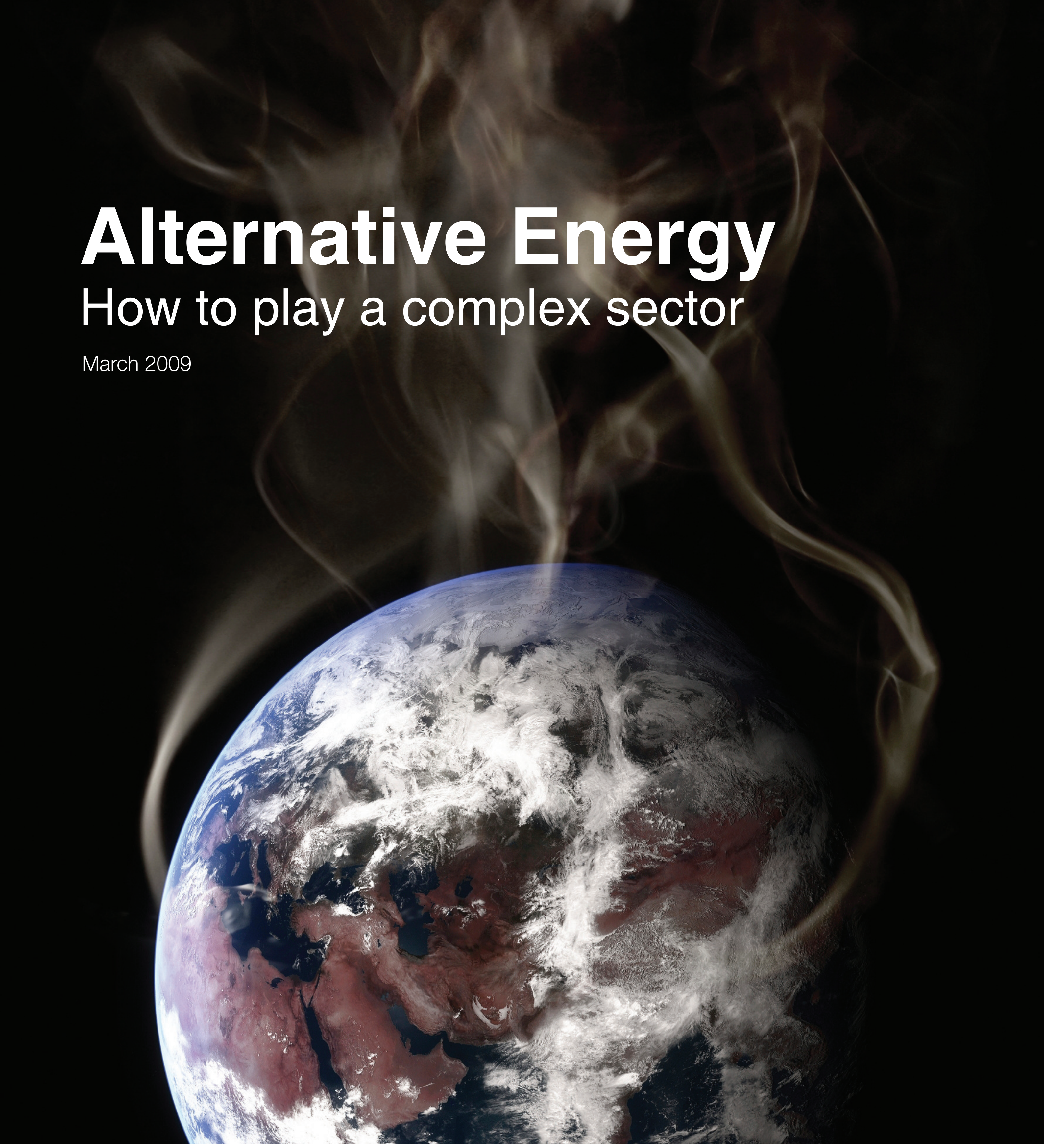
Alternative Energy

How to play a complex sector

March 2009



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COMPANIES MET IN COMPILING THIS REPORT

Acta*	Landkom International
AFC Energy	MP Evans Group
Ceres Power	New Britain Palm Oil
Clipper Windpower	Novera Energy
CMR Fuel Cells*	Nviro Cleantech
D1 Oils	Oxford Catalysts Group*
Energem Resources*	Ocean Power Technologies
FibreGen (Libra Natural Resources)	Protonex Technology Corporation*
Gas Turbine Efficiency	ReneSola
GEM BioFuels	Renewable Energy Holdings
GTL Resources	Renewable Energy Generation
Hansen Transmissions	Solar Integrated Technologies
Idatech	TMO Renewables
Jetion Holdings	Zenergy Power
Kedco*	

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Sector research

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Alternative Energy
How to play a complex sector

Within the UK's incentive regime, it is only wind power that has both the financial returns and scalability to create value for investors in operational assets. For other types of energy, investing in cost-reducing new technologies is the higher-risk, higher-reward strategy. We examine the technologies, costs and potential returns of investing in the sector and recommend sweet-spots in the value chains.

Invest in wind or gas generation

Costs for electricity generation from alternative sources remain around four times higher than traditional fossil fuels. Many technologies remain uneconomical despite a UK regulatory regime expected to direct a minimum of c £9.3bn towards electricity from alternative sources by 2015. Wind, large hydro and gas generation (landfill, sewage and biomass) are exceptions and electricity generators are our preferred investment area in the current environment (as opposed to equipment suppliers). Solar is our least preferred technology for the UK, being high-cost and low-productivity.

Play other technologies through developers

For other technologies, developers, particularly those with test sites, grants or large industrial backers, offer the greatest chance of success. To be viable, we estimate that the cost of generation needs to reduce by an average of 39%. As the electricity generating unit for each technology averages 60% of total project costs, new technologies or manufacturing techniques that reduce this could quickly gain traction if they can be funded through to maturity.

Building an investment strategy in small- and mid-cap

Most of the generating assets are being built by the large utilities whereas the technology development is by private companies. Therefore navigating within the small- and mid-cap space to gain exposure to our preferred areas requires stock picking rather than baskets of stocks. Overall our preferred stock for operating assets is Novera Energy, with Kedco, Ocean Power Technologies and Zenergy as emerging plays. Further up the supply chain, ReneSola and Hansen Power Transmissions are likely to grow while we see high risk to Clipper Windpower.

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Analysts
Ian Osburn +44 (0) 20 3077 5722
iosburn@edisoninvestmentresearch.co.uk
Anil Sharma +44 (0) 20 3077 5721
asharma@edisoninvestmentresearch.co.uk

For institutional enquiries please contact:
Gareth Jones +44(0) 20 3077 5704
gjones@edisoninvestmentresearch.co.uk

COMPANIES FEATUERED IN THIS REPORT

Clipper Windpower
Hansen Transmissions
Kedco
Novera Energy
Ocean Power Technologies
ReneSola
Zenergy

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Investment summary: How to play a complex sector

New regulation presents opportunities

In a sector driven by regulation, the new UK Energy Bill will create opportunities when it comes into effect on 1 April 2009. The largest change to the law is to give varying levels of incentive to different renewable electricity generating technologies and to double the maximum available incentive.

In this report, we look at which technologies will now be viable for electricity generators, examine the industry dynamics to pick the sweet-spots in the value chains and use our investment criteria to select companies that represent the best way to play our strategy in the small- and mid-cap sectors.

Offshore wind and waste-to-energy (ex-landfill gas) the winners

We used UK government survey data on investment costs and leverage for alternative energy projects in the UK and applied the new regulatory regime to calculate an internal rate of return (IRR) for new projects. Our threshold for investment is a lifetime project IRR of greater than 10%.

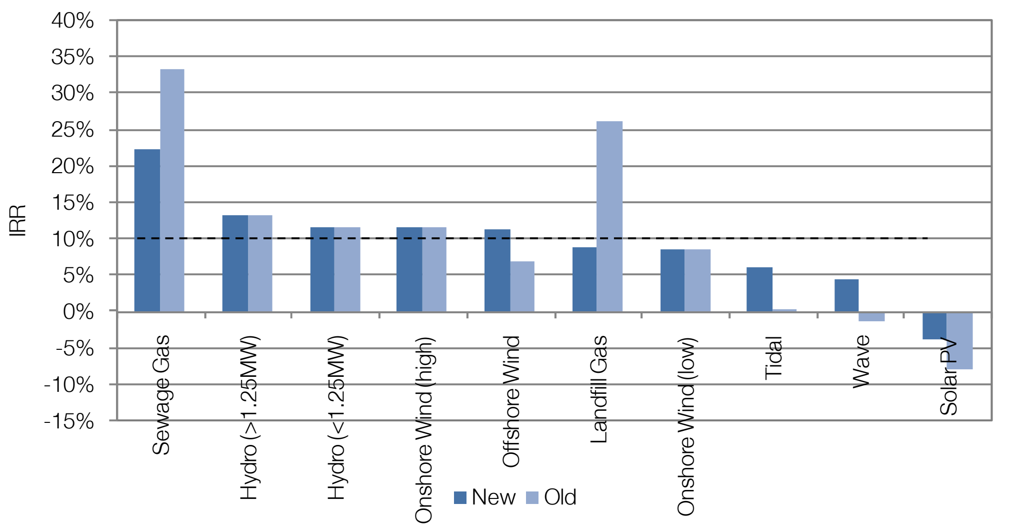
For the first time, offshore wind projects are now viable as the incentive is increasing by 50%. This is not surprising as the UK has vast offshore wind resources that are underexploited and represent the greatest chance to meet the government target of 15% of electricity from renewable sources by 2020.

Another winner is waste-to-energy (WtE), which sees a doubling of incentives. Given the variability of fuel types and costs, equipment costs and business models, it is unrealistic to look at the overall sector. We identify wood gasification, food waste processing and agricultural waste/energy crops as key positive areas for investment. Waste producers are also now in a good position, with previous costs of disposal now potentially a revenue stream.

Landfill gas is one of the biggest losers, as its incentive is reduced to 25% of the original level, bringing the UK's alternative energy regime in line with other regulation to discourage landfill use (the most prominent being the landfill tax). As landfill competes for fuel with waste-to-energy, this is a further boost for WtE and we expect landfill operators to move from landfill gas generation to WtE.

It is important to note that currently operating assets are unaffected by the new regulation, which guarantees that incentive levels will not reduce once a project has reached the final stages. The incentive scheme is capped to limit the cost to UK consumers.

Exhibit 1: IRRs for projects under the old and new regulatory regimes



Source: DECC (BERR), Edison Investment Research

Our assumptions for the calculations in this report are an electricity price of £45 per megawatt hour (MWh) (the four-year historical average) and UK incentive (Renewable Obligation Certificates price) of £50 per MWh.

Play the other alternative energies through technology developers

Wave, tidal and solar are all emerging technologies in the UK and remain unviable for investment on our IRR criteria. We recognise that solar is nearer to being viable in other countries where sunlight availability is much greater, but this is not within the scope of this report.

The new UK scheme gives wave, tidal and solar the maximum incentive, effectively lowering the bar for the technology challenge to reduce costs. We look at the new technologies emerging and make picks within the front-runners, especially those that have funding plans through to commercialisation or at least the near term.

Industry dynamics: Generators, fuel producers and silicon wafers

Aside from the downstream electricity generators, there are shifting dynamics within the supply chains of alternative energies that affect the suitability of investment at each stage.

Overall, we like the developers of wind (both onshore and offshore) and waste-to-energy sites and currently avoid the others.

In the upstream wind sector, we believe that the recent shortage of turbines and bottlenecks of gearbox and bearing supply have created long order backlogs and a culture of large prepayments – a significant positive for manufacturers which use this cash to run their businesses. Given turbine manufacturers are both adding capacity and seeing order cancelations, we expect a corresponding reduction in lead times and prepayments. This means turbine manufacturers will have a higher funding requirement going forward while the operators benefit once again.

We see high risk to any manufacturers experiencing costs due to equipment reliability or payments under guarantees, both of which may potentially be large.

In waste-to-energy, operators should achieve very good returns and early movers are likely to benefit by securing the best feed stock supplies. Waste producers should also benefit as the value of the waste should increase significantly, especially food waste and landfill waste, which currently has an associated disposal cost.

In solar, silicon prices collapsed at the end of 2008 while new supply continues to increase. We believe developers of new sites (ex-UK) could benefit as costs per watt reduce and we expect a corresponding increase in demand. Within UK-listed stocks, we prefer value-adding mid-stream companies, such as wafer manufacturers, which can pass on lower sales prices upstream once one-offs such as inventory write-downs have been absorbed.

Under the new incentives, developing landfill gas sites is no longer as attractive (nor does it meet our 10% criteria) and while sewage gas still does, we found no listed developers in the small- or mid-cap space.

Special case: Energy efficiency

In addition to production we looked at the energy efficiency industry. Industry consultants see increased efficiency in industry as one of the cheapest methods of reducing emissions in high volume. We see high temperature superconductors as a potentially stable new technology with reduced risk that has wide applications. Within European mid-cap, Zenergy Power has near-term products under development although funding to commercialisation remains a risk area.

Investment criteria: Particular to technology

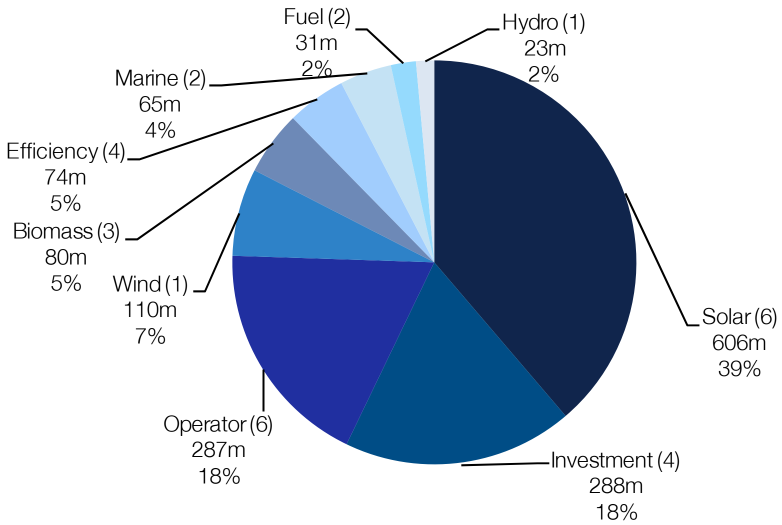
Given the high cost of developing generating facilities, most investment is by the large utilities (which get fined for not using sufficient electricity from alternative sources). In the technology development space, most work is completed either in private companies or universities. Therefore, playing these investment ideas in the small- and mid-cap space is limited by the available companies.

Using our sector views above, we built an investment framework for each sector and looked for companies that fit well into this.

AIM has 29 companies in the alternative energy generation and efficiency sector with a combined market cap of £1.5bn; we aim to help investors digest this sector.

Exhibit 2: AIM-listed alternative energy sectors by market capitalisation (£) and % of total

Note: Figures in brackets give number of companies.



Source: LSE AIM, Bloomberg, Edison Investment Research

Generally, for operators, we look for a successful track record, projects under development (preferably through the UK planning system) and secure funding by project financing, a large partner, and a strong balance sheet or alternative cash flows.

For the developers, which are generally cash consumptive while they invest in research and development, we look for a route to commercialisation, funding from any source and also signs that the technology is maturing such as successful test sites or early projects.

Overall, in wind Novera Energy looks an attractive wind farm operator with large growth plans. We also like Hansen Transmissions as a component supplier insulated from market turmoil and moving production to low-cost countries. We see large risks to Clipper Windpower, which has continued to have technology issues and has abandoned plans to develop its own wind farms.

In waste-to-energy, we like Kedco, which uses relatively mature technology and a good project pipeline, while Ocean Power Technologies is our preferred wave generator, with its first generating plants funded by large partners.

ReneSola represents a good solar play with rapid expansion and cost reduction although we see a near-term inventory write-down.

Exhibit 3: Company view

Technology		Clipper	OPT	ReneSola	Kedco	Hansen	Zenergy	Novera
	Market cap	£101m	£37m	£124m	£46m	£623m	£44m	£48m
	Net debt/(cash)	€19m	$88m	$224m	(€5m)	€133m	€7m	£71m
Wind	Operator with established assets	×				×		✓
	Positive cashflows/balance sheet strength not reliant on working capital	×				✓		✓
	Track record of assets through planning	-				-		✓
	Large partner/project finance	×				✓		✓
	Order backlog	✓				✓		✓
	Low technology risk	-				×		-
	Insulated from weakening turbine demand	×				-		✓
Solar	Operator with established assets			×				
	Positive cashflows/balance sheet strength not reliant on working capital			×				
	Insulated from over silicon supply			✓				
	No UK operating assets			✓				
	Business model to benefit from falling price			✓				
Biomass	Captured feedstock				✓			
	Proximity to feedstock sources				✓			
	Established sites/planning approval				✓			
	Low technology risk				-			
	Positive cashflows/balance sheet strength				×			
Marine	Established operating assets		×					
	Established funding/balance sheet strength		✓					
	Low technology risk		-					
	Large partner/project finance		✓					
	Order backlog		✓					
Energy Efficiency	Established operating assets						✓	
	Established funding/balance sheet strength						×	
	Low technology risk						✓	
	Large partner/project finance						-	
	Order backlog						-	

Source: Edison Investment Research

1 Greenhouse gas emissions: Bad and getting worse

Climate change fears are based on the increase in greenhouse gasses (GHGs), the main constituents being carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_20 or Nox). US Environmental Protection Agency (EPA) data suggest that over the last 650,000 years, the CO_2 concentration in the atmosphere has ranged from 200-300 parts per million (ppm), last hitting 300ppm approximately 125,000 years ago. With the current reading of 382ppm, or 127% of the previous peaks, we are entering an unknown period for the Earth's climate.

EPA data positively correlate atmospheric carbon with the average polar ice cap temperature. Dr Faith Birol of the International Energy Agency (IEA) believes we are on course for a 6°C average temperature increase by 2030 with a corresponding "catastrophic" effect on the environment at that time.

Furthermore, global emissions of GHG will increase exponentially if current trends of population and consumption growth continue. James Smith, chairman of Shell UK, stated at a recent presentation that in his view the global economy could be five times as large in 2050 compared to today and if emissions targets are half current greenhouse gas emissions, for example, simple maths requires a tenfold decarbonisation of the economy.

The largest challenge to decarbonisation is deployment. Many technologies are capable of large GHG emission savings but have an economic and cultural cost compared to fossil fuels. Relying on early stage emerging technologies, no matter how good they are at reducing greenhouse gases, is unlikely to be sufficient given the historic lifecycle from laboratory to deployment has been around 30 years.

Carbon capture and sequestration (CCS) could become a large part of the process, allowing continued burning of fossil fuels. However, again, this alone is unlikely to be sufficient and in any case would require a large investment. We estimate the technological, mechanical and operational costs of capturing carbon from a coal-fired power plant is c €1bn. With the EU having 10-12 candidate large coal fired power plants, and with coal power regarded as an 'easy gain' that is only expected to shoulder 25% of the carbon reduction requirement, the size of the investment becomes clear. A further estimate, again from Shell, puts the investment requirement to decarbonise growth in the Indian and Chinese economies at nearly $1tn.

GHG emissions: Governments are taking action

The consensus among governments is that GHG emissions should be reduced and national frameworks are emerging in most countries to increase the cost of emissions. Key to this is suppressing fossil fuel use and increasing the electricity price to make alternative energy projects financially viable.

Energy and electricity production

The energy sector is by far the largest contributor to GHG emissions. In the US, EPA data show that in 2006 86% of CO_2 equivalent emissions were related to energy (97% of actual CO_2). Of the total 5,826m tonnes of CO_2 emitted that year, 2,328m tonnes were due to electricity production. In the UK in 2006, of the 557m tonnes of CO_2 emissions, 220m tonnes were caused by energy supply. Furthermore, significant amounts of methane were released globally through fossil fuel extraction (29% of the US total was for coal extraction alone).

Overall, the UK does not appear to be doing very well. Total electricity production statistics and CO_2 emission statistics from the UK government suggest 0.55 grams of CO_2 per MWh of energy supplied in 2006. This is a 6% increase compared to 2003.

Given the volumes of CO_2 emissions linked to electricity production and the myriad of technologies that can be used to reduce these, electricity generation is bearing much of the government's attempts to reduce overall carbon emissions and meet the EU's target of reducing UK carbon emissions by 15% by 2020.

2 UK regulatory regime acts as 'Robin Hood'

Summary

The UK Renewable Obligation Certificates (ROC) regime is designed to increase the price received by generators of electricity from alternative sources. It is paid for by effectively fining the electricity suppliers (traditionally utilities that get income from consumers) for not using renewables. Therefore the suppliers pay renewable producers more to avoid this charge. This system is administered through the Renewable Obligation (RO) mechanism.

For a percentage of every MWh a utility supplies, it is required to either produce a ROC or pay a fine (to buy out of the obligation, hence being called a buy-out fee). Both the percentage of MWh that needs to be covered and the price of the fine are pre-determined by legislation and are increasing.

The funds collected from all the fines are pooled and given back to the suppliers according to how many ROCs they submitted. Therefore, the 'dirtiest' suppliers give money to the 'cleanest'. This means the suppliers can pass on payments to the renewable generators and in this way the price that alternative energy generators can charge is increased.

So given ROCs are demanded from the suppliers, where do they come from? Ofgem gives a ROC to energy generators for the electricity they produce from alternative sources. Previously, this was one ROC per MWh but from 1 April 2009 it will be banded so some technologies will receive more than one ROC per MWh (mainly the emerging, expensive types to encourage investment) and some less (such as landfill gas and co-firing as these are less clean and more mature).

As it is set up as an internal market, the more total renewable energy production falls behind the percentage demanded by the government, the more capital will move from the dirty suppliers to the clean and therefore the higher the value of alternative electricity.

Other details exist to give investors in alternative energy greater certainty. Two such adjustments are 'grandfathering' and 'headroom'. Grandfathering guarantees the number of ROCs per MWh once production has started, ie it cannot be changed half way through the life of the regime. Headroom automatically increases the percentage of alternative electricity demanded from the suppliers if production is going to overshoot the target to stop the value of a ROC falling too sharply.

Background

The UK government has committed to an EU agreement that by 2020, 20% of all Europe's energy should come from renewable sources. In the UK this means 15% of electricity from renewable sources.

Under Kyoto agreements, the UK's obligation is to reduce greenhouse gas emissions by 12.5% from 1990 levels by 2008-2012. This implies an 8% reduction in CO_2 emissions over this period.

In June 2008, a consultation paper on the UK renewable energy strategy was published by the Department for Business, Enterprise & Regulatory Reform (or BERR, the predecessor of DECC, the

Department of Energy & Climate Change). The paper stated renewable energy is key to a low carbon future, energy security through diversification and to reduce greenhouse gasses.

To this end the Renewables Obligation (RO) is the government's chief mechanism for incentivising renewable electricity generation in the UK to meet the EU targets and is also an important part of the programme for securing reductions in carbon dioxide emissions.

The RO requires licensed electricity suppliers to source a specific and annually increasing percentage of the electricity they supply from renewable sources. The current level is 9.1% for 2008/09 rising to 15.4% by 2015/16 as set out in the renewable obligation order. The monitoring and administration of this system is done through Renewable Obligation Certificates (ROCs).

What is a ROC?

A ROC is the green certificate issued by Ofgem for eligible renewable electricity generated within the UK and supplied to customers within the UK by licensed suppliers. Under the original energy law, one ROC was issued per MWh of electricity supplied. Under the energy bill that passed through the UK legislature in 2008, different technology types of electricity generation are set to receive a different number of ROCs per MWh of generation, through a structure called banding.

Ofgem demands ROCs from suppliers

Ofgem demands that a particular electricity supplier must deliver sufficient ROCs to cover its Renewables Obligation. The RO is set as a percentage of electricity supplied and was initially set at 3% in 2002/03 (April year-end) rising to 15.4% by 2015 (increasing approximately by 1% per year).

Exhibit 4: ROC banding

Band	Technologies	Level of support ROCs/MWh
Established 1	Landfill gas	0.25
Established 2	Sewage gas, co-firing of non-energy crop (regular) biomass	0.5
Reference	Onshore wind; hydro-electric; co-firing of energy crops; EfW (energy from waste) with CHP (combined heat and power); geo-pressure; other not specified	1.0
Post demonstration	Offshore wind; dedicated regular biomass	1.5
Emerging	Wave; tidal stream; fuels created using ACT (advanced conversion technologies) such as anaerobic digestion; gasification and pyrolysis; dedicated biomass burning energy crops with or without CHP; dedicated regular biomass with CHP; solar photovoltaic; geothermal; tidal impoundment (<1GW); microgeneration	2.0

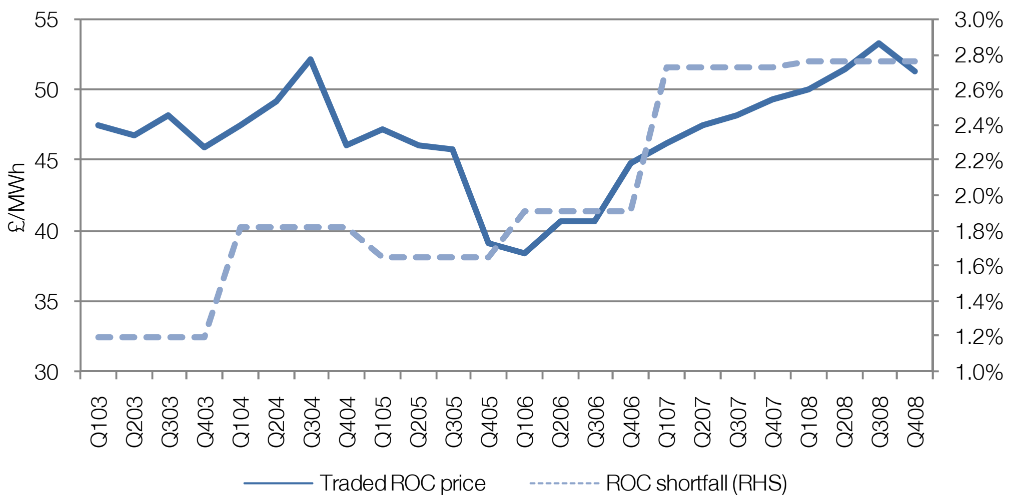
Source: DECC (BERR), Edison Investment Research

The allocation of technologies into these bands was based on cost analysis performed by Ernst & Young and the result of consultations with industry by the government. Very green and emerging technologies benefited from extra support, while landfill and sewage gas saw a reduction in support. Banding only applies to new projects, and currently operating assets will continue to receive one ROC per MWh.

ROC pricing

ROCs may be freely traded. It is usual for a generator to sell the ROC at the same time as the electricity but there is no legal demand for this and some power purchase agreements (PPAs) are for electricity only. The ROC price is a function of the buy-out price and the shortfall of total ROC generation compared to the renewable generation target. As renewable generation (and therefore ROC issuance) has fallen below the target every year of the ROC regime, the ROC price has always been above the buy-out price.

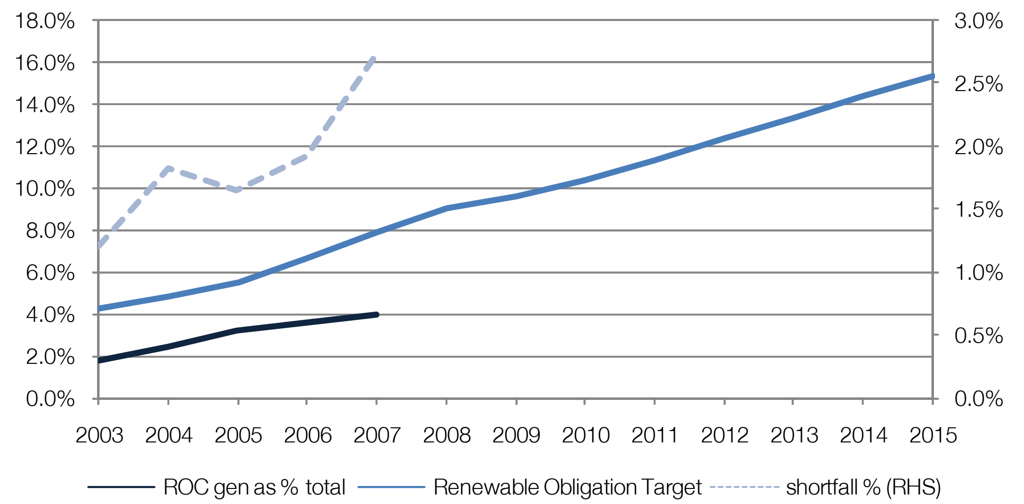
Exhibit 5: Traded ROC prices since beginning of the regime and shortfall from ROC



Source: Edison Investment Research, Non-Fossil Purchasing Agency, DECC

Any shortfall in the number of ROCs a supplier is able to submit compared to its obligation must be ‘bought-out’ using the buy-out mechanism.

Exhibit 6: The shortfall of ROCs has been increasing



Source: Edison Investment Research, DECC, Energy Bill 2008

The buy-out mechanism and ROC pricing

The buyout price is £35.76/ROC (ie per one MWh) in 2008/2009 and increases by the RPI annually until April 2015 when it will remain flat.

The buy-out price drives the value of ROCs by giving a ROC material value to the supplier, ie its ability to avoid the buy-out price. The implied ROC price can be expressed by:

$$\text{ROC Price} = \frac{\text{Renewable Obligation target}}{\text{Market expectation of ROCs actually generated}} \times \text{Buy-out price}$$

Therefore, we can use the current price of the ROC to imply market expectation of actual ROC issuance compared to the RO. At a buy-out price of £35.76, the current ROC price of £51.29 with an RO target of 9.1% implies that the market is pricing in ROC generation equivalent to 6.34% of electricity generated, giving a shortfall of 2.76%.

Using the 2007 total ROC requirement to meet the RO, we calculate the total investment in renewable energy sources (as defined by the ROC regime) to be £644m. Going forward, we calculate the minimum total investment as c £9.3bn over the period 2009-2015, or an average £1.16bn per year.

At the end of the financial year, payments into the buy-out fund are redistributed (after the costs of the ROC regime administration are subtracted) among the suppliers according to how many ROCs each company supplied. The payment into the buy-out fund is capped at £200m in England and £20m in Scotland. Late payments are charged interest at the Bank of England base rate plus 5%.

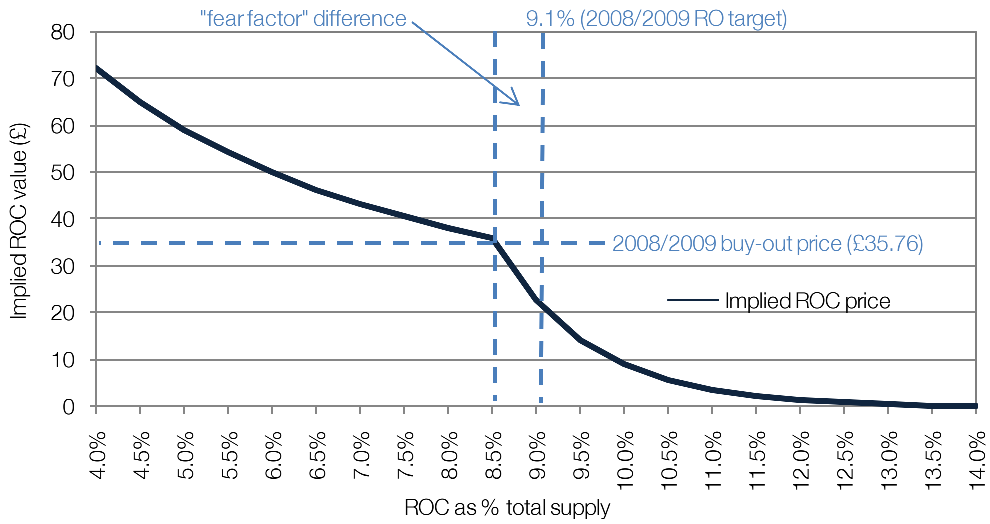
ROC price support and 'headroom'

The price of a ROC is above the buy-out price in any year in which there is a shortfall between the number of ROCs generated and the amount required to satisfy the RO. If exactly the correct amount of ROCs are generated, the ROC price will be equal to the buy-out price.

During consultation for the Energy Bill 2008, there was considerable concern within the industry about the effect on ROC pricing if the number of ROCs generated exceeded the RO. This is especially true as renewable energy technologies are relatively volatile, eg wind and solar because between any two years the level of wind and sun will vary. Once the RO has been reached, any extra ROCs cannot be carried over to a subsequent year's RO and hence have zero value (there is provision in the Energy Bill for the Secretary of State to allow ROCs to apply between periods but as yet no order has been passed).

We would expect the ROC price to fall below the buy-out price before this scenario unfolded as the market should anticipate the oversupply (the so called 'fear factor' in Exhibit 7) and generators would seek to offload their ROCs before they became worthless.

Exhibit 7: ROC prices vary by the shortfall of ROC issuance compared to obligation



Source: Edison Investment Research, DECC, Energy Bill 2008

The potential for ROCs to become worthless under such circumstances increases the risk to the economic case for renewables projects, especially those that have the highest cost of production (generally the technologies that receive the highest number of ROCs). Therefore, the government introduced the concept of 'headroom' in its energy bill, which allows the RO to be increased by up to 8% for any year in which the actual ROC issuance will exceed the RO.

Guarantees of support and 'grandfathering'

The Energy Bill 2008 introduces guaranteed support for projects using ROCs. ROCs are designed to make these projects economically viable and as they require long-term investment this guarantee is required to significantly reduce risk to investors. The guarantee takes the form of 'grandfathering'. Once a project is completed it is considered 'grandfathered' and its ROC allocation is guaranteed long-term. A reduction to the ROCs allocated to the band into which the technology falls will not apply to these projects.

Grandfathering is likely to be important to protect returns for renewable producers especially as ROC is scaled down as renewable generation nears the 20% EU target.

Special cases: Co-firing, biomass, waste to energy and CHP

The energy bill specifies the types of fuels and technologies that qualify for ROCs. Co-fired power plants are further restricted under the regime. Restrictions are placed on the origin of suppliers' ROCs, as up to a maximum of 10% can be satisfied from co-firing. This is to avoid the ROC regime being undermined by the introduction of co-firing to large 'dirty' power stations, eg coal or gas, which would flood the market with ROCs with relatively little environmental or emission benefit.

Furthermore, extra regulations exist for waste and biomass electricity generation based on the fuel used. Combined heat and power (CHP) generation is also eligible but must be subject to the CHP quality assurance scheme, which is based on a combination of power efficiency and the balance of electricity and heat generated by the CHP device.

Exhibit 8: Eligibility of bio-energy

Note: * Subject to a maximum fossil-derived energy content of 10%.
** CHP stations must be accredited under the CHP quality assurance scheme to be eligible. Schemes that are fully compliant with the good quality benchmark receive ROCs on the electricity generated from the biomass fraction of the waste. For schemes that are partially compliant, this is scaled back depending on their efficiency.

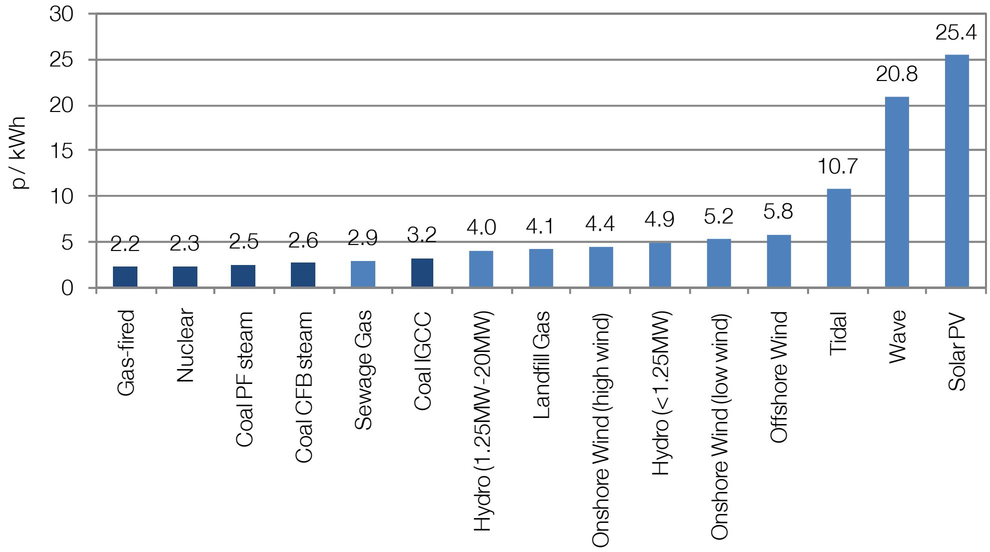
Type of generating station	Mixed waste	Waste that is purely biomass	Energy crops, agricultural waste and forestry material
Incineration	Ineligible	Eligible *	Eligible *
Pyrolysis, gasification and anaerobic digestion	Eligible for the biomass fraction of waste	Eligible *	Eligible *
Combined heat and power (CHP)	Eligible for the biomass fraction of waste produced as good quality CHP **	Eligible *	Eligible *
Co-firing	Ineligible	Eligible *	Eligible *

Source: Edison Investment Research, DECC, Energy Bill 2008

3 UK alternative energy does not make financial sense without support

Compared to fossil fuel energy generation, alternatives are still far more expensive. The average generation price for fossil fuels is c 2.6p/kWh (including decommissioning costs for nuclear). The cheapest non-gas burning alternative energy is large-scale hydro at 4.0p/kWh, a 56% premium. The average cost of the likely volume alternative energy generators (excluding tidal, wave and solar PV) is 4.5p/kWh, 73% higher, and 8.8p/kWh including all alternative energies we examined. Furthermore, the cheapest scalable technology (wind) is 4.4p/kWh. In short, if we want green electricity, we need to pay more for it.

Exhibit 9: Generation cost by technology



Source: Royal Academy of Engineers, DECC (BERR), Edison Investment Research

From a financial investment point of view, we believe an alternative energy project requires an IRR of at least 10% to attract significant investment and facilitate growth. Given our belief that deployment is the most capital intensive part of the concept-to-reality path, financing is and will be key.

Most projects secure project financing where the lenders are paid a proportion of the operational cash flows. Using bank financing would significantly reduce funding rates. Therefore it is unsurprising that most alternative energy installations are by the large generator or utility companies and we believe they remain a very safe method of playing the sector. However, significant opportunities remain for small- and mid-cap players, particularly technology development companies that are currently trading on very low multiples. Characteristics we believe investors should look for include strong industry partners, secure financing or strong balance sheets and near-term products, eg those with successful testing sites.

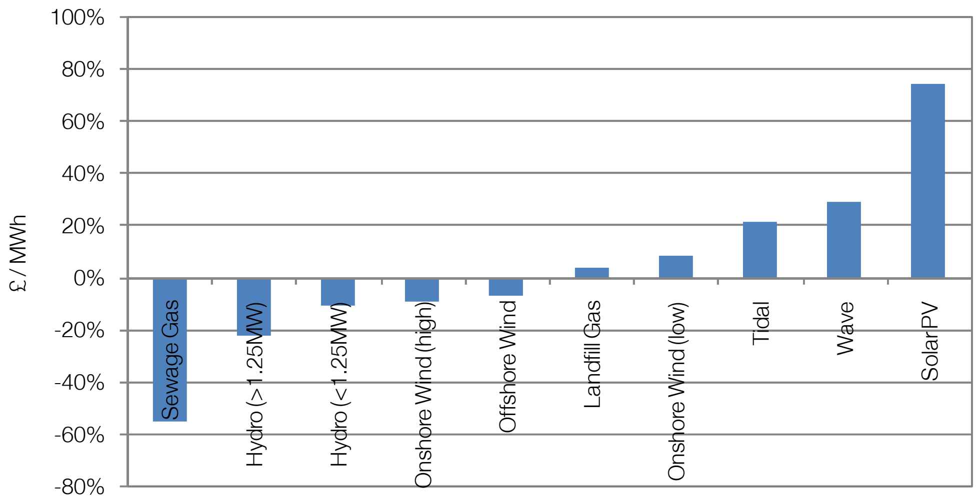
With support, wind, hydro and gas generation make good returns

Without regulatory support, the costs of producing alternative energy would be too great. With the four-year average electricity price of £45/MWh and without subsidy, the cost of alternative technologies needs to be reduced by an average 53% to offer our 10% IRR at this level, which coincidentally would bring the cost of electricity produced by alternative technologies to £46/MWh.

With the UK's subsidy regime providing different levels of support for the various technologies, we suggest the following investment strategies:

1) Invest directly in technologies or techniques that attempt to reduce the cost of generation; or
2) Invest in technologies where the regulatory regime has bridged the cost differential with traditional sources of electricity generation, thus making them financially viable.

Exhibit 10: Percentage decrease in cost required to achieve a project IRR of 10%



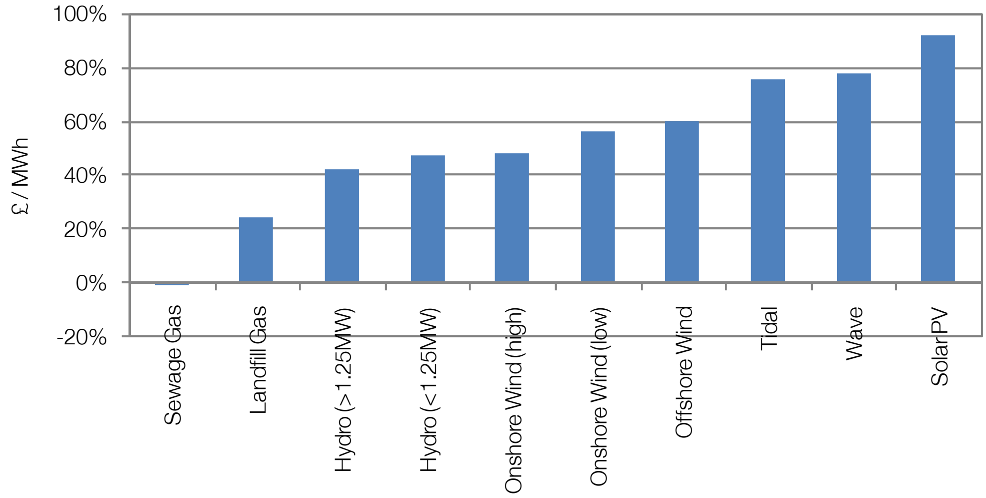
Source: DECC (BERR), Edison Investment Research

The adjusted ROC allocation for offshore wind makes operating assets viable under our returns criteria. This is key to the government's targets, as significant offshore wind farms are planned.

Furthermore, sewage gas projects continue to receive ROC allocations despite offering returns significantly above our 10% IRR criteria. These increase the cost to consumers but are likely to be limited by the number of sites suitable for projects.

Despite some imperfections, the ROC regime remains crucial to encouraging alternative energy projects. As shown in Exhibit 11, without this support only sewage gas meets our investment criteria among the producers, with the third most cost-effective, large hydro, still requiring a significant reduction in cost.

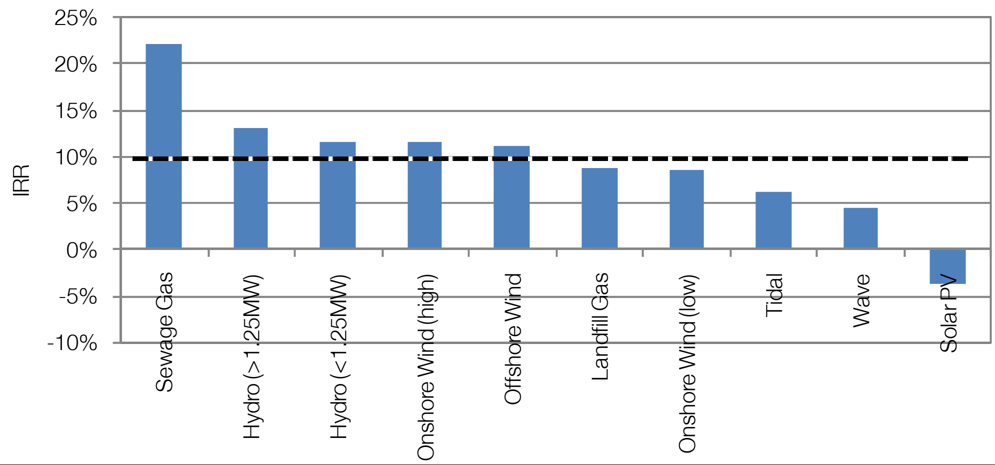
Exhibit 11: Percentage decrease in cost required to achieve a project IRR of 10% without ROCs



Source: DECC (BERR), Edison Investment Research

On our criteria, ROCs appear to be set at a sensible level with the likely near-term scalable energies, wind and hydro, having returns approximate to our investment criteria. This is important as returns above this would increase the cost to consumers, while below this would threaten alternative energy targets.

Exhibit 12: Project IRR by technology



Source: DECC (BERR), Edison Investment Research

The UK has significant tidal and wave resources that may offer a significant source of electricity in the future. However, the generation cost remains too high to be competitive.

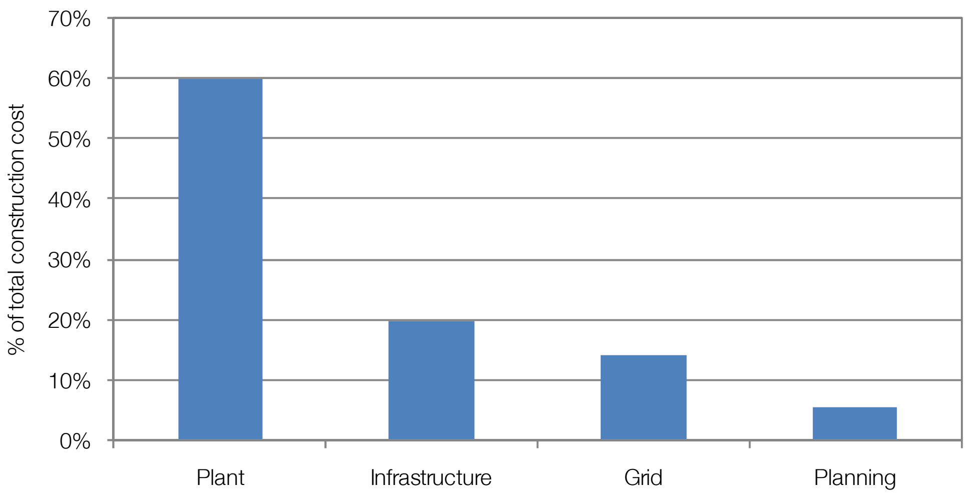
Solar power, both thermal (using sunlight to heat a liquid to drive a turbine) and photovoltaic (use of silicon to turn sunlight directly into electricity), remains the most expensive form of alternative generation. To this end, the ROC regime has allocated the maximum support, two ROCs/MWh, to encourage technological development. The low returns ensure that current projects will be limited to test and development sites, and therefore limit the cost to consumers.

4 Big gains to be made by making the technology cheaper

A recent report by Ernst & Young for the DTI (DECC) surveyed current alternative energy projects and broke the construction costs down by type.

Exhibit 13: Alternative energy project construction costs by category

Note: Grid connection for offshore wind farms taken as zero following meetings with DECC.



Source: DECC (BERR), Ernst & Young, Edison Investment Research

As plant costs make up the majority of the project cost, new technologies (or construction techniques) hold the key to reducing costs and form part of our investment thesis for wave, tidal and solar technologies.

Furthermore, for grid costs, mostly grid connection, the government is trying to move the cost of connection from producers to consumers, further increasing returns. This is most obvious for offshore wind power where regulation is seeking to ensure all connections are ‘free’ for the producer.

The cost of planning averages 6% of the overall costs. However, while its proportion is relatively small, most project planners we have spoken to, particularly for wind turbines, noted the length and complexity of the process as having a material impact on project risk.

Energy efficiency

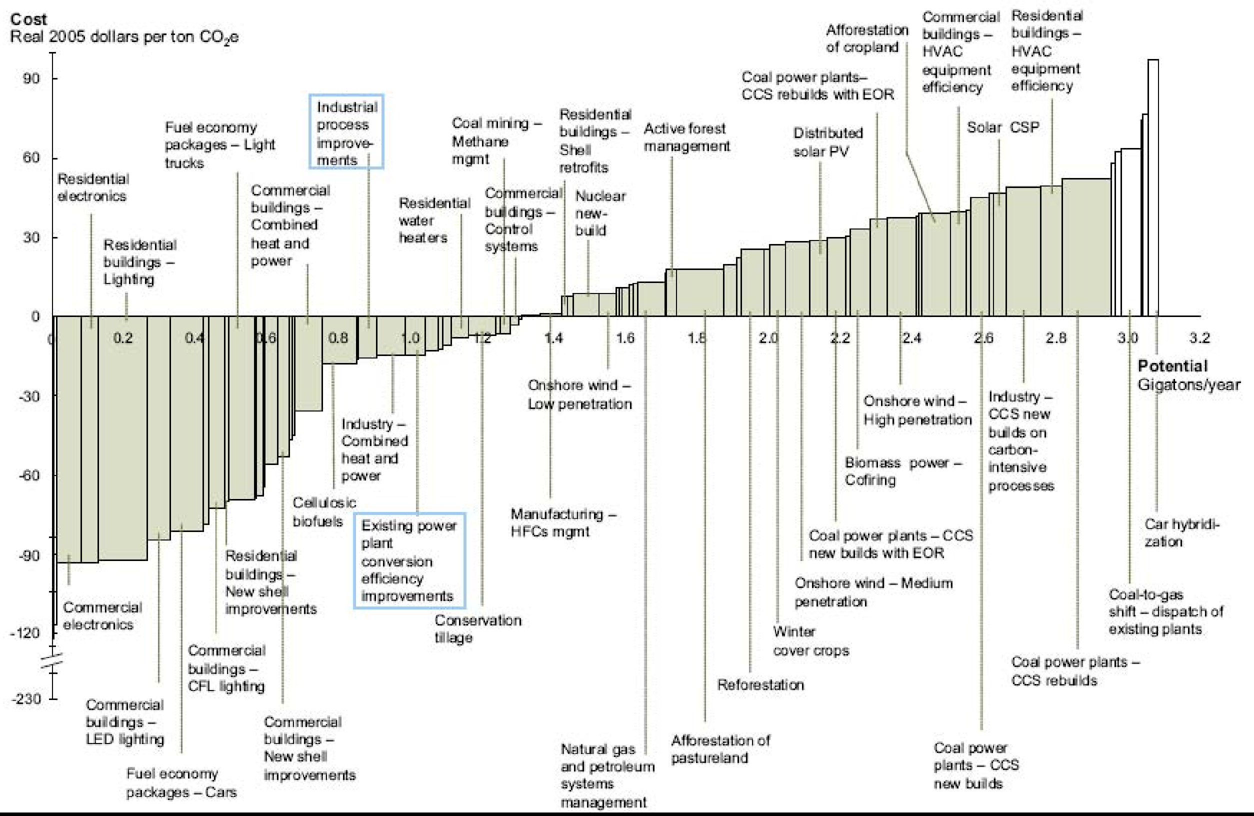
Energy efficiency offers a relatively inexpensive way to reduce carbon emissions and receives regulatory support in many countries. Across Europe, high efficiency systems receive support at the European rather than national level.

Using cost-benefit analysis, converting existing power plants to higher efficiency modern technology can offer some of the cheapest carbon savings. Government policies whereby energy users subsidise renewable energy producers (feed-in tariffs and the UK ROC regime) only increase this effect. Similarly, industrial process improvements also offer large savings.

We believe both of these effects apply to high temperature superconductor (HTS) materials, which have the potential to both improve efficiency (eg reduce electricity consumption) and improve performance (eg of industrial heaters and national electricity grids).

Exhibit 14: CO_2 gains to be made from different sources

Note: Both efficiency gains and alternative energy offer relatively cheap, high volume methods of reducing carbon emissions.



Source: McKinsey Analysis

Alternative energy technologies

We have chosen to profile the technologies of wind (onshore, offshore), solar (thermal, photovoltaic), bio-energy, hydro and marine (wave, tidal). These are the pre-eminent generation technologies and are sufficiently mature for financial analysis, as well as having the potential to be significant contributors to the alternative energy target set by the UK government. Although it will never be a major contributor to alternative targets, we have also included geothermal as it receives maximum ROC support.

Each technology can be be broken down into subtypes, which we highlight to demonstrate the scope of our research and which are incorporated into our financial analysis.

In the following sections, we look at the value chains of each technology and suggest the prime areas for investment. We also review the current status of the technology in the UK, its variations, and where the costs lie when constructing generating assets. We include observations or data we found interesting, and the major issues and advantages of the particular technology.

We have estimated financial returns for projects using a discounted cash flow model (DCF) to suggest the potential upside to investing in generating assets using a particular technology.

Our data are from a wide variety of sources, including industry bodies and associations, UK government surveys and interviews with the companies involved. We collected data on technology costs, funding availability, funding costs (which have changed little over the last two years), maintenance cycles and cost, and the cost of capital used by investors and others.

Our assumed electricity price is £45 per MWh, the approximate four-year average price, and our assumed ROC price is £50, ie close to the current price. This is despite our expectation that the shortfall of the actual alternative energy generation compared to the target will grow.

We took this approach as we believe that without coercion, industry will require sufficient returns to make the investment that is necessary to meet government targets. In addition, the UK incentive regime is focused on using market mechanisms to improve returns to encourage significant investment. The idea is that by improving the returns of riskier technologies, both investment in generating assets and technology development to reduce risks and costs are stimulated.

Some specific areas were omitted. These include fuel cells and carbon trading, which we consider sectors in their own right, as are clean or cleaner fossil fuels. Bio-fuels in the form of hydrocarbon substitutes such as bio-diesel were also excluded as they are not being used for significant electricity production and are linked more to transportation. We have also excluded landfill gas and sewage gas as they lack significant growth potential.

5 Wind

Exhibit 15: Wind supply chain: Our view on value

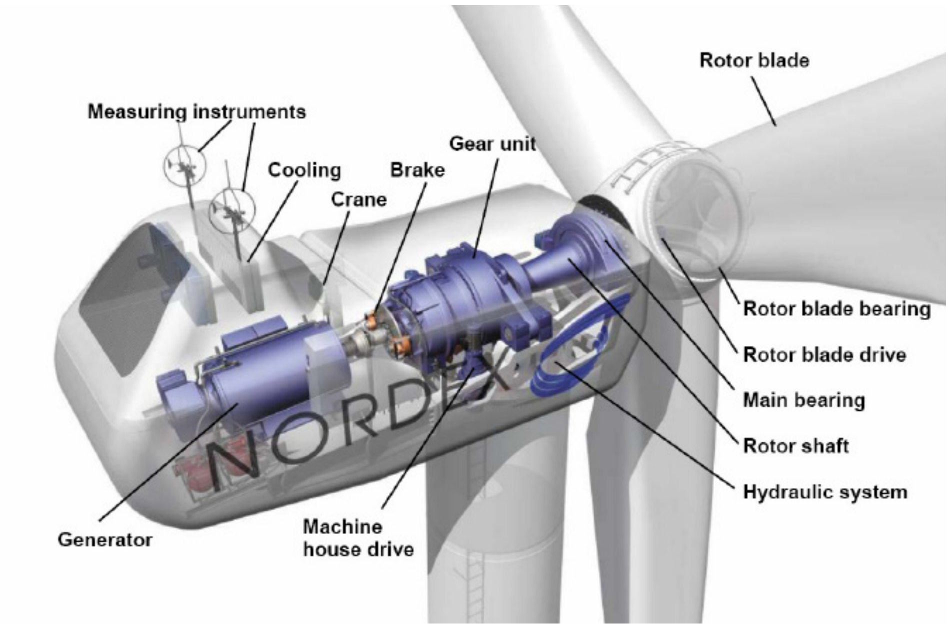
Wind	Component Manufacturers	Turbine Manufacturers	Site Developers
	- Neutral as components still required. Some additional capacity may be slowed	✗ Large prepayments giving negative working capital likely to unwind	✓ Finance is getting more difficult; however capex is backloaded therefore no significant losses if plant does not go ahead Culture of prepayments and long lead times likely to be eased as some projects cancelled Projects/companies that can get funding should benefit from weakening demand through lower prices but also from WC improvement as prepayments shrink
Listed Companies	Hansen Transmissions	Clipper Windpower	Greenko Group Novera Energy Renewable Energy Generation Renewable Energy Holdings SeaEnergy (Ramco)

Source: Edison Investment Research

Technology

All wind turbines operate on a similar principle. An electricity generating plant is mounted on a vertical stem allowing rotor blades connected to the plant to turn a generator as wind passes through the rotors. Advanced control units have been developed to alter the pitch of the rotors, the direction the turbine faces and the gearing between rotors and generator to ensure optimal power output. The gearing unit is important to again optimise generator output depending on wind conditions and rotor position and pitch.

Exhibit 16: The components of a typical wind turbine



Source: Nordex

The wind cannot be relied on to blow constantly

The unpredictability of the wind and the matching of wind generation with electricity demand is a challenge to wind power becoming a larger generator of the UK's electricity. A turbine may be automatically stopped if wind speeds move above or below the operating range, usually 4-25 metres per second (m/s). The optimal wind range is 14-25m/s for most turbines.

One approach to reducing the volatility of wind production is to site wind farms throughout the UK, thereby stabilising the contribution from wind overall. In this way localised wind patterns and their effects on individual farms or areas would be minimal. Recent DECC surveys suggest an onshore wind site in the UK would experience winds lower than 4m/s 15-20% of the time, although the chances of this happening at a national level are very remote (c 0.01%). Therefore, for 85% of the time over half of UK wind farms should be generating electricity. Overall, UK wind supply is sufficient to ensure a reliable level of generation.

If the wind can be relied upon, then velocity is the next issue. This is due to the wind power available for conversion to electricity being an exponential function of the wind speed. Potential electricity generation from wind blowing at 6m/s is twice that for wind at 5m/s.

Wind is an economic and scalable source of alternative energy. As wind is less reliable than fossil fuels, advances in energy storage could become a significant catalyst to wind farm building and an industry in its own right. Technologies that appear promising include advanced batteries and hydrogen generation (eg water electrolysis).

Technology made more complex by autonomous operation

Most turbines are the upwind type where the rotor is to the windward side of the tower. This has the advantage that the rotor does not enter the 'shadow' of the tower where there is lower wind, but it means an intelligent yaw mechanism is required to keep the rotors facing the wind. Yaw simply means rotation in this context. Yaw is important as it not only keeps the rotors perpendicular to wind direction, but also keeps the pressure load on the rotor blades within the limits of intended design. Malfunctioning yaw mechanisms can increase turbine stress and certainly reduce power generation.

Yaw mechanisms can cause problems with cables becoming twisted, so the yaw mechanism also tries to minimise the number of full rotations it completes, or has an unwinding period when it spins (usually up to five times) in one direction to unwind the cables.

Wind turbines have an array affect, meaning they disrupt the wind as it passes – the optimal wind speed reduction in a turbine is around one-third of entry speed – which is a design issue that limits the density of turbines on a wind farm and hence increases the area required per MW. The maximum possible conversion of wind energy to mechanical energy by a rotating turbine is 59.3% (Betz' law).

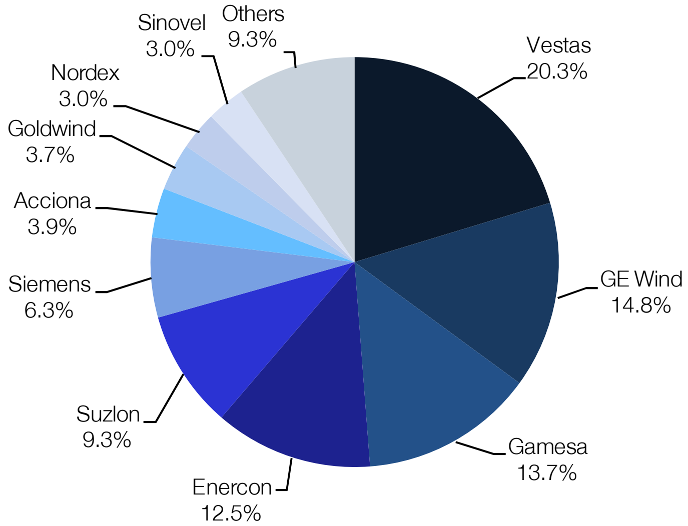
5.1 Industry analysis

Turbine supply

Turbine development is a high-risk, capital-intensive business. Therefore, supply is dominated by large national or international energy companies or conglomerates, particularly those with construction businesses. Most new turbine designs have a period of around four years during which mechanical and design flaws are identified, usually requiring expensive correction work to installed turbines.

The global onshore wind turbine supplier market is dominated by six companies that constitute over 75% of all onshore turbine deliveries. Headed by European companies, the top 10 manufacturers are notable for including two Chinese and one Indian company.

Exhibit 17: Global onshore wind turbine manufacturers by market share

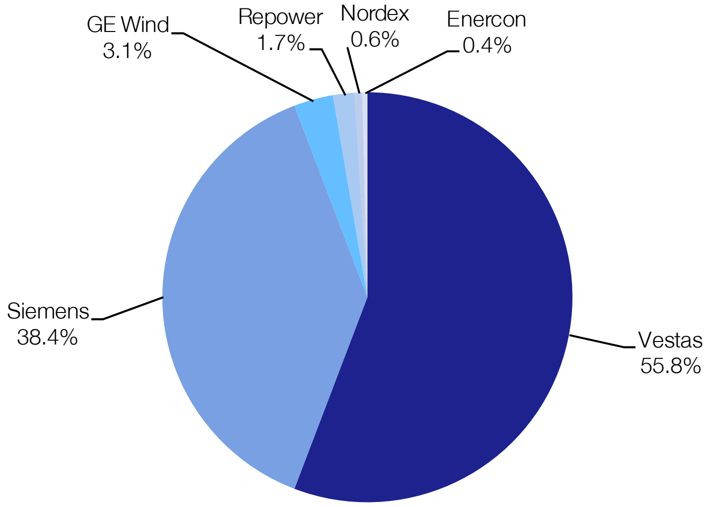


Source: BTM Consult, Edison Investment Research

Order lead times for components have been running at over one year, especially drive trains, gearboxes and bearings. Therefore, turbine supply is not elastic in the short term. As a result volatility in delivery times and cost relative to demand are likely to increase. We see this as having significant potential to cause delays to investment.

The average selling price for a gearbox at Hansen Power Transmissions increased from €64,000 in 2006 to €89,000 in 2009. In addition to demand, some of this increase will be material cost pass-through, larger average turbine size and increased servicing costs.

Exhibit 18: Global offshore wind turbine manufacturers by market share



Source: BTM Consult, Edison Investment Research

The British Wind Energy Association (BWEA) believes that only a few turbine suppliers have built up a credible offshore turbine business – Vestas, Siemens and REpower– with no offshore turbines currently manufactured in the UK. Clipper Wind Power plans a factory in Northern England to come online in 2014-2015 for its large offshore Britannia turbine.

In 2007, the lead time for turbines for offshore wind projects was two-three years.

Turbine cost

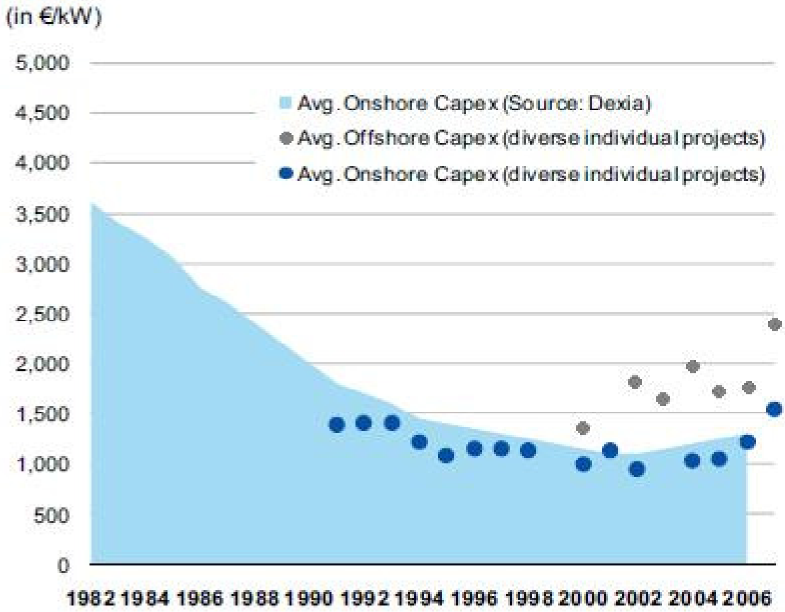
Currently onshore turbine costs in the UK are c £1.2m per MW with offshore costing c £1.6m. Many factors influence the cost including wind power, reliability, ground conditions, accessibility and grid connection. The difference in cost between onshore and offshore is reduced by the higher capacity utilisation of offshore wind farms and the fact grid connection costs are spread over operational years. On the flip side, construction and infrastructure expenses are increased by the harsher conditions (with site access often limited to weather or seasonal windows), the remote locations, the higher cost of securing or anchoring the turbine and the higher cost of capital, with offshore wind farms seen as having greater risk. On a per MWh basis, the costs are £44/MWh for onshore wind and £58/MWh for offshore.

The main reduction in costs in the past 30 or so years has been via increased generation capacity. New materials and designs have allowed turbine size to increase significantly, but it is in the generator and turbine control that the most substantial gains have been made. For example, in 1980 RWE had a 38m (including rotor height) turbine with a capacity of 30kW. By 2005, the height had increased to 180m, a 4.7x increase, with a capacity of 5,000kw, up 167x.

The cost of the plant for a typical onshore wind farm is c 66% of the total installed cost, meaning there is further scope for technological progressions at the generator, plant or control levels to reduce the cost of production. Similarly for offshore, 52% of costs is the plant (assuming zero grid connection costs in line with UK government plans) with 46% the remaining infrastructure.

Exhibit 19: Surveyed total installation costs of onshore and offshore wind farm projects in Europe

Note: Costs are in euro not pounds sterling.



Source: RWE Innogy, Dexia

Overall, from 1982 until 2002, per MW wind farm costs were falling as technological developments improved and the industry's expertise grew. From 2004 onward, demand began driving the cost up again, peaking in 2007. Offshore wind farm costs appear to have increased most significantly. As an example of a tangible effect, Shell UK was originally an investor in the 1GW London Array. However, when costs per MW increased from the original £1.9m to £2.4m, Shell ended its involvement leaving its partners to continue the project.

Most of the technological improvements specifically for offshore wind are in the support platforms for the turbines and remote monitoring and maintenance systems, increasing the availability factor and reducing maintenance costs.

At the end of 2008, the high demand began to collapse, with Hansen Power Transmissions reporting some downward pressure on both volumes and prices for its gearboxes. It also reported an easing of bearing supply bottlenecks, meaning that both the most serious constraints of recent years, which increased turbine lead times up to 2007 and 2008, appear to be easing.

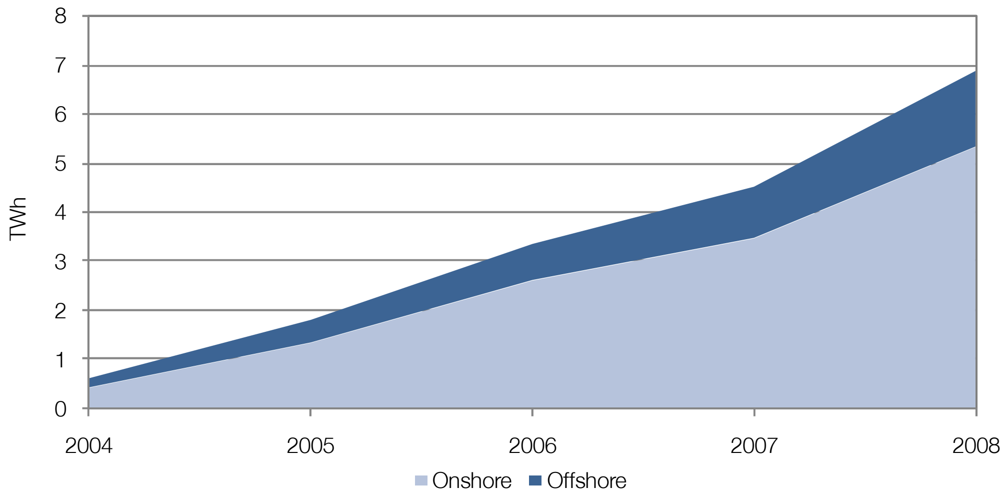
A recent development is the use of high-efficiency materials such as high-energy superconductor to increase power generation and reduce the cost per MW. Zenergy Power is developing such a generator in partnership with Converteam. We do not see near-term volume deployment of such generators, which would prototype early in 2010 and reach production in 2012.

5.2 Planning

The UK has completed two rounds of tendering for sites identified by the Crown Estate and BWEA as most suitable for offshore wind generation. A study in 1996 identified an accessible wind resource offering 230TWh of energy at water depths of 10-50m excluding restricted areas (eg shipping lanes). Recent government papers suggest a near-term recoverable 150TWh in wind energy. Both these figures remain significant relative to the total UK consumption of 341TWh in 2007. Technological improvements and a reduction in restricted areas are likely to increase this.

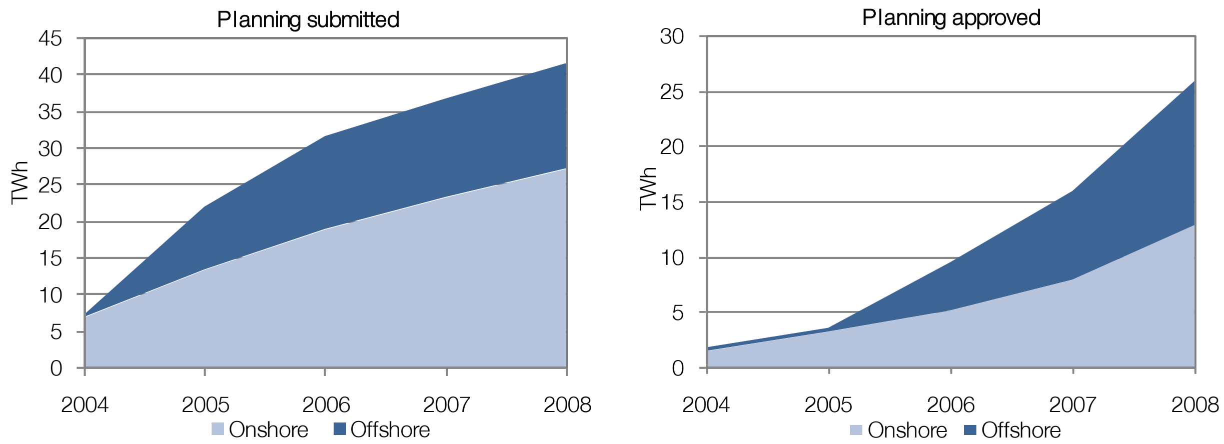
As shown below, onshore accounts for by far the largest proportion of wind generation capacity. However, we believe the impact of offshore wind is likely to be greater in the future. The number of offshore plans submitted for approval has gained on onshore in recent years, and with much lower rejection rates (no offshore plans have yet been rejected) their contribution is likely to be large.

Exhibit 20: Onshore and offshore generation capacity – currently built



Source: Edison Investment Research, BWEA

Exhibit 21: UK Wind onshore and offshore generation capacity submitted for planning and approved (cumulative)



Source: Edison Investment Research, BWEA

5.3 Offshore Wind

Exhibit 22: Costs, returns and scenarios for UK offshore wind projects

Technology Summary	
Total Cost (lifetime levelised £/MWh)	58
Year 1 installation cost (£/MWh)	526
Annual cost (£/MWh)	24
Av capacity factor	35.0%
Current ROC allocation /MWh	1.50
Electricity selling price (£/MWh)	120

Cumulative Return Estimates	1Y	3Y	5Y	10Y
RoI	12%	32%	49%	81%
RoE	53%	146%	224%	369%
Estimated payback period (project)	15 years			
Estimated payback period (equity)	2 years			

ROC allocation scenario	0.0	0.5	1.0	1.5	2.0
RoI	2.5%	5.6%	8.6%	11.7%	14.7%
RoE	11.5%	25.4%	39.2%	53.1%	66.9%
Estimated payback period (project)	18 years				
Estimated payback period (equity)	2 years				

Cost reduction for 10% IRR	No ROC	With ROC
Percentage levelised cost reduction	60.0%	-6.6%
Implied Levelised Cost (£/MWh)	58	62

Source: DECC (BERR), Edison Investment Research

Current status: The UK's big hope for a low carbon future

We expect offshore wind to make the largest contribution to meeting government carbon reduction targets, despite its 32% higher generation cost over onshore wind, which is mainly due to higher anchoring, construction and maintenance costs. The adjusted ROC allocation for offshore wind makes operating assets viable under our returns criteria. This is key to the government's targets, as significant offshore wind farms are planned.

Offshore wind seeks to use scaled up onshore wind technology to exploit the harsher, but higher energy, conditions found offshore in the UK. Given reduced concerns over the aesthetic impact (many sites are not visible from the shore), both turbines and fields may be larger.

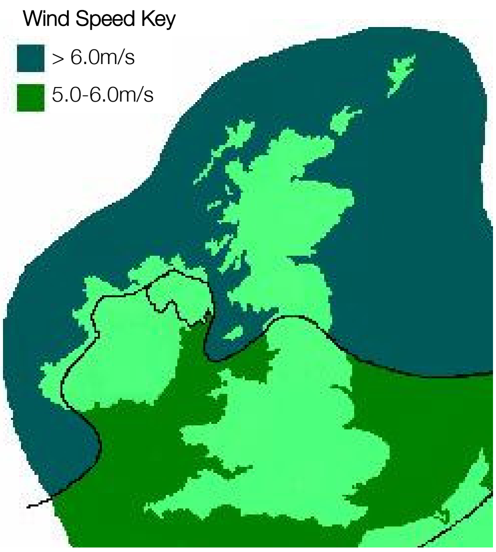
There are four sites in operation in the UK, with a total capacity of c 214MW. Projects totalling 950MW of capacity are awaiting planning approval and a further 7,200MW are awaiting planning applications (under 'round 2' of project tenders), illustrating the hopes being pinned on offshore.

Given that the vast majority of companies involved in the UK offshore wind electricity generation are utilities, gaining exposure to offshore wind is difficult because it represents a small proportion of overall business. We believe there are no UK listed, pure play companies. The closest to achieving this is Ramco Energy through its 88% holding of Sea Energy.

Offshore wind resource

The wind resources in the UK are vast, at c 23% of the European Union total with some of the highest wind speeds and powers.

Exhibit 23: UK and Ireland offshore wind resources



Source: Edison Investment Research, BWEA, Risø National Laboratory for Sustainable Energy

Planning

For both the Round 1 and Round 2 awards, the vast majority went to large utilities. This was expected, as it is the utilities that are penalised for not being sufficiently 'clean' under the ROC regime.

Exhibit 24: Round 1 Offshore wind farm winners

Note: * Indicates projects outside of Round 1 but conforming to its terms and treated as Round 1 by the BWEA.

Location	Size	≈ GWh	Developer/Turbines	Status
North Hoyle	60 MW	184	npower renewables (Vestas 2 MW)	Operating (Dec 2003)
Scroby Sands	60 MW	184	E.ON UK Renewables (Vestas 2 MW)	Operating (Dec 2004)
Kentish Flats	90 MW	276	Vattenfall	Operating (Sep 2005)
Barrow	90 MW	276	Centrica/DONG Energy(Vestas 3 MW)	Operating (Sept 2006)
Gunfleet Sands	30 turbines	276	DONG Energy	Approved
Lynn/Inner Dowsing	57 turbines	524	Centrica	Approved
Cromer	30 turbines	276	EDF	Withdrawn after approval
Scarweather Sands	30 turbines	276	E.ON UK Renewables/DONG Energy	Approved
Rhyl Flats	25 turbines	230	npower renewables	Approved
Burbo Bank	25 turbines	230	DONG Energy (Siemens)	Operational
Solway Firth	60 turbines	552	E.ON UK Renewables	Approved
Shell Flat	90 turbines	828	ScottishPower/Eurus/ Shell/DONG Energy	Submitted
Teesside	30 turbines	276	EDF	Approved
Tunes Plateau *	30 turbines	276	RES/B9 Energy	Submitted
Ormonde *	30 turbines	276	Eclipse Energy	Submitted
Total		4,939		

Source: BWEA, Edison Investment Research

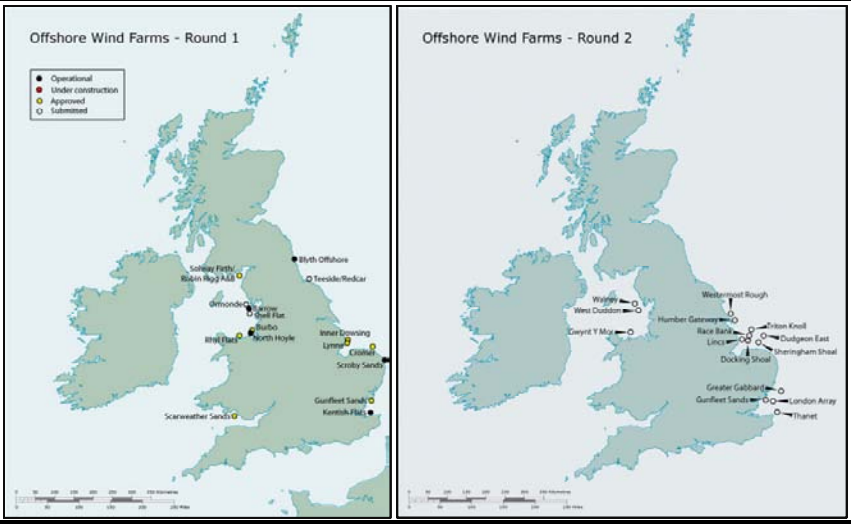
Exhibit 25: Round 2 Offshore wind farm winners

Note: * Shell UK was originally involved in the London Array but pulled out after approval.

Location	Max Size (MW)	≈ GWh	Developer
Docking Shoal	500	1,533	Centrica
Race Bank	500	1,533	Centrica
Sheringham	315	966	Ecoventures/Hydro/SLP
Humber	300	920	E.On
Triton Knoll	1,200	3,679	npower renewables
Lincs	250	767	Centrica
Westermost Rough	240	736	DONG
Dudgeon East	300	920	Warwick Energy
Greater Gabbard	500	1,533	Airtricity/Fluor
Gunfleet Sands II	64	196	DONG Energy
London Array	1,000	3,066	DONG Energy-Farm Energy/E.ON UK Renewables *
Thanet	300	920	Warwick Energy
Walney	450	1,380	DONG Energy
Gwynt y Mor	750	2,300	npower renewables
West Duddon	500	1,533	ScottishPower / Eurus / DONG Energy
Total	7,169	21,980	

Source: BWEA, Edison Investment Research

Exhibit 26: Offshore wind resources and sites under the England and Wales rounds one and two



Source: Edison Investment Research, BWEA, Risø National Laboratory for Sustainable Energy

5.4 Onshore Wind

Exhibit 27: Costs, returns and scenarios for UK onshore wind projects

Technology Summary	
Total Cost (lifetime levelised £/MWh)	44
Year 1 installation cost (£/MWh)	432
Annual cost (£/MWh)	14
Av capacity factor	31.0%
Current ROC allocation /MWh	1.00
Electricity selling price incl ROCs (£/MWh)	95

Cumulative Return Estimates	1Y	3Y	5Y	10Y
RoI	12%	34%	52%	88%
RoE	40%	112%	174%	294%
Estimated payback period (project)	12 years			
Estimated payback period (bank finance)	2 years			

ROC allocation scenario	0.0	0.5	1.0	1.5	2.0
RoI	4.6%	8.4%	12.1%	15.9%	19.6%
RoE	15.3%	27.9%	40.4%	52.9%	65.4%
Estimated payback period (project)	>20 years				
Estimated payback period (equity)	9 years				

Cost reduction for 10% IRR	No ROC	With ROC
Percentage levelised cost reduction	48.2%	-8.9%
Implied Levelised Cost (£/MWh)	23	48

Source: DECC (BERR), Edison Investment Research

Current status

There are around 200 onshore wind farms currently in operation in the UK, representing 2.7GW of capacity. This makes onshore wind one of the UK's more mature forms of renewable energy. However to put this in an international context, Germany installed c 1.6GW of total wind energy in 2008 alone. Germany is considered one of the most developed wind markets in Europe and its continued high installation rates are encouraging for all parts of the wind energy supply chain.

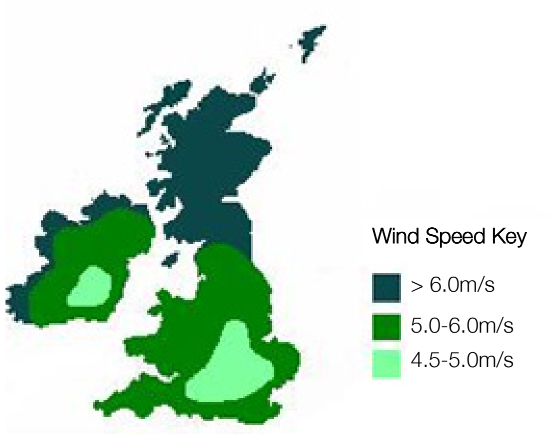
Onshore wind continues to have UK and regional government support. However, given the local government level of building planning in the UK, public objection plays a role in delaying wind farms successfully navigating the planning process. While this does not significantly increase costs directly, it is a source of uncertainty increasing risks. Recent BWEA data on planning applications, approvals and refusals suggests the number of wind farms in the planning process fell dramatically in 2008, potentially negatively affecting future growth.

Similarly to offshore wind in the UK, most onshore wind farms are owned by large utilities and private companies. Again we cannot find UK-listed, pure play companies. We highlight Novera Energy as having significant onshore wind potential, with a 250MW wind target, a wind farm in operation and projects under construction and in planning. Other companies include Renewable Energy Generation, which has wind farm assets in the UK and Canada and a biofuel project in the UK, and Renewable Energy Holdings, which has a variety of renewable generation assets in North America, Europe and wave energy under development in Australia.

Onshore wind resource

The UK has some of the best onshore wind resources in Europe, with the entire country potentially eligible for wind farms.

Exhibit 28: Wind resource map of the UK and Ireland

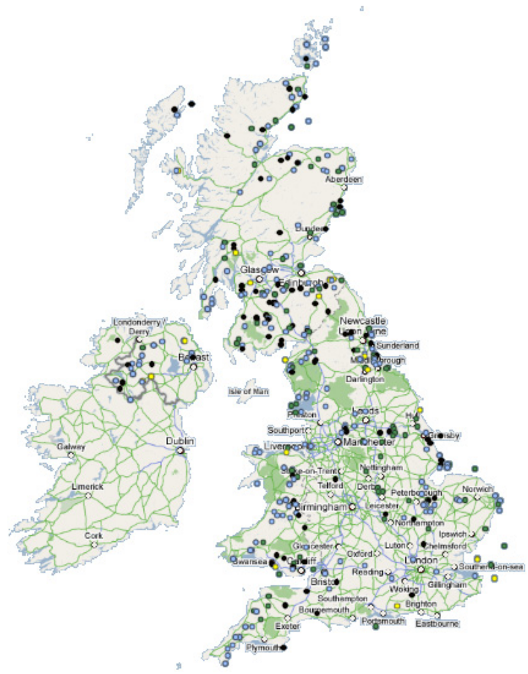


Source: Edison Investment Research, BWEA, Risø National Laboratory for Sustainable Energy

Planning

To date, many wind farms are placed near to areas of demand or electricity infrastructure rather than areas of high wind, suggesting further exploitation potential.

Exhibit 29: Location of onshore windfarms around the UK



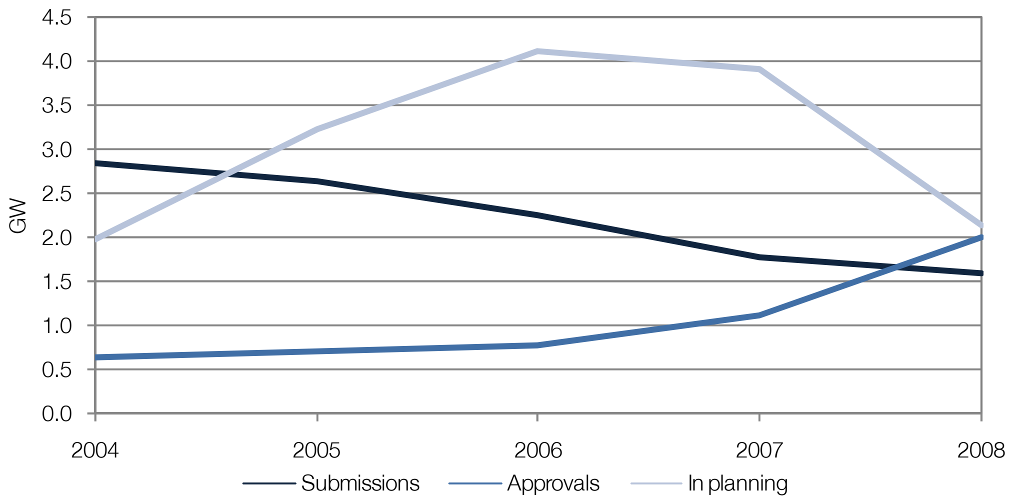
Source: BWEA

However, grid connection will prove a drag factor on expansion going forward. For onshore wind, grid connection currently accounts for 17% of project capex which could increase as more remote areas of high wind are exploited.

It certainly seems as though the high point for onshore wind building has been passed, as while the number of planning approvals and capacity under construction has been increasing, new capacity submitted for planning has been falling every year since 2004. Consequently the backlog of projects in the planning system is decreasing and we expect this to be reflected in total UK wind capacity in the coming years.

One way to counter this would be to increase the number of approvals relative to submissions (which has remained stable at around 56% for the last four years). However, with the UK's locally decided planning system and public hostility to wind farms this is politically sensitive and would be a short-term solution given new submissions fell below approvals for the first time in 2008.

Exhibit 30: An acceleration in new wind farm capacity is likely to be short-lived



Source: BWEA, Edison Investment Research

6 Solar

While not mature, Solar is an emerging technology in the alternative energy space. Therefore, there is a range of competing technologies to provide the lowest cost solution.

Energy generation is based around two main technologies, solar photovoltaic and solar thermal. Solar photovoltaic uses silicon wafers to convert sunlight directly into electricity, while solar thermal uses solar energy to heat a medium, usually air or gas but also oil, sodium and molten salt, which is then harnessed either for the heat directly, or to power an electricity generator.

6.1 Solar photovoltaic

Exhibit 31: Solar supply chain: Our view on value

Solar	Polysilicon Production	Wafers/Ingot Production	Cell Production	Module Production	Site Developers
	× Silicon costs falling significantly Sales contracts floating-price in nature Protected to a certain extent by consolidated market	- Neutral as silicon cost falls	× Competition from falling prices – margin impact	× Competition from falling prices Potential margin impact	✓ Improved returns as solar cost falls Prepayments to suppliers likely to reduce slightly
Listed Companies		Pure Wafer PV Crystalox Solar ReneSola	Jetion Holdings Powerfilm	Jetion Holdings Solar Integrated Technologies	Greenko Group

Source: Edison Investment Research

Exhibit 32: Costs, returns and scenarios for UK solar photovoltaic projects

Technology Summary	
Total Cost (lifetime levelised £/MWh)	254
Year 1 installation cost (£/MWh)	3,371
Annual cost (£/MWh)	32
Av capacity factor	16.0%
Current ROC allocation /MWh	2.00
Electricity selling price (£/MWh)	145

Cumulative Return Estimates	1Y	3Y	5Y	10Y
RoI	2%	6%	9%	14%
RoE	18%	48%	72%	115%
Estimated payback period (project)	>25 years			
Estimated payback period (equity)	8 years			

ROC allocation scenario	0.0	0.5	1.0	1.5	2.0
RoI	0.2%	0.7%	1.2%	1.6%	2.1%
RoE	2.0%	5.9%	9.8%	13.7%	17.6%
Estimated payback period (project)	>25 years				
Estimated payback period (equity)	2 years				

Cost reduction for 10% IRR	No ROC	With ROC
Percentage levelised cost reduction	92.0%	74.2%
Implied Levelised Cost (£/MWh)	20	66

Source: DECC (BERR), Edison Investment Research

Current status: Not cost-effective in the UK

Even with the maximum two ROC incentive, solar photovoltaic energy production in the UK does not make economic sense. The costs are too high and there is not enough sunlight to make the low conversion factors and capacity utilities viable.

However, Germany and Spain are two regions where the industry makes more sense and both have incentive regimes to encourage capacity growth. In the last two years, through the use of large subsidies, Germany has been adding approximately half the world's additional solar power, which has been growing at c 50% pa. The US and China have suitable regions, but are only emerging solar markets.

Technology

The main component of solar cells is silicon (solar grade). Silicon is produced from quartz sand in several melting and cleansing steps.

Solar grade silicon can be partly sourced from the scraps and offcuts of the semi-conductor industry which may be melted at high-temperature into either monosilicon or polysilicon ingots before being sliced into wafers. A polysilicon producer may perform one or both of these steps although solar cell manufacturers also do this in their own right, as both steps are value adding. A recent innovation is solar film or ribbon, which use up to 80% less silicon, but reduce performance in solar cells.

Until 2007 strong demand from both the solar and semi-conductor industries caused silicon prices to rise steeply. Under these price conditions, suppliers announced significant increased manufacturing capacity and we expect to see cancellations and scale-backs as financial conditions remain tight and the solar price remains weak (2009 prices look c 30% below 2008). This will reduce a significant input cost for solar cell manufacturers, which should see increased demand in the medium term as they become more competitive compared to other alternative energy types.

As silicon prices increased, solar wafer manufacturers began vertically integrating with polysilicon producers to capture silicon supply. This trend is likely to continue despite more difficult funding conditions as supplies are still required and polysilicon asset prices are reduced.

6.2 Solar thermal

Current status: No scale production in the UK

The UK does not use solar thermal on any scale. Therefore we have used the US as an example, as it has the best data on solar thermal systems. In the US, systems are classified by the temperature at which they operate. The range from c 90-160°C is medium temperature, with temperatures above or below this range being high or low temperature, respectively.

Low temperature collectors are usually flat-panel or flat-plate designs that are fixed.

Medium temperature collectors may also be flat-plate but may also have a form of 'concentrator'. Usually, this is a reflective plate to concentrate the solar energy from a wide area onto a smaller area or point. These are usually individual systems and relatively small, such as those from Sterling Engine Solutions or RawSolar.

High temperature systems use a large concentrator to achieve the required high temperatures. They may be a scaled up single collector design, such as the largest collector in the world at Odeillo in the French Pyrenees, or designed to use a greater area to concentrate on a smaller area, such as a solar trough or linear Fresnel reflectors.

Exhibit 33: Summary of solar thermal generation capacities

Note: * US 2007 average, source EIA.

Temperature	Temperature Range (°C)	Generative Capacity (kWh/m^2)*	Example system designs
Low	< 90	3.93	Flat-plate Small scale Single system/small array
Medium	90 - 160	2.89 – 3.09 (no concentrator) 6.77 (concentrator)	Flat-plate or concentrators Usually arrays of flay plates Usually single concentrators
High	>160	3.15	Concentrators necessary Either large scale or large array Parabolic trough or LFR most common

Source: EIA US 2007 average, Edison Investment Research

Areas of continued research are heat storage devices such as thermoclines or tanks that can be used to store the solar energy for use on demand when the solar system may not be producing, most obviously at night.

Receiver technologies

To make solar technologies work on an industrial scale, a number of systems have been developed to concentrate the sun's energy.

Linear Fresnel reflectors (LFR) and compact LFRs

LFRs are reflecting arrays used to concentrate solar energy, usually on to towers. They are differentiated by using flat reflecting mirrors that simulate a parabolic dish.

Parabolic troughs

Parabolic troughs use modular concave troughs to focus solar energy onto a collector pipe on the focal point that runs the length of the trough. In this way, solar troughs only need to move on one axis (usually East-West) to ensure continued operation. It also means the foot-print of a plant is usually square vs the circular shape for power towers.

According to the US Department of Energy's National Renewable Energy Laboratory, 58% of the cost of a solar trough is in the support structure. As this is relatively mature technology, cost reduction is unlikely other than economies of scale. Therefore, reducing the cost per MW of solar thermal would likely rely on improved generation efficiency.

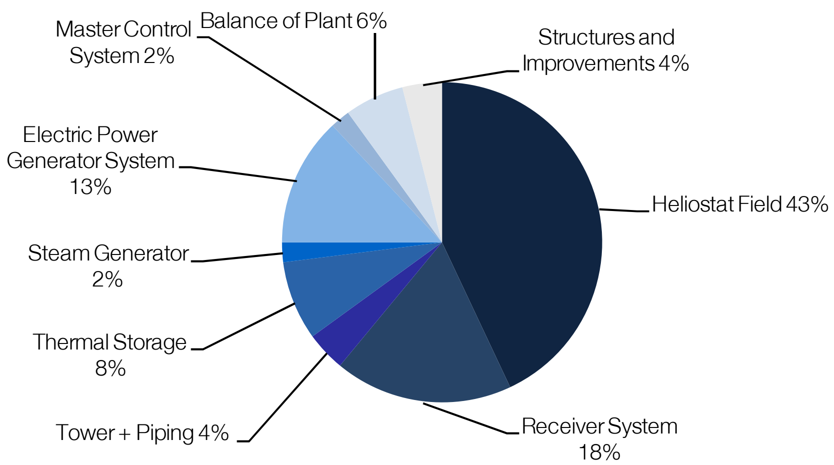
Concentration technologies

Receiver technologies include power towers and central towers and are the focus of concentrated solar radiation from an array. The individual mirrors turn on two axes to ensure focus remains on the tower as the sun moves.

Industry analysis

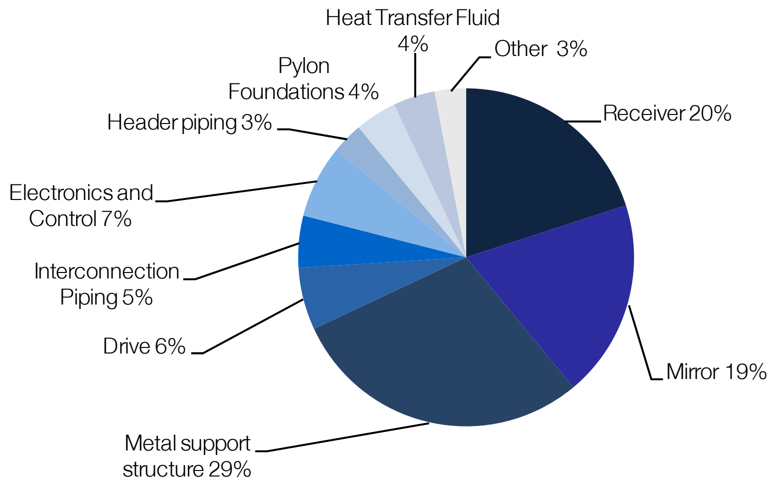
We have used data published by the National Renewable Energy Laboratory in the US to provide a cost comparison for solar heliostat and parabolic generation systems.

Exhibit 34: Cost breakdown for solar heliostat system



Source: NREL, Edison Investment Research

Exhibit 35: Cost breakdown for parabolic dish solar generation



Source: NREL, Edison Investment Research

As there is no UK industry of any scale, we have used data from the US to show the costs of an industrial-scale solar parabolic generation project. Nevada Solar One has an area of 400 acres and can power 14,000 homes. The site's owner, Acciona, states that it cost $260m and has a capacity of 64MW, which equates to $4,063/kW. At an average 30% capacity utilisation (which is in line with NREL data), this represents a cost of $13,540/kWh. Acciona states that capacity could be increased to a maximum of 75MW. Assuming no additional expenditure to increase capacity, this would bring costs down by c 17% to $3,467/kW or $11,560/kWh.

7 Bio-Energy

Exhibit 36: Landfill gas value chain: Our view on value

Landfill Gas	Component Suppliers	Plant Suppliers	Gas Generators	Site Operators
	-	-	-	-
	Most landfill sites use established technology Relatively minor cash flows for most manufacturers	Volumes likely to be relatively low	Most sites mature at or past peak gas production	Limited expansion as new sites actively discouraged by legislation Likely competition on revenue streams from waste to energy Potential long-term value in landfilled materials ROC regime reducing incentives by 75%

Source: Edison Investment Research

Exhibit 37: Sewage gas value chain: Our view on value

Sewage Gas	Component Suppliers	Plant Suppliers	Gas Generators	Site Operators
	-	-	-	-
	Most sites use established technology Relatively minor cash flows for most manufacturers	Volumes likely to be relatively low	Limited additional sites	ROC regime reducing incentives by 50%

Source: Edison Investment Research

Exhibit 38: Waste to energy supply chain: Our view on value

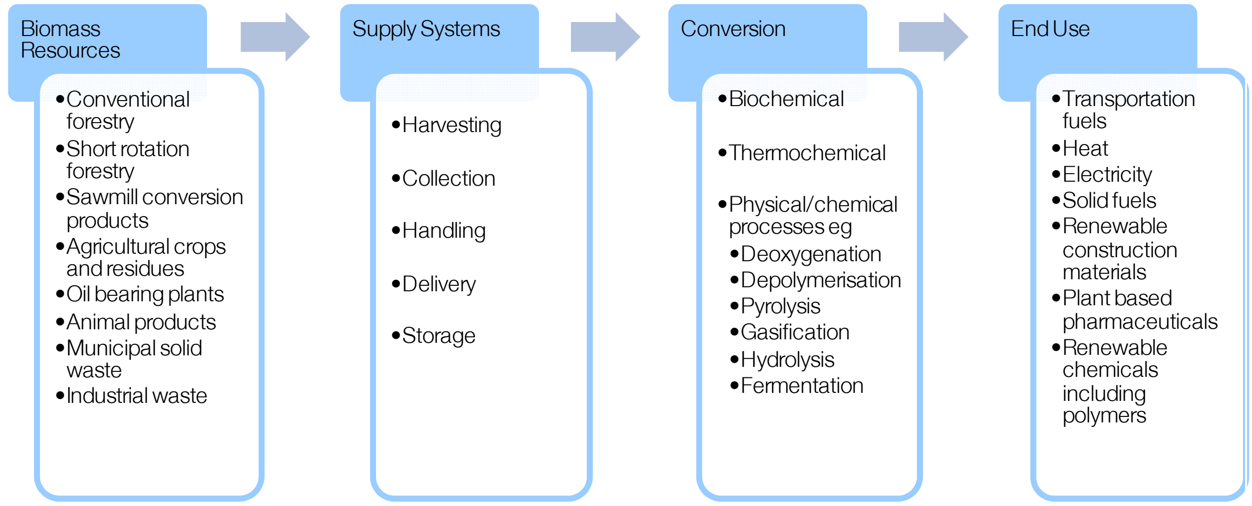
Waste to Energy	Feedstock Producers	Technology Developers	Plant Suppliers	Developers/Site Owners
	✓	-	-	✓
	Previous costs of disposal now a revenue stream Feedstock 'land grab' in action Price likely to increase significantly JVs with producers capture continued value generation	Returns benefit as value of efficiency increases with price of feedstock Current technologies offer sufficient returns with little technology risk	Plant mostly from mature markets with already large margins	Returns increasing; often JVs with feedstock producers to capture supply
Listed Companies				Greenko Group Helius Energy Kedco Novera Energy

Source: Edison Investment Research

Technology

Biomass is defined as any biological material derived from plant or animal matter, living or deceased. Being carbon based it may be used for energy purposes. Recently the term biomass has been associated with alternative energy. However, in reality there are many different end uses of biomass depending on the conversion technology used (shown in Exhibit 40).

Exhibit 39: Biomass stages



Source: DEFRA, Edison Investment Research

Conversion technologies

Conversion technologies can be split between thermal and chemical processes (and sometimes both) depending on the dominant conversion mechanism.

Exhibit 40: Conversion technologies

Conversion technology	Description	Type of technology
Combustion	An oxidation process by which flammable materials are allowed to burn in the presence of air or oxygen resulting with the release of heat, which can either be used directly or to drive a steam engine to produce electricity. Generally the by-products from combustion contain nitrogen (N), water vapour (H_2O), carbon dioxide (CO_2) and a surplus of oxygen (O_2).	Thermal
Gasification	A partial oxidation process that relies on chemical reactions occurring at high temperatures. The biomass is exposed to a controlled temperature, which is managed by varying the amount of oxygen that is combusted. During gasification a carbon source, such as coal, natural gas or biomass, is broken down into carbon monoxide (CO) and hydrogen (H_2), plus CO_2 and possibly hydrocarbon molecules such as methane (CH_4).	Thermal/ Chemical
Pyrolysis	Pyrolysis is the precursor to gasification, and takes place as part of both gasification and combustion. It consists of thermal decomposition in the absence of oxygen. Generally all three states of matter, solid, liquid and gas, are released during pyrolysis. The ratio of each is dependent upon the composition of the biomass and the operating conditions.	Thermal/ Chemical
Anaerobic digestion	A series of processes in which micro-organisms break down biomass, in simple terms, by consuming it. A by-product of this process is a biogas (generally composed of methane and carbon dioxide) and a solid residue, which is nutrient rich and can be used as either fertiliser or animal feedstock.	Chemical
Fermentation	A sub section of anaerobic digestion, where a series of chemical reactions convert sugars to ethanol. It occurs as the yeast or bacteria feed on the sugars. As the sugars are consumed ethanol and CO_2 are produced.	Chemical
Composting	Aerobic decomposition of biomass, ie decaying. This process releases the majority of bound carbon energy as heat.	Chemical

Source: Edison Investment Research

7.1 Industry analysis

In this section, our focus is on the use of biomass for electricity and CHP (combined heat and power), thus our analysis is based on the technologies involved in the conversion of biomass for use in these applications. It is important to note that while each technology is given an umbrella term, for example 'gasification', there are many sub methods of gasification. For the purposes of this report we have explored these sub methods but do not describe in detail their variances and processes.

Cost factors

In contrast to the other sources of alternative energy, dedicated bio-energy requires a supply chain and infrastructure in place to cultivate and transport the biomass. While the use of biomass for energy is not new, its use on an industrial scale is. As with all emerging industries, compared with fossil fuels there are no established supply chains or quality standards. This problem is extenuated by an underdeveloped market place.

Against this backdrop it is unrealistic to consider a single cost/MWh for each biomass source. A variety of factors, some of which are outside human influence and do not necessarily move together, affect costs. Therefore, we have taken a bottom up approach to costs using data from the DTI's working paper, 'Economic analysis of biomass energy'. We have started with the biomass feedstock itself, looking at transport costs and how the cost varies depending on the end use, for example, whether the biomass is being used for dedicated power generation or co-firing with coal.

We have grouped biomass sources into categories such as short rotation crops (SRC) and assume a base price scenario and range for each category. This is contrasted with a central fossil fuel assumption, which also varies depending upon the end use of biomass. Once these costs are in place we analyse the end uses and observe the additional cost of using biomass within each segment.

Feedstock

Biomass – supply and cost (to consumers of biomass) – is affected by:

a) The profitability to farmers of producing either food or energy crops;
b) Seasonality and weather conditions;
c) Varying types of biomass have differing biological attributes; and
d) How much pre-treatment is needed (if any) before the biomass is ready for conversion.

Exhibit 41: Biomass prices

Biomass type	Central price (£/GJ)	Price Range (£/GJ)
Forestry woodfuel – chips	2.5 (60)	2.0-3.0
Forestry woodfuel – logs	2.0 (40)	1.5-2.5
Energy crops:		
– Short rotation crops (SRC)	3.5 (70)	3.0-4.0
– Miscanthus	3.0 (53)	2.5-3.5
Arboricultural arisings	2.5 (49)	2.0-3.0
Straw	2.0 (35)	1.5-2.5
Waste wood – clean	2.5 (49)	2.0-3.0
Waste wood – contaminated	1.0 (20)	0.5-1.5
Pellets from woodfuel	4.5 (90)	4.0-5.0
Pellets from SRC	5.5 (110)	5.0-6.0
Pellets from miscanthus	5.0 (100)	4.5-5.5
Pellets to domestic (including delivery)	7.0 (140)	6.0-8.0
Imported biomass (including delivery)	4.5 (90)	3.5-5.5

Source: DTI working paper 'Economic analysis of biomass energy'

Transport

Transport costs can be a significant element of the overall cost of generation due to varying physical properties of the biomass affecting packing, namely density, which depends on the moisture content. Other factors include the number of round trips that can be made, which itself is a function of the haulage distance and the time required to load and unload.

Transportation for industry is mature so the costs are less variable. Most bio-energy plants are small compared to fossil fuel powered plants. Their mobility implies they can be located closer to their input source, again reducing transport costs.

Exhibit 42: Operating costs for a 38t gross tri-axle combination

Fixed cost	£270/day
Variable cost	36.3p/km
Operating time	240 days/year

Source: Freight Transport Association

Exhibit 43: Estimated average transport costs

Note: Figures in brackets are estimated average transport distances in km.

Application	Energy crops	Woodfuel	Straw
Power generation	£	£	£
1% co-firing, 2,000MW	N/A	0.30 (17)	0.30 (23)
5% co-firing, 2,000MW	0.50 (35)	N/A	0.80 (52)
10% co-firing, 2,000MW	0.66 (49)	N/A	N/A
30MW dedicated	0.36 (24)	0.37 (25)	0.38 (28)
Heat			
0.1 MW (th)	0.30 (17)	0.30 (17)	N/A
1.0 MW (th)	0.30 (17)	0.30 (17)	N/A
10.0 MW (th)	0.30 (17)	0.30 (17)	N/A
CHP			
0.1 MW	0.30 (17)	0.30 (17)	N/A
1.0 MW	0.30 (17)	0.30 (17)	N/A
10.0 MW	0.36 (24)	0.37 (25)	0.368 (28)

Source: DTI working paper 'Economic analysis of biomass energy'

Biomass end use

End use costs depend on whether the plant is a combined heat and power, dedicated power or heat plant. The amount and type of biomass also affects the operational settings of the plant.

Co-firing power generation

Co-firing is generally considered in relation to existing coal fired power stations where the substitution of coal can offer significant reductions in CO_2 emissions. However, co-firing's long-term potential is dependent upon an increasing uptake from new/refurbished coal power stations. This should be aided by regulation such as the 'large combustion plant directive', which aims to control emission levels.

Exhibit 44: Cost of co-firing – existing coal power plants

Note: Woodfuel comprises forestry woodfuel, sawmill co-product, arboricultural arisings and clean waste wood; all values rounded to two significant figures; generation costs are NPV values based on 15-year project duration.

Biomass type	Co-firing	Biomass cost including transport (£/GJ)	Total generation cost (£/MWh)	Increase in generation cost relative to new coal (£/MWh)	Increase in generation cost relative to new gas (£/MWh)
Straw	1%	2.3	47	18	14
Woodfuel	1%	2.8	52	23	19
Imports	5%	4.5	57	28	25
Miscanthus	5%	5.4	72	43	39
SRC	5%	6.0	77	48	44
Woodfuel	5%	5.0	67	38	34
Imports	10%	4.5	56	27	23
Miscanthus	10%	5.5	71	42	39
SRC	10%	6.2	77	48	44

Source: DTI working paper 'Economic analysis of biomass energy'

The incremental cost of co-firing in existing plants, shown in Exhibit 44, suggests generation is likely to be skewed towards straw, woodfuel and imports.

Exhibit 45: Costs of co-firing - new coal fired power stations

Note: Woodfuel comprises forestry woodfuel, sawmill co-product, arboricultural arisings and clean waste wood; all values rounded to two significant figures; generation costs are NPV values based on 15-year project duration.

Biomass type	Co-firing	Biomass cost including transport (£/GJ)	Total generation cost (£/MWh)	Increase in generation cost relative to new coal (£/MWh)	Increase in generation cost relative to new gas (£/MWh)
Straw	1%	2.3	54	25	22
Woodfuel	1%	2.8	58	29	26
Imports	5%	4.5	62	33	30
Miscanthus	5%	5.4	74	45	41
SRC	5%	6.0	78	49	45
Woodfuel	5%	5.0	70	41	37
Imports	10%	4.5	61	32	29
Miscanthus	10%	5.5	74	44	41
SRC	10%	6.2	78	49	45

Source: DTI working paper 'Economic analysis of biomass energy'

Biomass dedicated to power generation

Power stations that operate solely using biomass tend to be of a much smaller size than the 1-2GW capacity of a fossil fuel plant; typical capacity ranges between 20-50MW. However, their small size is beneficial in the following ways:

- Plants can be located close to their fuel source, reducing transport costs.
- There is little public/political disruption.
- Plants can handle a variety of inputs.

Exhibit 46: Generation costs for a dedicated biomass power station

Note: Woodfuel comprises forestry woodfuel, sawmill co-product, arboricultural arisings and clean waste wood; all values rounded to two significant figures; generation costs are NPV values based on 15-year project duration.

Biomass type	Biomass cost including transport (£/GJ)	Total generation cost (£/MWh)	Increase in generation cost relative to new coal (£/MWh)	Increase in generation cost relative to new gas (£/MWh)
Miscanthus	3.3	104	75	71
SRC	3.9	111	81	78
Straw	2.4	93	64	60
Woodfuel	2.9	99	70	66
Wood waste – contaminated	1.4	81	52	48

Source: DTI working paper 'Economic analysis of biomass energy'

The cost differential between biomass and fossil fuels is significant, and with technological and biological improvement the conversion efficiency could be improved, leading to a lower cost per gigajoule. Whether or not this will be achievable with little additional cost remains to be seen.

Biomass combined heat and power (CHP)

Not only does CHP offer the potential to utilise energy resources at a greater overall efficiency, applications for CHP are potentially greater than each individual component.

Exhibit 47: Cost of substituting biomass CHP for oil and gas CHP (8MWe and 30MW th capacity)

Note: e = electricity, th = thermal.

Biomass type	Fossil fuel displaced	Total biomass cost (£/GJ)	Load (%)	Additional cost when placed on electricity (£/MWh)	Additional cost when placed on heat (£/MWh th)
SRC	Oil	3.8	80%	67	17
	Gas	3.8	80%	75	19
Woodfuel	Oil	2.8	80%	44	11
	Gas	2.8	80%	53	13
Waste wood - contaminated	Oil	1.3	80%	11	3
	Gas	1.3	80%	19	5

Source: DTI working paper 'Economic analysis of biomass energy'

Exhibit 48: Cost of substituting biomass CHP for oil and gas CHP (0.3MWe and 10MW th capacity)

Biomass type	Fossil fuel displaced	Total biomass cost (£/GJ)	Load (%)	Additional cost when placed on electricity (£/MWh)	Additional cost when placed on heat (£/MWh th)
SRC	Oil	3.8	80%	91	23
	Gas	3.8	80%	193	48
Woodfuel	Oil	2.8	80%	38	9
	Gas	2.8	80%	140	35

Source: DTI working paper 'Economic analysis of biomass energy'

7.2 Other sources of biomass

Waste-to-energy

Under the EU Landfill Directive, by 2010 England must reduce the amount of biodegradable municipal waste diverted to landfill to 75% of that produced in 1995. There are a variety of measures in place to aid this process, including the landfill allowance trading scheme (LATS) and landfill tax. For 2008/09 tax rates were:

- Active waste (biodegradable, reacts with the ground) – £32/tonne (excluding VAT)
- Inactive waste (does not react with the ground) – £2.50/tonne (excluding VAT).

The rate for active waste will increase by £8/tonne a year until at least 1 April 2010, by which stage it will be £48/tonne. The rate for inactive waste is frozen until 1 April 2010.

The implementation of the landfill directive classified landfill into three main types: hazardous waste, non-hazardous waste and inert waste.

The directive has had a marked change on UK waste disposal. Since 2001 waste to landfill has fallen by 22%, outstripping landfill capacity, which has fallen by 10% since 2001. During 2007 facilities in England and Wales managed a total of 159m tonnes of waste:

- 65m tonnes were land filled;
- 50m tonnes were transferred, before final disposal or recovery;
- 28m tonnes were treated;
- 11m tonnes were handled through metal recycling facilities; and
- 5m tonnes were incinerated.

Exhibit 49: England and Wales landfill snapshot, 2007

Sites	%	Waste, mt
Non-hazardous (biodegradable)	77%	50.05
Inert	18%	11.70
Restricted user	4%	2.60
Hazardous	1%	0.65

Source: Environment Agency, Edison Investment Research

At the end of 2007 there were 684m cubic metres of remaining capacity at permitted landfill sites in England and Wales, which can provide nearly seven years of landfill life for non hazardous wastes at 2007 rates of disposal.

Regulation controlled by the EU directive is limiting capacity and levying charges, which are providing the building blocks required to explore alternative disposal methods. Add to this the ROC regime and waste disposal becomes not just an avoidance of costs but an 'energy from waste' investment choice.

Exhibit 50: Opportunity costs and revenue from waste to energy

Note: Landfill tax represents forthcoming charges for 2009/10.

Avoided landfill cost	£15/t
Avoided landfill tax	£40/t
Avoided LATS	£150/t (max)
Revenue from electricity	£8/t (equivalent to £35/MWh)

Source: DTI working paper 'Economic analysis of biomass energy'

7.3 Other conversion technologies

Anaerobic digestion

Anaerobic digestion (AD) is a series of processes through which organic matter is converted to energy in the absence of oxygen through the action of micro-organisms. The process can be applied, with suitable preparation, to most biodegradable materials; essentially the micro-organisms feed on the organic matter and the most common by-products are biogas (methane) and carbon dioxide. Solid or liquid residues are left that could have value as fertiliser, or in the case of solids as an additional energy resource.

The biogas can be used to produce useful energy in the form of heat or electricity, or it can be blended with propane to substitute for natural gas. For example, in Sweden, biogas blended with propane is compressed and used to fuel a regional bus fleet. AD is considered particularly suited to the conversion of wet materials such as farm, food industry and catering wastes. AD can be deployed at size ranges from a few hundred kWs to several MWs, depending upon the availability of biomass material and, in the case of heat, a suitable year round demand.

Exhibit 51: Cost of substituting biomass AD CHP for oil and gas boilers – 1MW th capacity

Technology	Gate fee (£/t)	Fossil fuel displaced	Load (%)	Additional cost when placed on electricity (£/MWh)	Additional cost when placed on heat (£/MWh th)
Small AD CHP	None	Oil	85%	71	53
Small AD power	None	Oil	85%	47	-
Medium AD CHP	None	Oil	85%	25	22
Medium AD CHP	None	Gas	85%	31	35
Medium AD CHP	30	Oil	85%	CE	CE
Medium AD CHP	30	Gas	85%	CE	CE

Source: DTI working paper ‘Economic analysis of biomass energy’

8 Hydro

Exhibit 52: Hydro energy supply chain: Our view on value

Hydro	Component Suppliers	Plant Suppliers	Site Operators
	✓ Most sites use established technology Relatively minor cash flows for most manufacturers New high-efficiency technologies have the potential to be retro fitted	✓ Volumes likely to be relatively low – replacement every 7-8 years Plant value high New high-efficiency technologies have the potential to be retro fitted	- Dominated by large utility or generator companies
Listed Companies			Andes Energia Novera Energy OPG Power Ventures

Source: Edison Investment Research

Exhibit 53: Costs, returns and scenarios for UK hydro projects

Technology Summary	
Total Cost (lifetime levelised £/MWh)	40
Year 1 installation cost (£/MWh)	447
Annual cost (£/MWh)	7
Av capacity factor	40.0%
Current ROC allocation /MWh	1.00
Electricity selling price (£/MWh)	95

Cumulative Return Estimates	1Y	3Y	5Y	10Y
RoI	13%	36%	55%	93%
RoE	46%	127%	197%	332%
Estimated payback period (project)	11 years			
Estimated payback period (equity)	3 years			

ROC allocation scenario	0.0	0.5	1.0	1.5	2.0
RoI	5.5%	9.1%	12.7%	16.4%	20.0%
RoE	19.6%	32.6%	45.5%	58.5%	71.4%
Estimated payback period (project)	16 years				
Estimated payback period (equity)	4 years				

Cost reduction for 10% IRR	No ROC	With ROC
Percentage levelised cost reduction	42.1%	-22.2%
Implied Levelised Cost (£/MWh)	23	49

Source: DECC (BERR), Edison Investment Research

Technology

Hydropower can be captured wherever a flow of water falls from a higher level to a lower level. This may occur where a stream runs down a hillside or a river passes over a waterfall or man-made weir, or where a reservoir discharges water back into the main river.

Hydro-turbines convert water pressure into mechanical shaft power, which can be used to drive an electricity generator or other machinery. Potential power generation is directly proportional to both water flow rate and the vertical fall of the water.

Of greater importance than water speed is the vertical fall of the water (known as the 'head') which is essential for hydropower generation; fast-flowing water on its own does not contain sufficient energy for useful power production (except on a very large scale such as offshore marine currents). It is for this reason hydropower is often found at dam sites and not simply in the free flowing river – the dam provides greater opportunity for head.

It is generally better to have more head than more flow, since this keeps the equipment smaller and cost lower.

Sites where the gross head is less than 10m are generally classified as 'low head', from 10-50m 'medium head' and above 50m 'high head'.

8.1 Industry analysis

Regulation

Aside from the Renewable Obligation framework, the European Water Framework Directive has an impact on hydropower development in the UK. The directive is a co-ordinated policy to improve and integrate the way water bodies are managed throughout the EU. It aims to reach good chemical and ecological status in inland and coastal waters by 2015. To this end, the Environment Agency is the 'competent authority' for carrying out the directive across England and Wales.

Exhibit 54: Hydro regulatory hurdles

Body	Hurdle
The Environment Agency	To ensure that the site is acceptable
Scottish Environmental Protection Agency	To establish a design that is acceptable To identify the permissions required To discuss and agree an acceptable river operating regime (ie amount and timing of abstractions)
Relevant planning authority	To ensure that the site is acceptable To establish a design that is acceptable, especially where construction work is needed To identify permissions required
Fisheries bodies or those with an interest in fisheries (eg angling clubs) Scotland: the District Salmon Fisheries Board	To address possible concerns at the design stage
Statutory environmental bodies eg English nature and the Countryside Commission	To address potential environmental impacts at the design stage
Scottish Natural Heritage Landowners	To address ownership, access and leasing issues, way-leaves for cables To address possible objections to development
Regional Electricity Company	If an electricity connection is required, to establish any design constraints and connection costs

Source: British Hydropower Association

Licences and consents

Watercourses of any size in England and Wales are controlled by the Environment Agency. To remove water from them (even though it may go back in) will almost certainly require the Environmental Agency's permission in the form of a licence. There are three licences in particular that can apply to a hydropower scheme, as shown in Exhibit 55.

Exhibit 55: Licences and consents

Licence	Purpose/Reason
Abstraction	If water is being diverted 'away from the main line of flow of the river'. In practice, the only type of scheme not requiring an abstraction licence would be a barrage-type project where turbines are installed on an existing weir and the water remains between the existing banks of the river. All new abstraction licences are now time-limited to 12 years, after which they must be renewed. The Environment Agency has stated that there will be a "presumption of renewal", but this is clearly an area of risk for new developments.
Transfer	Applying to certain hydro-schemes since April 2006. This recognises the non-consumptive nature of a hydropower abstraction and does not require the abstracted flows to be measured.
Impoundment	If changes are being made to structures that impound water, such as weirs and sluices, or if new structures are to be built.
Land Drainage Consent	For any works being carried out within 9m of a 'main channel'.

Source: British Hydropower Association

Grants

For domestic developers and other non-commercial owners, the government has reduced the VAT payable on hydroelectric plants to 5% provided they are supplying buildings that are used for either residential or charitable purposes.

The government's Low Carbon Buildings Programme offers grants to domestic owners of mini-hydro plants equal to £1,000 per kW installed, up to a maximum of £5,000, provided the equipment is chosen from an approved product list and installed by a registered installer.

Exclusion from ROC regime

The Energy Bill does not allow electricity generated from large-scale hydro sources to gain a ROC. This is because the economic case for large-scale hydro is sufficient to gain investment in its own right, thus small-scale hydro projects are included to encourage further investment.

Small scale hydro

Exhibit 56: Costs, returns and scenarios for UK small scale hydro projects

Technology Summary	
Total Cost (lifetime levelised £/MWh)	49
Year 1 installation cost (£/MWh)	471
Annual cost (£/MWh)	11
Av capacity factor	40.0%
Current ROC allocation /MWh	1.00
Electricity selling price (£/MWh)	95

Cumulative Return Estimates	1Y	3Y	5Y	10Y
RoI	12%	32%	50%	84%
RoE	38%	107%	166%	279%
Estimated payback period (project)	13 years			
Estimated payback period (equity)	3 years			

ROC allocation scenario	0.0	0.5	1.0	1.5	2.0
RoI	4.6%	8.1%	11.5%	15.0%	18.4%
RoE	15.4%	26.9%	38.4%	49.9%	61.3%
Estimated payback period (project)	16 years				
Estimated payback period (equity)	3 years				

Cost reduction for 10% IRR	No ROC	With ROC
Percentage levelised cost reduction	47.5%	-11.0%
Implied Levelised Cost (£/MWh)	26	55

Source: DECC (BERR), Edison Investment Research

Technology

A typical small-scale hydro generating facility will consist of:

- Water taken from a river by diverting it through an intake at a weir.
- In medium- or high-head installations, water may first be carried horizontally to the forebay tank by a small canal or 'leat'.
- Before descending to the turbine, the water passes through a settling tank or forebay in which the water is slowed down sufficiently for suspended particles to settle out.
- The forebay is usually protected by a rack of metal bars (a trash rack), which filters out waterborne debris.
- A pressure pipe, or 'penstock', conveys the water from the forebay to the turbine, which is enclosed in the powerhouse together with the generator and control equipment.
- After leaving the turbine, the water discharges down a tailrace canal back into the river.

Why small scale?

Although it is unlikely to be a significant contributor to the UK's energy requirement, small-scale hydropower is one of the most cost-effective and reliable energy technologies for clean electricity generation.

In particular, the key advantages that small hydro has over wind, wave and solar power are:

- High efficiency (70-90%), by far the best of all energy technologies.
- A high capacity factor (typically >50%), compared with 10% for solar and 30% for wind.
- A high level of predictability, varying with annual rainfall patterns.
- Slow rate of change; the output power varies only gradually from day-to-day (not from minute-to-minute).
- It is a long-lasting and robust technology; systems can readily be engineered to last for 50 years or more.

It is also environmentally benign. Small hydro is in most cases 'run-of-river'; in other words any dam or barrage is quite small, usually just a weir, and little or no water is stored. Therefore, run-of-river installations do not have the same kinds of adverse effect on the local environment as large-scale hydro or dam usage.

9 Marine

Exhibit 57: Marine energy supply chain: Our view on value

Marine	Component Suppliers	Plant Suppliers	Technology Developers	Developers/Site Owners
	✕ Until the deployment stage volumes are low and unpredictable As designs change risk of component substitution Potential high cost to develop new components	✕ Until the deployment stage volumes are low and unpredictable	- Development continues, test sites and funding remain in place The UK has significant marine assets for the right technologies to exploit Deployment in the medium term will driver value creation	- Returns increasing but do not yet justify investment Technology risk ensures debt limited and expensive
Listed Companies			Ocean Power Technologies Renewable Energy Holdings	

Source: Edison Investment Research

Invest in technology companies

The European Marine Energy Centre believes there are 148 companies globally that are developing a commercial device. Of these, 95 are developing wave technology and 53 tidal. We believe it is too early to determine which technology will be the most successful, although certain trends are emerging.

Developments in wave technology are currently skewed, with 48% of companies aiming to utilise point absorber devices. In tidal, 40% of companies are focused on horizontal axis turbine devices.

Trends we believe investors should look for are companies with large industry partners, strong balance sheets and prototype devices currently in testing.

Only one commercial site globally

Developed by Pelamis Wave Power and based on point absorber wave technology, the Aguçadoura farm off Portugal is the world's first wave farm. It is important to note that the Pelamis device has taken over 10 years to reach commercialisation.

9.1 Wave Energy

Exhibit 58: Costs, returns and scenarios for UK wave projects

Technology Summary	
Total Cost (lifetime levelised £/MWh)	208
Year 1 installation cost (£/MWh)	1,037
Annual cost (£/MWh)	31
Av capacity factor	30.0%
Current ROC allocation /MWh	2.00
Electricity selling price (£/MWh)	145

Cumulative Return Estimates	1Y	3Y	5Y	10Y
RoI	7%	18%	28%	43%
RoE	20%	53%	79%	124%
Estimated payback period (project)	>20 years			
Estimated payback period (equity)	7 years			

ROC allocation scenario	0.0	0.5	1.0	1.5	2.0
RoI	0.9%	2.4%	3.9%	5.4%	6.9%
RoE	2.4%	6.7%	11.0%	15.3%	19.7%
Estimated payback period (project)	>20 years				
Estimated payback period (equity)	4 years				

Cost reduction for 10% IRR	No ROC	With ROC
Percentage levelised cost reduction	78.1%	28.9%
Implied Levelised Cost (£/MWh)	46	148

Source: DECC (BERR), Edison Investment Research

Ocean waves are created by the interaction of wind with the surface of the sea. The size of the waves is determined by the wind (speed, period and fetch), bathymetry of the seafloor (which can focus or disperse the energy of the waves) and currents. Waves have the potential to provide a completely sustainable source of energy that can be captured and converted into electricity by wave energy converter (WEC) machines. WECs have been developed to extract energy from shorelines and out to deeper waters offshore.

Estimates of the potential global electricity generation for wave energy vary widely from 8,000 to 80,000TWh per year (global electricity generation in 2005 was around 17,300TWh).

Technology

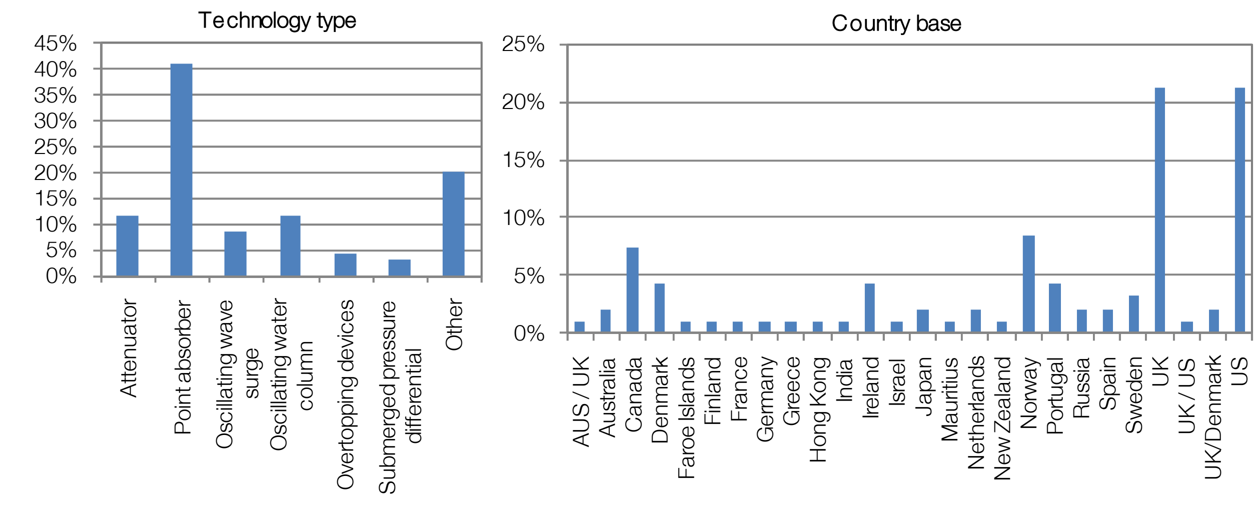
Of the 53 technologies, there are six main WEC technology types being developed globally:

Exhibit 59: Description of the main wave technologies

Type	Description
Attenuator	A floating device that works perpendicular to the wave direction and effectively rides the waves. Movements along its length can be selectively constrained to produce energy. It has a lower area parallel to the waves in comparison to a terminator, so the device experiences lower forces.
Point Absorber	A floating structure that absorbs energy in all directions through its movements at/near the water surface. The power take off system may take a number of forms, depending on the configuration of displacer/reactors.
Oscillating Wave Surge Converter	This device extracts the energy caused by wave surges and the movement of water particles within them. The arm oscillates as a pendulum mounted on a pivoted joint in response to the movement of water in the waves.
Oscillating water column	This is a partially submerged, hollow structure. It is open to the sea below the water line, enclosing a column of air on top of a column of water. Waves cause the water column to rise and fall, which in turn compresses and decompresses the air column. This trapped air is allowed to flow to and from the atmosphere via a turbine, which usually has the ability to rotate regardless of the direction of the airflow. The rotation of the turbine is used to generate electricity.
Overtopping device	This device relies on physical capture of water from waves, which is held in a reservoir above sea level, before being returned to the sea through conventional low-head turbines which generates power. An overtopping device may use collectors to concentrate the
Submerged pressure differential	This device is typically located near shores and attached to the seabed. The motion of the waves causes the sea level to rise and fall above the device, inducing a pressure differential in the device. The alternating pressure can then pump fluid through a system to generate electricity.

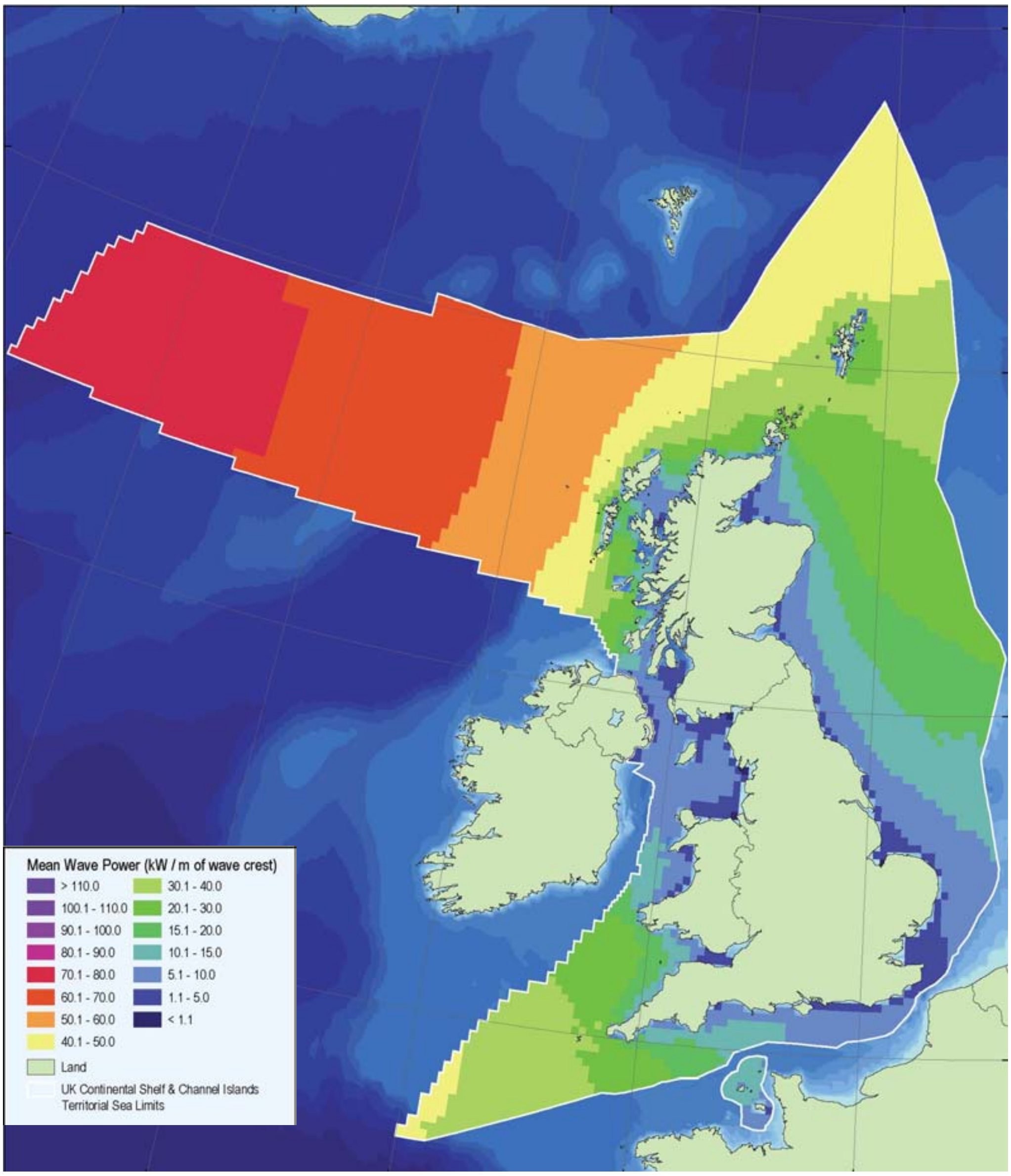
Source: EMEC, Edison Investment Research

Exhibit 60: Global snapshot of wave technology



Source: EMEC, Edison Investment Research

Exhibit 61: UK average wave power



Source: DECC (BERR)

9.2 Tidal energy

Exhibit 62: Costs, returns and scenarios for UK tidal projects

Technology Summary	
Total Cost (lifetime levelised £/MWh)	107
Year 1 installation cost (£/MWh)	963
Annual cost (£/MWh)	24
Av capacity factor	35.0%
Current ROC allocation /MWh	2.00
Electricity selling price (£/MWh)	145

Cumulative Return Estimates	1Y	3Y	5Y	10Y
RoI	8%	21%	32%	51%
RoE	40%	107%	161%	255%
Estimated payback period (project)	>20	years		
Estimated payback period (equity)	3	years		

ROC allocation scenario	0.0	0.5	1.0	1.5	2.0
RoI	1.4%	3.0%	4.6%	6.3%	7.9%
RoE	6.9%	15.1%	23.2%	31.4%	39.5%
Estimated payback period (project)	>20	years			
Estimated payback period (equity)	2	years			

Cost reduction for 10% IRR	No ROC	With ROC
Percentage levelised cost reduction	75.8%	21.6%
Implied Levelised Cost (£/MWh)	26	84

Source: DECC (BERR), Edison Investment Research

Tidal energy exploits the natural ebb and flow of coastal tidal waters caused principally by the interaction of the gravitational fields of the earth, moon and sun. The fast sea currents are often magnified by topographical features, such as headlands, inlets and straits, or by the shape of the seabed when water is forced through narrow channels. The tidal stream devices, which utilise these currents, are broadly similar to submerged wind turbines and are used to exploit the kinetic energy in tidal currents. Due to the higher density of water, the blades may be smaller and turn more slowly than wind turbine equivalents, but can still deliver a significant amount of power. To increase the flow and power output from the turbine, concentrators (or shrouds) may be used around the blades to streamline and concentrate the flow towards the rotors.

Technology

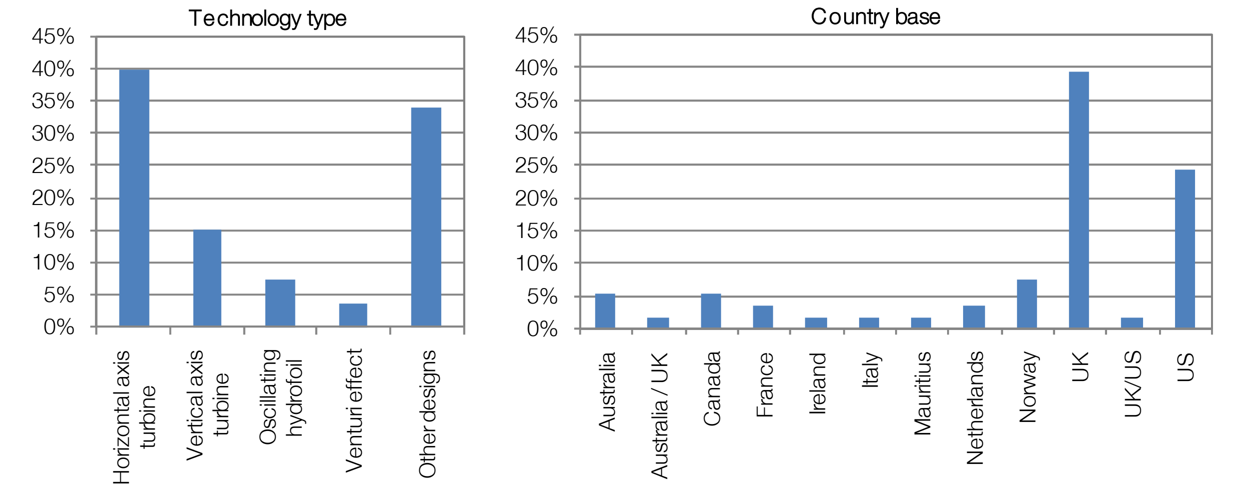
Of the 25 tidal technologies, there are four main types of Tidal Energy Converter (TEC) being developed:

Exhibit 63: Description of main tidal technologies

Type	Description
Horizontal axis turbine	This device extracts energy from moving water in much the same way as wind turbines extract energy from moving air. Devices can be housed within ducts to create secondary flow effects by concentrating the flow and producing a pressure difference.
Vertical axis turbine	This device extracts energy from moving in a similar fashion to that above, however, the turbine is mounted on a vertical axis.
Oscillating Hydrofoil	A hydrofoil is attached to an oscillating arm and the motion is caused by the tidal current flowing either side of a wing, which results in lift. This motion can then drive fluid in a hydraulic system to be converted into electricity.
Venturi Effect	By housing the device in a duct, this has the effect of concentrating the flow past the turbine. The funnel-like collecting device sits submerged in the tidal current. The flow of water can drive a turbine directly or the induced pressure differential in the system can drive an air-turbine.

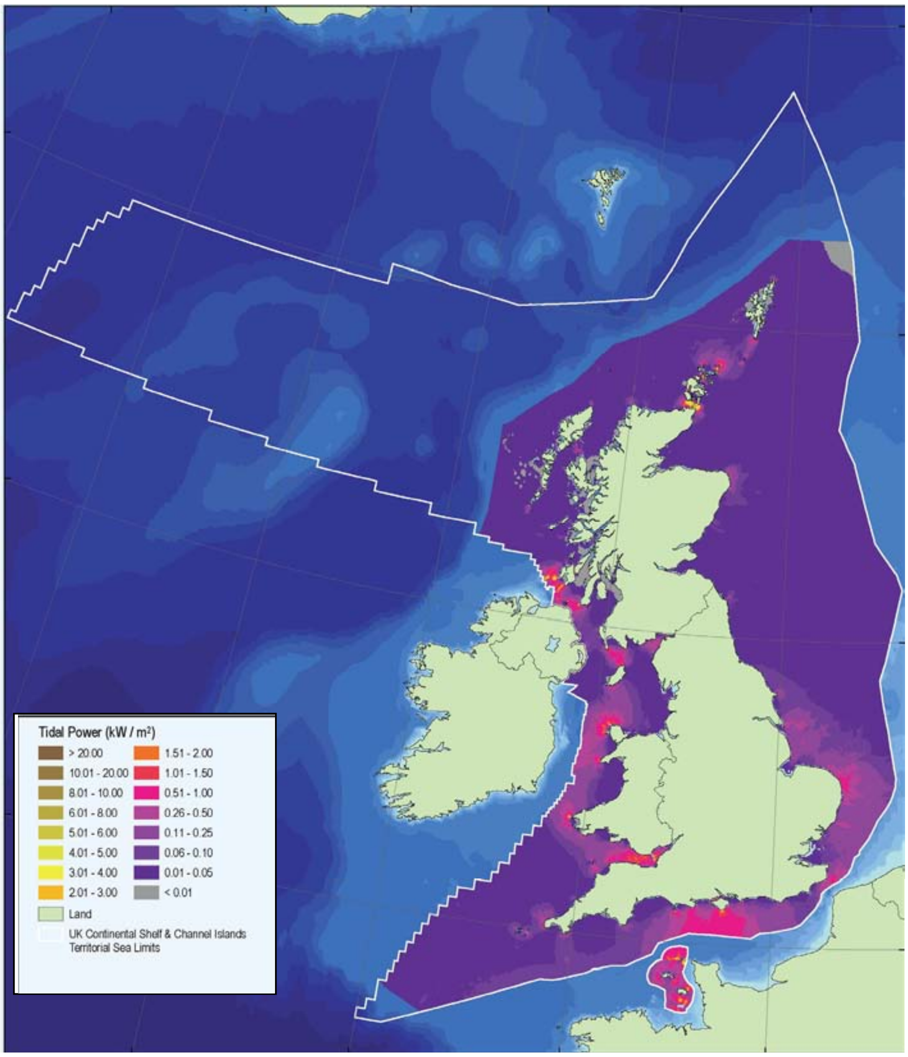
Source: EMEC, Edison Investment Research

Exhibit 64: Global snapshot of tidal technology



Source: EMEC, Edison Investment Research

Exhibit 65: UK average tidal power



Source: DECC (BERR)

10 Geothermal

Potential advantages over other forms of renewable energy

In contrast to other alternative energies, geothermal activity is unaffected by daily, seasonal and annual changes in weather conditions. Therefore it is constantly and consistently available, which offers numerous benefits compared to other sources such as the potential for base-load power plants, ie plants that are devoted to the supply of a minimum amount of power. This allows geothermal power plants to operate at least at 90% of capacity, a key differentiator from other forms of renewable energy.

Requirements and operation of a geothermal system

A geothermal system has been described as a process where convective fluid transfers heat from a source to a free surface. To recover the earth's heat for geothermal energy, such a system requires three components:

1) A heat source – usually rocks below the earth's surface, but also steam pools.

2) A reservoir – this consists of hot permeable rocks through which fluids, typically water, extract heat. The fluids generally lie above a layer of impenetrable rocks therefore are 'trapped' allowing the reservoir to maintain its temperature and be replenished either naturally (rainfall) or via discharged fluid from a managed source.

3) A heat carrier fluid – the fluid from the reservoir that can pass through permeable rocks.

Shallow geothermal energy, as classified by the Geothermal Centre, is a depth between 0–400m with anything in excess of this classified as deep.

Extraction and use

Some of the hot fluids (water) migrate upwards through faults and cracks in the earth reaching the surface as hot springs or geysers. However, most fluids remain trapped underground, forming reservoirs.

By drilling wells into the reservoir, hot geothermal water and steam can be extracted. Once available at production well heads the fluids can be used for electric power generation, heating purposes or for combined heat and power (CHP).

Types of power plant

There are four types of geothermal power plants.

Exhibit 66: Geothermal power plants

Type of plant	Description
Flash power	Geothermally heated water is separated into steam and water; the steam drives a turbine generating electricity, while the water is re-injected into the reservoir
Dry steam	The wells produce only steam, thus in contrast to flash power no separation is needed. Steam drives a turbine to generate electricity.
Binary power	The geothermal fluid is used to heat another liquid which boils at a lower temperature to water. A heat exchanger keeps the two different liquids separate. When boiled the liquid turns into gas and the force of the expanding vapour drives a turbine to generate electricity.
Flash/binary	A combination of the flash and binary plants.

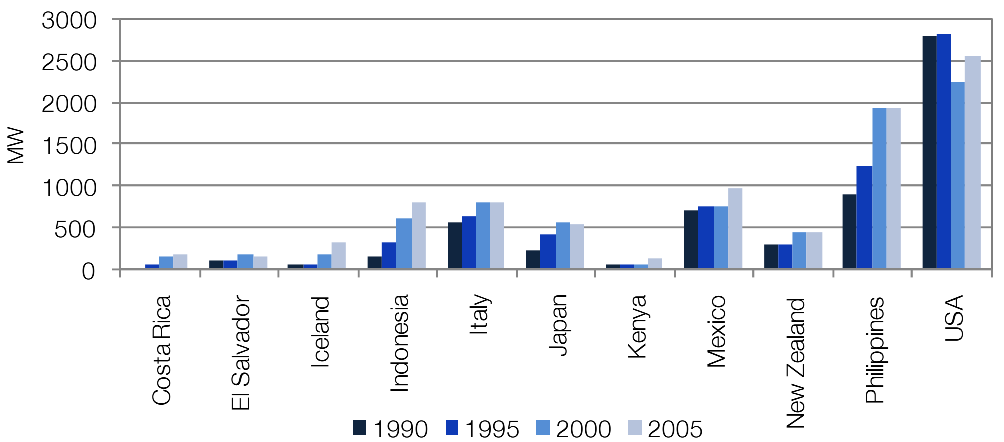
Source: Edison Investment Research

10.1 Industry analysis

Installations

Two of the most prominent regions for both shallow and deep geothermal sources are sites where tectonic plates collide and sites where geysers are found.

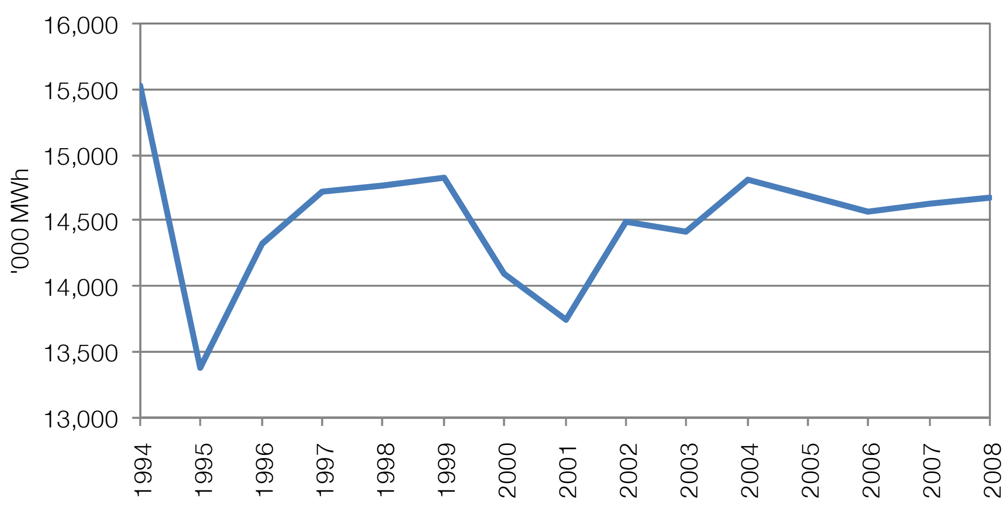
Exhibit 67: Largest installed geothermal capacity by country



Source: International Geothermal Association, Edison Investment Research

The US produces by far the most geothermal power, with most of the activity centred on the West Coast particularly in the state of California. In total, the US has 66 geothermal power plants. As at August 2008, almost 4GW of new geothermal power plant capacity was under construction in the country.

Exhibit 68: Geothermal electricity production in the USA

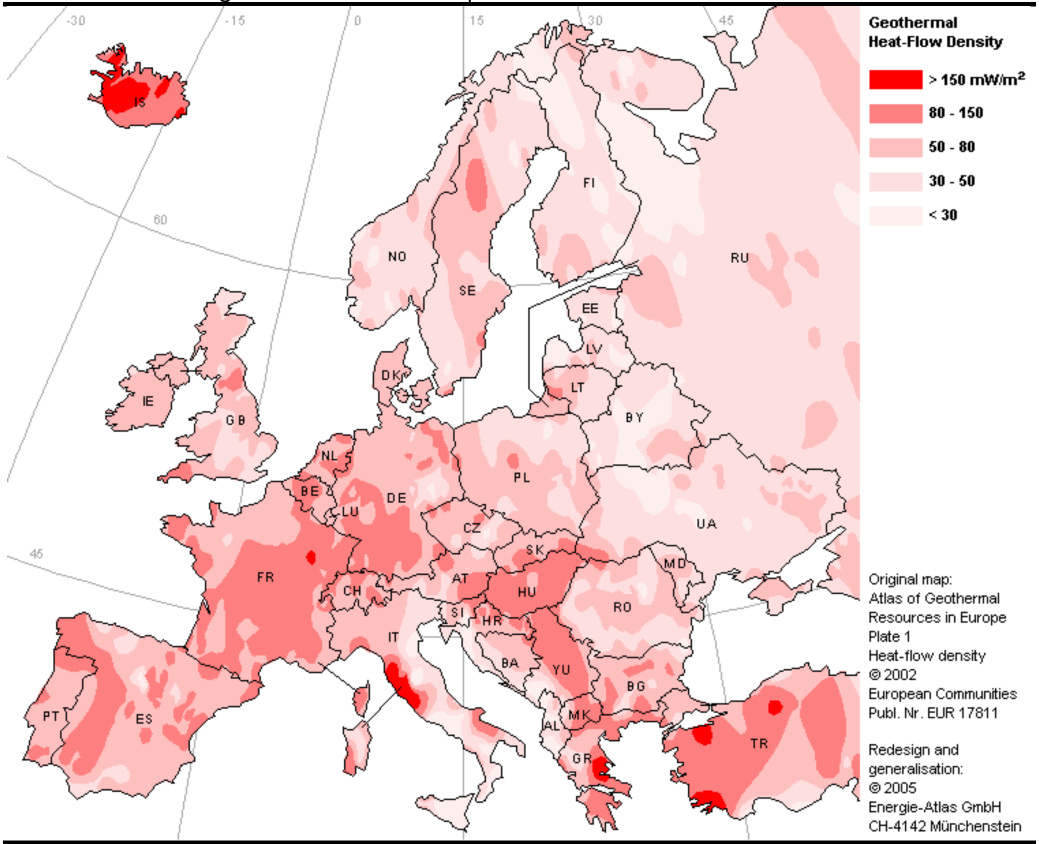


Source: EIA, Edison Investment Research

European resource

There are limited possibilities for power generation from geothermal energy across mainland Europe, principally in Italy and France. In the UK, there is only one site in Southampton, a CHP system providing 16GWh per year.

Exhibit 69: Potential geothermal sites in Europe



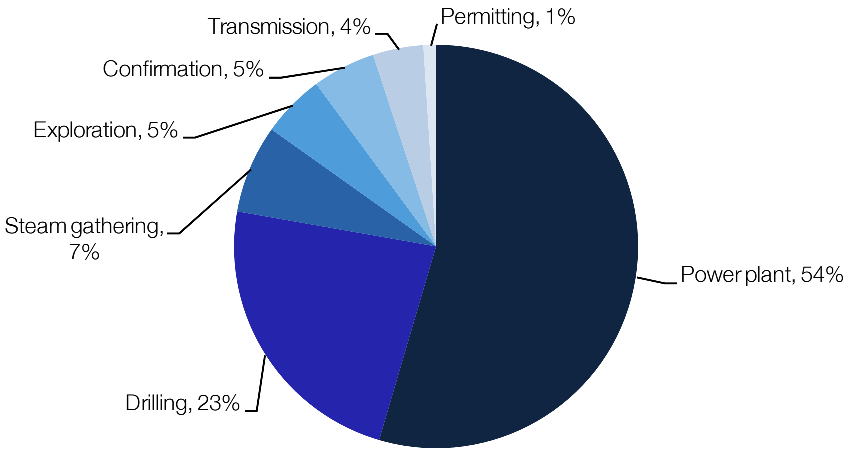
Source: Energie-Atlas GmbH

Costs

Analysing geothermal costs is a difficult process, as industry information does not always conform to published data. Another problem is cost data where similar notions to qualify cost components, have different meanings or definitions. Capital cost is a good example of this, where the scope of the cost components can be variable and, in most cases, the constituents are unclear.

As a guide, in 2005, The Geothermal Energy Association published a detailed paper on geothermal costing, which clearly defines various costing aspects, and utilises many industry sources and projects. Its cost breakdown for a typical geothermal power project is shown in Exhibit 70. The association concluded that an economically viable power plant could cost as little as $2,800/kW or 35c/kWh installed. Meanwhile, The California Energy Commission estimates the levelised costs from new plants at 4.5c-7.3c/kWh, while developers have reported a range of 5.5c-7.5c/kWh.

Exhibit 70: Cost breakdown



Source: Geothermal Energy Association

Company profiles

Edison investment research

Wind: Clipper Windpower

Investment summary: High risk, delayed reward

Clipper is developing wind turbine products, with the stated aim of high reliability and therefore lower-cost energy generation. In common with other manufacturers, faults were discovered in early turbines. In Clipper's case the company was brought to the brink despite the fact component suppliers were found to be at fault. Plans to develop wind farms have been scaled back, reducing potential value creation and reliability of cashflows, and potentially leaving the company vulnerable to any further turbine faults no matter where in its supply chain they may occur. We also believe Clipper would be negatively affected by the ending of prepayments for wind turbines.

Operating asset plans abandoned

Through its CAPGEN former subsidiary, Clipper owns options on land across North America and Europe for 13.6GW of wind farms. Operating assets would have allowed Clipper to drive turbine sales and reduce risk by establishing stable cash flows from electricity sales. However, Clipper failed to raise funding and as credit markets tightened, the plans were dropped. CAPGEN is now looking to divest the options on land with planning permission, although the last successful sale was in 2006. More recently, Clipper has signed JV agreements with BP Wind Energy to take option land through planning in the US with capacity up to 5GW.

Effective liability for its suppliers

Clipper is now a turbine manufacturer with a relatively weak balance sheet (book value $12m and total assets less inventories $167m, compared to an industry average of $23bn and $133bn, respectively). The original issues with Clipper's turbines were in part due to manufacturing techniques at component suppliers, but Clipper could not seek compensation and had to raise $200m for repairs. The company hopes to recoup some of this in the future, for example through reduced prices from suppliers. With effective liability for manufacturing outside of its control, we see ongoing risk to Clipper despite management believing most issues are in the past.

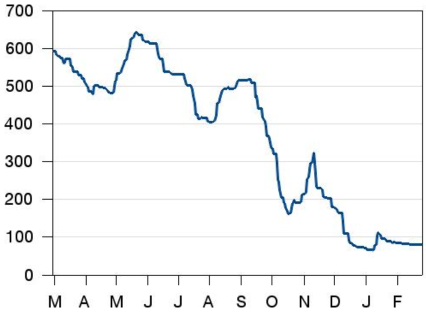
Funding capex plans in changing environment

Clipper is currently developing a 7.5MW offshore turbine, Britannia, which it expects to build at a new factory in the UK in 2012. Early engineering issues with this turbine could be expensive, with the high capex required for the Britannia development. New factory investment and further potential remediation work may mean Clipper would be consuming cash over the next few years. The company has also relied heavily on customer prepayments (worth 83% of total assets in 2007). As turbine bottlenecks reduce, we expect customer prepayments to fall, which could significantly affect Clipper and give the large turbine producers an advantage.

Price	81.0p*
Market Cap	£105m

*priced as at 25 February 2009

Share price graph



Share details

Code	CWP
Listing	AIM
Shares in issue	129.9m

Price

52 week	High	Low
	643.0p	63.5p

Recent newsflow

Feb 2009	Cuts jobs and output
Dec 2008	First 25MW in S Dakota
Nov 2008	Management appointment
Oct 2008	JV up to 5GW in S Dakota
Oct 2008	Management appointment

Business

Clipper Windpower manufactures 1.5MW onshore wind turbines. Clipper has options on a US land portfolio that it intends to take through the planning process for wind farm projects and divest.

Bull

- Large order backlog with prepayments
- Engineering expertise
- Project development through CAPGEN

Bear

- Expensive teething problems
- Weak balance sheet and cash flows continue vulnerability
- Reduced demand likely to concentrate orders at the largest suppliers

Analysts
Ian Osburn
Anil Sharma

Investment criteria

Investment criteria	Summary	Comment
Operator with established assets	×	A turbine manufacturer. Dynamics are moving value to developers and operators.
Positive cash flows/balance sheet strength not reliant on working capital	×	Production issues at first site required a capital raising. BS remains weak vs peers.
Track record of assets through planning	-	A history of planning successes but legacy portfolio and abandoned site development.
Large partner/project finance	×	Clipper has no large industry partners.
Order backlog	✓	A significant order backlog with prepayments. Potentially at risk with lower demand.
Low technology risk	-	Initial technology issues now thought to be resolved.
Insulated from weakening turbine demand	×	Turbine supply is now the most significant source of cash flow. Plans for wind farm development have been shelved.

Industry dynamics

Value chain
As supply bottlenecks for wind turbines reduce and overall demand for turbines weakens, we believe the optimal positioning for investors in wind energy has moved from exposure to manufacturers, to developers/generators.
While turbine supply was tight, a culture of prepayments to manufacturers emerged which we expect to reverse. Furthermore we expect some margin pressure at component suppliers and turbine manufacturers which must be resisted by reducing costs.

Clipper Windpower peers
The top 10 global turbine manufacturers, of which Clipper is not one, account for c 91% of the onshore turbine market on 2007 numbers. These companies are far larger than Clipper with average balance sheet assets (less inventories/prepayments) of c $134bn vs c $167m for Clipper in financial year 2007-2008. In offshore wind, in which Clipper hopes to compete with its new turbine, the top four represent 99% of the market and we expect market penetration for Clipper to be difficult.

Chairman: James GP Dehlsen

In 1980 Mr Dehlsen founded Zond Corporation until its partial acquisition in 1997 by Enron. An advisor to the Department of Energy's Wind Program and delegate to the Conference on Climate Change in Kyoto, Japan. A former board member of the American Wind Industry Association. BSc and MA in Business Administration. Six US patents including wind technology related. Recognition for his work in the wind industry includes the Lifetime Achievement Award conferred by the American Wind Energy Association, and the Danish Medal of Honour.

Financial summary

Year end 31 December	€'000s			
PROFIT & LOSS	2007	2008	2009e	2010e
Revenue	23,869	702,478	900,478	990,478
(% change)	N/A	2843%	28%	10%
EBITDA	(188,142)	(178,828)	44,161	32,452
(% margin)	N/A	N/A	5%	3%
EBIT pre GW and excepts	(196,837)	(196,218)	25,032	9,845
(% margin)	N/A	N/A	3%	1%
Net financials	4,965	(2,214)	(5,841)	(11,906)
Other				
Profit before tax (norm)	(191,872)	(198,432)	19,191	(2,062)
Tax	(608)	3,969	960	41
Net income	(192,480)	(194,464)	20,151	(2,020)
EPS c (norm)	(1.8)	(1.5)	0.2	(0.0)
BALANCE SHEET				
Fixed assets	41,924	24,534	52,172	38,918
Current assets	701,729	567,231	587,542	569,159
Current liabilities	(624,901)	(653,931)	(620,284)	(531,184)
Long term liabilities	(106,440)	(212,228)	(258,979)	(342,210)
Shareholders equity	12,312	(274,395)	(239,549)	(265,317)
CASH FLOW				
Cash flow from operations	(94,653)	(126,619)	(52,298)	(86,923)
Capex	(11,084)	(7,657)	(23,231)	(31,035)
Net debt (cash)	(114,420)	19,206	94,735	212,693
RATIOS				
EV/Sales	8.9	0.4	0.2	0.2
ROCE	N/A	N/A	N/A	N/A
Stock turn	8803	234	201	187
Debtor days	55	29	29	29
Creditor days	1410	61	53	49

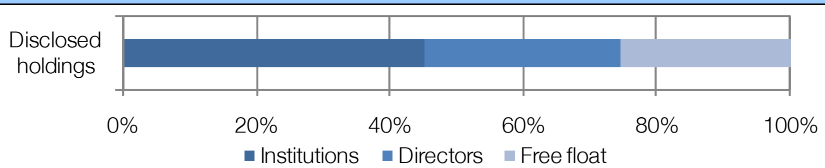
President and CEO: Douglas Pertz

Former CFO and a partner with One Equity Partners. A board member of Nalco Holdings. Former chairman of IMC Global until its merger to form The Mosaic Company. Former president and CEO of Culligan Water Technologies and vice-president of Danaher Corp. Also former executive positions with Cummins Engine Company and Caterpillar. BSc in Mechanical Engineering.

CFO: Michael E Keane

Former CFO to Western Atlas, Unova and Computer Sciences Corporation. Executive positions at Litton Industries and Price Waterhouse. BSc in accounting, MBA from the Anderson Graduate School of Management and Certified Public Accountant.

Shareholdings



Edison investment research

Wind: Hansen Transmissions

Investment summary: COGS are turning

The long-term fundamentals of the wind industry are reassuring for Hansen, although concerns remain on the short/medium-term macro-economic environment and its effect on turbine demand. In response, Hansen is managing capacity expansion in low-cost production countries over the next few years in an attempt to improve margins without creating oversupply. With secure relationships with key wind turbine producers, Hansen is well positioned to weather short-term volatility.

Volume and cost management key

Globally, Hansen supplies gearboxes to four of the 10 largest wind turbine manufacturers representing c 39% of the onshore and 96% of the offshore turbine market. Hansen's management estimates that it has over a 50% market share for large (>1.5MW) gearboxes. Contracts are long-term, priced in euro, and applied universally; consequently, gearboxes can be produced in low-cost countries for a higher margin. We believe financial performance (until contract expiry) depends on end market volumes and taking out costs from design and production.

Capacity control to react to market environment

Hansen currently has two operational factories located in Belgium with c 7,100MW of wind production capacity. With the plants running at high utilisation rates and both turbine production and the number of turbine models at its key customers growing, extra capacity is required. The new facility in India could add 5,000MW capacity but its ramp-up is being controlled and cautiously raised to its maximum by FY13. The second new facility in Tianjin, China, could offer a maximum of 3,000MW of capacity by FY12, which again can be adjusted to react to market conditions. Given the significant difference in employment costs we believe short-term production will be skewed towards India, with the facility likely to reach maximum capacity ahead of China. This flexibility to shift and restrict capacity while reducing costs should protect margins at a point in the cycle when its large customers are applying downward pressure on prices.

Move to low-cost production countries

Hansen's average manufacturing employee in Belgium cost €56k in FY08. Chinese and Indian employees cost €10k and €6k, respectively. In FY08 labour costs were c 24% of sales, implying significant cost reductions as production is transferred to India and China, reducing labour costs as a percentage of sales.

Insulated from changes in industry dynamics

We expect wind farm developers to reduce prepayments to turbine suppliers as supply increases relative to demand. Turbine manufacturers will have to shoulder this additional capital requirement. However, Hansen does not take prepayments from customers and is therefore unaffected by this shift in capital.

Price	92.0p*
Market Cap	£616m

*priced as at 25 February 2009

Share price graph

Share details

Code	HSN
Listing	FULL
Shares in issue	670.1m

Price

52 week	High	Low
	323.5p	75.0p

Recent newsflow

Feb 2009	Agreement with unions
Jan 2009	Trading update
Oct 2008	Interim results
Sep 2008	India update
Sep 2008	China update

Business

Hansen Transmissions manufactures gearboxes for use in industry and wind turbines. As of FY08 wind turbine manufacturer was responsible for 80% of revenue and is the company's focus for the next four years.

Bull

- Move to low production countries to cut costs
- Positive cash flows from operations
- Expansion management

Bear

- Single investor holds 61% stake
- Four major customers creating concentration risk

Analysts
Ian Osburn
Anil Sharma

Investment criteria

Investment criteria	Summary	Comment
Operator with established assets	✗	At this point in the cycle Hansen is not best positioned in the value chain.
Positive cash flows/balance sheet strength not reliant on working capital	✓	Positive pre-working capital movement.
Track record of assets through planning	-	N/A
Large partner/project finance	✓	Long-term supply agreements with Vestas, Gamesa, Siemens and Suzlon.
Order backlog	✓	Bespoke gearbox design can take between 12-24 months and production 6-9 months.
Low technology risk	✗	Gearboxes for larger turbines utilise advanced technology. 2% warranty provision.
Insulated from weakening turbine demand	-	Hansen will face margin pressure, despite contracted prices and falling COGS.

Industry dynamics

Value chain
As supply bottlenecks for wind turbines reduce and overall demand for turbines weakens, we believe the optimal positioning for investors in wind energy has moved from exposure to manufacturers, to developers/generators.
While turbine supply was tight, a culture of prepayments to manufacturers emerged which we expect to reverse. Furthermore we expect some margin pressure at component suppliers and turbine manufacturers which must be resisted by reducing costs.

Hansen peers
For the major turbine manufacturers Winergy, a private subsidiary of Siemens, is a known gearbox supplier and is Hansen's largest competitor. Management estimates that within the 1.5MW to 4.5MW turbine range, Hansen has a 50% market share compared to 30-35% for Winergy. In smaller gearboxes Winergy has a far higher market share.
Other major competitors include China High Speed Transmission, Bosch and Eickhoff.
Buyers often have a policy of multi-source supply meaning other customers are not always direct competitors.

Chairman: Tulsi R Tanti

Tulsi R Tanti joined Hansen in 2006, being the then chairman and managing director of Suzlon Energy at the time of Suzlon Energy's acquisition of Hansen.

Mr Tanti founded Suzlon Energy in 1995 and acted as chairman and managing director of Suzlon Energy until 2006, when he took up a less managerial position as mentor and member of the board of directors of the Suzlon Energy Group.

Financial summary

Year end 31 March	€'000s			
PROFIT & LOSS	2007	2008	2009e	2010e
Revenue	335,563	421,482	635,589	729,629
(% change)	N/A	26%	51%	15%
EBITDA	48,536	58,139	108,492	143,880
(% margin)	14%	14%	17%	20%
EBIT pre GW and excepts	36,750	40,747	82,265	113,772
(% margin)	11%	10%	13%	16%
Net financials	(4,817)	(7,792)	(10,659)	(8,752)
Other	(1,162)	(1,413)	(2,131)	(2,446)
Profit before tax (norm)	30,771	31,542	69,476	102,574
Tax	(9,857)	(3,218)	(19,493)	(25,643)
Net income	20,914	28,324	49,983	76,930
EPS c (norm)	5,349	5.2	0.1	0.1
BALANCE SHEET				
Fixed assets	200,169	353,795	449,308	571,701
Current assets	249,661	584,600	594,332	639,200
Current liabilities	(117,594)	(162,146)	(230,957)	(264,437)
Long term liabilities	(170,202)	(229,131)	(193,782)	(262,189)
Shareholders equity	162,034	547,118	618,901	684,275
CASH FLOW				
Cash flow from operations	(8,544)	54,536	60,093	118,489
Capex	(62,439)	(171,009)	(122,500)	(152,500)
Net debt (cash)	(101,670)	132,731	40,247	(28,160)
RATIOS				
EV/Sales	0.3	3.5	2.5	2.3
ROCE	11.3%	10.8%	12.6%	13.7%
Stock turn	74	118	118	118
Debtor days	79	77	77	77
Creditor days	111	130	130	130

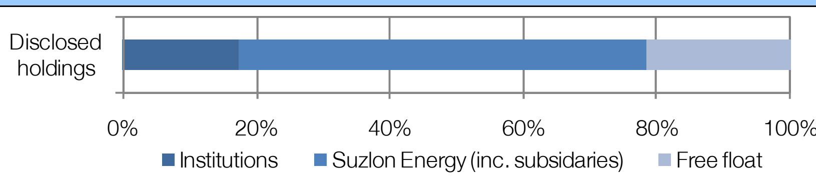
CEO: Ivan Brems

Ivan Brems joined the Group in 1974, and became chief executive officer in 2006. Previously he was vice president of corporate marketing and business development, a post he held for five years. He has over 25 years of experience in sales and marketing with Hansen.

CFO: Alex De Ryck

Alex De Ryck joined the group in 2004 as chief financial officer. Prior to joining the group, he held a number of high profile positions, including chief executive officer of Esselte Belgium and Eldon Belgium, chief financial officer of the Dymo Group and the Eldon Enclosures Group and finance manager at Honeywell Europe.

Free float



Wind: Novera Energy

Edison investment research

Investment summary: Saddle up

Novera has over 122MW of installed capacity currently in operation, generating c 570GW of electricity. The vast majority is from landfill gas (90MW), with 10 hydro sites (17MW) and one wind farm (14.5MW). Novera is reinvesting cash flows from operational assets to expand its wind business, which should take Novera to c 357MW of capacity on a two- to three-year horizon. Continuing the record of successful project completion should generate significant shareholder returns and we believe Novera's deep discount to NAV could attract further takeover interest.

Existing operations ensure longevity

Novera has been an early mover in the UK alternative energy sector. It has captured 46 landfill assets expected to last over 20 years. While output declines at the landfill gas assets, terminating fixed-price contracts will increase revenues giving Novera substantial stable cash flows that it is using to diversify and expand its generation portfolio. Novera is currently the 13th largest renewable generator in the UK, ahead of Centrica, and one of the only UK-listed pure play alternative energy generators.

A stalked horse?

Given Novera's green generation portfolio and growth plans, we believe it could offer significant value to a buyer, for example, a large utility company. Coupled with the fact it is trading at a deep discount to NAV (55% in 2008e), and with previous bid interests from two large shareholders coming out of the price restriction period early this year, we believe there could be further bid interest in the company.

Growth projects identified to reach targets

Novera has a target of 250MW of wind energy by the end of 2011. The significant project pipeline is based on 10 wind farms that should add at least 124MW, with a further 355MW in pre-planning. Of the 10, the three largest (92MW minimum) have received planning consent. With this 250MW, Novera would become the seventh largest generator of renewable electricity in the UK on 2008 numbers. Novera has been successful in obtaining planning consent with only one 10MW site withdrawn from planning on radar interference concerns from the Ministry of Defence.

Funding and diversification

We estimate that, at 30% equity financing, Novera requires around £32m to fund its next two consented projects. The company has indicated project finance remains available, but has become more expensive (by c 50-95bps) since 2007. With equity markets currently unattractive and the large scale of pipeline projects, we believe other sources of finance could be used in the short term, such as the divestment of shares of some operational assets. For example, by our calculations, a sale of half of the current operating sites would cover half of the equity requirement for the 250MW wind target. We expect Novera to maintain a diverse portfolio of technologies for alternative energy production.

Price	32.8p*
Market Cap	£47m

*priced as at 25 February 2009

Share price graph

Share details

Code	NVE
Listing	AIM
Shares in issue	143.5m

Price

	High	Low
52 week	96.5p	29.0p

Recent newsflow

Feb 2009	Final results
Jan 2009	Fleeter Wood farm update
Jan 2009	Trading statement
Dec 2008	Bullamoor farm planning
Dec 2008	Gordonstown farm planning

Business

Novera Energy is a power generation company that uses alternative energy based assets located within the UK. The group has 46 landfill gas, 10 hydro and two wind farms assets in operation. Growth plans are currently focused on aggressive wind expansion.

Bull

- Established producing assets
- Various funding options
- Strong pipeline of consented projects

Bear

- Ambitious projects that face regulatory risk
- Counterparty risk on OTC swaps

Analysts
Ian Osburn
Anil Sharma

Investment criteria

Investment criteria	Summary	Comment
Operator with established assets	✓	47 landfill sites (87MW), 10 hydro (16MW) and one wind (14MW).
Positive cashflows/balance sheet strength not reliant on working capital	✓	FY08e expected cash of £20m. Cash flows from existing assets funding expansion.
Track record of assets through planning	✓	Two wind sites recently consented, another nine in planning, of which one was rejected.
Large partner/project finance	✓	Majority of electricity generated is sold on long-term contracts to Centrica.
Order backlog	✓	Three wind projects in development, alone offer at least 92MW of capacity.
Low technology risk	-	The turbines have recourse to the manufacturers.
Insulated from weakening turbine demand	✓	As turbine demand softens, this improves Novera's bargaining position with suppliers.

Industry dynamics

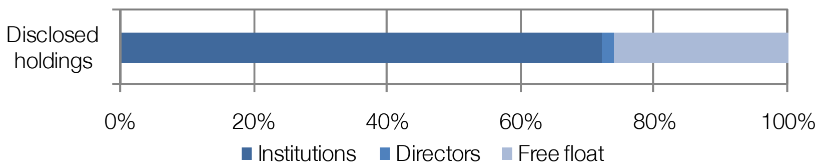
Value chain
As supply bottlenecks for wind turbines reduce and overall demand for turbines weakens, we believe the optimal positioning for investors in wind energy has moved from exposure to manufacturers, to developers/generators.
While turbine supply was tight, a culture of prepayments to manufacturers emerged which we expect to reverse. Furthermore we expect some margin pressure at component suppliers and turbine manufacturers which must be resisted by reducing costs.

Novera Energy peers
Listed competitors include Renewable Energy Generation and major utilities such as SSE. In terms of new sites, larger ones attract competition from utilities and smaller sites attract competition from private firms. Novera has generally been successful at finding new sites without having to compete in an auction-style process.
Novera can take projects from development through to operation, which helps differentiate it from a number of the other smaller, more capital constrained developers.

Financial summary

Year end 31 December	£'000s			
PROFIT & LOSS	2007	2008	2009e	2010e
Revenue	32,148	35,514	42,673	54,464
(% change)	N/A	10%	20%	28%
EBITDA	10,225	10,263	14,936	19,062
(% margin)	32%	29%	35%	35%
EBIT pre GW and excepts	4,950	4,020	7,434	9,488
(% margin)	15%	11%	17%	17%
Net financials	(4,698)	(4,905)	(6,013)	(7,667)
Other	(3,813)	(4,178)	(4,072)	(4,072)
Profit before tax (norm)	(3,561)	(5,063)	(2,651)	(2,251)
Tax	1,578	1,519	1,442	1,190
Net income	(1,983)	(3,544)	(1,209)	(1,060)
EPS c (norm)	(2)	(2)	(1)	(1)
BALANCE SHEET				
Fixed assets	160,637	169,893	186,319	203,673
Current assets	19,197	28,299	19,077	30,357
Current liabilities	(14,709)	(31,730)	(22,613)	(25,155)
Long term liabilities	(107,896)	(108,170)	(128,267)	(158,267)
Shareholders equity	57,229	58,292	54,517	50,609
CASH FLOW				
Cash flow from operations	10,933	10,790	5,350	11,103
Capex	(11,677)	(13,900)	(28,000)	(31,000)
Net debt (cash)	(77,107)	(70,547)	(101,479)	(121,033)
RATIOS				
EV/Sales	4.9	4.9	3.7	3.3
ROCE	12.2%	6.7%	9.2%	10.2%
Stock turn	N/A	1	0	0
Debtor days	83	80	80	63
Creditor days	104	165	140	122

Free float



Chairman: Roy Franklin

Roy Franklin is chairman and a non-executive director of Novera Energy plc.

Roy was formerly chief executive of Paladin Resources plc, prior to which he was group managing director of Clyde Petroleum plc. Before joining Clyde in 1991, he worked at BP for 18 years, latterly heading up BP Exploration's acquisition and divestitures group. Roy currently chairs Bateman Litwin NV, the AIM-quoted oilfield services group, and sits on the Board of Santos Ltd, an oil and gas exploration company.

CEO: David Fitzsimmons

David spent 27 years with BP where he held senior positions in all core businesses, including CEO of BP's oil trading, president of BP Asia and commercial director for BP's Gas, Power and Renewable business. He brings to Novera an in depth knowledge of energy markets together with proven management and strategic skills, and experience in leading growth businesses.

David joined Novera in October 2005, since which time the company has completed its transition from Australia to the UK, raised £38m to acquire the remaining 50% of NMRE, a 50:50 joint venture between Novera and Macquarie, and established a strong portfolio of development opportunities in wind and energy from waste.

CFO: Rory Quinlan

Prior to joining Novera, Rory held senior positions with Ergon Energy and Xstrata (MIM Holdings).

Rory joined Novera in 2004 and has since been integrally involved in all of Novera's significant corporate activity incorporating acquisitions and debt and equity financings. Namely, the creation and financing of the Novera Macquarie Renewable Energy JV (NMRE) in 2004 and the subsequent acquisition and financing of NMRE from Macquarie International Infrastructure Fund in 2007; the recent financing and commercial structuring of the Lissett Airfield Wind Farm, listing on LSE (AIM), delisting from the Australian Stock Exchange (ASX), and change in domicile and reincorporation from Australia to Novera Energy plc in the United Kingdom.

Solar: ReneSola Ltd

Edison investment research

Investment summary: Becoming cheaper

Prices for ReneSola's main input cost, silicon, crashed c 30% in late 2008. ReneSola will be impacted by this due to reductions in stock values and lower expected profits in the short term, but should see uplift in demand for its solar wafer products as they become more competitive on price and generate higher returns for solar energy operators. We believe it could be painful, but a stronger company could eventually emerge.

Expect delays in aggressive expansion

ReneSola saw aggressive expansion 2006-2008e as capacity grew sixfold. With prices throughout the silicon supply chain falling, ReneSola's challenge is to pass on these reductions to suppliers and cut costs. 300 tonnes of in-house polysilicon production from mid-year should help, but short-term both sales and profits will be negatively impacted and margins are likely to come under pressure. Furthermore, the company has significant stock, now worth c 30% less, and we expect more capital to be absorbed to fund operations as customer prepayments reduce. Overall in the tighter conditions and with another large capacity increase committed, we expect ReneSola to raise debt in 2009 as well as delay the second phase of its planned expansion, which would raise capacity to 1GW from 825MW. If capacity expansion recommenced, we believe ReneSola would return to the capital markets.

Write-downs and reduced expansion

At listing in August 2006, management noted that increased supply was likely to reduce the supply bottleneck and silicon prices. Despite this, to fulfil customer orders, ReneSola built inventories throughout the summer of 2008 to c $320m. Prices crashed in November 2008 and we expect a c $100m inventory write-down.

Achieving positive cash flows the real test

In every year since listing, ReneSola has raised capital to fund its expansionary programme. Given that this is likely to be scaled back, we see potential for ReneSola to post positive cash flows for the first time in 2009, despite the inventory write-down. Reducing costs and lowering expansion expenditure will be key to this. ReneSola has the potential to save significant processing costs through the use of virgin silicon rather than scraps from the semi-conductor industry.

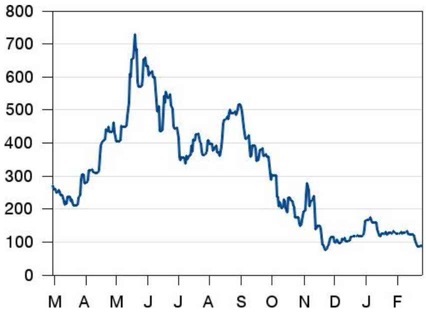
Weaker end markets in the short term

Strong solar demand has been driven in part by rapid expansion in Germany and Spain, with the US and China emerging. While alternative energy is protected to some extent by government regulation and incentives in most countries, it is still has a high cost of generation vs other alternative energies and demand may be affected in the short-term by credit availability. We are already seeing some weaker demand although we expect lower silicon prices feeding through to silicon module costs to increase demand once again.

Price	87.5p*
Market Cap	£120m

*priced as at 25 February 2009

Share price graph



Share details

Code	SOLA
Listing	AIM
Shares in issue	137.6m

Price

52 week	High	Low
	725.2p	76.8p

Recent newsflow

Nov 2008	4th in Deloitte Fast 50 China
Nov 2008	¥1.06bn new credit line
Jun 2008	Close of 10m ADS capital
May 2008	6Y 525MW supply contract
May 2008	6Y 105MW supply contract

Business

Renesola manufactures silicon wafers for integration into solar photovoltaic cells. The company has developed proprietary techniques to use scrap silicon and other silicon materials as feedstock for production of mono, and multi, crystalline ingots and wafers.

Bull

- Potential to monetise recent aggressive capacity expansion
- Variable rate purchase contracts ensure price reduction pass-through
- Potential near-term positive cashflows

Bear

- Moving from expansion to cost cutting
- Large inventory write-down likely

Analysts
Ian Osburn
Anil Sharma

Investment criteria

Investment criteria	Summary	Comment
Operator with established assets	✗	ReneSola is a silicon supplier.
Positive cashflows/balance sheet strength not reliant on working capital	✗	Large capex has kept ReneSola requiring capital in each of the last three years.
Insulated from silicon oversupply	✓	Silicon wafers are a value added capital good using silicon as a raw material.
No UK operating assets	✓	ReneSola is a silicon supplier.
Business model to benefit from falling price	✓	Reduced silicon cost should drive demand for ReneSola's silicon wafers.

Industry dynamics

Value chain

The silicon path moves from producers of virgin polysilicon, ingot and wafer producers, to solar cell designers/manufacturers, solar module makers and finally solar site developers. The site developers are likely to benefit most from falling costs with recent increased supply capacity reducing bottlenecks and reversing the culture of prepayments. The other sectors in the supply chain will see short-term pain with the lower value for inventories, reduced profits even if margins are maintained and higher funding requirement as reduced prepayments get passed along. Most impacted will be the polysilicon suppliers who face short-term capex and increased supply with sales prices now c 30% less.

ReneSola peers

There are a number of silicon wafer producers. LDK Solar has the largest market share with REC Group number two, although its strategy is more focused on polysilicon and downstream products. ReneSola is the third largest producer. Overall, given global wafer capacity is relatively low, competition is currently not severe.

Chairman: Martin Bloom

Mr Bloom is currently the chairman of the China UK Venture Capital Joint Working Group and special advisor for Asia of Argopolo Capital Partners. He is a former partner of Cambridge Accelerator Partners. BA (hons) in economics. MA in history.

Financial summary

Year end 31 March	$'000s			
PROFIT & LOSS	2007	2008	2009e	2010e
Revenue	635,930	640,879	796,769	874,713
(% change)	N/A	1%	24%	10%
EBITDA	51,707	120,827	121,767	151,386
(% margin)	8%	19%	15%	17%
EBIT pre GW and excepts	47,537	110,175	111,032	138,040
(% margin)	7%	17%	14%	16%
Net financials	(2,578)	0	0	0
Other	0	0	0	0
Profit before tax (norm)	41,849	110,175	111,032	138,040
Tax	6,156	(16,526)	(27,758)	(34,510)
Net income	47,977	93,648	83,274	103,530
EPS c (norm)	48.0	68.1	60.6	75.3
BALANCE SHEET				
Fixed assets	177,369	323,484	417,178	508,260
Current assets	263,241	600,614	541,641	599,654
Current liabilities	(158,376)	(337,567)	(389,014)	(434,579)
Long term liabilities	(147,308)	(82,797)	(82,797)	(82,797)
Shareholders equity	125,709	503,735	487,009	590,538
CASH FLOW				
Cash flow from operations	(35,342)	(91,314)	54,836	80,166
Capex	(114,520)	(197,254)	(104,429)	(104,429)
Net debt (cash)	156,216	233,567	292,339	199,640
RATIOS				
EV/Sales	5.1	1.5	1.0	1.5
ROCE	43.5%	27.3%	16.0%	17.1%
Stock turn	162	183	162	162
Debtor days	111	111	111	111
Creditor days	107	107	107	107

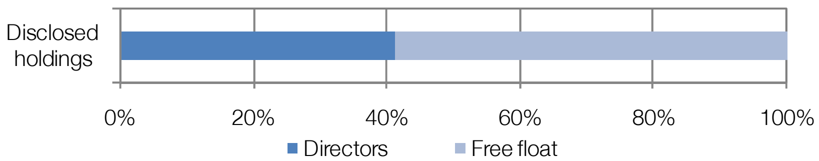
CEO: Xianshou Li

Founder of the solar energy business in 2005. Previously founded Yuhuan Solar Energy Source and was a general manager of Yuhuan County Solar Energy. Also a Yuhuan County Culture Bureau government official. BA in industrial engineering management.

CFO: Charles Xiaoshu Bai

Previously CFO of Fenet Software and vice-president of Tractebel Asia. Also formerly FD of Ogden Energy Asia Pacific. Associate director of Deutsche Bank in Hong Kong. BA in economics and MBA from IMD Business School.

Shareholdings



Edison investment research

Waste to Energy: Kedco

Investment summary: Changing markets

Securing feedstock is essential in order to become a significant electricity generator from biomass. To achieve this, Kedco is attempting to alter the industry dynamics of waste to energy through JV structures, which we believe will secure feedstock on a long-terms basis, will be capital efficient and deliver first mover advantage.

Strategy

Kedco is using two tried and tested technologies for generation: gasification of wood and anaerobic digestion (AD) in the form of dry fermentation of either food or agricultural waste. Both of these receive high support from the UK and Irish regulatory regimes ensuring high returns. Incentives for the waste industry are also skewed towards use or recycling rather than disposal, for example there is a landfill tax of c £40/t, gate fees of c £30/t and a food predisposal cost of c £50/t.

Shifting dynamics

Currently there are no financial incentives for waste wood producers to dispose of their waste. Kedco's gasification JVs intend to pay the partner for waste wood to capture supplies in the long term. For dry fermentation, the JV intends to receive revenue for accepting food waste, which would otherwise be subject to landfill fees. Kedco's JVs intend charges to be at a discount to these fees to capture supplies while providing an additional revenue stream alongside electricity sales. It is prudent to expect waste and landfill operators to react. As landfill gate fees effectively have a floor, we see more operators investing in waste to energy themselves.

Capital efficiency

The JV is arranged on a transparent basis whereby both parties are aware of the margins and costs of each partner. Early projects indicate that debt financing of up to 65% is available. For gasification and AD the upfront capital costs are €11m and €8m, respectively, equating to a €1.9m and €1.4m equity requirement from Kedco. As Kedco will supply the equipment to the JV it will make a margin that it can use to offset some of its equity requirement. There will be a lag between the expenditure and income which we expect to be approximately nine months, implying a short-term funding requirement.

Projects and funding

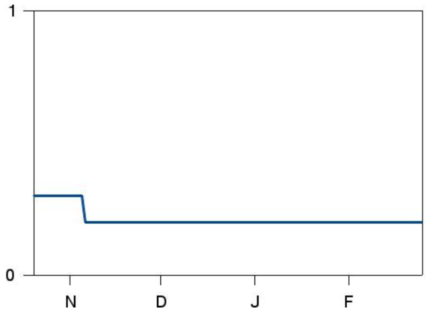
Currently there are two signed contracts and five letters of intent for an initial 24MW of capacity. We expect construction and operation of two gasification 2MW plants by the second half of 2009, the successful operation of which should prove the business case. The advantage of the JV structure has attracted more than 25 potential projects, all in advanced negotiations. Seven of these, in particular, have a greater chance of near-term success with details expected in Q309. While Kedco has sufficient capital for its first two projects, we expect a further capital raising in order to fund rapid expansion.

Kedco is a research client of Edison Investment Research Limited

Price	€0.20*
Market Cap	€41m

*priced as at 25 February 2009

Share price graph



Share details

Code	KED
Listing	AIM
Shares in issue	199.45m

Price

	High	Low
	€0.26	€0.17

Recent newsflow

Jan 2009	Director's dealings
Dec 2008	Director's dealings
Dec 2008	Change of adviser's name
Nov 2008	Director share purchase
Oct 2008	Listing on AIM

Business

Kedco is the holding company of a bio-science energy group. The company, through its subsidiaries, helps companies throughout the UK and Ireland to convert waste into clean energy. Kedco also has a number of existing businesses serving industrial and residential customers, all with a renewable energy focus including the sale of biomass boilers and the production of wood and biomass.

Bull

- Strong regulatory support and drivers in the form of ROCs and landfill tax
- JVs capture feedstock and cash flows
- A healthy pipeline for contracts

Bear

- Funding of expansion plans will likely require capital raising
- Emergence of potential competitors
- Pace of scalability

Analysts
Ian Osburn
Anil Sharma

Investment criteria

Investment criteria	Summary	Comment
Captured feedstock	✓	The JV ensures a long-term contract thus securing feedstock from the agricultural partner.
Proximity to feedstock sources	✓	The operational assets are located on-site (feedstock), reducing transportation costs and increasing utilisation.
Established sites/planning approval	✓	Two signed projects, five letters of intent and 25 projects in advanced negotiations.
Low technology risk	-	The technology is not new, however, the yields may vary with anaerobic digestion. Over time Kedco has tested various inputs to observe which will provide the best yield.
Positive cashflows/balance sheet strength	×	Kedco will need to raise finance in order to finance expansion beyond its first two projects.

Industry dynamics

Value chain

Waste to energy on an industrial scale is an emerging sector. It is a welcome development for waste producers as it creates value for the waste, in many cases for the first time. Therefore, the previous cost of disposal is now becoming a revenue stream for waste sales. For generators, technology risks are relatively low while they receive high regulatory support. We see securing feedstock supply at suitable cost (especially as prices rise with feedstock demand) as the main challenges for the industry. Our main unknown factor is the reaction of landfill operators who could see pressure on gate fees and landfill value.

Kedco peers

Potential competitors include technology providers, and existing waste and landfill operators. Both technology and operators could bypass Kedco to interact with each other. However, for technology providers and waste operators Kedco's JVs are a comprehensive solution (sourcing, construction, maintenance and ongoing management). We see potential for waste and landfill operators to invest in waste to energy themselves.

CEO: Donal Buckley

Donal Buckley is one of the four original founders of Kedco. Since its incorporation in March 2005, Donal has played a key role in the development of the company. Prior to his involvement with Kedco, Donal was a divisional manager with SWS Farm Services Limited, an Irish company specialising in wind energy. Donal graduated from University College Dublin in 1997 with a degree in agricultural science.

Financial summary

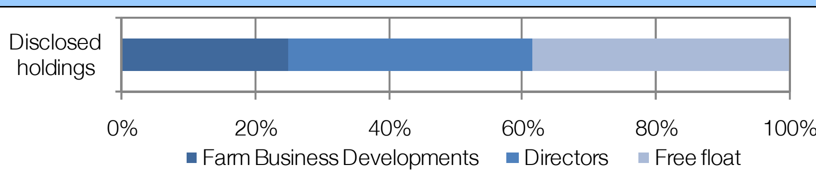
Year end 30 June	€'000s			
PROFIT & LOSS	2007	2008	2009e	2010e
Revenue	7,636	9,016	19,000	52,412
(% change)	N/A	18%	111%	176%
EBITDA	(1,320)	(3,816)	(1,408)	27,796
(% margin)	N/A	N/A	N/A	53%
EBIT pre GW and excepts	(1,759)	(4,456)	(2,011)	27,266
(% margin)	N/A	N/A	N/A	52%
Net financials	(376)	(797)	(529)	(365)
Other	(122)	(118)	82	(7,591)
Profit before tax (norm)	(2,257)	(5,370)	(2,458)	19,309
Tax	(39)	(21)	165	(7,509)
Net income	(2,257)	(5,370)	(2,458)	19,309
EPS c (norm)	(265)	(452)	(1)	11
BALANCE SHEET				
Fixed assets	6,092	7,410	8,822	19,341
Current assets	3,875	3,307	7,244	26,692
Current liabilities	(2,815)	(2,044)	(1,364)	(1,797)
Long term liabilities	(6,716)	(7,318)	(7,318)	(7,318)
Shareholders equity	437	1,356	7,384	36,918
CASH FLOW				
Cash flow from operations	(2,481)	(3,155)	(1,069)	27,595
Capex	(2,646)	(2,294)	0	0
Net debt (cash)	(7,255)	(5,444)	(25)	19,154
RATIOS				
EV/Sales	1.0	0.6	1.8	0.4
ROCE	N/A	N/A	N/A	147%
Stock turn	97	66	22	9
Debtor days	82	56	18	7
Creditor days	66	48	22	11

CFO: Gerry Madden

Gerry Madden joined Kedco in May 2007 as the executive director of finance. Prior to this, Gerry operated his own consultancy practice between 1998 and 2007 advising companies on merger and acquisition activities.

Gerry is currently a non-executive director of Ecom Interaction Services Limited, a subsidiary of Newcourt plc. Gerry is a fellow of the Institute of Chartered Accountants in Ireland, having qualified as an accountant with KPMG in 1987.

Free float



Marine: Ocean Power Technologies

Investment summary: Bobbing along

OPT is one of only two AIM-listed companies focused on marine energy. Despite low newsflow during financial year 2008, the company has placed itself in a position where it is awaiting successful final development of its 0.15MW wave energy buoy, the PB150. With a strong cash balance, secured sites, quality partners and the UK regulatory regime heavily favouring marine energy, OPT has much in its favour to take its technology through to commercialisation and deployment.

Projects and timeline

We believe two projects offer the best chance of near- term success and cash inflows for OPT in the long term. The first is a joint venture with Iberdrola and Total off the north coast of Spain for a 1.39MW buoy farm. OPT is contracted to install the devices – funded by Iberdrola at cost – and through the JV retain a 10% exposure to the operation of the assets. The second, in Oregon, US, is a 50MW farm to be operated by OPT. The project is being divided into manageable stages, the first of which is for 1.5MW by the end of 2011. The PB150 design and assembly was completed at the end of calendar year 2008 and we expect field trials of the device to be completed during mid 2009, ready for deployment by the end of 2009. Upon operation OPT can address all of its projects and head towards commercialisation.

Returns

Management estimates it will be capable of producing 300 buoys pa at its facility in New Jersey, US, lowering the capex cost to roughly $4m/MW. In contrast to offshore wind, the capital costs per MW for OPT are significantly higher, by c 50%. Regulatory support is therefore required to bridge the returns gap before we believe utilities would invest in OPT's technology for sizable electricity generation. Across Europe, in the majority of countries, marine energy receives the highest or second highest level of financial support in €/KWh.

Funding

OPT raised $90m in April 2007 through listing on NASDAQ and as at 31 October 2008 had $89.6m in cash and cash equivalents. Combined with the various grants and funding already secured, this suggests shareholder dilution to realise planned projects is unlikely. There are certain nuances within funding arrangements, such as matching grants from cash and a grant repayment (with zero interest), which shareholders should also be aware of.

Revenue recognition accounting creates volatility

Funding received to aid development costs is being recognised as revenue over the life cycle despite the 'one-off' nature of such support. We believe this is not a true reflection of ongoing business as projects are not expected to come on stream until FY11.

Price	367.5p*
Market Cap	£38m

*priced as at 25 February 2009

Share price graph

Share details

Code	OPT
Listing	AIM
Shares in issue	10.2m

Price

52 week	High	Low
	670.0p	305.0p

Recent newsflow

Feb 2009	New CEO and new CTO
Jan 2009	Lockheed Martin agreement
Jan 2009	Appointment of Nomad
Dec 2008	Leighton agreement
Dec 2008	Q2 results

Business

OPT is the manufacturer of a wave energy device called the 'Power Buoy', whose operation is based on a point absorber. The company is aiming to commercialise this technology across the US, Western Europe, Australia and Japan.

Bull

- JV with Iberdrola and Total in W Europe
- Strong cash position
- Scale up ready and already agreed

Bear

- Awaiting completion of the PB150
- Progress dependent on development
- Revenue recognition creates volatility

Analysts
Ian Osburn
Anil Sharma

Investment criteria

Investment criteria	Summary	Comment
Established operating assets	✗	OPT currently has no operating farms, the PB150 is being site tested.
Established funding/balance sheet strength	✓	Strong balance sheet with a NAV of $9/share and c $90m in cash and equivalents as of 31 October 2008.
Low technology risk	-	The technology has no historic record, yet there have been few problems so far.
Large partner/project finance	✓	Iberdrola and Total in Spain and France. Also the US Navy. Has received and continues to receive grants. 10% stake in JVs with Iberdrola and Total.
Order backlog	✓	Potentially significant, projects are in place and are awaiting deployment of the PB150.

Industry dynamics

Value chain

Marine technology is still in its infancy, with many years of R&D completed. Only recently have we started to see some progress towards commercial devices. According to the European Marine Energy centre there are 95 and 53 global developers of wave and tidal technology, respectively, not all of which will survive. There is currently no stand-alone wave energy operator/developer market or component suppliers, therefore for exposure today investors must play the technologies or plant manufacturers. We recommend technologies, such as OPT, that have large company backing, order backlogs and/or a strong balance sheet.

OPT peers

Within wave energy there are 95 companies attempting to develop a successful commercial device. Of these, 45% (39) are focused on extracting energy based on the same principals as OPT, ie point absorber generation. Only one other is stock exchange listed, Renewable Energy Holdings. Other noticeable participants (not necessarily with similar technology) are Fred Olsen, Pelamis, Wave Dragon, Finavara and Oceanlinx.

Executive chairman: George Taylor

Dr Taylor has been the chief executive officer since 1993 and a director since 1984, when he co-founded OPT.

From 1990 to 2004, Dr Taylor was president and from 1984 to 1990, he was vice president. In 1979, he co-founded and served as president of Princeton Research Associates, Inc., a consulting engineering, technical marketing and product development company. In 1971, Dr Taylor co-founded Princeton Materials Science, Inc., a manufacturer of liquid crystal displays and digital watches.

Financial summary

Year end 30 April	$'000s			
PROFIT & LOSS	**2007**	**2008**	**2009e**	**2010e**
Revenue	2,531	4,772	3,162	6,938
(% change)	N/A	89%	N/A	119%
EBITDA	(12,297)	(18,934)	(17,484)	(16,359)
(% margin)	N/A	N/A	N/A	N/A
EBIT pre GW and excepts	(12,544)	(19,148)	(17,798)	(17,116)
(% margin)	N/A	N/A	N/A	N/A
Net financials	1,390	4,435	2,000	2,000
Other	(22)	(28)	(43)	(51)
Profit before tax (norm)	(11,176)	(14,741)	(15,841)	(15,167)
Tax	0	0	0	0
Net income	(11,176)	(14,741)	(15,841)	(15,167)
EPS c (norm)	(212)	(145)	(141)	(124)
BALANCE SHEET				
Fixed assets	2,196	15,033	2,366	4,170
Current assets	117,515	92,518	76,276	54,586
Current liabilities	(6,328)	(6,647)	(3,953)	(8,672)
Long term liabilities	(842)	(805)	(189)	(189)
Shareholders equity	112,541	100,099	74,501	49,895
CASH FLOW				
Cash flow from operations	(7,468)	(13,662)	(12,711)	(20,903)
Capex	(325)	(533)	(1,377)	(2,613)
Net debt (cash)	115,664	88,648	74,560	51,044
RATIOS				
EV/Sales	N/A	11.3	2.8	5.7
ROCE	589%	N/A	N/A	2834%
Stock turn	N/A	N/A	N/A	N/A
Debtor days	170	176	176	176
Creditor days	909	455	456	456

CEO: Mark Draper

Since September 2004, Mark has served as the chief executive and director of OPTs wholly owned European subsidiary based in the UK, Ocean Power Technologies Ltd. From 2001 to May 2004, Mr Draper served as managing director, generation business of PowerGen plc, a UK power utility. In this capacity, he was responsible for over 9,000MW of power generating assets, including a 60MW offshore wind power station.

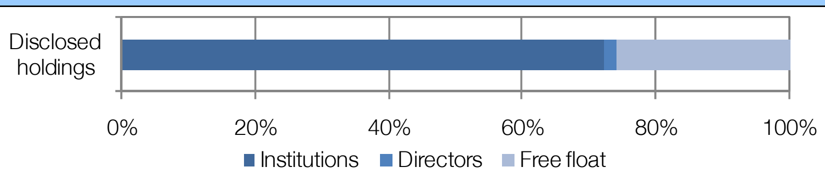
Mark serves as a non-executive director on the board of Slough Heat & Power, a utility company. He also serves as a director of Iberdrola Energias Marinas de Cantabria, SA, the joint venture in which OPT participates.

CFO: Charles Dunleavy

Charles has served as CFO and senior vice president since 2000 and as treasurer, secretary and director since 1990. From 1993 to 2001, Mr Dunleavy served as vice president of finance.

Prior to joining OPT Charles was the CFO of Whole Systems International a multimedia instructional systems and IT company. From 1983-1990 Charles was the corporate controller for Intermetrics Inc a publicly held software engineering company now part of the Titan group.

Free float



Efficiency: Zenergy Power

Investment summary: Monetising HTS

Zenergy's technology is based on high-temperature superconductors (HTS), which offer the ability to significantly increase efficiencies at both ends of the electricity cycle: generation and consumption. Zenergy's first products demonstrate the gains to be made and further products, including an HTS wind turbine, are on the horizon. The company recognises that for some products, particularly generators, a large part of the value comes from operating the assets and therefore seeks earn-outs or equity participation in projects using its technology. For other products, Zenergy positions itself as a high-margin, high-technology component supplier. In either case, unit sales is the most important driver of value creation.

Early projects show potential for HTS

Zenergy has large partners for its first products. HTS power generators are built with UK partner Converteam SAS (formerly Alstom Power). At the other end, Zenergy's induction heaters for metal billets are built in partnership with Bültmann. This significantly reduces technology risk. The first induction heater vastly exceeded expectations and the first hydro generator is expected to do the same. Zenergy's third product, a fault current limiter (FCL) for installation on electricity grids was installed by California Edison in early 2009 for evaluation.

From scientist to salesperson

The total annual market size for Zenergy's three products is some €11bn. Key to monetisation of this is turning early successful product launches into unit sales. For its induction heaters, over 20 customers are looking at the product. US utility companies continue to evaluate the FCL product and European utilities the HTS generator for hydro sites. These large customers have the potential to order large volumes; however timing is difficult to predict and we expect more clarity in H209. Zenergy is looking at the potential to build an investment fund to participate in renewable energy projects and monetise efficiency gains from using its technology in addition to unit sales.

Early success in renewable energy

Through its partnership with Converteam, Zenergy is supplying HTS for a high-efficiency generator to be used by E.on at one of its hydro sites in Germany which should increase output by c 36%. Furthermore, RWE has commissioned Zenergy to look at the potential to retrofit eight hydro sites (c 228MW) with similar technology.

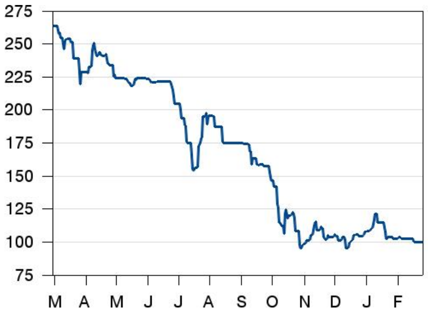
Likely funding required before monetisation

Trying to launch expensive but value generating products using new technologies is especially hard in downturns when potential customers are risk averse. Adoption of Zenergy's products in volume is likely to be delayed by the current environment. With our forecast 2008 cash at around one year of cash burn, we expect Zenergy to return to the capital markets by year-end 2009 seeking up to £10m.

Price	100.0p*
Market Cap	£44m

*priced as at 25 February 2009

Share price graph



Share details

Code	ZEN
Listing	AIM
Shares in issue	44.3m

Price

52 week	High	Low
	263.5p	95.0p

Recent newsflow

Feb 2009	RWE hydro power contract
Feb 2009	US DoE project funding
Jan 2009	Induction heater patent
Dec 2008	Options to management
Dec 2008	HTS ship propulsion funded

Business

Zenergy manufactures and develops commercial applications for high temperature superconductive materials. Products include electricity generation, particularly alternative energies where efficiency gains equate to large cost savings, fault current limiters, induction heaters and HTS wire.

Bull

- Products launched and moving to unit sales
- Positive breakthroughs in all markets
- Entering multiple large markets

Bear

- Cash consuming technology company in difficult market environment
- Long-term development costs
- Low visibility on orders and adoption

Analysts
Ian Osburn
Anil Sharma

Investment criteria

Investment criteria	Summary	Comment
Established operating assets	✓	Recently installed products have outperformed expectations.
Established funding/balance sheet strength	×	We expect Zenergy to look to raise capital by the end of 2009 before cash flows turn positive.
Low technology risk	✓	Almost all of Zenergy's products use established technology. The superconductive material is well known and we see lower risk than many new technologies.
Large partner/project finance	-	Zenergy has large industrial partners for its products but a weak capital base for HTS production in size.
Order backlog	-	Discussions are ongoing with multiple potential customers but as yet no orders have been placed.

Industry dynamics

Value chain

The potential applications for HTS are wide and include almost all copper applications. It is a relatively new product for mass market products. While the supply side is consolidated due to the niche nature of the material, market share will likely be gained not only based on the lowest cost producer but having large industrial partners to integrate the technology into established products. In the wider energy-efficiency market, near-term value for products aimed at smaller customers may lie in lower-cost but lower-returning products such as high efficiency conventional technology. However, we see significant value in larger projects such as HTS generators with the large utilities although this may take longer to appear.

Zenergy peers

There are few producers of HTS materials in industrial size. American Superconductors and Phillips (Sumitomo Electric) are two, while EHTS, InnoST are small producers of HTS wire. Zenergy's partners could in theory switch to a competitor but given new products are designed collaboratively we see this as unlikely. Competition comes from lower cost lower-performance alternatives.

CEO: Jens Müller

Jens Müller is co-founder of Trithor. His experience includes corporate finance at Deutsche Bank, high tech IPOs and E-Plus project finance, HTS technology since 1994 at Siemens AG, Vacuumschmelze and Cryoelectra. Müller has a PhD in physics from the University of Bonn.

Financial summary

Year end 31 March	€'000s			
PROFIT & LOSS	2007	2008	2009e	2010e
Revenue	268	2194	6121	9127
(% change)	N/A	719%	179%	49%
EBITDA	(4,230)	(2,702)	(1,154)	(496)
(% margin)	N/A	N/A	N/A	N/A
EBIT pre GW and excepts	(5819)	(4305)	(3099)	(2283)
(% margin)	N/A	N/A	N/A	N/A
Net financials	295	125	13	(36)
Other	578	1000	1000	500
Profit before tax (norm)	(5,500)	(3,180)	(2,086)	(1,818)
Tax	263	152	100	0
Net income	(5237)	(3028)	(1986)	(1818)
EPS c (norm)	(133.6)	(77.3)	(50.7)	(46.4)
BALANCE SHEET				
Fixed assets	1,671	1,068	1,398	1,387
Current assets	19,192	13,729	10,927	9,087
Current liabilities	(2619)	(5041)	(4325)	(4304)
Long term liabilities	0	0	0	0
Shareholders equity	22723	14235	12479	10650
CASH FLOW				
Cash flow from operations	(3957)	(5623)	(5024)	(1677)
Capex	(1275)	(1658)	(945)	(1286)
Net debt (cash)	17746	7089	1134	(1865)
RATIOS				
EV/Sales	289.1	34.6	675.0	452.7
ROCE	N/A	N/A	N/A	N/A
Stock turn	740	740	292	219
Debtor days	1026	365	292	219
Creditor days	2678	730	219	146

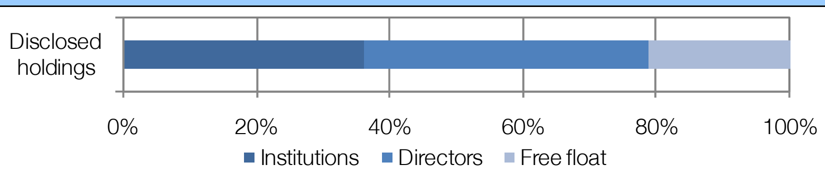
CFO: Karen Chandler

Karen Chandler was previously associate director at KPMG specialising in transaction services. She is experienced in AIM and LSE flotations, has extensive expertise in private equity and corporate M&A, and is a chartered accountant, holding an Executive MBA, Bsc.

CTO: Dr Carsten Bührer

Carsten Bührer is the chief technical officer of the group and also CEO and co-founder of Zenergy Power GmbH (formerly Trithor GmbH). He is an IPR expert with several patents, a member of EC sounding board, and has worked for several European research facilities. He holds a BSc in medicine, MSc and PhD in physics from the University of Bonn.

Free float



Other companies met in compiling this report

Exhibit 71: Company summary

Company	Market cap	Sub sector	Description
Acta	£2m	Fuel cells	Acta has developed a range of catalysts and associated technologies that allow the use of lower-cost base metals in place of platinum.
AFC Energy	£2m	Fuel cells	AFC Energy is attempting to commercialise power generation from alkaline fuel cells for use within the niche chlorine industry.
Ceres Power	£70m	Fuel cells	In partnership with British Gas, Ceres Power is developing a solid oxide fuel cell CHP boiler unit for residential use.
Clipper Windpower	£107m	Wind	Clipper is an independent turbine manufacturer based in the US. It plans to divest options on land with planning permission for wind turbines and to develop larger offshore turbines.
CMR Fuel Cells	£4m	Fuel cells	Currently in the process of going private following the acceptance of a tender offer, CMR develops direct methanol fuel cells for portable electronics and small stationary power generation.
D1 Oils	£12m	Biomass	D1 Oils is a biomass feedstock company concentrating on advancing Jatropha yields and plantations.
Energem	£14m	Biomass	Energem's main operations revolve around growing Jatropha feedstock in Mozambique.
FiberGen (Libra Natural Resources)	N/A	Biomass	FiberGen is a North American waste-to-energy company currently in discussions with PWC on whether to file for bankruptcy or other possible exit strategies.
Gas Turbine Efficiency	£17m	Efficiency	GTE develops components and products to introduce green technologies into turbines for the power generation, oil and gas and aviation industries.
GEM BioFuels	£7m	Biomass	GEM has Jatropha plantations in Madagascar and is aiming to become a feedstock producer for the biodiesel market.
GTL Resources	£4m	Biomass	GTL is a North American company focusing on producing ethanol from corn. The company has a facility capable of producing 100mgpa.
Hansen Transmissions	£620m	Wind	Hansen is an international bespoke gearbox manufacturer, predominately for use in wind turbines. Hansen is the dominant market player in gearboxes for larger turbines.
IdaTech	£45m	Fuel cells	IdaTech is a system integrator, combining fuel cell stacks with various BoPs required for a commercial back-up power unit. It is currently scaling up and installing units for major contracts in India and the US.
Jetion	£28m	Solar	Based in China, Jetion is a large manufacturer of downstream solar products such as cells and modules. The end use of its products is extremely varied, from street lighting to military.
Kedco	€40m	Biomass	Kedco is a UK, vertically integrated waste to energy company. The company has a unique approach in the sector, preferring to involve the feedstock producer in a joint venture structure.
Landkom International	£25m	Agriculture	Landkom is a rapidly expanding agricultural business based in Ukraine which grows a variety of crops. Mainly focussed on wheat and oil seed rape, Landkom is looking at starting a bio-fuels business with excess and low-grade grains.
MP Evans	£120m	Agriculture	MP Evans primarily concentrates on its substantial palm oil plantations in Indonesia and Malaysia. Traditionally the oil has been sold into the food industry.
New Britain Palm Oil	£357m	Agriculture	NBPO is Papua New Guinea's largest oil palm plantations and milling operator.
Novera Energy	£48m	Wind Landfill Hydro	Novera is a diverse operator of alternative energy assets across the UK. Focused on advancing its wind portfolio, Novera has a project pipeline of 10 wind farms that should add at least 124MW of capacity.
Nviro Cleantech	£11m	Clean coal	Nviro is concentrating on commercialising its form of pyrolysis to pre-treat dirty coal.
Ocean Power Technologies	$51m	Marine	OPT is a wave technology company aiming to commercialise its PB150 device. The company has strong industry partners in Iberdrola and Total.
Protonex Technology Corporation	£25m	Fuel cells	Using military grants, Protonex has developed a range of power supply technologies based on proton-exchange membrane fuel cells. These include battle field power supplies, UAVs and back-up power. Recently the company launched consumer facing products initially based on generation for recreational vehicles.
Oxford Catalysts Group	£34	Speciality Chemicals	Oxford Catalysts designs and develops speciality catalysts for the generation of clean fuels, from both conventional fossil fuels and certain renewable sources such as biowaste.
ReneSola	£123m	Solar	Based in China, ReneSola buys silicon and manufactures ingots and wafers for use by the solar industry. It has been expanding rapidly and vertically integrating into silicon production.
Renewable Energy Holdings	£21m	Wind Landfill Marine	REH is an operator of wind assets in Germany and landfill in Wales. It aims to commercialise its wave technology CETO device, using industry partners Carnegie and EDF Energies Nouvelles.
Renewable Energy Generation	£48m	Wind Biomass	REG is a holding company for three subsidiaries mainly focused on operating wind assets in North America and the UK.
Solar Integrated Technologies	£18m	Solar	SIT is a US based building integrated solar installer. Its main customers include logistics and food retailers and warehousing companies.
TMO Renewables	N/A	Biomass	TMO Renewables is a technology company aiming to commercialise its biological advances with thermophiles for use in anaerobic digestion of waste to energy.
Zenergy Power	£44m	Efficiency	Zenergy is a specialist manufacturer and developer of products using high-temperature superconductor (HTS) technology. HTS materials have no electrical resistance and Zenergy's products aim to improve the efficiency and cost of industrial processes, often replacing copper components.

Source: Edison Investment Research

Edison Investment Research Ltd — Team

Analysts

Jane Anscombe	Leisure, Media, Consumer	janscombe@edisoninvestmentresearch.co.uk
Guy Bell	Generalist	gbell@edisoninvestmentresearch.co.uk
Andy Bryant	Technology, Software, Telecoms	abryant@edisoninvestmentresearch.co.uk
Robin Davison	Life Sciences, Pharmaceuticals, Biotechnology	rdavison@edisoninvestmentresearch.co.uk
Mark Dichlian	Engineering, Chemicals, Alternative Energy, Oils Services	mdichlian@edisoninvestmentresearch.co.uk
Samantha Drover	Technology, Software, Telecoms	sdrover@edisoninvestmentresearch.co.uk
Richard Finch	Leisure, Media, Paper & Packaging	rfinch@edisoninvestmentresearch.co.uk
Charles Gibson	Mining	cgibson@edisoninvestmentresearch.co.uk
Nigel Harrison	Automotive, Engineering, Construction, Chemicals	nharrison@edisoninvestmentresearch.co.uk
Jason Holden	Financials, Technology, Support Services, Consumer	jholden@edisoninvestmentresearch.co.uk
Richard Jeans	Technology, Software, Telecoms	rjeans@edisoninvestmentresearch.co.uk
Roger Leboff	Property	rleboff@edisoninvestmentresearch.co.uk
Martin Lister	Technology, Media & Support Services	mlister@edisoninvestmentresearch.co.uk
Prof. Patricia Munroe	Life Sciences, Pharmaceuticals, Biotechnology	pmunroe@edisoninvestmentresearch.co.uk
Fiona Orford-Williams	Retail, Media, Consumer, Food Producers	forford-williams@edisoninvestmentresearch.co.uk
Ian Osburn	Industrials	iosburn@edisoninvestmentresearch.co.uk
Martin O'Sullivan	Technology	mosullivan@edisoninvestmentresearch.co.uk
Jacob Plieth	Life Sciences, Pharmaceuticals, Biotechnology	jplieth@edisoninvestmentresearch.co.uk
Nigel Popham	Generalist	npopham@edisoninvestmentresearch.co.uk
Alessandro Pozzi	Oil & Gas	apozzi@edisoninvestmentresearch.co.uk
Dr. John Savin	Life Sciences, Pharmaceuticals, Biotechnology	jsavin@edisoninvestmentresearch.co.uk
Anil Sharma	Industrials	asharma@edisoninvestmentresearch.co.uk
Simon Smith	Oil & Gas	ssmith@edisoninvestmentresearch.co.uk
Michael Starke	Mining	mstarke@edisoninvestmentresearch.co.uk
Claudia Starr	Strategist	cstarr@edisoninvestmentresearch.co.uk
Anthony Wagg	Mining	awagg@edisoninvestmentresearch.co.uk
Zhining Xu	Life Sciences, Pharmaceuticals, Biotechnology	zxu@edisoninvestmentresearch.co.uk

Support Team

Elizabeth Benson	Research Assistant	ebenson@edisoninvestmentresearch.co.uk
Peter Bristowe	Director, Investor Access	pbristowe@edisoninvestmentresearch.co.uk
Annabell Brunner	Financial Controller	abrunner@edisoninvestmentresearch.co.uk
Oliver Haslam	Business Development Manager	ohaslam@edisoninvestmentresearch.co.uk
Marianne Headey	Head of Investor Access	mheadey@edisoninvestmentresearch.co.uk
Scott McKenzie	Non-Executive Director	smckenzie@edisoninvestmentresearch.co.uk
Peter Molloy	Director	pmolloy@edisoninvestmentresearch.co.uk
Kimberley Over	Office Manager	kover@edisoninvestmentresearch.co.uk
Marina Patrick	Investor Access Manager	mpatrick@edisoninvestmentresearch.co.uk
Anna Phillips	Editor	aphillips@edisoninvestmentresearch.co.uk
Stephen Rogers	Research Manager	srogers@edisoninvestmentresearch.co.uk
Maana Ruia	Supervisory Analyst	mruia@edisoninvestmentresearch.co.uk
Neil Shah	Research Director	nshah@edisoninvestmentresearch.co.uk
Courtney Terrey	Business Development Associate/PA to Directors	cterrey@edisoninvestmentresearch.co.uk
Fraser Thorne	Managing Director	fthorne@edisoninvestmentresearch.co.uk
Emma Ulker	Research Assistant	eulker@edisoninvestmentresearch.co.uk
Gladys Wain	Distribution Manager	gwain@edisoninvestmentresearch.co.uk
Lara Young	Human Resources	lyoung@edisoninvestmentresearch.co.uk

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EDISON INVESTMENT RESEARCH LIMITED
Lincoln House, 296-302 High Holborn, London, WC1V 7JH

Telephone +44 (0)20 3077 5700
Facsimile +44 (0)20 3077 5750

Email enquiries@edisoninvestmentresearch.co.uk
Web www.edisoninvestmentresearch.co.uk