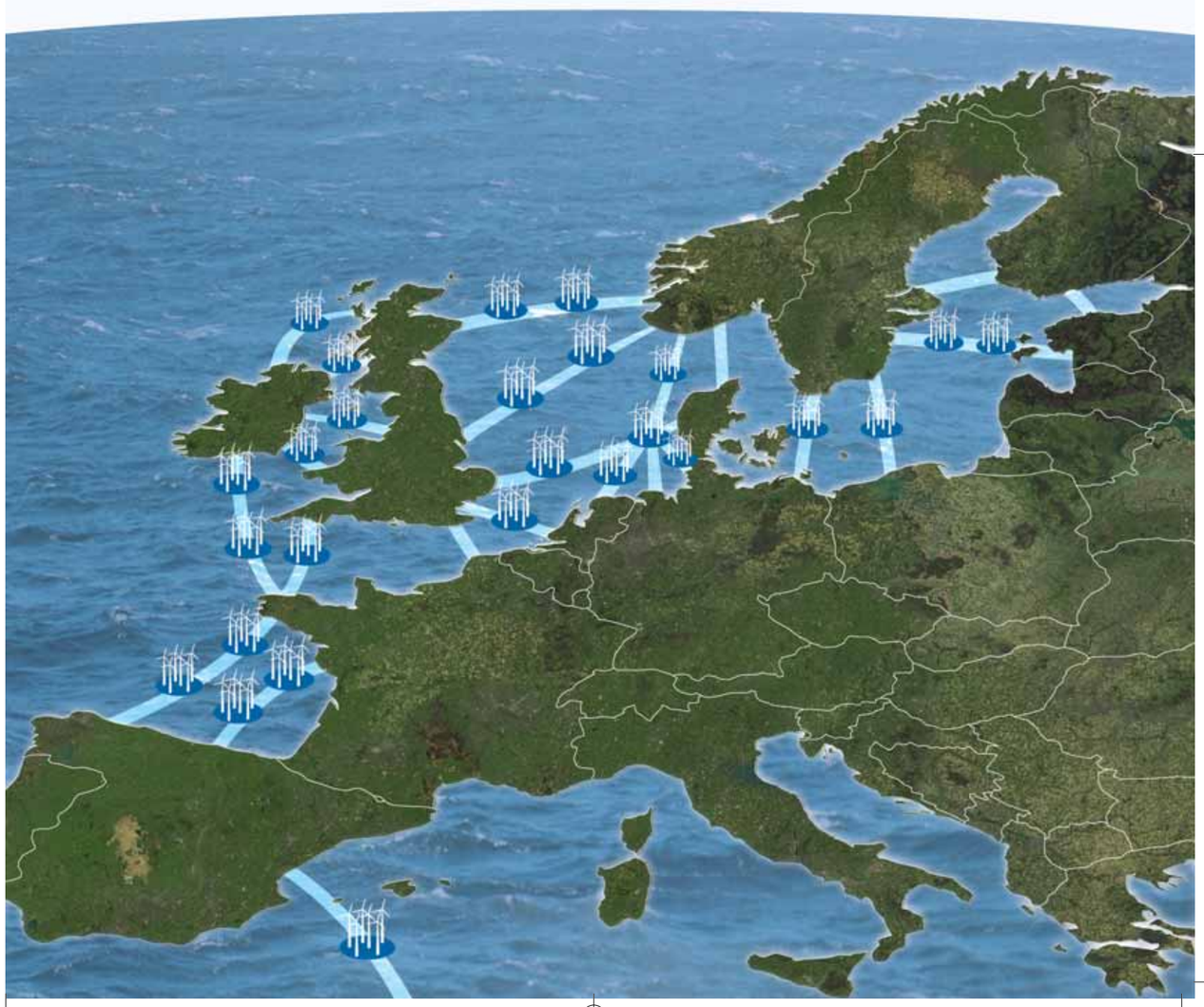
Airtricity®

Building a more **powerful Europe**

Supergrid
the power to connect



Europe's Energy Challenge

Environmental sustainability
Security of supply
Economic competitiveness

Introduction

Airtricity is a world leading renewable energy company with a strong track record in developing, constructing and operating wind farms across Europe, North America and Asia. In 2006, as part of its offshore wind farm strategy, Airtricity announced plans for the creation of a pan European subsea energy grid, called Supergrid.

The Supergrid will ultimately link a series of offshore wind farms through the Baltic Sea, the North Sea, the Atlantic, the Bay of Biscay and the Mediterranean.

Following its vision for Supergrid, the company has embarked on a number of offshore projects and is actively putting plans in place for the 10GW Foundation Project. The Foundation Project will consist of a number of projects in Dutch, German and United Kingdom waters, interconnected with one another and with their respective national grids. This will prove the concept at a regional level and will form the basis for developing the Supergrid as a whole.

The challenge

It is now commonly accepted that Europe is facing an energy challenge. Rising demand for energy will meet with decreasing fossil fuel stocks and increasing prices. The European population will be caught in the middle.

The trio of environmental sustainability, security of supply, and economic competitiveness continue to frame the debate on Europe's energy future. The pressures applied by these three forces require revolutionary answers.

Climate change

Climate change is the major backdrop to our decisions on our energy future. Energy is a major source of greenhouse gases, but an area in which we have much of the technologies to hand. The challenge is the scale at which we must now deploy them.

Security of supply

The International Energy Agency informs us that oil supplies may be limited within five years. Predictions are emerging of historically high oil prices. Supplies of fossil fuels are decreasing and consolidating in fewer hands. The argument on Peak-Oil has turned from "if" to "when". Europe needs supplies of energy that are domestic, secure and sustainable.

The value of wind

A key challenge will be to ensure no loss of competitiveness, in keeping with the Lisbon Strategy. This is the least well understood element of the debate. The cost of renewables is discussed, but not their value, specifically the value of wind.

This value has five components.

- Wind reduces the marginal cost of generation. When it blows, it replaces the most expensive plant in a generation portfolio, the peaking plant. The marginal price of electricity drops, as does the average cost.
- Wind reduces the price of fossil fuels. It decreases the forward price for fossil fuels, reducing the cost of "brown power". This is similar to the phenomenon in the Nordic market, where the supply of hydro increases when the snow melts in the spring and decreases the fossil fuel price. Studies in Mexico have shown that a 10% increase in wind penetration brings about a 10% reduction in fossil fuel prices.
- Wind is fixed in price. The fuel is free and the capital costs are known. Increased wind penetration dampens exposure to escalating electricity costs. Increasing the amount of wind on the system provides a better cost/risk profile and reduces prices to the consumer. Work by Shimon Awerbuch in Scotland show a saving of 6% as a result of increasing wind penetration from 20% to 30%.
- The generation of power from wind produces no carbon dioxide emissions. This means a reduction of carbon abatement payments.
- Onshore, huge energy losses occur when electricity is transmitted long distances. Wind farms are dispersed in marginal areas and save on transmission costs, because they reduce the need to move power long distances. Offshore wind, utilising HVDC technology, makes long distance transmission more economic. It has fewer losses than conventional transmission technology. It generates power on the network and facilitates the movement and trading of electricity between national grids.

Supergrid allows the economic utilisation of the wind resource further out to sea and creates the infrastructure for an internal market in electricity.

I hope you will share in our enthusiasm to create Europe's first truly continental and commonly sponsored, energy project.

Eddie O'Connor
Chief Executive Officer
Airtricity

Europe's targets and the necessity for offshore wind

20:20:20
20% reduction in emissions
20% renewable energy
by 2020

"… the EU makes a firm independent commitment to achieve at least a 20% reduction of greenhouse gas emissions by 2020, compared to 1990...
...it endorses the following targets: a binding target of a 20% share of renewable energies in overall EU energy consumption by 2020...."

European Council, Presidency Conclusions, March 9th, 2007

Requirement for offshore wind

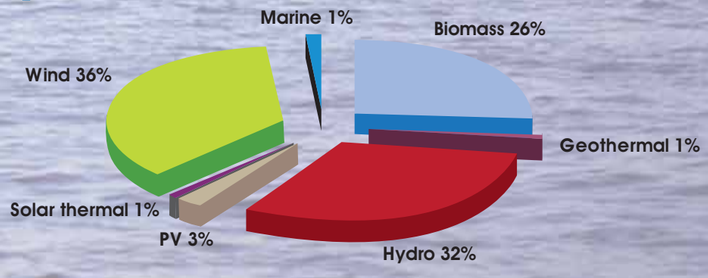
Europe has set itself the target. The individual member states will contribute towards the overall target to varying degrees, but wind generated electricity will have to carry the greatest share of renewable electricity. In order to meet the 20:20:20 target, offshore wind will have to significantly contribute. The required amount of electricity from wind, as calculated by the EU Commission, is such that given constraints onshore, at least a third will have to come from offshore.

The Commission's Analysis

The Transport and Energy Directorate of the European Commission (DGTREN), analysed the 20% renewable energy target and divided it into sectors:

- According to DGTREN's estimates, 20% of energy from renewables will translate to 34% of electricity coming from renewables by 2020.
- DGTREN also estimate that the vast majority of renewables in 2020 will come from only three sources: hydro, biomass and wind. Nearly all new renewable generation will have to come from wind and biomass, as the vast majority of predicted hydro capacity is already in existence.
- 36% of EU renewable electricity will need to be generated by wind in 2020, according to DGTREN. Across the EU, this means that 13% of the total electricity supply will come from wind.
- The 36% figure for wind equates to at least 150GW of wind capacity installed. Given likely constraints such as planning and availability of land, at least a third of this will be offshore.
- These figures are supported by the analysis of the European Wind Energy Association (EWEA). The EWEA target for offshore is 60GW by 2020, with a follow on target of 150GW by 2030.

Share of Renewable Electricity in 2020



Source: DGTREN

The concept

Two established technologies
Two experienced players

The Concept

The Supergrid brings together two established technologies to power Europe; High Voltage Direct Current Transmission; and offshore wind turbines.

Supergrid provides an energy infrastructure that spans the continent, interconnecting markets throughout Europe. While power is generated on the network, it also facilitates the trading of electricity, creating the infrastructure for a true European internal market in electricity.

The scale of the grid allows for the capturing of the offshore wind resource across all the oceans of Europe. The transmission technology allows for the optimal exploitation of the resource, as it has fewer transmission losses over distance than conventional transmission technology.

The flexibility of the transmission system, allows it to incorporate new offshore technologies as they come onstream. The Supergrid's scale will result in further development of the core technologies involved, leading to economies of scale and technological breakthroughs.

The catalyst will be provided by Airtricity and ABB, two world leaders in their respective fields.

Experienced offshore wind farm developer

Airtricity has a strong track record in offshore development.

- Together with GE Energy, Airtricity co-developed the first phase of the Arklow Bank project off the east coast of Ireland.
- Through a joint venture partnership with Fluor, Airtricity is developing the 500MW Greater Gabbard project off the coast of Suffolk in England, around the Inner Gabbard and Galloper sandbanks.
- Airtricity is also developing the 300MW Butendiek wind farm located 34 kilometres off the coast of Sylt in Northern Germany.
- In the Netherlands the company is aiming to develop 4 wind farms in the North Sea ('West Rijn', 'Breeveertien', 'Den Helder', 'Noord Hinder') with a total of 2600 MW.

Experienced offshore transmission provider

ABB – Power and productivity for a better world

"We have today established an advanced transmission technology, HVDC Light®, for demanding offshore applications to feed electricity to platforms but also to connect and support integration of electrical networks. We have worked very closely with Airtricity on the technology aspects of their concept for an EU Supergrid Project and have concluded that this European technology fits well with their plans to construct an offshore grid."

Bo Normark, Senior Vice President Marketing and Sales, ABB Grid Systems

Technical aspects of the Supergrid

Proven technology
Cost effective

Offshore grid technology

For technical reasons the transmission of electricity offshore over distances greater than 100km is carried out using High Voltage Direct Current (HVDC) systems comprising onshore converter stations and HVDC undersea cables.

In 1954, the world's first commercial HVDC link based on mercury arc technology went into operation between the Swedish mainland and the island of Gotland. Around 20 years later, in the early 1970s, the thyristor semiconductor started to replace the mercury arc converters and have been the standard HVDC transmission technology for the point-to-point transmission of power between AC grids ever since.

However, over the last ten years a new technology has been developed by ABB called HVDC Light® based on transistors. This technology is more flexible and is suitable for connecting islanded systems (such as offshore wind farms) to AC grid systems, supporting AC grids with voltage control and forming the multi-terminal networks necessary for the Supergrid.

ABB has implemented several systems using this latest technology including supplying power to the Troll gas platform 68km off the coast of Norway and the 350MW Estlink interconnector between Estonia and Finland.

This technology is now commercially available at 300kV and can transmit 1080MW on a pair of subsea cables each of diameter 94mm (image of actual size cable on opposite page).

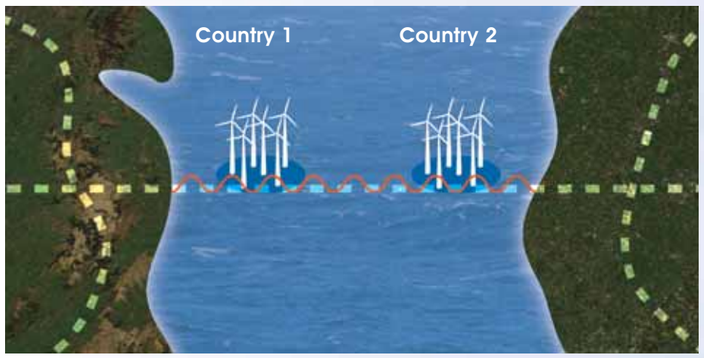
Offshore grid topology

The main benefits of the Supergrid come from combining the connections from offshore wind farms to shore with interconnectors between grid systems. The topology that results is that of interconnectors between countries being formed by linking up one or two offshore wind farms with each other and with the grid systems of two or more countries.

Offshore grid costs

Offshore transmission costs can equate to 10-20% of the total costs associated with an offshore wind farm and so a more cost-effective utilisation of the offshore transmission infrastructure will be significant in producing least-cost renewable energy.

The Supergrid topology both allows a greater utilisation of offshore wind farm connections to shore as they can be used for intra- or inter-system trading when the wind farms are not at full output, and for interconnections within and between grid systems at a lower cost. Just looking at the interconnection aspect alone, when offshore wind farms are more than 60-70km from the onshore grid, it can be more cost-effective to integrate them using the Supergrid topology than with the conventional radial connections.



Key:

Electricity Grid

Flow of Electricity

The role of Supergrid in Europe's energy future

The diagram on the opposite page outlines a scenario of Europe's energy future over the next thirty years and provides a context to the Supergrid. It plots the potential development of two streams; the fossil resource stream; and the renewable resource. It also broadly shows the areas where they interlink.

Parallel paths

Blue boxes represent the common guiding forces: increasing tension over diminishing fossil resources; and more use of renewable electricity.

The next three decades will see an increase in tension between superpowers over diminishing resources. International geopolitics will increasingly be shaped by competition for resources.

This necessarily results in a large increase in renewables. Rising energy demand and decreasing sources will result in the use of more varied sources of energy and renewable electricity will have to fill a substantial portion of the gap.

Fossil resource stream

Competition for the remaining hydrocarbons will intensify in the next decade. The resultant increase in prices will encourage investment and exploration into energy products to replace fossil fuels.

Over ten years this leads to the redesign of energy using products, for example, the internal combustion (IC) engine being redesigned in favour of an electric engine.

Within 20 years, the use of oil and gas is only feasible in areas where it is uniquely useful, such as in the development of plastics, pharmaceuticals, and aviation fuel.

Within 30 years, no new fossil fired generation plant is being built.

Renewable resource stream

The renewables stream diverges in two directions: development of new technology and improvements in current technologies.

New Technology

R&D progresses into new renewable technologies.

Increases in R&D results in the early emergence of ocean renewables such as wave and tidal over the next ten years. Their mass deployment follows over the next decade.

The R&D process results in the emergence of "blue sky" energy technologies, towards the end of the next ten years. Their deployment occurs approximately 20 years after initial emergence.

Current Technology

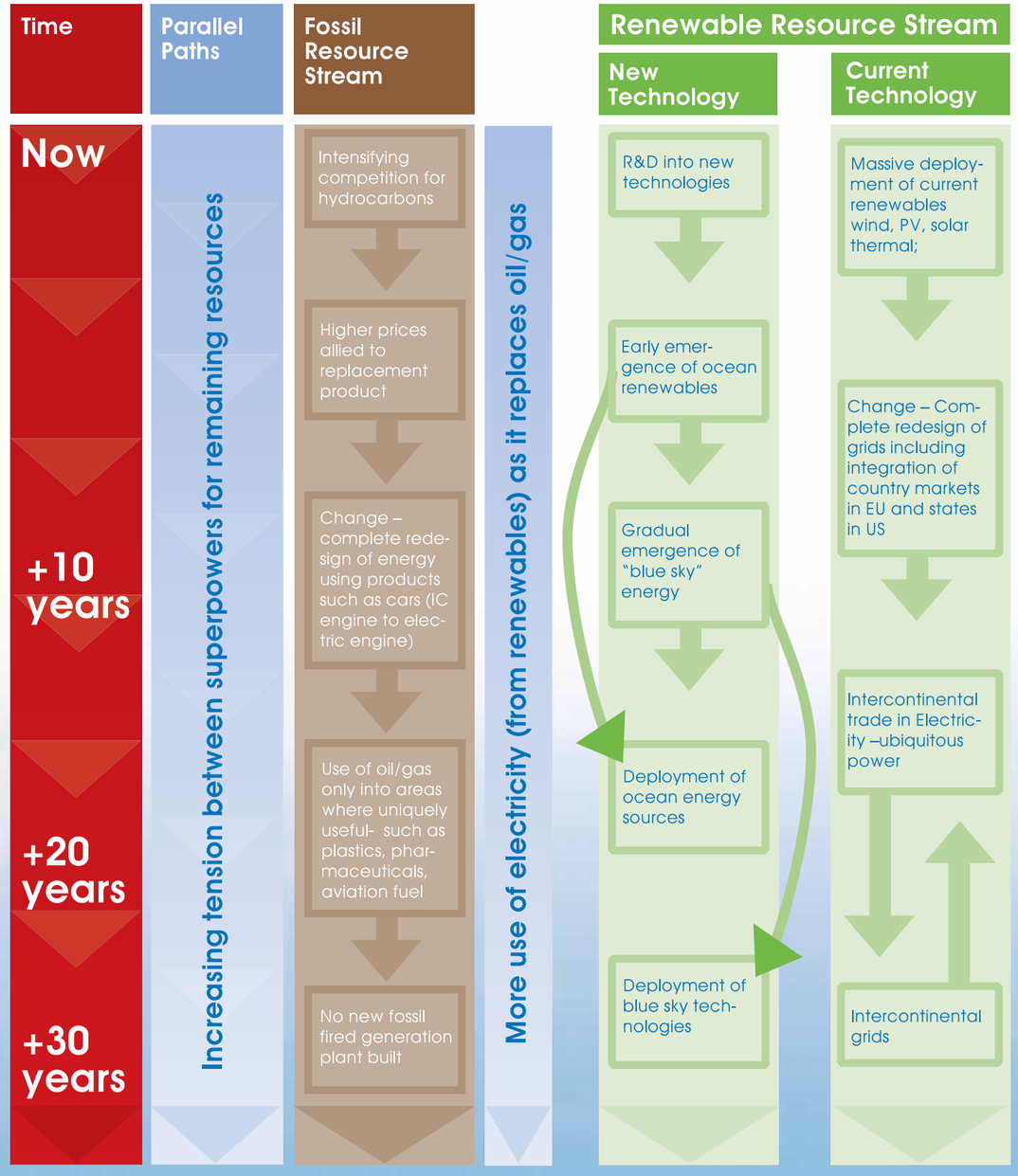
There is a considerable increase in the amount of renewables deployed across Europe, particularly wind, photovoltaic and solar thermal.

The national grids are redesigned to facilitate the greater development of renewables over the next ten years. This encourages the integration of differing country markets and the eventual inclusions of markets in the E.U. and states in the U.S.

Intercontinental trade in electricity develops over the following ten years.

Intercontinental electricity grids develop within thirty years.

The role of Supergrid in Europe's energy future



10GW Foundation Project

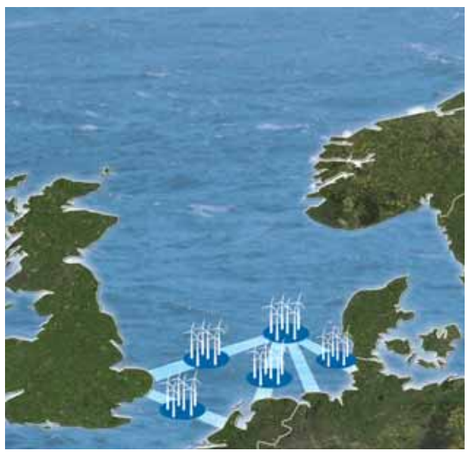
The first step towards the Supergrid is the 10GW Foundation Project. The Foundation Project will consist of a number of projects in Dutch, German and United Kingdom waters. These projects will be interconnected with one another and with their respective national grids. This will prove the Supergrid concept at a regional level. The connected areas will be sufficiently far apart to prove the smoothing effect in electricity supply from wind farms over a broad area.

Location	North Sea interconnecting three countries: United Kingdom, the Netherlands and Germany
Area	3,000km2 (approx.)
Number of turbines	2,000
Turbine capacity	5MW
Water depths	30-50 metres
Operational date	2017-2019
Tonnes of CO2 avoided p.a.	30,000,000 (if coal); 17,200,000 (if gas)
Cars taken off Road p.a.	at least four million
Homes powered	6,250,000
Tonnes of fossil fuels saved from being imported p.a.	7,000,000

Electricity costs for the first 25 years of operation of the 10GW project are estimated at €108/MWh and for the second 25 years at €63/MWh.

These figures are based on the following:

Wind Farm Capital Cost	€2.5m/MW
Wind Turbine Foundation Life Time	50 years
Transmission Cables Life Time	50 years
Life time of other assets	25 years
Repowering costs after 25 years	€1.25m/MW
Capacity factor	40%
Offshore Transmission Costs	€2.5bn
Proportion of offshore transmission costs recovered from wind farm	2/3
Proportion of offshore transmission costs recovered from trading	1/3
Gearing	75%
Cost of debt	7.0%
Cost of equity	20.0%



The 10GW Foundation Project is the first ever project intended to supply power simultaneously to three different national electricity systems. It is a large project, and not one which Airtricity seeks to accomplish alone. Airtricity proposes to establish a consortium of progressive companies to develop, finance and build the project. Airtricity proposes to lead this consortium.

"As a matter of fact, I have discussed the super wind grid, as it is called, with Chancellor Merkel. It is potentially a very exciting project for a huge wind farm in the North sea…"

U.K. Prime Minister (Tony Blair), House of Commons, February 7th, 2007.

"Opportunities provided by the TEN-E scheme should be examined and work on a European offshore super-grid should be initiated."

Communication from the Commission to the Council and The European Parliament
Renewable Energy Road Map, Renewable energies in the 21st century: building a more sustainable future, January 10th, 2007.

"We will work with the European Commission and other national grid operators to develop an offshore wind farm grid connection system to power the rest of Europe."

Fianna Fáil & Green Party, Irish Programme for Government, June 13, 2007.

"The supergrid proposal to link member states offshore is therefore very much in line with our goal of integrating national EU energy markets by removing barriers to the freer flow of energy around Europe."

Malcolm Wicks, U.K. Minister for Energy, Adjournment Debate House of Commons, June 16th, 2006.

"It is therefore necessary that Commission comes forward with a European action plan on off shore wind. Such a strategic action plan would be an absolutely important approach. It should mainly show a perspective how to reach such off shore goals, describe a "one-stop-shop approach" and together with the most welcomed proposal of a European Strategic Energy Technology Plan, it should pave the way towards a European offshore supergrid. It is in Europe's interest to realize such projects."

Mechtild Rothe, German MEP and Vice President of the European Parliament.

Excerpt from her speech on the European Wind energy conference in Milan in May 2007.

"Getting large scale offshore wind competitive within the short term and paving the way towards a competitive European offshore supergrid."

Communication from the Commission to the European Council and the European Parliament an Energy Policy for Europe, January 10th, 2007.

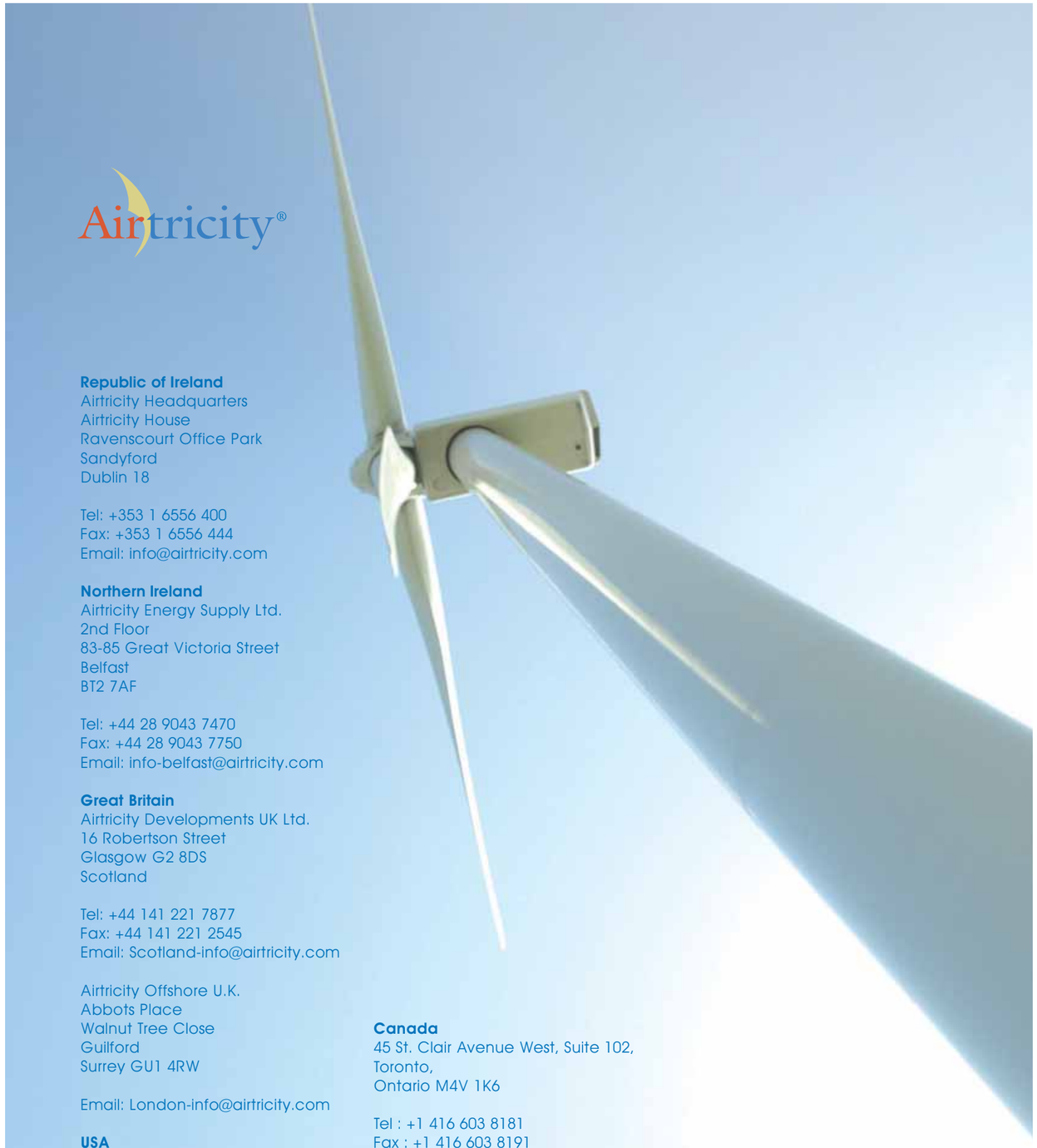
"So the Commission is proposing nothing less than a new industrial revolution in energy policy, increasing the present level of non-hydro renewables – such as wind, solar, PV, biomass, and biofuels - by more than 6 times present levels in about 12 years.

It is truly ambitious, but also possible, with major increases in wind and the development of a major off-shore European supergrid, more biomass for heating, biofuels will need to become a real and every day part of the lives of European citizens, more solar and pv and new technologies such as wave."

Andris Piebalgs, Energy Commissioner, Energy for a Changing World: The New European Energy Policy, Speech at the EU Energy Law and Policy conference, Brussels, 25 January 2007.

"We want to see a programme of proposals (for Europe), including more investment in renewables technology, including second generation biofuels and offshore wind."

NL Prime Minister Balkenende in a letter with Tony Blair to Finnish Prime Minister Vanhanen, 19 October 2006.



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Supergrid the power to connect

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