getting on with the job of building renewable electricity generators

Siemens Energy agrees with Select Committee over urgency but argues that systems do not have to be manufactured in the UK for targets to be reached.

In this review of renewable energy, The Informed Executive has so far had the opportunity to explore the subject with BERR Secretary John Hutton, Shadow DEFRA Secretary Peter Ainsworth and Phil Willis, the Chairman of the Select Committee which had conducted an investigation into Renewable Electricity-Generation Technologies. There was a consensus between those interviewed about energy goals which crossed the political divide.

Any differences noted were on matters of detail for developing and implementing the detailed strategy to achieve the 35-40% of electricity, that will have to be generated from renewables by 2020.

The Government has yet to crystallise out the mechanics of its approach, having called for a public consultation on the subject, though Mr Hutton was keen to stress the need for a diversified approach to all of our energy requirements, not just the renewable component.

Phil Willis of the Commons Innovation, Universities, Science and Skills Committee, agreed that the targets could be achieved but argued that no further delay could be justified if they were to be met. The committee's report expressed serious concern over the fact that renewable technology was not being manufactured to any extent in the UK: more seriously, perhaps, there was a profound shortage of qualified staff in the field.

And Peter Ainsworth was supportive of the goals on all counts; demanding immediate action and calling for a different basis for incentivising producers of renewable energy. If adopted by a future Conservative Government, his proposed change on that front could reset the ground rules for investment in renewables.

What we have not heard so far is any reaction from the kind of business in the renewables supply chain which will prove instrumental in meeting the quota.

How far can such companies allay the fears of the Select Committee about skills shortages, for example? What would it take for the industry producing renewables technology to make a sustained, long-term investment in the UK - if indeed that were needed - to move renewable generation on course towards its 2020 target?

We turned for that perspective to Siemens, a brand associated with the UK for a century and a half; a commercial pragmatist but one which clearly understands the British marketplace and has sustained investment here over the decades.

Chris Ehlers, who is the Divisional Director, Renewables, Siemens Energy, appreciates many of the concerns that the Select Committee has expressed, seeing the absence of a renewables manufacturing sector as a direct consequence of earlier decisions in the UK economy. "Britain wanted to be in the service sector rather than manufacturing. A difficult decision was made which has had quite an impact on resources. Much of the manufacturing infrastructure needed to change

direction again has been dismantled over the years so that any attempt to reverse the situation for renewables would necessarily be slow: it would also need a fundamental change of mindset."

Centres of Excellence

Though a group headquartered in Germany, Siemens has established manufacturing centres for its different businesses at key locations around the world from which it supplies international markets.

As part of that strategy, the company has its global centre for competence for small industrial gas turbines in Lincoln, where it employs around 2,000 staff.

In February 2008, the company announced a £40m investment programme into the manufacturing centre there; moving the present city-centre operation to a newer, more efficient plant that it is building on the outskirts. The investment by Siemens is significant and helps to counter some of the negative perception of manufacturing in the UK.

The output from Lincoln is set to play an increasingly important role in the renewable energy sector, as the industrial-scale turbines built there have an essential role in the conversion of heat created from combustible, renewable materials into electrical power.

Applying the same principle of centres of expertise, Siemens developed its global centre for wind turbine manufacturing in Denmark. That country was probably the first in Europe to recognise the issues posed by fossil fuels after the first oil crisis in the early '70s. With sufficient wind to warrant the use of turbines as a key part of its long-term energy strategy, the Danish Government took the initiative, and manufacturers – Siemens amongst them – set up plant to accommodate the demand which grew rapidly.

By the '90s, Germany had emerged as a market for green energy, and an industrial culture evolved to build wind turbines. Siemens supplied the German market from Denmark and has continued to support new markets as they have emerged, from its manufacturing facilities there.

£40 million investment by Siemens Energy in UK manufacturing centre for small industrial gas turbines while production of wind turbines remains for the foreseeable future in Denmark

Siemens casts its net across staff in similar industries in the areas where the wind farms are being developed: most have been in Scotland so far. Wind power is seen as a very go-ahead industry to be associated with, and there has been a positive feedback. People with comparable skills are retrained. As unemployment is above average in many of the locations, there is a valuable base to build upon.

Above: Construction under way at the Burbo Bank Offshore Wind Farm, which comprises 25 turbines and is situated on the Burbo Flats in Liverpool Bay

Page 25: Onshore wind farm at Bein Ghlas, Scotland, which appears to harmonise well with the local environment.

Major supplier to UK market

As Chris Ehlers observed, one of those markets is the UK, to which it has been a major vendor of wind turbines. "The UK is the second most important market for us in volume terms after the US.

"As a result, we have been building up our wind business here steadily. A year ago there were 100 staff: that has nearly doubled to 180 in twelve months."

Examining how that workforce is occupied may give some indication to future demand for skills as the renewable electricity marketplace expands by a factor of seven: ten if John Hutton's figures are taken at face value. Most of the team has been engaged in servicing wind farms for clients, it appears; a relationship which seems set to continue as more turbines come on stream.

Each client differs in the resources it can deliver internally, so it would be expected that, over a five year period, some of the larger generating customers would look to take aspects of the servicing in-house. Either way, however, it will require technicians with the skill set – and the head for heights – that goes with turbine maintenance.

Ehlers sees a new tier of wind power expertise emerging in the UK. "Now we want to develop more local competence in the design and execution of turbine installations, so we are building up capacity for project management and the associated professional engineering skills."

Project management skills required

Whether blue-collar engineering technicians solving problems 160 metres up a turbine, or professional engineers setting in place schedules to bring a project on stream on time, there remains the question of how and where those people are to be recruited and trained. Siemens casts its net across staff in similar industries in the areas where the wind farms are being developed: most have been in Scotland so far. "Wind power is seen as a very go-ahead industry to be associated with, and we therefore have a positive feedback. We can take people with comparable skills and re-train them. With unemployment being above average in many of the locations, there is a valuable base to build upon.

"Typical sources of recruitment are amongst those with chemical or process engineering construction experience, with a proportion joining from the Armed Forces – they have the kind of skills that we can work with. Half a year's theoretical and practical re-training completes the conversion."

That conversion takes place in Newcastle upon Tyne where the Siemens Energy Division has a manufacturing plant with training facilities. Health and safety is an essential part of that process before staff move on to training on the specialist tools and equipment and technology.

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Physical fitness and the ability to work at heights are pre-qualifications for the course as might be expected, so there is currently an age 'window' of 20 to 40 for those who can be taken on board to do the job safely.

While the majority of wind farms are to be located onshore, there are offshore installations. Being able to cope with the rough seas that go hand in hand with strong winds adds another criterion for would-be recruits on that side of the business.

Will the present pool of recruits dry up before the task is complete? Mr Ehlers sees the recruitment base broadening as the number of staff needed rises to meet demand. "We want to take younger people on as apprentices and train them up from first principles."

Training currently in Denmark

Engineers moving into project management and related 'professional' activities are currently being trained in Denmark, but this is unlikely to be a permanent arrangement. Three months to one year of conversion – depending on the experience and planned target area of those being recruited – is providing the level of training required.

Siemens' intention in the medium term is to move the base for this training to the UK for staff who will be working here. That development that would no doubt be welcomed by Phil Willis and his Committee. The growing demand for qualified professionals would suggest the move would happen in 18 months to 2 years; well inside the timeframe for 2020.

If Siemens Energy can see that there is a demand for such staff in such a short timeframe, would it not make more sense for the company to make that investment now and ensure the availability of locally-trained staff even sooner? Having a critical mass of staff to be trained is clearly one factor, but a major determinant is that word 'investment'.

"It is very important that we have long term planning security. The more we have a stable environment for renewables, the easier it becomes for companies like Siemens to increase their level of investment in the UK. The Renewables Obligations scheme creates an acceptable environment for that to happen, but we recognise that the debate around such incentives is continuing."

Peter Ainsworth of the Conservative Front Bench is on record supporting the Feed-In Tariffs approach to incentivising investment, citing the success of the scheme in Germany. Arguably, this provides greater incentives for smaller and medium scale operators to come on stream, so that the profile of generating companies coming into the market could start to change if there were a new government after the next UK General Election.

With the possibility of a different investment regime in place at some point within the next 2 years, it is perhaps understandable why major companies are hesitant today about committing to investment programmes in what would be deemed to be 'maturing' technologies such as wind turbines.

In Denmark, Siemens Wind Power produces rotor blades in one cast that are 52 metres in length and forms part of a wind turbine with a capacity of 3.6 MW

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biomass generator feeding national grid from local wood

Reference to biomass is highly signficant from the Siemens perspective – and the national renewables plan - as Mike Rolls, Divisional Director, Energy Solutions, at Siemens Energy explained. “The Government’s UK Renewable Energy Strategy document estimates that around 60% of the renewable heat requirement, and 13% of renewable electricity could be produced from biomass sources. If that were the case, then biomass would account for around one quarter of the 15% renewable target to which the UK is committed.”

The term biomass covers a complete portfolio of generating technologies that use energy produced from plants and other organic material, including energy crops and biogas.

Probably the most straightforward generators are those which turn non-contentious material such as wood remnants from managed forests and specially grown trees into heat and then steam that powers turbines to generate electricity.

As Rolls noted, “Biomass has moved on from the days of experimental systems struggling to output a Megawatt under test conditions: fully commercial installations are contributing power to the national grid network.”

Above: E.ON UK’s Steven’s Croft Biomass Power Station at Lockerbie in Scotland, for which Siemens Energy supplied the steam turbine system and electrical controls.

Opposite: Dual-purpose environmental technology: Siemens has clad the façade of a waste recycling plant in Trezzo (Lombardy) with solar modules and linked the system to the local power supply network.

Indeed, one of the highest profile biomass generators is Steven’s Croft at Lockerbie, in Scotland, where the consortium building the system was led by Siemens Energy, which supplied the steam turbine system, the generator and the electrical controls from its plant at Lincoln.

The customer was E,ON UK, which brought this 44 MW system on line in December 2007. Lockerbie is in a highly afforested part of Scotland which provides a mixture of wood being grown as a crop and local forest waste; the kind of material which has little economic value in any other context.

Using these materials, E.ON will generate enough electricity to supply around 70,000 homes. No less important, the power generated in this way will prevent the emission of 140,000 tonnes of greenhouse gases every year.

High levels of efficiency

Seen as part of an industrial ecosystem, biomass generation can achieve exceptionally high levels of efficiency. Exhaust steam from the turbine stage of a combined heating and power (CHP) system, for example, could be used to supply steam for industrial processes, with ‘low grade’ heat at the end of that cycle being used for space heating, and other applications where continuous supplies of heat are required.

Rolls cites some interesting examples. “Liquefied natural gas will be imported to the UK in increasing quantities in the coming years.

“The gas requires heat to turn it back into a vapour, a task for which these CHP plants are ideal. Refineries are also major users of steam for processing so that if generation can be combined with the refinery operations, energy does not go to waste. The efficiency of such integrated systems can increase to over 80%.”

Steven’s Croft Biomass generator at Lockerbie uses a Siemens steam turbine and local wood supplies to enable E.ON UK to supply sufficient electricity for 70,000 homes.

Renewables mix

With the benefit of hindsight, the UK Government is keen not to be committed to a single source of renewable energy – wind turbines, for example – to the exclusion of others. Indeed, BERR Secretary John Hutton sees renewables as one component of a multi-faceted energy generating strategy that includes nuclear energy and fossil fuels.

Siemens is typical of a generation of power technology companies offering multiple energy streams. It has been involved, for example, in a long term joint venture supplying hydro-electrical plant in the UK; primarily in the Highlands of Scotland where geographical and environmental conditions lend themselves to producing electricity consistently using water turbines.

As Chris Ehlers noted, "Hydro-electric power is a mature technology, well proven in the field, and a very well-established business. That experience will prove a major advantage when we look further at barrage schemes across river estuaries. The technology involved in both cases is similar."

He went on to explain that barrages employ a different technology from the wave systems which form another strand of water-driven generating systems. The company has a Scottish-based joint venture called Wavegen which is developing wave-driven systems.

They use oscillating water column technology, where columns of air are compressed by the movement of the waves. The air drives a ventilator which drives an electrical generator.

While it is vital for the UK to maintain a broad range of generating options to 2020 and beyond, it is important that any

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'new' technology being brought to the portfolio can demonstrate efficiency at least as high as existing generators. Siemens has been working with photovoltaic cells, a technology where energy conversion rates have been increasing.

They operate at between 10% and 15% energy conversion, but generating companies inevitably question the viability of any light-powered system under the weather conditions experienced in the United Kingdom.

"There are additional technologies which boost conversion rates to between 20% and 25% by concentrating sunlight. The argument must be that if it is proving viable in Germany, it should have a role here, where conditions are broadly similar. The principle is that solar power is focussed on a receiver that reflects the light on to a tank in which water is heated to generate steam for a turbine. We supply parts of that technology."

Are the numbers viable?

When challenged over the number of wind turbines that would be needed to fulfill the renewable energy quota, John Hutton saw 7,000 of these systems in place by 2020.

From the Siemens' perspective, that number can be built and commissioned over the time remaining. With that quota a manufacturing possibility, did Chris Ehlers consider that the 35% renewable electricity share by 2020 was viable?

"That figure is certainly attainable, but the UK Government will have to act now, and concentrate on the technologies which we know can deliver those figures.

"In our view, that means wind power and hydro power - including the barrages. It also involves a major contribution from Biomass generation, where there is a rapidly growing base of operators at work in the UK.

"It is unlikely that any of the other renewable technologies could be applied on a sufficiently large scale to make a real impression on the total."

Chris Ehlers obviously speaks for Siemens Energy. But his observations about investment confidence and the ability to deliver technical solutions on time and in sufficient volume are echoed right along the renewables supply chain. The Government now has to change gear from aspirations to the realm of the possible. §

Voth Siemens Hydro is a joint venture supplying hydro-electrical plant, primarily in the Highlands of Scotland where conditions are appropriate for producing electricity consistently.