INTRODUCTION

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Energy needs in the world and consumption are growing with electricity generation, transport and industries needs. However, the energy environment knows deep changes. First, the prevision of a peak oil, geopolitics conflicts and speculation enhance oil prices. Then, greenhouse gas emissions conduct to climate change and new environmental concerns and policies. Finally, energy activities are more risky because of price volatility, liberalisation of electric and gas markets and lack of investments or operators coordination. Governments and others authorities (European Union) publish directives and decisions to adapt their economy to these changes. Several objectives, as to reduce the country dependence on fossil fuels or limiting greenhouse gas emissions to respect the Kyoto protocol, are adopted in several countries. In Europe, for example, the post-Kyoto objectives are the three times 20 : 20% of renewable energy in electricity production, 20% of emissions reductions in carbon dioxide and 20% of energy savings by 2020. These objectives are ambitious, so the topic selected is a very interested one to study. Moreover, to achieve these objectives, we need several competences (engineers in materials or energy production, economists, sociologists) so this topic must be consider as a frontier topic.

The session will be structured as follow. To introduce the session, the energy context will be presented with the evolution of main variables (energy prices, consumption, renewable energy development) and concerns (climate change policies, renewable energy technologies). Two presentations will follow this introduction, one on the hydrogen technology and the other on superconductors. The hydrogen is one of the energy of the future because it is abundant and cleaner for the environment. There are a lot of actual researchs on the production of hydrogen (with for example the use of nuclear power plants or wind generation), on its stockage, that is the main problem in its use, and in development of motors. Hydrogen is one of the energetic solutions to reduce consumption dependence on fossil fuels in transport

for example and global warming. To achieve post-kyoto objectives, we do not only need new energies, but also to increase efficiency in energy use and consumption. Superconductors are one of the technologies that could be used to increase energy efficiency and security in electricity transport. They are also necessary for the fusion, a potential great source of future energy without greenhouse gas emissions. So, they are natural materials for sustainable development, CO2 emission reductions and energy savings. These two presentations lead to solutions to energy questions that appear with the new energy context and concerns.