policy consistency, performing a series of U-turns, the wider population do not share this uncertainty. Commercial benefits remain (in the right circumstances), but people now have more reason to invest than purely the financial incentives.

Businesses are leading the way in this respect, recognising that a demonstration to environmentalism can offer intangible benefits to their brand and reputation, acknowledging their own corporate and environmental responsibility.

The landscape and goalposts may have changed, but the future remains the same. Renewables in the UK still represent great opportunities for developers and investors alike; not just economically, but to protect the future of this planet and create a significant, lasting legacy that goes beyond the balance sheet.



**RENEWABLES OFFER MORE
THAN JUST A FINANCIAL
BENEFIT; THEY LEAVE A
LASTING, POSITIVE LEGACY
ON OUR PLANET**



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