GE, GRTgaz, Ineris, McPhy and the French network of Universities of Technology sign research memorandum of understanding to accelerate innovation around hydrogen

- *Bringing together French industrial champions and key academic institutions, this research MOU intends to advance innovation around hydrogen for all uses, including low-carbon projects for gas power generation and industrial applications*
- *This MOU establishes a hydrogen (H2) research framework with dedicated resources in France to design and conduct a joint program, fostering collaboration and innovation in support of the energy transition.*

BELFORT, France – September 30th 2021 – General Electric, GRTgaz, Ineris, McPhy and the network of universities of technology in France (UTBM, UTC et UTT) today announced the signing of a Memorandum of Understanding (MOU) creating a hydrogen research framework for power generation.

This collaboration aims to strengthen research and development knowledge on hydrogen production, transport, storage, distribution and safety for all uses including power generation. It allows the creation of a research cluster based in France that will specifically evaluate the concrete application of hydrogen as a fuel for gas turbine power generation. In addition, this work also will address the modelling of their operation, the development of accessories and specific components, safety and certification of the systems.

This collaboration involves:

- GE Gas Power - a global leader in natural gas supply technology, services and solutions,
- GRTgaz – a European leader in natural gas transmission and a world expert in gas systems,
- INERIS - the French National Institute for Industrial Environment and Risks, an industrial and commercial public establishment under the aegis of the Minister for Environment,
- McPhy - an industrial group, specialized in zero-carbon hydrogen production and distribution equipment (electrolyzers and refueling stations),
- The Universities of Technology at Belfort-Montbéliard (UTBM) – a leading centre for hydrogen research in France, Compiègne (UTC) and Troyes (UTT), which constitute a unique, leading, and innovative network of scientific, cultural and professional universities, training first-class engineers and doctors.

This new hydrogen research framework for power generation will encompass four research streams focused on different aspects of the Hydrogen Combined Cycle Gas Turbine (CCGT) value chain:

- System Integration & Operability Modeling, aiming at developing integrated model of gas turbine and hydrogen storage, blending and consumption, and aiming at designing economic solutions that meet marketplace needs. That model aims at developing a comprehensive solution, centered around a hydrogen-fueled gas turbine that will provide power on demand and ensure grid stability in a carbon-reduction context;
- Accessories and Balance of Plant Components development for Hydrogen readiness including the development of equipment (valves, hoses, seals, analyzers/sensors, flow meters, etc.), simplification of purge systems, and gas separation technology. This stream therefore focuses

on the qualification of all the peripheral systems that are required for plant operation, to enable the conversion of existing gas-fired plants to higher hydrogen fuel levels;

- Safety and Certification of Components and Systems, to enable highest safety standards;
- Test platform equipped with an electrolyzer, to put into practice the developed concepts and solutions and validate them on an industrial scale. This includes improving the capabilities of the hydrogen test bench at the GE Gas Power production site in Belfort, where the 9HA advanced gas turbine is manufactured.

In parallel, the creation of a hydrogen research hub will allow the hosting of PhD students from the relevant academic institutions, as well as providing initial seed funding and oversight to launch the research program. This collaboration will enable stakeholders to join forces to apply to calls for interest for major European or National innovative projects dealing with the design, development, production and use of H2 systems and successive stages (feasibility, design, setup/erection and commissioning of prototypes) relating to the project.

A few statements:

"*This Research Framework demonstrates GE's leadership in driving forward decarbonization solutions for gas power generation - for the region (Bourgogne-Franche-Comté), for France, Europe and the world. We are honored to join forces on this important effort with public institutions and corporate champions, both nationally and locally within the Belfort ecosystem. GE has a long history of innovation, and we look forward to utilizing our 80+ years of gas turbine development experience and over 8mln hours of hydrogen combustion learnings in our installed base to solve real problems that will accelerate our hydrogen charge,*" said Martin O'Neill, Vice President of Strategy, GE Gas Power.

"*Research & Development is a central issue in accelerating and achieving the energy transition. We are proud to be associated with this alliance to share our knowledge and skills for the development of hydrogen. Through its RICE (Research & Innovation Center for Energy) R&D Department, GRTgaz will mobilise its recognised experts and state-of-the-art infrastructure to shed light on the various projects, identify innovative and reliable solutions, and support the growth in the use of hydrogen,*" said Pierre Blouet, Director of RICE - GRTgaz.

"*The safety of new hydrogen processes and systems is an essential condition for the successful deployment of this sector. Through this research cooperation, Ineris is pleased to make its 25 years of expertise in hydrogen available to support tomorrow's industrial innovations, which are necessary for the energy transition*," said Franz Lahaie, Ineris' hydrogen project manager.

Luc Poyer, Chairman and acting CEO of McPhy comments: "*Within this working group, McPhy will contribute, in a sector logic, to the sharing and cross development of knowledge. This initiative marks a further step for McPhy, which is accelerating the development of technical and industrial skills in the heart of the territories. We are proud to participate in the consolidation of a French industry at the forefront of hydrogen technologies*".

About GE Gas Power

GE Gas Power is a world leader in natural gas power technology, services, and solutions. Through relentless innovation and continuous partnership with our customers, we are providing more advanced, cleaner and efficient power that people depend on today and building the energy technologies of the future. With the world's largest installed base of gas turbines and more than 200 million operating hours across GE's installed fleet, we offer advanced technology and a level of experience that's unmatched in the industry to build, operate, and maintain leading gas power plants. For more information, please visit www.ge.com/power/gas and follow GE's gas power businesses on Twitter and LinkedIn.

About GRTgaz

GRTgaz is Europe's second-largest gas carrier, with 32,500 km of pipes and 640 TWh of gas transported. The company has 3,000 employees and generated nearly €2.3 billion in turnover in 2020. The GRTgaz core purpose is: "Together, we enable an energy future that is safe, affordable and climate neutral". GRTgaz is an innovative company undergoing a major transformation to adapt its network to new ecological and digital challenges. It is committed to a 100% carbon-neutral French gas mix by 2050. It supports the hydrogen and renewable gas sectors (biomethane and gas from solid and liquid waste). GRTgaz carries out public service missions to guarantee the safety of gas transmission for its 945 customers (shippers, distributors, industrial companies, biomethane plants and producers). With its subsidiaries Elengy, the European leader in LNG terminal services, and GRTgaz Deutschland, operator of the MEGAL transmission network in Germany, GRTgaz plays a key role in the European gas infrastructure scene. The company exports its know-how internationally, in particular services developed by its research centre, RICE. Find us on www.grtgaz.com and Twitter.

About Ineris

Ineris, a public institution under the supervision of the Ministry of Ecological Transition, has been developing French expertise as a reference for public policies on risk prevention for 30 years. The uniqueness of its expertise is based on its strong applied research capabilities and its knowledge of the field, acquired through its work for industry. As part of the energy transition, Ineris is helping to control the risks associated with the hydrogen sector. It relies on its test facilities and its historical knowledge of dangerous phenomena to ensure the clean and safe development of the sector.

About McPhy

In the framework of the energy transition, and as a leading supplier of hydrogen production and distribution equipment, McPhy contributes to the deployment of zero-carbon hydrogen throughout the world.
Thanks to its wide range of products and services dedicated to the industrial, mobility and energy markets, McPhy provides turnkey solutions to its clients adapted to their applications in industrial raw material supply, fuel cell electric car refueling or renewable energy surplus storage and valorization. As a designer, manufacturer and integrator of hydrogen equipment since 2008, McPhy has three development, engineering and production units based in Europe (France, Italy, Germany).
The company's international subsidiaries ensure a global sales coverage of McPhy's innovative hydrogen solutions. McPhy is listed on NYSE Euronext Paris (Segment C, ISIN code: FR0011742329; ticker: MCPHY). www.mcphy.com

About the French network of Universities of Technology

Since 2013, the UTBM in Belfort-Montbéliard, the UTC in Compiègne and the UTT in Troyes have been grouped together in the network of Universities of Technology (UT), with a view to sharing and promoting the same original model of education and research. These three institutions are public establishments of a scientific, cultural and professional nature whose main missions are the training of engineers and the development of technology. The UTBM, UTC and UTT are both engineering grandes écoles (members of the Conférence des grandes écoles and the Conférence des directeurs des écoles françaises d'ingénieur) which award diplomas validated by the Commission des titres d'ingénieurs (CTI), and universities (members of the Conférence des présidents d'université). Thus, the French universities of technology combine the reputation of the major engineering schools and the assets of the universities. Since the creation of UTC in 1972, UTBM in 1985 and UTT in 1994, these three institutions have graduated more than 25 000 engineers. UTBM is a founding member of Université Bourgogne Franche-Comté and has an industrial chair with GE. UTC is a member of the Sorbonne University Alliance. UTT is a member of the European University of Technology Alliance - EUt+.

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