EMBARGOED TO 00.01
29 MARCH, 2010

Come sun, rain, or high wind: Europe could create a 100% renewable electricity supply by 2050.

A new study, released this week, demonstrates how the opportunity exists to power Europe and North Africa exclusively by renewable electricity by 2050, if this is supported by a single European power market united with a similar market in North Africa.

The study, by international energy and climate experts from PricewaterhouseCoopers LLP in collaboration with researchers of the Potsdam Institute for Climate Impact Research (PIK), the International Institute for Applied Systems Analysis (IIASA) and the European Climate Forum (ECF) has formulated the first policy roadmap towards a 2050 goal of achieving a 100% renewable power sector in Europe and North Africa.

A transformation of the power sector based on 100% renewables would address energy security and supply concerns while decarbonising electricity generation and at the same time contribute to a substantial reduction in energy poverty.

Taking into account existing infrastructure and electricity generation capacities, and recognising the need for a cross-national power system, the proposed SuperSmart Grid would allow load and demand management for power, independent of when and where the power is generated. Making the most of natural resources and established weather patterns it would incorporate:

- The vast concentrating solar potential of southern Europe and the arid deserts of North Africa
- The hydro capability of Scandinavia and the European alps
- Onshore and offshore wind farms in the Baltic and North Sea
- The continent's ocean tidal and wave power
- Biomass generation across Europe.

The researchers studied the policy, markets, investments and infrastructure leadership needed to achieve the 100% renewables goal in terms of financial, infrastructure and government policy milestones for policy makers and business.

The study focused the examination on a 100% renewable electricity supply to consider the market and infrastructure potential of natural resources, but recognised that in addition to renewables, there are other routes to achieving a low carbon future. Amongst the most significant, the expansion of nuclear power and the development of carbon capture and storage (CCS) for the burning of fossil fuels.

Gus Schellekens, director, sustainability and climate change, PricewaterhouseCoopers LLP said:

> "Europe and other parts of the world are arriving at a crossroads where we have the choice and ability to achieve renewable power at scale. Opportunities to use clean and affordable natural sources of electricity have been flirted with over the past 150 years. This study lays out a clear framework of how this time could be different."

Anthony Patt, International Institute for Applied Systems Analysis, comments:

> "The combination of increased demand for electricity and security of supply is a very powerful driver of major power sector change in Europe and worldwide. The study and the roadmap have been formulated to stimulate a debate about energy and climate change possibilities in Europe."

Currently, the European power system is dominated by fossil fuel (55%) and nuclear (30%) electricity. 15% of Europe's power supply is from renewable electricity dominated by old hydro power stations. Expansion of renewable energy including onshore wind, and biomass has been modest at best to date.

Come sun, rain, or high wind: Europe could create a 100% renewable electricity supply by 2050…./2 of 5

Despite this, the technological capability for developing renewable forms of power generation is already in place, or emerging and envisaged, and the economics of the key technologies is improving, albeit in a difficult financing environment.

A renewables powered Europe would change the landscape for consumers and business. Electro-mobility could be introduced on a mass scale, leading to day-to-day transport of people and goods without the CO2 penalty associated with fossil fuel. In North African countries, the provision of reliable and potentially unlimited solar electricity could provide the basis for substantial social and economic development across the region.

By 2050, with renewable technologies deployed at scale across Europe and North Africa, significant cost reductions would make the renewable power sector a major employer of skilled workers in both Europe and North Africa, and cost competitive, providing affordable electricity across the region. Developing a strong cooperation for large scale renewables will also decrease dependency from energy imports and develop strong interdependencies between Europe and its neighbours.

Antonella Battaglini of the Potsdam Institute for Climate Impact Research said:

> "Climate change requires an ambitious vision and collaboration across borders and boundaries we have not previously envisaged. If we don't examine the art of the possible, we will never inform critical policy decisions that need to be made sooner rather than later. This study represents a major milestone in the effort of unravelling the Gordian knot of policy, and finding workable solutions to the EU's power supply, security and carbon challenges."

Richard Gledhill, partner, sustainability and climate change, PricewaterhouseCoopers LLP said:

> "Decarbonising the power sector to meet climate change goals is likely to require big increases in renewables and nuclear, as well as the deployment of carbon capture and storage at commercial scale. What the study demonstrates is the reality of the game changing policy and business decisions we will have to make, whatever our energy mix. But it also de-bunks some of the conventional criticisms of large scale renewables.
>
> "It is a challenging vision, but it shows how geographic and technological diversification can help address cost and security of supply concerns. Integration with North Africa would unlock allow Europe to huge additional solar capacity. This would require a sustained partnership and the development of closely linked energy policies going forward, but it could pay big dividends in terms of regional development, sustainability and security."

ENDS

Contacts:

PwC
Rowena Mearley, Corporate media relations, PricewaterhouseCoopers LLP
Tel: +44 (0)213 47 27, Mobile: 07952 715739, Email: rowena.mearley@uk.pwc.com

PIK
Uta Pohlmann, Patrick Eickemeier, PIK press office
Tel. : +49 (0)331 288 25 07, E-mail : press@pik-potsdam.de

IIASA
Leane Regan, Communications Department, The International Institute for Applied Systems Analysis
Tel: +43 2236 807 316, E-mail : regan@iiasa.ac.at

Come sun, rain, or high wind: Europe could create a 100% renewable electricity supply by 2050…./3 of 5

Note(s) to Editor:

1. Across Europe there have been significant differences in renewables growth to date. Denmark and Germany, show strong growth rates (60% and 80% renewable energy growth since 2000). France and Austria have decreasing shares of renewables due to increasing electricity demand and stagnating renewable capacities.
2. Included in the Policy road map
   - The development of Europe wide business cases by 2015 for renewables and grid infrastructure projects at a European level, that include long term renewable (REN) and climate targets
   - The build-up of significant renewable energy generation capacity by 2015 to harvest wind and solar potentials
   - Phasing out of fossil fuel subsidies by 2020 and the development of a strategic timeline for phasing out financial support for renewable technologies
   - Setting up of REN targets for North Africa by 2020
   - The creation of a single European power market by 2020
   - Strategic decommissioning of fossil fuel plants in the EU and North Africa beginning in 2030, leading to their wholesale replacement by large scale renewable power generation by 2040.
3. Concentrated Solar Power, currently operating at a quarter of the capacity of wind power, could potentially be the lowest cost technology available for Europe. If its installation capacity was doubled, cost reductions would be 65% over time relative to other technologies, the study finds. Wind capacity has been growing at an average rate of 25% over the last 15 years.
4. European power sector emissions decreased during the 1990s, they have subsequently increased again and are today only 5% lower than in 1990.
5. About 50% of Europe's current energy demand is met with imported fuels and there are projections that this could increase to 70% in the coming decades.
6. Almost all European and North African countries are strongly dependent on imported fuels for their power generation, such as gas, coal and uranium. Only Poland, Czech Republic, Algeria and Libya are self-sufficient in fuels for the electricity sector.
7. View the relative costs and current installed capacities of energy technologies at http://www.pwc.co.uk/eng/publications/100_percent_renewable_electricity.html
8. Download the report at http://www.pwc.co.uk/eng/publications/100_percent_renewable_electricity.html
9. A report released in March by the UK Department of Energy and Climate Change found that harnessing the full potential of marine energy could provide enough power for up to 15 million homes and save up to 70million tonnes of C02 by 2050.
10. The PwC Sustainability & Climate Change practice is a network of 800 dedicated specialists globally, 100 in the UK. Specialisms include adaptation and mitigation, policy, financing, carbon trading and financing, reporting and assurance, renewables and climate change economics. In addition to our climate change specialists, PwC's International Development Assistance team with a staff of 600 professionals globally, regularly implement projects for donor clients world wide.

Come sun, rain, or high wind: Europe could create a 100% renewable electricity supply by 2050…./4 of 5

About PricewaterhouseCoopers

PricewaterhouseCoopers (www.pwc.com) provides industry-focused assurance, tax and advisory services to build public trust and enhance value for our clients and their stakeholders. More than 163,000 people in 151 countries across our network share their thinking, experience and solutions to develop fresh perspectives and practical advice.

"PricewaterhouseCoopers" refers to PricewaterhouseCoopers LLP (a limited liability partnership in the United Kingdom) or, as the context requires, the PricewaterhouseCoopers global network or other member firms in the network, each of which is a separate and independent legal entity.

The Potsdam Institute for Climate Impact Research

The Potsdam Institute for Climate Impact Research (PIK) is one of the world leading institutes for climate impact research. Researchers in the natural and social sciences work together to study global change and its impacts on ecological, economic and social systems. They examine the Earth system's capacity for withstanding human interventions and devise strategies for a sustainable development of humankind and nature. Support for this study was provided by PIK's Research Domain IV: Transdisciplinary Concepts and Methods. Their aim is to develop new approaches to research problems in areas where traditional concepts and methods are found wanting. The SuperSmart Grid concept is such an area: it envisages a 100% renewable electricity supply in Europe and North Africa, by investigating possible pathways to an infrastructure capable of transmitting renewable electricity from a variety of small and large generation sites scattered over wide areas with the ability of managing fluctuating supply, loads and demand management.

International Institute for Applied Systems Analysis (IIASA)

IIASA is an international research organization that conducts policy-oriented research into problems that are too large or too complex to be solved by a single country or academic discipline. This includes problems like climate change that have a global reach and can be resolved only by international cooperative action, or problems of common concern to many countries that need to be addressed at the national level, such as energy security, population aging, and sustainable development. The Decisions and Governance research group involved with this study is located with IIASA's program on Risk and Vulnerability. Their objective is to investigate how the presence of risk and uncertainty influences the design of successful policies in the areas of environmental management and climate change. The work of the group covers both mitigation of and adaptation to climate change, and has a particular focus on the adoption of renewable energy technologies.

European Climate Forum (ECF)

The European Climate Forum is a platform for joint studies and science-based stakeholder dialogues on climatic change. ECF brings together representatives of different parties concerned with the climate problem. The core activity of the Forum is to define and carry out studies to provide arguments for long-term climate mitigation and adaptation policies leading ultimately towards a sustainable development path.

Come sun, rain, or high wind: Europe could create a 100% renewable electricity supply by 2050…./5 of 5

ATTACHMENT 1: RELATIVE COSTS AND INSTALLED CAPACITIES OF LOW CARBON TECHNOLOGIES.

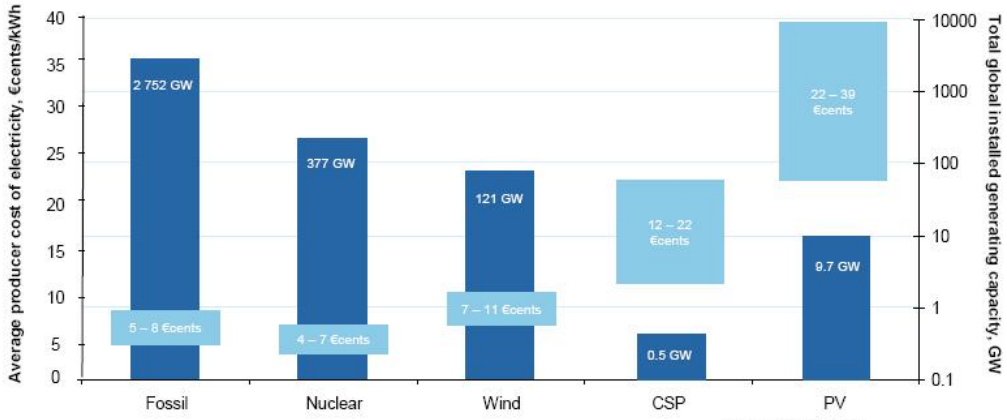

Figure 11: Relative costs and installed capacities of different technologies[37, 39, 79-85, 111-117]

Figure 11 illustrates typical current levelised generation costs, current installed capacities and potential for generation cost reductions for the most common technologies, based on several data sources. The blue bars represent the range of electricity costs for new installations, as of 2009, for a variety of technologies. But these costs can and will change. The dark blue bars, corresponding to the right-hand scale, indicate the total installed capacity worldwide.

Because that scale is logarithmic, each space between the horizontal gridlines corresponds to just over a doubling of installed capacity. Hence, increasing installed capacity from one grid line to the next would be likely to result in a lowering of investment costs for that technology by about 10-15%[78]. This allows one to see that growing the capacity of wind to match that of nuclear will be likely to lower its range of costs to that of fossil fuels. Given that wind capacity has been growing at an average rate of 25% over the last 15 years, this is something that could easily occur in the next five or six years, should the current trend continue. It also suggests that growing the capacity of CSP to about a quarter of that of wind today - doubling the installed capacity six times to about 32 GW – could well result in cost reductions of over 65%, making CSP the least-cost technology available.