

Europe and Brazil join forces to improve the efficiency of the energy sector with HPC

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On 2 and 3 February 2016, the High Performance Computing for Energy ([HPC4E](#)) project officially launches with a kick-off meeting for partners at Barcelona Supercomputing Center (BSC). Coordinated by BSC and running from 1 December 2015 to 30 November 2017, the project has been granted €2 million in funding by the EU's Horizon 2020 research and innovation programme. HPC4E brings together European and Brazilian partners that include both companies within the energy sector, such as REPSOL, TOTAL, Iberdrola and Petrobras, as well as the following research centres: BSC, CIEMAT, Inria, University of Lancaster (ULANC), COPPE, LNNC, ITA, Universidad Federal do Rio Grande do Sur and Universidad Federal de Pernambuco.

Energy is one of the current priorities for EU-Brazil cooperation. The main objective is to develop high-performance simulation tools that go beyond the state of the art to help the energy industry respond to both future energy demands and carbon-related environmental issues. This objective follows the societal

challenges defined for H2020 programme and the [Strategic Energy Technology Plan](#) (SET-Plan) of the EU. HPC4E aims to achieve the Energy and Climate targets for 2020 and beyond on reducing greenhouse gases, increasing the proportion of energy from renewable sources and improving energy efficiency. In particular, the HPC4E project focuses on three different levels of the energy chain for different energy sources:

- HPC to improve wind energy efficiency and exploitation
- HPC to develop more efficient and renewable fuels and reduce greenhouse gas emissions using Biogas advanced combustion methods
- HPC to reduce the environmental costs and risks of hydrocarbon reserve exploration

With the participation of the most important HPC e-Infrastructures in Europe and Brazil, the project will exploit significant joint resources and expertise. The [Computer Applications in Science and Engineering](#) (CASE) department of BSC will play a crucial role in the development of new HPC simulation algorithms and tools capable of taking advantage of future Exascale HPC capabilities for the energy sector. José María Cela, European HPC4E coordinator and CASE director, says: “The energy sector is one of the sectors that can most benefit from the possibilities provided by HPC. We could not improve current energy production systems if we didn’t have supercomputers. If HPC is already considered necessary for research and innovation, the next generation of supercomputers will be even more important.”

Wind energy

Reduction of the cost of electricity generated by wind farms by mitigating risks related to the design and operation of large-scale wind turbines through enhanced knowledge of wind conditions. Better quantification of the wind energy potential, and provision of data and models that can improve spatial planning tools and operations, ensuring an effective and efficient deployment of wind power.

Biomass

Increasing the contribution of sustainable resources to produce fuels for transportation and energy production. Bioenergy will play a crucial role in the achievement of the 2020 targets. It currently provides more than 2/3 of the renewable energy in the EU, and is expected to account for more than half the EU's renewable energy in 2020 and for about 11% of the total EU energy consumption.

Geophysics

The potential impacts for the oil and gas industry include: reducing the cost of investment associated with data processing; the ability to visualise structures in the subsurface more than five times smaller than is currently possible; minimising the amount of drilling required in order to exploit a field; better resource management associated with the exploitation of candidate reservoirs.

More information about the context:

Energy needs worldwide will increase yearly until 2020 and far beyond. The International Energy Agency (IEA) 2014 report [1] estimates that the global energy demand is set to grow by 37% by 2040. Energy scarcity (or inefficient usage) can lead to higher prices, which will have a critical impact on the economy, as emphasised by the Energy Challenge in the European Commission Horizon 2020 work program (the Energy Challenge is designed to support the transition to a reliable, sustainable and competitive energy system), and by the priorities of the Brazilian Ministry of Science and Technology. Different governmental programs both in EU and Brazil have been started to promote and improve the efficient use of energy, e.g. EERA, ESFRI Energy and KIC Energy in EU and the “National Strategy on Science, Technology and Innovation 2012-2015” in Brazil.

About BSC

Barcelona Supercomputing Center (BSC) is the national supercomputing centre in Spain. BSC specialises in

High Performance Computing (HPC) and its mission is two-fold: to provide infrastructure and supercomputing services to European scientists, and to generate knowledge and technology to transfer to business and society. BSC is a Severo Ochoa Center of Excellence and a first level hosting member of the European research infrastructure PRACE (Partnership for Advanced Computing in Europe). BSC also manages the Spanish Supercomputing Network (RES).

About Repsol

With more than 27,000 employees and a presence in more than 40 countries, Repsol is one of the [world's](#) leading [integrated](#) energy companies. Repsol is a global and integrated company, present along the entire value chain. The company's diverse global asset portfolio allows it to participate in areas with the greatest energy resources worldwide. It is vertically integrated and operates in all areas of the oil and gas industry, including exploration and production, refining, distribution and marketing, petrochemicals, power generation and trading.

About Iberdrola

Iberdrola has undergone a wide-ranging transformation over the last ten years which has enabled it to advance through the ranks to become the number one Spanish energy group, one of the Spanish main companies on the Ibex 35 by market capitalization, the world leader in renewable energies, and one of the world's top power companies. The company has established itself as a global leader within the sector, becoming one of the leading operators in the UK, one of the largest electricity utilities in the United States, the main private energy generator for Mexico and as the electricity supplier with the most customers in Brazil.

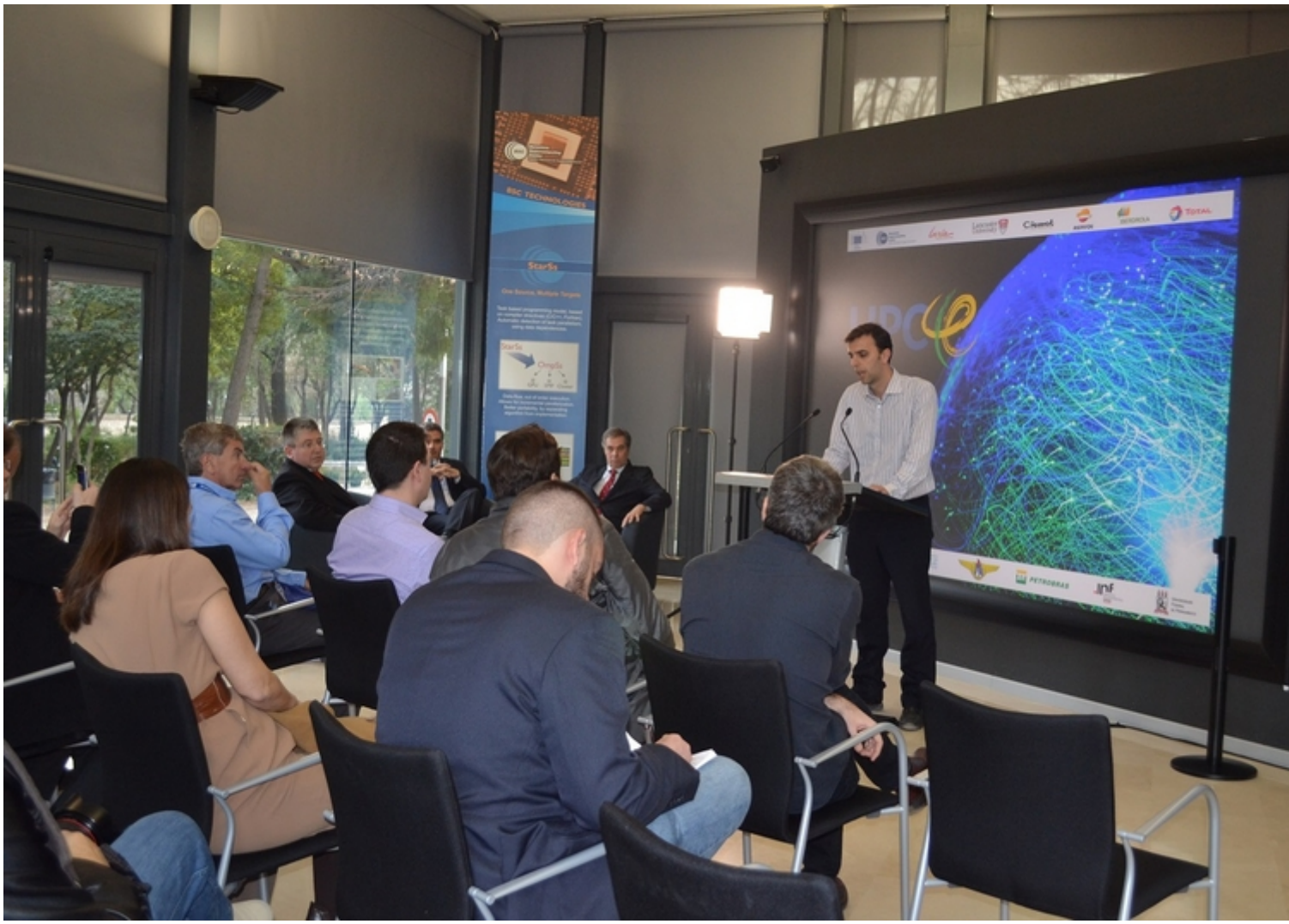
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Barcelona Supercomputing Center - Centro Nacional de Supercomputación

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