



# A new bottleneck to come?

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I know what you are thinking, right now you may be considering installing an offshore windfarm and here I am telling you about the problems of getting rid of the thing again.

But!

The topic is relevant whether you are installing a windfarm, nearing an end to the operational life, or actually in the process of preparing the decommissioning of the windfarm.

Why, you might ask, is this relevant, the removal of the wind turbines is actually the reverse operation of installing it or not?

The answer is that this is actually not the case. And as usual the devil is in the detail. Here are the reasons.

In the early years I was frequently asked to give a quote for how much it would cost to remove an offshore turbine, my answer was simple, the same plus inflation as it would cost to install it. This is partly the answer, however a significant number of costs will occur which we did not foresee when we were originally asked.

Firstly, the sheer number of turbines, which have to be removed, will make a significant impact to the port where you have to unload them. For the Danish and German North Sea, Esbjerg seems a good bet. But here we still be installing new turbines in the years to come and thus the space will be expensive to book and scarce in availability.

Secondly, the vessels which have to de-install the turbines and foundations are the same – by and large – as those

installing the turbines and foundations in the first place. So once again we hit a bottleneck in terms of installation capacity. You may argue that the older and smaller vessels could do that and you are right, only a number of them have already gone out of service, so also are the two vessels I originally designed and built. Therefore this will be an issue to deal with. A simple addition of the turbines and foundations to be decommissioned in any given year on top of the turbines and foundations to be installed, will give you the actual size of the problem. And it is significant.

Thirdly, removing the foundations is a challenge. Most people think it is as simple as cutting them at or below seabed level. However, this is neither cheap, fast nor effective. I have tried cutting monopiles offshore before and this was certainly a



cost to be considered. Cutting 80 foundations is hugely expensive and takes a long time.

Furthermore, the German authorities and the OSPAR convention members are of the opinion that the piles should be removed entirely if possible, so cutting may not be an option. Fortunately the technology is there and it is cheaper than cutting the piles, much more environmentally friendly and relatively simple to perform.

Then there is the issue with removing the cables. Leaving them in the seabed is not an option. As an example, the Crown Estate has requested that pipelines buried 60cm or less below the seabed must be removed entirely. This will also apply to the cables and the mattresses and other artificial scour protection which has been used previously.

To my knowledge no technology exists which can efficiently remove the cables from the seabed. And if there were so, it would be very time consuming and expensive.

Taking down substations may or may not be required immediately, as they can be reused for a new windfarm with the same output but with less and bigger turbines. But if this is the case, the same logic applies and again a cost and availability item for the safe decommissioning of these structures must be considered.

#### **Port logistics and recycling of material**

The wind turbines consist of many different materials and though most of them are harmless, in the sense they are dealt with in a large number of recycling facilities, there is a problem with some of the materials,

such as fiberglass from blades and housings as well as carbon fibre from blades if built in.

#### **Port logistics**

The first problem you should consider is that there is no facility today which can safely, swiftly and cost effectively recycle 80 turbines, 80 foundations, 100+ km cables and the bits and pieces. The scrapping facilities in ports are not geared for this business and the sheer amount of steel going through will require handling facilities of considerable size. Furthermore, most of the scrap yards today, although certainly holding the relevant certificates, are not geared towards the level of documentation required by the industry. I see this as a major problem. Firstly the scrap is expensive to get rid of – anyone



thinking they will make money from scrapping a windfarm should reconsider – handling the components over large distances is not an option, the nearest suitable facility will be the only relevant one from a cost perspective alone.

Handling fiberglass is difficult. The blades will have to be cut down in length and then shredded into coin size bits and thereafter burned in a special incinerator which can handle this type of material. In Germany there are two or three facilities, in Denmark and the UK there are none! The German facilities can only handle a few hundred tons each – per year – and they are located around the country and not necessarily at a port where we decommission turbines.

Therefore getting rid of the considerable amounts of fiberglass shreds is a big problem.

Even worse if the blades are composite and have carbon fibre as part of the construction. The carbon fibre cannot and may not be burned and must be stripped out of the fiberglass before shredding. It is almost unnecessary to state that this is a

huge cost. Furthermore, getting rid of the carbon fibre is problematic as well, as this must be disposed in a special facility, provided it can be reused, which is doubtful.

Handling foundations seem to be the least of a problem, but this is not actually the case. The size and numbers make it difficult to cut them rapidly enough in order to get rid of the scrap fast and efficiently. The grouted connection between monopole and transition piece will have to be separated and the process is time consuming. The most obvious solution is to cut the scrap with a large scissor and excavator. But the steel dimension is 50mm or more, plus concrete, so this is not cheap or fast either.

I recently spoke to a specialist in recycling of materials on a large scale and he thought that he would probably be able to generate a profit for the customer when scrapping the cables. However, as the discussion developed, he reconsidered and his predicted projection was that this would not be the case.

The cables must be dug out of the ground

first. Pulling the cables out seems a neat solution, but the cables won't allow for much pulling force. They were not designed for this and the cables will rip at low tension.

So getting the cables out of the ground present a challenge. Once out, they must be cut, in say 24m lengths and then freighted back to shore. The outer skin must be removed and so must the double helix steel reinforcement. Both operations are required and the outcome is getting rid of low value material. The copper or aluminium cores must then be extracted and again this is a difficult process requiring special tools and handling facilities.

Once the high value material is retrieved, the cost has been considerable and my guess is that a break even at best is what can be achieved.

The points to be considered are:

1. Equipment and people offshore to remove the windfarm. The relative cost is the same or higher than for installing the windfarm in the first place. The vessels

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which can perform this work are already in use and the level of documentation on HSE and Q will be exactly the same as when installing the windfarm. Thus the cost will be high.

2. The standard to which the components have to be removed will be significantly more onerous than previously expected. Leaving parts in the water is not an option.
3. Facilities onshore are few and cannot receive and process the difficult components in the large amounts which are going to be the case. Further, the ability to process carbon or fibre glass is not just for everyone to do. You require a specialised processing plant and the accompanying permits to do so. Not many are about and they are not where we would ideally want them to be.
4. Processing the materials is much more complicated than expected. The numbers, the sizes and the complexities of the scrap prevent non specialized facilities to bid for the work. Furthermore,

the speed at which you remove the windfarm may very well outperform the capability of the processing plant to get rid of the material.

5. Port and transport logistics seem to be an issue as well. Transporting scrap over large distances by road is a no go. It is simply too expensive.
6. The documentation which is required by the owners of the windfarm may prevent most of the potential facilities to carry out the work. They are not geared towards this type of operation and documentation level.

#### **Bonus treat**

Of course I have saved the best to last. Cross border transport of waste. All the red flags are up at the authorities. Scrapping British carbon fibre blades in Germany is a major paper hassle. You are now exporting and importing toxic waste..... And the same applies the other way around or anywhere else for that matter. It will be interesting to see how this will be dealt with.

Even internally in Germany, bringing material back from the EWZ into German ports has a big tax issue attached to it. So whoever thought this would be easy will have to think again. It won't.

#### **Conclusion**

Having looked into the problematic for some time now, talking to the people who have actually scrapped a few turbines and listening to their concerns and talking to people who have recycling as their business, I have scratched the surface of this problem.

There seems to me to be cause for great concern, the windfarm owners will have to stack up much larger bonds in order to deal with this issues when time comes and I am convinced that a lot of wheeling and dealing will be tried in order to circumvent this – at least it seems to me to be – massive unknown cost and handling issue.

For the entrepreneurial mind-set, there is definitely an opportunity to be made in this sector and guess what? It's just around the corner.