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Revitalisation of local economy by development of renewable energy (REvLOCAL)

RENEWABLE ENERGY CLUSTER IN HAMBURG (GERMANY)

August 2016

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This publication should be cited as:

IEA RETD TCP (2016), Revitalisation of local economy by development of renewable energy: good practices and case studies (REvLOCAL), IEA Renewable Energy Technology Deployment Technology Collaboration Programme (IEA RETD TCP), Utrecht, 2016.

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(Stichting Foundation Renewable Energy Technology Deployment)

ACKNOWLEDGEMENTS

The Authors would like to thank the IEA RETD TCP REvLOCAL Project Steering Group (PSG) members for their guidance and support throughout the project, as well as the interviewees and the external reviewers:

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1. WHY HAMBURG RENEWABLE ENERGY CLUSTER?

'Hamburg is the hub of renewable energy in Europe; there is no question about it' (interview with Czech energy company). Since the introduction of a feed-in-tariff to support the deployment of renewable energy in Germany, Hamburg has gradually positioned itself as a global centre for wind energy technology services, as well as wider renewable energy sources. The federal level Renewable Energy Act (EEG) coupled with the autonomy of Hamburg as a city state, provide the city with the freedom and political buy-in for economic policies which support the energy transition in the North of Germany. City authorities as well as diverse local and international companies focusing on the renewable energy sector, have made use of the cluster policy to support their shared interests across a number of levels.

Representing over 180 companies in the renewable energy sector in the Hamburg Metropolitan Region, the Hamburg Renewable Energy Cluster (EEHH) is a leading renewable energy cluster in the north of Germany. We wanted to examine the EEHH in more detail and see how an ambitious city state works successfully with business and the public to turn energy transition into a thriving and growing sector, delivering multiple socio-economic benefits to the region. Where there are relatively ambitious national policies, what impact can coordinated and enthusiastic promotion at local and regional level have on maximising positive impacts?

2. METHODS AND CHALLENGES

2.1. METHODS

The objective of the case study on the EEHH was to shed light on the appropriate national and local policies to achieve increased local deployment of renewable energy, while simultaneously revitalising the local economy. In total we carried out eight interviews, this included:

- Representative from the cluster organisation
- German wind turbine manufacturer
- Danish energy supplier
- Czech energy company
- Asset management company focused on renewable energy
- Local green party
- The city Mayor
- A leading expert on the Energiewende

The interviews were conducted via telephone and in person and were structured around the core questions outlined below.

- *How to increase and/or maintain employment in the local economy induced by the development of renewable energy projects?*
- *What type of employment and new business can it create? What are the conditions to make it happen?*
- *How to establish and/or maintain new business related to renewable energy built-in local economy?*
- *How to ensure that the resulting economic impacts can be extended over longer periods of time, and not only during the construction phase of these renewable energy projects?*
- *What are effective schemes and instruments (in the broadest sense, e.g. education and training) that enable local economy to gain welfare/benefit from renewable energy projects located in the area? Are there conflicting policies or policy structures (e.g. with respect to state-aid support, WTO, EU)? How are they being addressed in the case studies?*
- *Are there conflicting policies or policy structures (e.g. with respect to state-aid support, WTO, EU)? How are they being addressed in the case studies?*
- *How to divide policy roles between national and local governments to achieve successful revitalisation of the local economy?*

These core questions were then tailored for each interview. Six interviews were in-depth, whilst two were based on shorter exchanges. Interviews were complemented with wider desk research on the EEHH, including official documentation, media articles and relevant national as well as regional legislation.

2.2. CHALLENGES

The Hamburg case study was difficult to get started. Although the EEHH and its members have been very cooperative, it took them sometime to respond to our email requests. This may be partly due to a German school holiday.

People within the cluster we talked to are very knowledgeable about the technology and the high level political agenda; however, they are less aware of the socio-economic aspects which this project is trying to draw out. The wind sector is incredibly complex, and there are significant differences between the local benefits which are derived from different businesses involved in the supply chains.


Recent changes to the EEG in Germany will have a measurable impact on the future direction of this sector. The EEG 2016 bill was passed by the German Federal Parliament on Friday 8th July 2016, which was after the content of this report was developed. Nevertheless, some core aspects of the EEG 2016 have been included in discussions.

3. BRIEF SUMMARY

The following is a brief summary of our key findings from the case study on the renewable energy cluster in Hamburg, Germany.

- Hamburg's renewable energy cluster, the Erneuerbare-energien-hamburg (EEHH), was established in 2011 with the aim to strengthen cooperation between key regional and international players in the wind energy sector. Its overarching objective is to foster the city's position as a national and global centre for wind energy.
- The strength of national legislation to support the development of renewables via the Energiewende, coupled with the City of Hamburg's initiative to establish and part-finance the cluster have helped concentrate a diverse range of businesses and job opportunities in the city and the surrounding region.
- The members of the cluster recognise that all aspects of the wind energy supply chain provide opportunities, not just locally but also in exporting services globally. Within the cluster, all aspects of the sector are represented: this includes supply chain management, legal teams, and financial institutions, as well as production sites.
- Hamburg itself has little employment in the production of wind equipment, with most of the local jobs focused on services which support the implementation of wind park projects. However, within the wider Metropolitan Region there are a number of production facilities.
- Discussions on Germany's renewable energy act (EEG) taking place this spring (2016) will have a significant impact on how wind energy capacity can develop in the future. The cluster's hierarchy provides opportunities for lobbying in Berlin, with access to German ministries, to help ensure that national policy decisions are supportive of local strategies.

4. OVERVIEW

Geographic location	The cluster is located primarily in the City of Hamburg (Germany) with a number of members also located in the wider Hamburg Metropolitan Region.	
Type of RES	Focusing on wind energy (with some solar and biomass)	
Project development	The Hamburg Renewable Energy Cluster (EEHH) was established in 2011	
Background information	A joint initiative between the Free and Hanseatic City of Hamburg and the 57 founding members. Today the cluster comprises more than 180 members. Wind energy in northern Germany is a key factor in the German Energiewende.	
Renewable energy project	The cluster includes 10 wind turbine manufacturers, and 7 offshore wind project developers. The cluster accounts for 65% of all German offshore wind projects.	
Impacts on employment	1,500 companies active in the field of renewable energy in Metroregion Hamburg (53% of these in Hamburg City), this accounts for more than 25,000 jobs (59% or around 12,000 of these in Hamburg City). 2008-2012 growth of 56% employment in the renewables sector (+4.6% total employment Metro Hamburg Region) (Prognos, 2012)	
Business opportunities	Renewable energy deployment (off- and on-shore wind, biomass, solar); transmission and storage (smart grids, batteries, hydrogen); applications (e-mobility, green ports, smart cities); administration and service (legal, consulting, supply chain, financial service etc.)	
Other impacts	<ul style="list-style-type: none"> • Diversification of the regional economy • Energy security and nuclear phase out • Political engagement of the public and policy makers at local and national level • Competition and interaction with other north German regions 	
Durability of impacts	Employment in renewables in Hamburg is not linked to the production phase of projects but the whole production chain – with a focus on renewable energy services. Members of the EEHH operate globally and thus benefit from export opportunities.	
Enabling policies	<ul style="list-style-type: none"> • EEG (federal Renewable Energy Act) – particularly the feed-in-tariff • German Federal System – autonomy of Hamburg • Cluster Policy in Hamburg • Referendum on city ownership of energy production 	
Conflicting policies	<ul style="list-style-type: none"> • EEG – particularly the Ausbaupfade (renewable energy trajectory) and shift to auction system (from 2017) • Public opposition – NIMBY (not-in-my-backyard) • European Commission rules on state aid 	
Governance	Complex due to the federal system in Germany. And also the increasingly international nature of the sector. EEHH provides a platform for advocating on behalf of the members at the state and federal level. Members of the EEHH’s executive committee are local politicians.	

5. BACKGROUND INFORMATION

Hamburg's renewable energy cluster, the Erneuerbare-energien-hamburg (EEHH), was established in 2011, with the aim to strengthen cooperation between key regional and international players in the wind energy sector. Its overarching objective is to foster the city's position as a national, and potentially global, centre for wind energy products and services.

The cluster was started with just 57 members, at a time when the engagement of business in wind energy sector represented a growing but nevertheless uncertain opportunity. Although some wind energy companies were already located in Hamburg when the cluster was formed, the cluster's membership has grown to 180, an increase linked to growth of the industry locally.

Whilst Hamburg has a relatively strong economy, its historic industrial and economic strengths in logistics, aviation and maritime services are not guaranteed. Wind energy has provided a locally-appropriate opportunity for diversification, as it has synergies with both the maritime and aviation sectors, and is well suited to the local coastal geographical situation and climate.

6. RENEWABLE ENERGY CLUSTER – OVERVIEW

‘Since 2011 the cluster agency named Renewable Energies Hamburg has linked together the various players in the metropolitan region’s wind-power sector. Hamburg is a **key international location and service centre for the wind power industry**. Not only the leading manufacturers for equipment and wind farms are to be found in the metropolitan region, but also the small to mid-sized companies that deal with project development, installation and maintenance – and there is co-operation with the logistics, aviation and maritime industry clusters’ (interview with the city Mayor).

In Hamburg and its metropolitan region, a range of stakeholders, including entrepreneurs, researchers and politicians, are engaged with supporting Germany’s transition to renewable energy, known as the *Energiewende*. The Renewable Energy Hamburg cluster is not focused just on the construction or manufacturing phase of renewable energy projects, but rather on the whole production chain of renewable energy products and services (see Table 1). The EEHH was established to facilitate growth in this sector. The EEHH aims to pool the skills and experience necessary for the energy transition at local, federal, and even global levels.

Politics	Energy	Mobility	Efficiency
Energy transition <i>Energiewende</i>	Renewable energy	Smart infrastructure	Green buildings
	Wind energy	Hydrogen technology	E-quarters
Energy and climate change	Battery and Storage	E-mobility	Clean industry
Cluster development	Smart grid		Smart city
Urban redevelopment	RE hybrid technology		Smart Grids
International relations	R&D		

Table 1 Key topics and activities in the EEHH cluster.

The cluster was initiated by the Free and Hanseatic City of Hamburg. It is a registered company (Erneuerbare Energien Hamburg Clusteragentur GmbH). The City of Hamburg owns a 51% share of the company, with the remainder held by the association of 187 members (EEHH, 2016). Half of its budget comes from the City of Hamburg, with the remaining funding coming from the annual fees of the member organisations. The growth in membership of the cluster not only reflects the growth in the sector driven by the investors’ certainty. In the early stage of the EEHH, wind energy was considered to be a more risky sector to enter than it is in today’s maturing market.

We learnt that the cluster deals with a range of services including energy provision, financing companies, certification providers, producers, research institutes, engineering consultancies, telecommunications, logistics, human resources, public relations and media, project developers, law firms, insurance companies, public institutions, and administration services. This reflects the complexity of the wind sector and the wide skillsets and markets which it depends upon.

The EEHH itself has five permanent staff, who manage its activities. They are supported by both an executive committee (made up of companies and research institutes) and a supervisory board comprising people from Hamburg’s government and private companies.

7. DELIVERY OF LOCAL IMPACTS IN HAMBURG AND ITS METROPOLITAN REGION

7.1. EMPLOYMENT

RQ 1 How to increase and/or maintain employment in the local economy induced by the development of renewable energy projects?

- A focus on wind energy services and engineering has allowed Hamburg to increase local employment significantly. Direct employment is in excess of 24,000 jobs.
- Thanks to sustained growth in the sector international companies set up their office in Hamburg, and existing companies expand their presence, increasing the employment base. Ambitions for further deployment of renewables suggest this growth will be sustained.

RQ 2 What type of employment and new business can it create? What are the conditions to make it happen?

- Wind energy production is highly decentralised and reliant on complex services and skill sets. The EEHH has an established expertise in wind energy services. Regional wind energy production and maintenance are provided by facilities outside of the city. All these subsectors provide diverse jobs.
- Offshore wind is highly demanding in terms of human resources and expertise in the sector is difficult to develop. Hamburg is now a global leader in developing offshore wind projects.

Today the city of Hamburg and its metropolitan region make important contributions to jobs and growth associated with the Energiewende. The EEHH commissioned a consultancy to analyse the economic importance of the renewables sector to the Hamburg metropolitan region. Some of the main findings of the report are outlined below (Prognos, 2012):

- 1,466 companies involved in renewables are located in the region (53% in Hamburg city)
- 24,700 people employed in the renewable energy sector (equivalent to 1.4% of the total employment of the region)
- Employment in the renewable energy sector grew by 56% between 2008-2012

Our discussions with some of the key employers in the region, as well as other stakeholders helped to reveal why renewable energy sector is such useful source of jobs. It seemed that all of the stakeholders interviewed agreed that it was powerful tool for stimulating the economy and creating diverse skilled and long lasting employment.

Diverse, direct and indirect employment

The interviewee from the local green party told us that the region had become an important site for companies linked to the renewables sector to be based. As well as some of the largest European companies in this sector, it also hosts ‘a lot of smaller companies, i.e. consultants, lawyers, engineering firms that have been founded as service providers to those that are carrying out the Energiewende’. She explained that these SMEs complement the large companies such as producers of wind turbines (e.g. Nordex), electricity suppliers (e.g. Lichtblick, Hamburg Energie and Greenpeace Energy), contractors (e.g. Enercity), **with a total of 12,000 people employed in renewables in the city alone.**

Large companies employ people directly and single production sites or the headquarters of a large firm can employ a significant number of permanent staff. This means that the jobs created are not limited to

construction and manufacturing during installation phases. **Wind turbine manufacturers**, such as Nordex, founded in 1985 and also an EEHH cluster member, have become a relatively large corporation employing 2,800 people.

‘Of course it is a big city, but when we decided as the market leader in offshore wind, to also come to Hamburg, impacts the decisions of others. When we decided Hamburg was the right city for us, I expect other companies decided to come here too’ (interview with Danish energy provider)

This impression that there was a kind of critical mass of wind energy companies in Hamburg companies was made clearer in our discussions with a representative from a Czech energy company on why they had decided to set up an office in Hamburg in 2016: **‘If we want to be taken seriously about renewable energy, particularly in Western Europe, I believe the most logical place to do that is in Hamburg.** That is why we decided to build an office here.’

As well as direct employment, indirectly the renewables sector has helped to create other jobs in the region. Our interviewee from an asset management company told us that the Energiewende has allowed her firm to **grow and directly employ specialists in renewable energy portfolio management and investment analysts**. Beyond this, the investments which the firm makes indirectly create employment opportunities for many people. Indeed, **indirect jobs might not just be limited to those in the renewables sector**; for instance our interviewee from a wind turbine manufacturer explained that ‘Whenever a turbine manufacturer decides on a new production site there will be direct and indirect employment in the region. Direct employment at the manufacturing site itself, as well as additional suppliers that are located in the same area. Installation, operation and service of wind farms will call on local businesses, for example for building materials such as concrete for the foundations of turbines. Indirect employment is generated through additional local commerce, demand for housing, local services, and so on’.

Persistent growth with plans for expansion

Table 2 presents the growth in investments in renewables in Germany between 2000 and 2014. Many of the companies which are located in Hamburg have grown, have ambitions for growth in the future, and are undoubtedly drawing on investments in the sector. We were told for instance that when a Danish energy provider set up their first office in Hamburg in 2011, starting with 10 employees, by 2013 this had increased to 70 employees, and today the figure exceeds 120.

Energy source	2000	2005	2012	2013	2014
Wind energy	1.9	2.5	3.9	6.6	12.3
Total (all renewables)	4.6	11.9	20.3	15.7	18.8
Investment in wind energy as % of total	41.3%	21.0%	19.2%	42.0%	65.4%

Table 2 German investments in new renewable energy installations since 2000 (billion EUR) (Bee-Ev, 2015).

‘Germany has an engineering tradition, and Hamburg is successfully attracting these engineers. Maybe in the past these engineers would have decided to go to the south or to the west of Germany’ (interview with Danish energy provider).

In March 2016, Nordex decided to expand the size of its headquarters in Hamburg. Its existing headquarters in Ochsenzoll (a district in the Hamburg metropolitan area), which it first occupied in

2011, has already expanded capacity from 500 to 800 employees. The announcement of the construction of an additional building at the same site follows the pending purchase of Spanish wind company Acciona Windpower. The headquarters will now have space for around 1,200 employees, reflecting the growth of this business alone (Nordex, 2016).

A representative from a Czech energy company was quick to explain the Hamburg phenomenon further: ‘obviously, when you have growth in any sector there will be jobs and windfalls from taxes etc. This goes without saying. But for renewables in particular there is a lot of evidence and studies which explain the various benefits which different forms of energy provide. **Renewables clearly have a positive impact, and this is because this form of energy production is decentralised.** This means all the structures are at smaller scales and cover several communities. Unlike a single power plant which might provide many jobs but are generally concentrated in one location – and per MW of conventional energy there is the need for more people, employees and different services across the value chain in order to support them. In this sense renewables are more efficient at creating jobs’.

Offshore wind as a human resource intensive sector

Offshore wind farms were highlighted as being particularly intensive in terms of know-how. One interviewee explained: ‘offshore energy is unique because you have to have very specialised teams; because in addition to maintenance aspects, you have a lot of complex requirements in terms of the technical operation which aren’t shared with onshore farms. For example, anything to do with the sea, the tides and storms, health and safety, and the environment calls on very specific skill sets. These skills are not easy to get hold of, this means that experts in the region have a combined expertise. With this expertise you can build up a region as a hub for certain activities such as offshore, this is exactly what has happened around Hamburg’ (interview with Czech Energy Company).

Creating jobs both in and outside the city

In Hamburg itself there are not many production sites for wind energy or wind energy installations. The city state is too small to accommodate large wind farms or the necessary production facilities. In Hamburg, employment is focused on high skilled services covering all aspects of wind energy, ‘this includes planning, getting permission, financing, all steps for one project - it’s a very complex sector’ (interview with a cluster association representative).

Our interviewee from a leading wind turbine producer explained: ‘In Hamburg itself, at our headquarters, we currently have 1,000 people (including Service), with a variety of jobs. This includes the CEO’s office, general management, and a number of departments such as engineering which look at technical questions which emerge while implementing projects. We also have logistics and project management, who are responsible for transportation and the installation of wind farms. Service and Operation units complete the picture’.

Production and service sites for wind energy engineering exist at coastal locations in the Hamburg Metropolitan Region and beyond. In answering the question ‘do you think the renewables sector is effective at creating jobs?’ one respondent from a wind turbine manufacturer responded: ‘Yes it is! We employ people in all the areas mentioned above. In addition, there are also a number of service hubs that are located close to the wind farms that are operated by our customers on land and at Sea.

One Danish wind farm operator for instance, has a wind turbine service facility located at Norden-Norddeich, Ostfriesland. At this site there are 50 permanent staff to carry out the operation maintenance on their wind farms. **‘This is a really good example, where you see a German headquarters in Hamburg, like we have, and then the real hands on work, which requires people to**

be located near to the wind farms at the coast. Of course these two elements depend on one another' (interview with Danish energy provider)

Siemens is now in the process of completing a large manufacturing and production facility for nacelles (located on the top of the turbine this is the main mechanical part including the generator) in Cuxhaven, Lower Saxony. They invested EUR 200 million in the site, which covers an area of 24,000 square meters at the harbour edge, and will employ up to 1,000 people when it is completed in 2017 (Siemens, 2016).

7.2. BUSINESS OPPORTUNITIES

RQ3 How was the business related to renewable energy established and/or maintained so that it is built-in local economy?

- Hamburg has a geography and location which make it practically well-suited to become a headquarters for the deployment of wind energy in the North Sea and northern Germany.
- Hamburg has developed a city brand as the hub for renewable energy in Europe. Creating win-wins for the city and the companies located within it.
- The EEHH cluster provides a mutually reinforcing platform for its members to network and export wind services to internationally.

We tried to explore why Hamburg had been so successful in creating these business opportunities. From a very practical perspective, Hamburg is well-located to support the development of wind energy in Europe. 'In the North Sea there is a lot of wind, the conditions are also very good. So, **from a technical point of view it's sensible to install offshore wind farms here'** (Interview with Danish energy supplier). From other interviews we discovered however that it was much more than its geographical situation which has made the city such a thriving hub for renewables. The key success factors are presented below.

Presenting Hamburg as a hub for renewables

One aspect which emerged from the interviews was that the city of Hamburg has been successful in developing **a city brand for the renewables sector**. The city has taken steps to establish the city's name as a center for renewables, for instance in 2011 as well as setting up the EEHH, Hamburg was also European Green Capital - largely on the basis of its efforts to promote clean energy.

Our interviewee from a Czech energy company described Hamburg's reputation like a win-win for the city and the stakeholders active in the sector: 'when companies including large multi-nationals are being active and innovative in a city, developing new technologies, the more the profile of a city is raised.'

'I joined the company after we set up in Hamburg, but all I can say is that the city **is the hub for offshore wind**. All the big utilities and companies have located their wind power units here in Hamburg, and of course it is an important city, and it's incredibly well connected', 'Hamburg is a big city and has influence over other cities and regions. If you have a city with a strong cluster in a particular sector with a lot of good initiatives you can spread the success of this further and even out of the city' (interview with Danish energy supplier).

Using the cluster as platform for commerce

All the companies which we interviewed were members of the EEHH, they all explained why they were attracted to being members of the cluster. The cluster creates a network of companies and provides a platform for exchange. It also helps its members for example, by supporting international projects, or

locating funding opportunities. Different platforms such as the Renewable Energy Award or industry exhibitions allow companies working in distinct and specialist fields to interact, as well as emerging players or even innovative students to get the attention of larger companies. This is important in the wind energy sector because of the diverse nature of the organisations involved as well as the need for constant innovation (drawing on an interview with cluster association).

‘If you come to a city as a non-German company of course you need to do a lot of networking, and this is what the cluster provides. So **it makes sense to have a good network from the beginning**. The cluster gives you access to other stakeholders, think tanks, consultancies, and so on, which help to locate your business in the market, and also open up new business opportunities.’

This idea of the mutual benefits of being part of a cluster was also mentioned in another interview: ‘[being a cluster member] is really a marketing and networking exercise. You learn a lot by being aware of all the different activities which are going on within the cluster. You could be reliant on your own networks, but even if you are a large company, it’s very useful to have conferences, events and tools to discover what’s happening in the market.’

Based locally acting globally

Many of the renewable **energy companies located in Hamburg are either international companies which chose to locate in Hamburg, or they are German companies which operate locally and internationally.**

Some activities in Hamburg cover the implementation of renewable projects outside of the Hamburg metropolitan region, outside of Germany, and in some cases outside of Europe. Our interviewee from a Danish energy provider explained ‘we have a matrix organisation, this means that people located here in Hamburg, are not only responsible for working on German projects, but are also working on British or Danish projects. So these projects are important because they maintain employment here in Germany’. DONG Energy has the strategy to increase its total wind capacity to 6.5GW by 2020. In February 2016, DONG energy made the final investment on its Hornsea Project One offshore wind farm, adding 1.2 GW to the companies wind capacity, and placing it on track to meet its 2020 target. This project will provide electricity for one million homes in the UK (Dong, 2016).

In April 2016, a Czech energy company opened an office in Hamburg in order to increase their presence on the renewable energy market. Currently, the Hamburg office has two managing directors and two additional employees, but it already has plans to expand. Our interviewee from the company explained ‘We are looking at acquisitions and deployment, particularly for wind energy, PV, biomethane and waste to energy. **Whether or not it is being done in Germany or Western Europe, a lot of this work can be done from Hamburg**’.

In this sense, the success of Hamburg cannot be isolated from opportunities elsewhere in the economy. **The strength of Hamburg has been its emergence as an international player in wind energy, rather than just serving local needs.**

7.3. DURABILITY OF ECONOMIC IMPACTS

RQ4 How to ensure that the resulting economic impacts can be extended over longer periods of time, and not only during the construction phase of these renewable energy projects?

- Wind farms represent long-term and cost-intensive investments. The work to develop wind farms does not stop with the connection to the grid, but includes further research and development, maintenance and repowering programmes.
- Wind energy is a growing sector in which Hamburg has a strong reputation, maintaining expertise will allow the city to continue to export wind services in emerging markets even if projects are not being developed locally.
- Hamburg actively promotes an increasing demand for local renewable energy and supports new grid connections.

Wind energy as a long term investment

The stakeholders involved in wind energy production demonstrate that the economic impacts and benefits are not limited to the construction phases of projects. For companies like Siemens Wind Power who entered into wind energy manufacturing in 2004 when it purchased Bonus Energy, wind energy has always been a long-term project.

Our interviewee from the local Green Party emphasised that the benefits of renewables in Hamburg would not be short lived: ‘The Energiewende will not be completed until a certain number of windfarms or installations have been put in place. Support, repowering and new installations will always remain necessary, as will research and education’. Wind farms themselves are not complete once they are connected to the grid as they are dependent on regular maintenance. On average, a wind farm can be in operation between 20 to 25 years.

The concept of ‘**repowering**’ is important in Germany. As innovation allows for efficiency gains, there has been pressure to retrofit or replace old turbines. Figure 2 below shows how the wind turbines have evolved since 1990 demonstrating improvements in engineering. Replacing existing (operational but considered obsolete) generators with new (more efficient) ones has the potential to create significant additional economic activity and increase renewable capacity. However, **the new EEG 2016 includes repowering within its volume limits, thus repowered turbines will also have to enter the grid through the auction system. This leaves uncertainty as to the extent to which repowering will be carried out by existing turbine owners.**

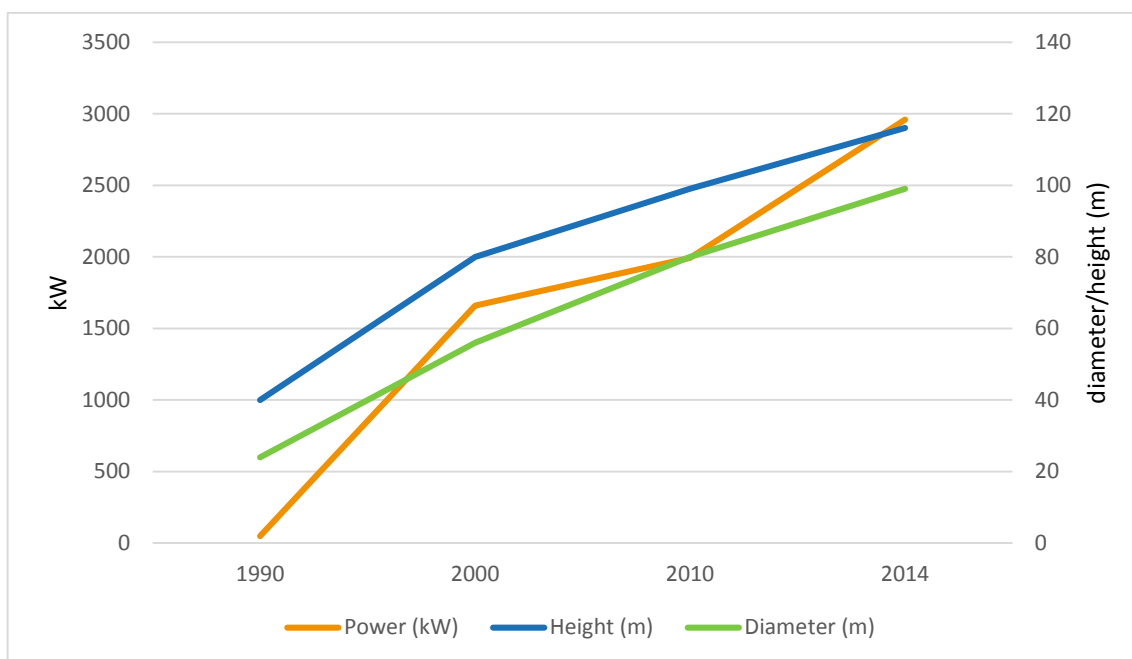


Figure 2 Technological development of wind turbines in terms of size and power 1990 - 2014 (DEWI, 2015).

Exporting Hamburg’s expertise to emerging markets

One of Hamburg’s strengths has been its ability to maintain leadership in the sector. This leadership means that the city can continue to be active, and export the skills needed to develop and manage new projects across the globe.

When we discussed this with a representative from the leading operator of off-shore wind she stressed that ‘off-shore wind is truly a European business. But we are increasingly seeing more, non-European, countries decide that off-shore wind is an energy solution for the future. We need to be ambitious in order to keep European and German leadership in this sector, and then successfully export the know-how we have built over several years.’

A number of EEHH members are already operating in developed and emerging markets and have plans for future expansion. For example, DONG energy moved into the US market in 2015 by purchasing 2.5 GW of project development rights off the coast of Massachusetts. In May 2016, the company also made the decision to set up an office in Taiwan.

When asked about their decision to switch their headquarters location to Hamburg in 2011, our interviewee from a German wind turbine manufacturer explained that ‘for any manufacturer it is important to have a stronghold in important markets – either with main offices, headquarters or manufacturing sites and service hubs. But we also have production facilities and strong presences in other important markets such as in Denmark, the UK, the US, Canada and in Asian regions. New sites are planned in markets such as Morocco or Egypt.’ Similarly, our interviewee from the cluster agency gave Nordex as an example, explaining that this German company develops wind turbines in South Africa, Pakistan and Morocco. We were also told that the cluster agency is now receiving delegations from Asia and increasingly Latin America, as well as the ‘usual suspects’ such as Scandinavian countries.

Persistence during the crisis

As well as exploring new markets, persistence in Hamburg has also helped to maintain the economic benefits from clustered renewables activity in the city, attracting and retaining firms. In a quite open conversation, a partner of an asset management company focusing on renewables explained us the story of her company: ‘we originally worked for a Danish investment fund. We were asked to set up a Hamburg office for them when the market for renewables was growing. However, when the financial crisis struck they decided to close the office. We thought rather than let the office close in 2007, we will do a management buy-out, keep it open and continue to invest in renewables. **So our choice to be in Hamburg is about persistence and coincidence rather than intention.**’

Since 2007, the company has invested 2 billion EUR in renewable energy.

Maintaining a local demand for renewable energy

We learnt that to support energy transition, EEHH makes an effort to increase local demand for renewable products. Interviews revealed that matching the demand to the supply of renewables was a key objective for the success of the Energiewende.

The city of Hamburg sold state owned coal fired power stations (Wedel and Tiefstack) to Vattenfall Europe AG in 2002. However, since a referendum in the city conducted under a slogan: ‘Unser Hamburg - unser Netz’ (‘Our Hamburg – our grid’), **Hamburg is trying to buy back control of energy production and the district heating network** (Hamburg, 2013).

In addition, ‘Hamburg Energie’ – an energy producer owned primarily by the city state, has been established in 2009. Its aim is to buy back energy production facilities and **to increase the supply of renewable energy in the region**. This has already started: ‘Hamburg Energie’ have developed the so-called Energieberg (Energy Mountain) building on a former landfill site that uses biogas and wind turbines to produce energy close to the city centre. However, we also learnt that further alternative sources to conventional energy are needed if all 470,000 local homes are to be heated.

One potential threat to the economic benefits from the wind sector in Hamburg was the inconsistency of wind energy production and local energy demand. Indeed, the grid is already congested during generation peaks. Considering that several of the German states have the ambition to be renewable energy exporters, **balancing supply with demand is an increasingly important issue**. Exposing renewables to balancing responsibilities could however impact the viability of the sector, particularly as guaranteed tariffs expire (drawing on interviews with an asset management company). Investment in energy storage and smart grid technologies is therefore crucial for mitigating this risk. Hamburg’s renewable energy sector appears to have already understood the challenge, and has become very active in these areas. The synergies of the wind industry with other sectors and innovation have never been more prominent.

7.4. SOCIAL AND ENVIRONMENTAL IMPACTS

What social and environmental impacts associated with RES development can be identified?

- Renewable energy has allowed Hamburg and the region to diversify the economy, offsetting loss of jobs in maritime sectors or the need to dredge the Elbe to support the port of Hamburg.
- Existing maritime sectors demonstrate transferable know-how suitable for the renewables sector sustaining local economies which might otherwise be in decline.
- The semi and high skilled jobs in production and maintenance facilities are more valuable to local people than alternative entry level positions in other sectors.

Diversifying Hamburg's maritime economy to secure jobs

There is a big **social motivation for local communities to invest in renewable energies**. We were told that 'positive impacts on social structures' are among the main benefits of sustainable energy production. This is because of the **changing nature of the city's economy**. While Hamburg has been a key European player in shipping, many recognise that it does not present the opportunities for growth and employment which it used to. 'The decline of the shipping industry was a key motivation to push for more renewables, as [the city] thought it was the only alternative for a city state like Hamburg in order to be less vulnerable' (interview with the asset management company).

We discovered that the situation for the maritime sector has become increasingly complicated: **ports offer less employment** as processes are increasingly mechanised, and furthermore 'the **River Elbe needs to be dredged and deepened** before the largest container ships can use the harbour. There is opposition to this, particularly for **environmental reasons**. And in any case, other competing harbors do not have this predicament, particularly Rotterdam with which Hamburg has a long standing competition for trade'. There is an ongoing court appeal to determine whether dredging can take place in the Elbe, with environmental groups opposed, as well as local farmers who believe their fruit orchards will be affected by increased salinity in local waterways. However, without dredging it is feared that Hamburg will lose out to other European ports (DW, 2014). Additionally, the opening of the deep water harbour JadeWeserPort in Wilhelmshaven in 2012, which is just 150km west of Hamburg, provides an alternative for container ships too large for Hamburg's port. JadeWeserPort is financed by the states of Bremen and Lower Saxony.

'Offshore wind particularly has contributed to a kind of reindustrialization for example in the coastal areas of Lower Saxony. This is very important for the region and the people there. **Some maritime businesses have completely shut down in the past but others who found links to the wind sector were able to develop new business activities**. There are some businesses which have worked in similar sectors, so have some relevant and transferable know how' (interview with wind turbine manufacturer). On this subject our interviewee from the cluster agency gave the example of Spitzner Engineers, which started as an engineering company focusing on aeronautical engineering but made the choice to start to develop wind turbine rotor blades.

When we spoke to an expert on the Energiewende about the types of jobs which had been created in the renewables sector in Germany he explained that 'the jobs created are diverse and cover a range of skills. Even low level jobs in production facilities require training and certification. These jobs are better paid and more valuable to the economy and for individuals than other types of entry level jobs, including agricultural work'.

Public acceptance of renewable energy

Public support and acceptance has played and will play a central role in the Energiewende in Germany. Indeed, in some areas public opposition on new power transmission lines has delayed the timely implementation of necessary infrastructure (interview with turbine manufacturer). ‘Public acceptance is important and it is necessary to find solutions such as, the implementation of underground cabling in sensitive areas.’

In February 2016, the EEHH conducted a survey of 1,575 Germans in order to assess how sentiments had developed towards the Energiewende five years after Fukushima. The survey showed that North German federal states (Bremen, Hamburg, Lower Saxony and Schleswig-Holstein, see table 3) have a more favourable attitude towards the policy in general, and towards wind energy in particular, than respondents in Southern states.

Survey question	Northern Germany (Y/N %) <i>Bremen, Hamburg, Lower Saxony and Schleswig-Holstein</i>	Southern Germany (Y/N %) <i>Baden-Wuerttemberg and Bavaria</i>	Total (Y/N %)
Was it the right decisions to phase out nuclear energy and switch to renewables?	80/16	72/23	74/21
If a wind turbine was going to be constructed close to your home would you agree?	60/36	55/42	56/41

Table 3 EEHH Survey on the Acceptance of the Energiewende – February 2016.

Our interviewee from the cluster explained the results as follows: ‘People in the north have now learned through the construction of infrastructure projects, including on and offshore wind farms, transmission terminals, and bioenergy projects, how to cope with the Energiewende. They are **able to see the immediate benefits of the Energiewende in their immediate vicinity**, for example through the economic impacts on their local economy.’

The survey shows that **people in the north of Germany are very positive towards renewable energy**. As our interviewee explained: ‘the experience is that when you start new projects, particularly in the countryside or close to family neighbourhoods, people don’t like to have tall wind turbines erected in their backyard. All projects have this experience. If you want to be successful **you really have to talk to people from the beginning**. Some firms offer opportunities for financing local installations, so they can benefit from investments. It’s necessary to **apply different methods** to achieve a higher level of public acceptance. This is a very big issue.’

7.5. ENABLING POLICIES

RQ5 What are effective schemes and instruments (in the broadest sense, e.g. education and training) that enabled local economy to gain welfare/benefit from renewable energy projects located in the area?

- The federal level EEG, particularly with the onset of the feed-in tariff, has made investment in wind energy economically attractive and less risky. Hamburg is a base for these investments.
- A city level cluster policy supports actors in the wind sector to network, and grow, providing job security for the local population.
- Multiple education and research institutions within the cluster interact with business to provide individuals and R&D to meet the demands of this dynamic sector. Businesses also train personnel directly and employ people explicitly from the region. The semi and high skilled jobs in production and maintenance facilities are more valuable to local people than alternative entry level positions in other sectors.
- Actors interact horizontally up and down governance levels, in areas such as funding, information and unexpressed needs. The cluster facilitates these interactions.

Policies which have enabled the success of the Hamburg cluster come from both the federal and local levels. These policies are importantly evolving over time reflecting Germany’s commitments and priorities to renewables change. As we could find out in the interviews the major ones link to the Hamburg’s cluster policy, federal energy policies and education facilities which work alongside industry.

Energiewende, the Federal Renewable Energy Act, and feed-in tariff

‘The Federal Renewable Energy Act is a success story in renewable energy. The feed-in tariff was a key factor in Hamburg’s development as a center for renewables’ (interview with Czech energy provider)

The Energiewende supported by the Federal Renewable Energy Act (EEG) provides the overarching federal policies which promote the development of renewable energy in Hamburg. The City of Hamburg has aligned itself with the federal objectives of 35% of its electricity to be produced by renewables by 2020. The development of the EEG has been a key factor in the renewable energy transition in Germany, and has been a highly politicized issue. Up until now, a feed-in-tariff (FIT) has guaranteed an energy price for renewable energy which is sold to the grid. This support has been gradually reduced, and will be undergo significant changes in 2017 as the EEG is revised. It was highlighted by all interviewees how important this instrument has been so far.

When Germany initiated the feed-in-tariff back in 1991 and with the first EEG in 2000, this was one of the key incentives for a number of companies to set up their operations in Hamburg. ‘[The EEG] has been very important for the expansion and development of the renewable energy sector. **It really started with the feed-in tariff** in Germany. The EEG was consequently developed over the years, integrating more and more market elements. Currently we have 33% of renewables in the country’s electricity mix’ (interview with wind turbine manufacturer).

‘Germany became one of our key markets because the German government decided to change their energy system. At the same time [Danish energy provider] decided that renewables were the right solution. Offshore wind in Germany suddenly became very promising, particularly because of the policy,

targets and clear road map provided by the [federal] government.’ ‘When the government first started to promote offshore wind, there was still reluctance amongst investors, because financially it remained unattractive. But **everything changed with the legislation**, which offered the feed-in tariff, offering industries twelve years at one price, or eight years at a higher price. This led to a lot of investment; many companies opted for a high tariff over eight years’ (interview with Danish energy provider).

Using a cluster policy to retain investments

Hamburg has been visibly active in trying to strengthen and diversify its own economic position. The feed-in tariff represented a significant investment in renewables by the German government and a **cluster of renewable energy businesses was one method to attract some of this investment to the city**. Hamburg has a track record at using clusters to support the economic development of specific sectors. Indeed, the EEHH is not the only cluster in the region but one of ten. Other clusters include e.g. Hamburg@work which focuses on media, IT and telecommunication; Aviation Cluster Hamburg Metropolitan Region which focuses on the aviation industry; Life Science Nord which focuses on medical technology, biotechnology and pharmaceuticals; Logistik-Initiative Hamburg which includes more than 450 logistics companies; and Hamburg Kreativ Gesellschaft which provides an agency for creative industries. A brochure on **Hamburg’s ‘Cluster Policy’** from Hamburg’s Ministry of Economics, Transport and Innovation (2011), explains that the city ‘owes its many years of above average growth to an overall strategy of economic policy that acknowledges the city’s existing strengths while seeking out and developing areas with future potential. To this end, **Hamburg makes use of the modern instrument of cluster policy’**.

Innovation and personnel to meet sector demands

Education and training is a crucial part of the success of Hamburg, and a number of **universities and research institutes are represented in the cluster membership** (as presented Table 4 below). Furthermore, many of the companies in the cluster provide their own certification and training, in order to develop the necessary work force. As already discussed the demand for human resources and technical expertise necessary to operate in the wind sector is one of Hamburg’s strengths, and maintaining this skills base will be essential for the longevity of the city’s current position in the sector.

Type of institution	Organization/Institute
Universities	Universität Hamburg
	University of Technology Hamburg-Harburg
	West Coast University of Applied Sciences
	Haw Hamburg (University OF Applied Sciences Hamburg)
	Hafencity University (HCU)
	Helmut Schmidt University of the Federal Armed Forces
	Leuphana University
Research Institutes	Lübeck University of Applied Sciences
	Fraunhofer ISIT
Vocational Training Centers	Tutech Innovation GMBH
	BZEE Training Centre for Renewable Energy
	The Frankfurt School of Finance & Management

Institut für Berufliche Bildung AG
Offshore-Safety-Trainingscenter Cuxhaven GmbH
Sophia T gGmbH
Staatliche Gewerbeschule Energietechnik
Staatliche Gewerbeschule Metalltechnik
Akademie für erneuerbare energien lüchow-dannenberg

Table 4 Education and research institutes in the EEHH membership.

We were impressed by how a **turbine manufacturer engages on multiple levels to ensure they have access to suitable workforce**. ‘Within the cluster there are a number of universities and also vocational training centers. They can provide suitable education programmes to meet the basic industry needs. We cooperate directly with one university where we support a junior professorship for wind energy (interview with a turbine manufacturer).

Beyond the many companies engaged in renewables, education and research facilities also play an important role: ‘between Hafencity University (HCU), University of Technology Hamburg-Harburg, Haw Hamburg, and the Universität Hamburg, there are several institutes with several thousand students engaged in studies and training related to renewable energy. The Hamburg Chamber of Crafts (Hwk-hamburg) offers in its Elbcampus information and instruction for professionals interested in the installation and operation of renewable energy facilities. This increase in knowledge drives dynamic development of the renewable sector here’ (interview with local green party).

Some companies also carry out training programmes directly. When speaking about employment at their wind farm maintenance facility in Ostfriesland, our interviewee from a Danish energy supplier, explained ‘**all of the jobs there are highly skilled jobs, but the reality is that there are no university degrees for service technicians for wind farms. So we make an effort to look for people from the region with certain skill sets - they are usually electricians and electrical engineers**. So we are already taking skilled people, then we provide them with further training, such as HSE certification, which will allow them to work off-shore. They are trained within the company and we provide the training.’

In addition to training, **research institutes** including some of those mentioned above are also key players in technological innovations in renewables. For example, a number of universities and research institutes are engaged with the ‘NEW 4.0’ project (Box 1 below), for which they are exploring technologies for energy storage (HAW-Hamburg, 2015).

‘The universities are directly engaged in the development of wind energy projects, and also on energy storage research. There is a lot of research at the moment into smart grids; particularly active in this field is the Hamburg University of Applied Sciences.’

Each year, the EEHH runs the German Renewables Award, and offers an award to the ‘**Student Thesis of the Year in Wind Energy**’. The EEHH cluster is also often an exhibitor at job fairs, rather than just industry fairs. At job fairs they offer advice on the sector, as well as guidance on which academic programmes at which universities are useful to get jobs in the sector.

Interlinkages between policies and actors

We wanted to explore what exactly the added value of a cluster was in terms of local economic boost through renewables in Hamburg. What we have learned is that **the interactions between actors at different levels was one of the main benefits of the cluster approach to deploying renewable energy.**

- **Advocacy:** Through joint advocacy the cluster can influence the framework shaped at a federal level.
- **Internal interactions:** There are interactions within the cluster, for example the wind energy developers or grid providers may approach research institutes in order to set the agenda for research and development.
- **Fund raising:** The cluster members apply at the federal level for funding to carry out the research, with further funding provided by private investors.
- **Outreach:** Finally, the cluster may act at career events informing students from the region about the degree choices that can provide them with employment within cluster member companies.

Box 1 Funds deployed in support of EEHH.

In December 2015, the City of Hamburg in association with the state of Schleswig-Holstein secured 230 million EUR from the Federal Ministry for Economic Affairs and Energy for the project called 'NEW 4.0' ('Norddeutsche EnergieWende 4.0', North German Energy Transition). The total project budget is 600 million EUR and involves a consortium of 60 partner companies, with the overall objective to showcase the region as providing 100 renewable energy for 4.5 million inhabitants. As part of the project universities and companies in the region are exploring explicitly how to manage 'excess' wind power, including the development of large storage facilities as well as responsive industries, which operate machinery when energy generation is high. The city also runs an investment bank, 'IFB Hamburg', which offers loans to individuals and companies who make investments in energy infrastructure, energy efficiency and retrofitting buildings (drawing on interview with local green party).

7.6. CONFLICTING POLICIES

RQ6 Are there conflicting policies or policy structures (e.g. with respect to state-aid support, WTO, EU)? How are they being addressed in the case study?

- EU State aid rules have forced a transition of the EEG to an auction system. Whether or not the new system will impact small players remains to be seen as it depends on the final design of the auctioning scheme. Wind energy associations are actively advocating for favourable policies in this area.
- Germany's road map for the Energiewende within the EEG contains volume limits for on and offshore wind. Concerns remain that the new targets are unambitious.

The emergence of Hamburg as a leading city in the renewables sector has not been without complications. A number of complex political, social and legal issues have and continue to provide barriers to the deployment of renewables. Due to the complexity of renewable energy policy, it is difficult to distinguish between conflicting policies, but the challenges that emerged from the interviews link clearly to legislative changes.

Volume limits on the deployment of wind energy

All interviewees mentioned the benefits of having a clear road map for deploying renewables, but also the need for ambitious targets, to ensure that the share of renewables increases and the costs of deployment remain low. Both in existing legislation and EEG 2016 draft the legislated expansion volumes were not seen to be ambitious enough. The successive *Ausbaupfade* (road map) of the EEG can be seen in Table 5.

‘In the new EEG we would have liked to have seen a larger volume for offshore wind, previously we had bigger targets in Germany. And in 2014 targets were already reduced. Offshore wind is currently more expensive than onshore, but those costs are coming down. Furthermore, in order to further reduce costs you need economies of scale.’

Version of the EEG	Onshore wind (GW per annum)	Offshore wind (GW per annum)
2012	2.5	10 by 2020, 25 by 2030
2014	2.5	6.6 by 2020, 15 by 2030
2016 (draft)	2.8 (2.9 from 2020)	0.73

Table 5 Road map (Ausbaupfade) for on and offshore wind in the EEG.

‘The highly ambitious targets in the 2011-2012 drove the expansion of offshore wind, nearly 3GW, which we experienced in 2015. This is why we said maybe the targets should be increased again, and be more ambitious. The more ambitious the targets are the better it is for supply chain, the easier it is for investors to invest, and the costs are reduced. With the new EEG we of course feel like the volume is not high enough’. ‘The plan for 730MW is equivalent to just one or two wind farms a year if you compare it to a project like Gode Wind [600 MW]. The supply chains in Germany could deliver 3000MW a year. Germany has huge potential, as well as skills, and an engineering tradition, but to be able to export this you also need to have a strong home market’ (Danish energy supplier).

Impacts on the renewables sectors aside, our interview from the local green party was also quick to point out that any energy which was not produced from renewable sources would be produced from fossil fuels – she recommended an increase in the target of the share of total renewables for electricity production to 45%.

State aid issues and auctioning scheme

Over its history the EEG has undergone several revisions and amendments. Triggered by the decision by the European Commission that a transition period of two years only would be permitted to average energy prices, ongoing amendments (Spring 2016) will again change the nature of the legislation.

‘One of the central changes of the current EEG reform is that we will be moving to an auction system, by which the tariff will no longer be determined by the government, but by an auction.’ (Interview with wind turbine manufacturer)¹.

¹ <http://www.bmwi.de/BMWi/Redaktion/PDF/G/gesetzentwurf-ausschreibungen-erneuerbare-energien-aenderungen-eeeg-2016,property=pdf,bereich=bmwi2012,sprache=de,rwb=true.pdf>

Interestingly interviewees gave some different perspectives depending on their role in the wind energy sector:

- Wind turbine manufacturer: 'we have welcomed the introduction of an auction system in a constructive way, as we have had experience with similar systems from other markets. The introduction of auctions however marks a change. Risks will increase compared to times before. In the past every project that was developed got grid access and a tariff based on a market premium. Now, projects will be developed then need to compete in auctions.'
- Danish energy supplier: 'We don't have any concerns about this; we are very familiar with auction models. Auction models are in place in the Danish and UK markets already. We see this as a tool to bring down the costs.'
- Czech energy provider: 'This [shift to auction mode] will have a big impact on the nature of the German energy market. The market is currently highly fragmented with many players of different sizes. The shift to auction represents the market becoming mature. This is a good thing, but some small players may struggle to meet requirements. This could foreseeably impact the jobs in the renewable sector in Hamburg'.

It was clear that there are concerns that a shift to an auction system could impact small businesses' ability to engage in new projects if the policy was not effectively designed.

Tools to maintain actor diversity

'There is a risk that the new EEG will force smaller players out of the market. **Actor diversity is important.** Big players always have the opportunity to return to conventional energy once the volume limits for renewables are met. Fossil fuels including brown coal remain cheaper and more lucrative. Environmental impacts are not included in the price of energy, and a move towards environmental taxation of energy sources is not currently politically feasible' (interview with local green party).

Indeed, the need to ensure plurality of actors is something which is outlined in the EEG 2016 draft, having said this the extent to which provisions in the EEG 2016 will support small players in the wind sector is difficult to predict. For all energy sources smaller plants up to 750KW are excluded from the auction process; however, current technology means that individual turbines generally exceed this limit (see figure 2). Additionally, the EEG 2016 also outlines the important contribution which energy communities have made in increasing the capacity of onshore wind in particular, and the need to preserve 'Akteursvielfalt' (actor diversity) in the Energiewende. Energy communities are defined as those projects with a size of at most six turbines and a power capacity of not more than 18 megawatts, with at least 51 percent of decision making power in the power of local residents.

Energy communities and SMEs are by definition important for social acceptance at a local and regional level because they are most active at these levels, and are directly engaged with specific communities. In this sense, our findings suggest that the continued presence of these actors within the Energiewende will help to support the deployment of renewable energy.

Grid development choices

Grid connections have been a prominent issue for the Energiewende in Germany, and wind energy from the North of Germany has been central to discussion. 'We are going from a centralized power system where we had many big blocks of nuclear and coal power stations, to a more decentralised system. In Germany, nuclear generation will be phased out by 2022. When wind farms are built they are not necessarily in the same place as the former big power stations, so we need **new grids**. In the future there will be more wind energy produced in the North so we need more powerlines going from the

North to the South of Germany. Currently two big powerlines are being implemented, including the Tennet (one of German electricity transmission system operators) SuedLink and Amprion (another grid operator) Ultranet. There are also national and European grid development plans. **This work has been delayed partly because of public opposition.** Some lines might be put underground in populated areas, but this requires a completely new planning process, which will take more time. Policies to accelerate the development of the grid are important to prevent the whole process from being slowed down’

Through discussions it also emerged that Germany had been in the vanguard in its choice of transmission system for offshore wind, particularly in the decision to use large 900 MW high voltage direct current (HVDC) converters. ‘900MW HVDC had never been built before. **Germany was a pioneer in this area, but it was also the cause of a lot of bottlenecks and delays.** Wind farms met a lot of delays, with grid connections being postponed again and again. However, once this issue was solved and decisions were made about how to improve the process, everything was solved. This is why we saw such a successful connection period in 2014-2015. The benefit of the 900MW converter is that you can connect multiple wind farms, so for each wind farm you don’t need to develop a new converter’ (interview with Danish energy provider). Discussions on grid connections are also part of the EEG 2016 draft.

Competition with other regions

Competition between German states arose as a potential challenge to the deployment of wind in northern Germany, as a representative from an asset management company described, ‘the interests in renewable energy are not always the same. **Local interests don’t always match with national ones.** In simple terms, everyone in the North wants offshore wind, whilst the states in the south don’t want offshore wind. But this is all part of politics. There is a power play, as in the south where a lot of the industry is located they would prefer to keep energy production close by. If the energy is produced in the north they don’t get any benefits just the costs’.

Future under the Danish model

The revised EEG will continue to change the interaction between the government and the renewable energy sector. One of the objectives of the German government within the EEG 2016 draft is to move towards a model of planning for developments where the state determines where new off-shore wind farms can be constructed.

‘Alongside the shift to the auction system we are also moving towards a new model of planning, it is comparable to what is already in place in Denmark: a public authority will develop future offshore projects — then the future operators put and offer in the auction. This is what is currently called the “Danish model” and it will be in place from 2026 onwards according to the new EEG 2017’ (interview wind turbine manufacturer).

At this stage it is difficult to say how this new model will affect the German wind energy deployment, or indeed the companies located in Hamburg, but it certainly represents the prospect of a changing role of the state in planning the deployment of offshore wind. Our interviewee from a Danish energy provider expressed some apprehensions at this change ‘the Danish model works very well in Denmark, however **the setup is very different in Germany, there are many more project developers and owners.** Right now, everyone wants to develop projects before the system changes. For the next five years we are going **to continue to compete with each other with our projects...**’

7.7. GOVERNANCE

RQ7 How to divide policy roles between national and local governments to achieve successful revitalisation of the local economy?

- The Federal level EEG provides a road map and generates investment confidence to support renewable energy deployment. EU level rules have resulted in a change in the EEG which will come into play in 2017.
- Local and regional policies such as the cluster policy, the re-purchase of local utilities, and strong research institutes, as well as active city branding supported by local politicians aims to capture the economic benefits of the Energiewende.
- As a city state Hamburg transcends federal lines and interacts with the surrounding states of Lower--Saxony and Schleswig--Holstein to complement its strength in renewable energy services with facilities specialising in wind energy engineering.

The governance issues behind the success of the Hamburg cluster and its impacts on the local economy are rather complex due to the number of actors involved. Our interviewees tried to explain to us the division of policy roles in this respect.

The federal authorities frame the operating environment for the cluster through the Renewable Energy Act defining the feed-in tariff (soon to be auction system) and the roadmap for renewable energy deployment. ‘The government sets the market. This is incredibly important because it provides the security and consistency which supports investments’ (Interview with Czech energy company).

The city of Hamburg has been a central actor in determining the cluster’s success. What we discovered was that the local stakeholders saw **the nature of Hamburg as city state** within the federal system as a key factor in its success. Our interviewee from the cluster explained ‘in the German federal system the lander, or states, have a reasonable level of autonomy, particularly for economic development’. Clearly Hamburg’s cluster policy stimulated growth from interdependent companies in wind energy. Other policies are also important such as the establishment of ‘Hamburg Energie’ to repurchase local energy production, and favour renewable sources including through demand aggregation. An expert on the Energiewende explained ‘apart from Berlin, Hamburg is unique in Germany because of its **status as a city state**. In itself it is too small and populated to be a major center for the deployment of renewables. However, its position as a key administrative, logistical, and financial center make it aptly suited to provide the service center for the Energiewende’.

In the Hamburg Metropolitan region, interviewees also noted the support which was given to renewable energy by local politicians. ‘There has been a really positive approach from the Mayor, who has been promoting offshore wind. The same is true for the Prime Minister from Lower Saxony, because a lot of job creation is also happening there.’ (Danish energy provider). Indeed the states of Hamburg, Lower Saxony and Schleswig-Holstein are evidently interacting to promote renewables. Whilst Hamburg is the location for wind energy services, much of the engineering and service facilities are located in other states close to the coast.

8. CONCLUSIONS AND RECOMMENDATIONS

8.1 CONCLUSIONS

From our case study on the renewable energy cluster in Hamburg, Germany, we draw the following main conclusions:

- **In Hamburg renewable energy sector is a key employer and has allowed the city's economy to diversify.** The city provides a nucleus for highly skilled service positions which cover the whole value chain of the wind energy sector. On the coast large production and maintenance facilities employ trained professionals. Total employment is over 24,000 jobs, and arguably has helped to offset job losses in the maritime and other industrial sectors.
- To become Germany's single renewable energy hub, the city has capitalised on its geography and support provided at the federal level. A **cluster policy has allowed companies to find mutual benefits** in locating in the city, and has created a network of businesses, education institutes and politicians, all promoting renewable energy. Other local policies included **regaining control of city energy production, helping engage citizens, and developing local acceptance and demand for renewables.** Ongoing discussions and review of this policy, particularly the move to an auction model and volume limits, will have an impact on Hamburg's position in the Energiewende beyond 2017 and on the benefits its citizens derive from it. **However, the Hamburg cluster and national energy policies appear to have been mutually reinforcing so far.**
- **Accumulated expertise, reputation and leadership from corporations and politicians are allowing Hamburg to export wind energy technology.** Global leaders in the wind energy sector have their headquarters in Hamburg; these are complimented by boutique SMEs with niche specialisations. Close cooperation with research institutes supports innovation. Maintaining leadership in the sector, for example through developing innovations for smart grids and energy storage during peak production, will allow Hamburg to derive socio-economic benefits from the deployment of renewables even if local implementation slows down. **There is a strong argument that clusters such as Hamburg's help to speed the process of renewables deployment globally, as well as regionally.**
- There are theoretical risks to a powerful regional cluster; it could lead to **group-think among participating businesses, with a negative impact on innovative business models;** or it could **reduce the potential benefits of renewable investment in other parts of the region.** We have not identified any indication of these happening – it seems likely that the range and diversity of businesses engaged in the EEHH, and its clear ambition to play a regional, rather than merely local, role, contribute to this.

8.2 RECOMMENDATIONS

We recommend the following based on this case study:

- A **cluster policy** provides a powerful tool to allow diverse businesses with shared goals to network and mutually benefit. Clusters help to **engage actors in the private sector, local authorities and education institutions to cooperate and create economic and logistical synergies.** They also provide a shared voice for advocacy work at different political levels.
- Public acceptance is a key factor in gaining local support for renewables. Hamburg demonstrated how to make renewables relevant to the public by creating skilled jobs for

maritime workers, putting energy production back in public ownership and redeveloping brownfield site with renewable energy projects.

- **Developing renewable energy locally is heavy in know-how and engineering, making these skills highly marketable.** Other cities developing renewable energy projects can **replicate** the success story of Hamburg to some extent by exporting the knowledge and expertise they accumulate, and turning renewables into an export business. This can help to extend the benefits of energy transition.

ANNEX I – REFERENCES

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- Interview with an asset management company, 18.05.2016
- Interview with an independent expert on Energiewende, 20.05.2016
- Interview with political party, 14.06.2016
- Interview with wind turbine manufacturer, 10.06.2016
- Interview with Czech energy company, 6.06.2016
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- Interview with Mayor of city, 25.05.2016

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