

Newsletter e-harbours #2, May 2012

## Investigating flexible demand for energy in a competitive logistic environment



**"We are performing extensive research in different harbour facilities, and our experience is that they can save much more on energy costs than you would expect at first sight.** More energy savings, more renewables, more flexibility that can be put to good use. Now and then we find a company that has actively studied its energy consumption and optimised it to the last euro. But most of the businesses pay no – or only very limited – attention to their energy consumption. We encounter companies with a huge energy bill, that do not exploit the difference between peak tariff and non-peak tariff." says Jef Verbeeck from VITO.

Read the full story on page 5



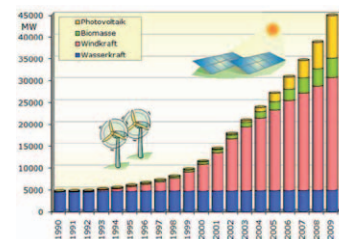
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## The core of doing business

"We're not there yet, but renewables, smart grids and saving energy are moving to the core of doing business."

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## Highlights



See some website highlights from [eharbours.eu](http://eharbours.eu) on page 3

## Showcases

Fresh updates from all the e-harbours showcases on page 5 - 10

# Editorial

## Renewables and smart grids are moving to the core of doing business.

Saving energy is saving money. But not at all times, so it seems. In our highly competitive economy 'saving time' is even more profitable. A well-balanced logistic process in the harbour industry is the key factor in surviving world-wide competition. Loading or unloading a large container in time is much more important than clean charging or de-charging a battery-pack of a few forklift trucks. No wonder saving energy or using renewables seems a minor factor for decision makers.

To reach its 2020-target, Europe needs to find smart solutions for more renewable energy in the grid. Our showcases are focussing on the quest for flexibility, looking at harbours from an 'energy-logistics' point of view, next to the basic 'logistics'. Not only on technical issues, but on legal, juridical and financial issues as well.

Accumulating energy in cold storage is basically a good idea, unless your bananas need 13,2C exact not 12.9C. Balancing the grid with EV is OK, until range anxiety comes in. Adjusting the basic processes of large harbour industries can be a breakthrough for renewable energy awareness, unless the profit is only at a promillage's rate.

At the same time we see strong signals from large countries as Germany that renewable energy opens up a gigantic market and a bright future for smart solutions. The data collected with Smart Grids techniques (predicting production and consumption, trading with unbalances, shifting the peaks) now represents a large value.

We're not there yet, but renewables, smart grids and saving energy are moving to the core of doing business.

Jan  
Schreuder  
Project  
manager  
e-harbours



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## E-harbours newsletter.

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www.eharbours.eu

## Website stories from eharbours.eu



### Tourist guides trained on e-harbours in Malmö

In mid February the e-harbours project together with City of Malmö arranged a full day training for tourist guides in Malmö.

<http://eharbours.eu/show-case-events/tourist-guides-trained-on-e-harbours-in-malmo>

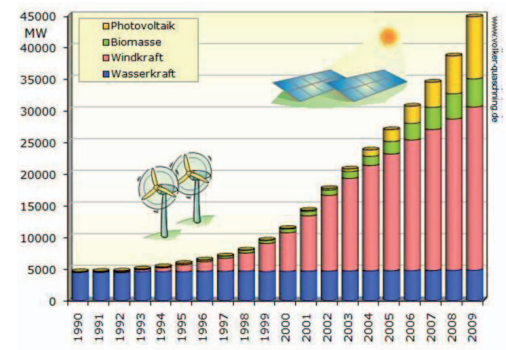


### 'We need Smart Grids to integrate renewables in the electricity system'

E-harbours interview with Hans Schäfers, from the Hamburg showcase of the e-harbours project:

Hans Schäfers is a fellow at engineering company Sumbi, and teaches at both the Hamburg University for Applied Science HAW and the Harbour City University of Hamburg.

<http://eharbours.eu/uncategorized/we-need-smart-grids-to-integrate-renewables-in-the-electricity-system>



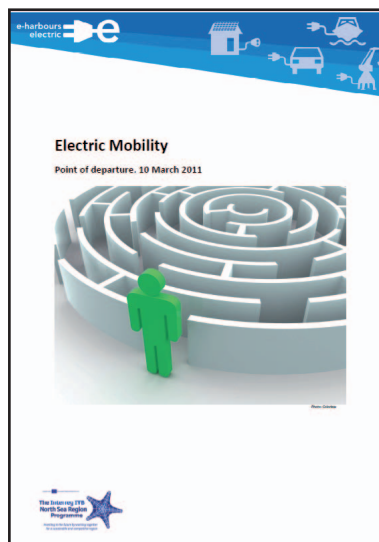
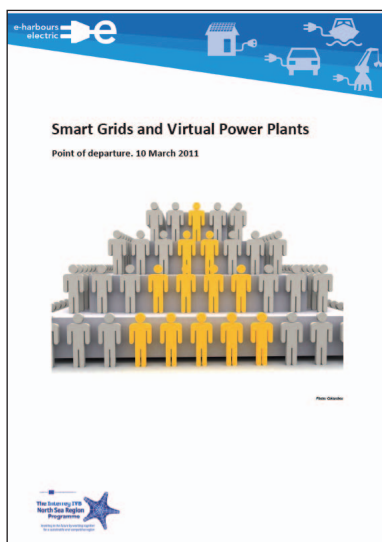
In October 2011 Flanders Smart Hub organized an Ignite evening with the topic of Smart grids. During this event 13 speakers were allowed to give very short presentations on their view on smart grids. Maarten Hommelberg from VITO, partner in the e-harbours project, had a presentation titled 'the hunt for flexibility', wherein he elaborated on the search for flexibility within the harbor of Antwerp.

<http://eharbours.eu/uncategorized/smart-grids-discussed-at-flanders-smart-hub>



# Point of departure Documents

At the e-harbours website you can download the Point of Departure documents for Smart Grids and Electric Mobility.



Get them at  
[www.eharbours.eu/download](http://www.eharbours.eu/download)

Or use the QR code link above

# Join the discussion online!

You are welcome to join our LinkedIn group on e-harbours where discussions on smart energy are being held.

Just follow the link below or click the link on the e-harbours website at [eharbours.eu](http://eharbours.eu)

<http://www.linkedin.com/groups?gid=3035541>





Showcase A1: Antwerp, Belgium. VITO and Port of Antwerp.

## Investigating flexible demand for energy in a competitive logistic environment

**"We are performing extensive research in different harbour facilities, and our experience is that they can save much more on energy costs than you would expect at first sight. More energy savings, more renewables, more flexibility that can be put to good use. Now and then we find a company that has actively studied its energy consumption and optimised it to the last euro. But most of the businesses pay no – or only very limited – attention to their energy consumption. We encounter companies with a huge energy bill, that do not exploit the difference between peak tariff and non-peak tariff. "**

Jef Verbeeck is part of the VITO-team that works with companies in the Antwerp harbour, analyzing their production process, and identifying sources of flexibility. "I have worked in the business world long enough to know that you have to present a financial outcome that looks interesting. More renewables is okay, but first of all the business case has to be sound.

### The energy costs are rising, that helps your business cases?

Sure, and it raises the awareness of energy matters. But in a lot of cases we encounter a barrier: the gains of our approach are not always realized by the party that carries the burden of investment and costs. Let me give an example: Chiquita wants his bananas transported at a fixed temperature from South America to Europe. The company leases cold storage containers (so called reefers), and hires a logistics firm to transport them. These reefers, that have a small cooling system on board, could be made smart, so that they use less energy, and cooperate with the systems on board of the ship. Chiquita would have to invest in smart reefers, but the gains will go to the shipping company. Those two parties will have to strike a deal to share the gains, and that takes time.

Energy costs may be rising, but what about the economic value of flexibility?



Our research shows that value is still quite limited. Our partners in the Hamburg showcase come to the same conclusion. But I think it will change. Look at the efforts policy makers all over Europe have made to stimulate renewable energy. As the capacity of wind turbines and PV-systems is growing, we reach the point where you cannot make full use of these renewables anymore. The fluctuations on the electricity net threaten to become more and more uncontrollable, unless we find a lot of flexibility on the demand side. So the market for flexibility will have to grow, smaller parties must get a chance to be involved. Completely new business models are needed to develop that market.

### The Antwerp harbour is planning the construction of dozens of wind turbines all over the harbour area. What do you think of this plan?

We had to expand our project plan because of these wind turbines. All companies we talk to want to know what a wind turbine on their terrain would bring them, what the gains will be in euro's per year. We can tell them that. We can discuss with them how they could integrate the electricity produced by the wind turbine in their energy household. We even can start talking about a virtual power plant, integration with the energy system of neighbouring companies. So we think it is a great plan, that opens many doors for us."

Showcase A2: Hamburg, Germany. University of Applied Sciences (HAW Hamburg)

## What makes a Smart Grid profitable?



Photo: Jo Schmaltz

**Shifting energy consumption is one of the most important goals of the Smart Grid. Renewable sources like PV-systems or wind turbines do not always deliver energy at peak hours. As the share of renewables in the energy mix is rising, we have to adapt our power consumption. From peak hours to off-peak hours, or better still, towards the hours that the renewable sources produce most. Load shifting is the technical term for this crucial adaptation process.**

The potential for load shifting in the Hamburg harbour is massive. The research team of the Hamburg showcase identified dozens of facilities in the harbour that could shift an important part of their power consumption. The top ten companies in the list could account for almost 70 MW of load shifting, a quarter of their installed power capacity (around 280 MW).

Smart Grids make shiftable loads into a commodity that can be sold. An in-depth analysis of the potential benefits for three Hamburg cold storage facilities shows a possible reduction of yearly energy costs by 13%. This reduction is reached by shifting load towards off-peak hours and selling flexibility on the spot market. Since the German electricity supply will be dominated more and more by renewable sources, the market price for flexibility (being able to deliver or to consume electricity at specified moments) is expected to

rise steeply in the future. That will make Smart Grids even more profitable.

Nevertheless, there are serious obstacles that still hinder the spread of Smart Grids. The Hamburg showcase identifies three main barriers:

- The owners of harbour facilities still lack the experience and information to estimate the financial benefits the Smart Grid will bring them. First of all, they want to safeguard the quality of their service and the productivity of the facility. Energy costs are (at least for most entrepreneurs) only one cost factor among many others.
- At the moment, the financial benefits of installing a Smart Grid still seem limited. The business case does not yet look very interesting, even when it promises much more in the future.
- Smart Grids are still relatively unknown, compared to much-debated technologies like PV-systems.

This last barrier triggered the Hamburg team to find ways to increase the visibility of the Smart Grid concept in Germany. In the coming months, they will stage a road trip, visiting important research centers and business hubs all over the country to discuss the advantages of the Smart Grid and their experiences with load shifting in the Hamburg harbour.



Showcase B1: Zaanstad, Netherlands. City of Zaanstad.

## Charging electric vehicles in a smart way

The Municipality of Zaanstad aims to be a climate-neutral city by the year 2020. One of the means to reach this goal is the switch to electric transport. Zaanstad decided to exchange the corporate diesel and petrol cars for a fleet of electric cars. This proved to be a far-reaching decision, triggering an innovation process that resulted in the design and construction of the first Smart Grid in the city.

For the charging of the electric cars, an infrastructure had to be developed. This proved to be a complex project, since a lot of parties were involved. The owner of the multi-story garage where the cars are charged, the builder of the charging system, the facility manager responsible for the cars, the end users, they all had to cooperate. The project REloadIT was born. Together, the partners decided on the following principles:

- The cars have to be charged with renewable energy from the region (PV and wind power from Zaanstad). Supply and demand are matched.
- The charging should not burden the electric system of the parking lot, so there is no need to increase the capacity of the network.
- When a reservation is made for an e-car through the computer system, a car must be made available that is charged sufficiently to finish the planned journey.
- The operator of the car fleet should be able to check real-time through a computer system what cars are connected to the charging system, and what the charging rate of the cars is.
- The system is integrated in the computer system of the Municipality.



These principles make clear there was more to solve than technical problems alone. The average user of an electric car suffers from 'range anxiety': can I reach my destination before the battery is depleted? To make electric transport attractive for a wider range of users, this anxiety has to be taken away. That is a main goal of the Smart Grid Zaanstad will use to operate the charging process of the electric cars. The municipality issued a tender, that has been completed successfully. The Smart Grid will be built this summer, and be operational next September.

The REloadIT project made Zaanstad aware it is an 'energy prosumer'. The Municipality produces its own green electricity, and can use that to power its own electric fleet. This principle can be implemented on a much larger scale. As a consequence, Zaanstad has been reconsidering its broader energy policy. A new energy contract for the city has been negotiated, that reduces the energy consumption of the municipality, enhancing the use of renewable sources. Also, not irrelevant in this time of tight budgets, it saves the Municipality a lot of money.

Showcase B2: Amsterdam, Netherlands. City of Amsterdam.

## Stimulating electric boating

**Boating on the Amsterdam canals is a popular pastime, not only for the millions of tourists that visit the city. More and more locals buy their own boat to cruise the canals, or rent a boat for an outing on the water, thus contributing to the levels of noise and pollution in the city center. The city of Amsterdam wants to promote electric boating in the town, both for professional uses and for leisure purposes.**

It is relatively easy to equip a boat with an electric motor and enough battery power to produce an acceptable range of action. The weight of the batteries (a big problem for electric cars) is less of a hindrance for boats.

The e-harbours showcase in Amsterdam started to facilitate electric leisure boating by providing charging points at strategic places on the main waterways. Currently there are five charging points for boats, each containing six plugs. The intention is to create ten more charging points in the coming year. These measures contribute to the rapid penetration of electric vessels in the Amsterdam leisure fleet (counting 14.000 boats in total). The number of electric boats doubled every year for the past two years, but is still only halfway the stated goal of 10% electric boating.

The next step in the Amsterdam showcase of e-harbours is to enhance smart solutions for the charging of electric boats. E-harbours started cooperation with a marina on the river Amstel that will be redeveloped. Marina Overamstel can become the first sustainable mooring spot in town, at a perfect location just outside the city center.

The city of Amsterdam does not develop the yacht harbour on its own, but invites other parties to do the job. A tender is launched for developers and operators of the marina, that will



incorporate 160 mooring places, a swimming pool, restaurants, caf  s and parking facilities. Part of the mooring space will be reserved for 30 electric rental boats. The new development provides an excellent setting for smart use of renewable energy.

The main building of the yacht harbour can house 500 m2 of solar panels, that charge the batteries of the rental boats by day. At night, this stored energy can be used to supply the restaurants in the marina. A smart grid coordinates the production and consumption of electricity in such a way, that the renewable energy is used to the full, and total energy costs are minimized.

Sustainability is not the only criterion that will decide the outcome of the tender. But plans that incorporate the production of renewable energy and the use of a smart grid for the charging of electric boats have a great chance to win the contest.



Showcase B3: Malmö, Sweden. City of Malmö.

## Testing a Smart Grid on household level

**Malmö aims at being a carbon neutral city by 2030. To fulfill this ambition, the city relies not only on planning measures (like enhancing public transport), but also on changes in consumption patterns and lifestyles of the citizens. The Malmö showcase in the e-harbours project fits perfectly in the climate policy of the Municipality, and brings it one step further.**



The Western Harbour area of Malmö, Västra Hamnen, once housed the Kockums shipyard, that played an important role in the industrial development of the city. Since the closure of the shipyard at the end of the last century, the area (140 hectares) is being developed into a mixed zone, with attractive housing projects, university research centers and offices. One outstanding feature of the Western Harbour is the focus on sustainability. The area aims at low energy usage and production of renewable energy through small wind turbines, solar panels on the roofs, solar collectors (heating tap water) and heat pumps. The first developed part of the area aims to be completely self sufficient in energy with a link to a large wind turbine in the Northern Harbour and seasonal storage of heat and cooling. There is a connection to the district heating system of the city, that can be used to deliver excess power to the grid, or as a back up in case of energy shortfalls.

Western Harbour is an ideal location for an experiment with Smart Grids in an apartment building, and that is exactly what the big electricity provider E.ON has developed. Eight apartments are furnished with their own PV-system and wind turbine on the roof. The buyers of the apartments get a free electrical car for three years. They can be parked and charges in the in-house

parking lot. The apartments have a Smart Grid, that calculates costs and benefits of actions like charging the electric car or starting the laundry machine, based on real-time energy pricing. The households will be informed about their energy costs and consumption and possible alternative actions by an Ipad, which also allows them to program their electrical household devices. At the end of this summer, the residents will move to the apartments.

In the meantime, Malmö thinks about expanding the e-harbours showcase. One important part of Malmö becoming a carbon neutral city is the efficient use of space and processes in the industrial Northern harbour. There electricity, biogas and heating are produced (renewables as well as non-renewables) for Malmö and the region. The area boasts a well developed infrastructure for gas, electricity and district heating, and has a large potential for the production of renewable energy.. Sorting, treatment and storage of many fractions of waste are located here. Within the e-harbours project Malmö plans to survey existing companies and activities in the Northern harbour, and analyse the potential for production of renewable energy and improving the efficiency of waste cycles.

Showcase B4: Scalloway, United Kingdom. Pure Energy Centre.

## Fishing port investigates the advantages of a Smart Grid



**Scalloway is a small fishing harbour situated in Shetland islands. The intensity and the large variety of activities in a relative small footprint make Scalloway Harbour a unique case study for the development of an energy monitoring strategy. The aim of the showcase is to gather energy data and use the findings to reduce/stabilise the harbour's energy, thereby increasing the sustainability of the Harbour.**

In collaboration with the harbour authority and the local organisations, Pure Energy Centre® and Robert Gordon University are developing a set of criteria to be used for an effective monitoring of the energy consumption of the Harbour. At the same time, the large potential of renewables energy available in Scalloway is under investigation, with the aim to assess the potential benefits in terms of economic value and CO2 emission. The showcase aim to increase the uptake of Renewable Energy in the harbour area by integrating the existing energy network with smart grid, virtual power plant and electric vehicles in order to generate a new sustainable energy management system for the harbour.

The energy monitoring strategy developed supports the assessment of the harbour activities and energy consumption level by using state of the art data monitoring technologies. The monitoring process in turn enables the lowest disruption for harbour's stakeholders. It also aims to reduce the cost and time of the assessment. The information/data gathered using the monitoring strategy can provide the required knowledge to define corrective actions to optimise the energy system within the harbour and increase its sustainability. It also supports harbour organisations to quantify their environmental impact within the harbour complex.

The outcomes of the energy monitoring strategy will allow the harbour community to analyse their energy consumption and behaviour, leading to the development of new and effective energy management strategies to reduce their energy costs and become more competitive, locally, regionally, nationally and internationally.



Aberdeen, United Kingdom. Robert Gordon University.

## Analysis and benchmarking of the showcases

### An interview with Bing Xu, Aberdeen Business School, Robert Gordon University

"My role is to evaluate the 7 showcases of the e-harbours project, and to identify the ones that offer the greatest potential for large scale implementation in the North Sea Region," says Bing Xu, Lecturer at the Robert Gordon University in Aberdeen. Recent research of Bing concerns the evaluation of competing forecasting models for oil prices and its volatility. She proposes several multidimensional frameworks that take account of conflicting criteria to assess relative performance.

**"The performance of oil-price models can be measured quite accurately. Isn't it much more complicated to compare the e-harbours showcases?"**

Yes and no. For my research on the relative performance of forecasting models, I only take 3 criteria into account and all these can be measured numerically. For the e-harbours showcases, I will not only take more criteria into account (for example, financial, environmental and social), but also have the difficulties to obtain precise numerical measures for these criteria. Therefore, I have to design a more complicated methodology that will provide solutions to select the best showcase(s) with conflicting and multiple criteria and often under uncertainties. Once the appropriate evaluation methodology is chosen, I think there is not much difference with comparing forecasting models.



And then you select the winner?

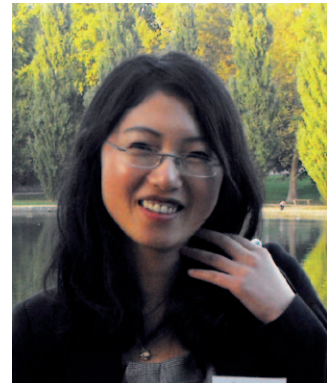
Well, I found out that researchers get quite sensitive when you try put up a competition. I do not want to say: you are the winner and he is the loser as everyone did a good job.

The preference of the different stakeholders is very important. The result of the evaluation may vary depending on the weight that a stakeholder gives to a certain aspect, like environment, finances or social effects. For example, for investors, the financial aspect is probably the most important; but for municipalities and politicians, they value social and environmental aspects just as important. When we look at the evaluation from different angles, we may end up with a different selection - one showcase might produce a sound business case, another may deliver a great reduction of CO2, and when you have a constraint on the budget, a third one might be the best choice. Therefore, what I am doing here is to select the "best" showcase that is most applicable in other harbor regions under certain assumptions.

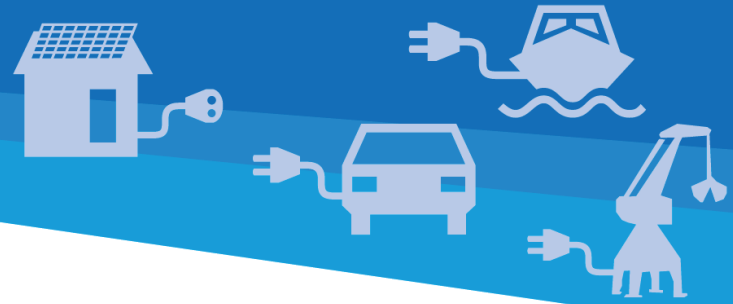
**The showcases of e-harbours develop. For example, some add new elements to their project in the course of time.**

Yes, you see new concepts developing in the showcases. That's why I will start the evaluation only when e-harbours is entering the final stages on the project, end of this year.

I hope the end result will be that we can say: this is a good idea. Do this all over the North Sea Region. It will produce good results for a limited input. I think that is what everybody at e-harbours wants. After all the hard work over the years, it is crucial that you have results to show for."







# The e-harbours project: Towards clean and energy innovative harbours in the North Sea region



## The objectives of e-harbours

The challenge is to create a more sustainable energy model in harbour regions on the basis of innovative intelligent energy networks (smart grids). e-harbours focuses 3 objectives:

- Increase the production and use of renewable energy in harbour cities. Harbour cities have extensive industrial areas with a great potential for development of sustainable energies; from wind, solar PV, tide, waves and the reuse of industrial waste, heat or cooling available
- Increase the use of energy smart grids. Attuning demand and supply of energy by flexible demand management, instantaneous load shedding (both directions), energy labelling, intelligent storage
- Increase the use of electric transport, a perfect partner to connect to large scale renewable energies and leading to a more healthy environment in the harbour regions

## Who are the e-harbour partners?

The lead partner of the e-harbours project is the municipality of Zaanstad in the Netherlands. The other partners are:

Municipality of Amsterdam, NL  
Port of Antwerp, BE  
City of Malmö, SE  
Hamburg University of Applied Sciences, DE  
Pure Energy Centre, UK  
Robert Gordon University, UK  
VITO, BE

The project is financially supported by the Interreg North Sea Region program.

## More on e-harbours

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