A major breakthrough to integrate renewable energy sources into the European electricity system, in collaboration with RTE and as part of the TWENTIES project,

Alstom takes world leadership in a key technology for the energy turnaround and the future of very high voltage direct current grids

Alstom Grid has achieved the best performance ever seen in a High Voltage Direct Current (HVDC) circuit breaker while testing a prototype at Alstom's testing facility in Villeurbanne, France, in presence of an independent expert. In less than 2.5 milliseconds[1], the HVDC circuit breaker interrupted currents exceeding 3,000 amperes. These tests were conducted as part of RTE's demonstration activities on the architecture and technologies for DC power grids, within the large scale demonstration project TWENTIES supported by the FP7 programme of the European Commission. In the context of the energy turnaround, these tests, led by RTE, contribute to the development and implementation of new technologies which facilitate the integration of renewable energy sources into the European electrical grid.

"European electricity transmission operators are faced with the challenge of integrating renewable energy sources. We are proud to be one of the pioneers in this sector", asserts RTE Chairman Dominique Maillard.

"This technological achievement is excellent news for the entire electrical engineering community, and a considerable advance in our industry," says Alstom Grid President Grégoire Poux-Guillaume. *"The direct current circuit breaker is a key element in building Supergrids, both onshore and offshore. It will help to increase the share of renewable energy on the grid."*

These results validate Alstom Grid's major technological breakthrough. The circuit breaker is a key element of power network protection in the event of a short circuit. Well-known for alternative current connections, the technology is required to perform 10 to 20 times faster to be used for direct current.

[1] *Comparable to the speed of the nerve impulse between the eye and the brain*

Operators increasingly use direct current to guarantee that power is carried efficiently over long distances or to stabilise the grid as it is confronted with a growing supply of power from variable sources. Circuit breakers are not necessary for direct current transmission line connections between two points. However, having a circuit breaker is vital for protecting complex so-called 'meshed' grids that will, in the near future, require the interconnection of several points. The challenge is to avoid failures and blackouts, by cutting the current in the malfunctioning element as fast as possible, isolating the fault from the rest of the grid. Alstom Grid's new circuit breaker paves the way to multiple possibilities for future direct current grids.

Alstom's achievement is even more valuable as it was conducted as part of the TWENTIES European project, which aims to foster the integration of renewable energy, especially wind energy, within Europe's power grid by 2020. To meet this challenge, 26 partners in the energy sector coming from 10 member States are "pooling their expertise". RTE, the French electricity transmission system operator, has mobilised its R&D resources to lead these demonstration activities on the future direct current offshore grid, one of the six demonstrators within the TWENTIES project.

The partners involved in the RTE lead demonstrator have identified an integrated set of components to protect the grid in case of default and have quantified expected performances in different network architectures. Alstom Grid's results already met some of these expectations, overcoming one of the major technical obstacles for the development of large scale high voltage direct current networks.

Tests will continue until the summer of 2013 as part of the TWENTIES project. The Alstom Grid teams are then planning on pursuing the qualification of this technology through a new milestone: interrupting a 7,500-ampere current at 180 kV.

About RTE

RTE, Réseau de Transport d'Electricité, is a utility company. Our job is to provide all of our customers with access to an economic, clean and secure electricity supply. RTE connect its customers thanks to a suitable infrastructure, and provides them all resources and services they need to use it. All with an emphasis on economic efficiency, respect for the environment and security of supply.To do this, RTE operates, maintains and develops the high and extra high voltage power network. It guarantees the reliability and proper operation of the power system. RTE transports electricity between electricity suppliers (French and European) and consumers, whether they are electricity distributors or industrial consumers directly connected to the transmission system.

With 100,000 km of lines between 63,000 and 400,000 volts and 46 cross-border lines, the network operated by RTE is the biggest in Europe. In 2012, RTE posted turnover of €4,529 million and currently employs some 8,400 staff.

About Alstom

Alstom is one of the world's leaders in power generation, power transmission and rail infrastructure and sets the benchmark for innovative and environmentally friendly technologies. Alstom builds the fastest train and the highest capacity automated metro in the world, provides turnkey integrated power plant solutions and associated services for all thermal (coal, nuclear, gas…) and renewable (hydro, wind, solar…) energy sources. It offers a wide range of

solutions for power transmission, with a focus on smart grids. The Group employs 92,000 people in around 100 countries. It had sales of €20 billion and booked close to €22 billion in orders in 2011/12.

Alstom Grid has 130 years of expertise in electrical grids. Whether for utilities or electro-intensive industries or facilitating the trading of energy, Alstom Grid brings power to its customers' projects. Alstom Grid ranks among the top 3 in electrical transmission sector with an annual sales turnover of more than €4 billion in 2011. It has 20,000 employees and over 90 manufacturing and engineering sites worldwide. At the heart of the development of Smart Grid, Alstom Grid offers products, services and integrated energy management solutions across the full energy value chain—from power generation, through transmission and distribution grids and to the large end user.

ABOUT TWENTIES

The European Union, in its backing for the progressive integration of renewable energies, especially wind power, launched in April 2010 the TWENTIES Project, an initiative whose objective is to significantly advance the development and implementation of new technologies which facilitate the widespread integration of wind power generation into the European electricity system.

TWENTIES, by mean of the implementation of six large scale demonstrations, intends to remove the barriers to integrate more wind power (from both onshore and offshore) into the European system by 2020. The full scale demonstrations aim at proving the benefits of novel technologies, the majority coupled with innovative system management approaches.

TWENTIES is the largest renewable energy demonstration project ever funded by the DG Energy of the European Commission. Red Eléctrica de España, the Spanish Transmission System Operator, is Project Coordinator and works together with another 25 companies and institutions from 10 different Member States and one Associated Country.

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