D6.012 Website Articles – Get to know the University of Manchester

The University of Manchester (UMAN) has long since been a key player in the development of hydrogen technologies and is considered an expert in developing hydrogen production through a variety of methods, including through thermal, nuclear, and solar processes, along with the electrolysis of water. With this expertise, the University of Manchester are the developers of the high-pressure chemical looping technology used in the RECYCLE project to produce hydrogen. Within the RECYCLE project, UMAN are responsible for the project management, material development, pilot preparation and pilot demonstration, and contribute to the industrial applications of the project.

The goals of the project are to demonstrate the feasibility of the RECYCLE integrated plant to produce 11kg/day of pure hydrogen by the end of Phase II of the project. Alongside the demonstration of the technology, the project will also perform a techno-economic and feasibility study of different plant sizes with a >95% CO2 capture rate, a 20% reduction in blue hydrogen cost and integration of the technology within existing industrial settings in the UK. The project will also aim to develop a credible 10 year commercial for the technology, engage with relevant stakeholders and other demonstration projects, and develop a modular technology with flexible use of feedstock/products.

An interview was conducted with Vincenzo Spallina, who is the Reader of Chemical Engineering and RECYCLE project coordinator at the University of Manchester, to find out more about this organisation and their involvement in the RECYCLE project.

The project provides an opportunity to continue the development of the chemical looping technology, initiated by the University of Manchester, to become commercially viable, in turn reducing the cost and CO_2 generation for hydrogen production. Vincenzo Spallina said *"If successful, the potential is extremely high. Consortium partners are all well-placed to cover the full value chain of the technology. Hydrogen market in UK and Europe could boost follow-up projects and innovation".*

Prior to the RECYCLE project, the first evidence of the concept technology was published in 2017. With funding from the UK Carbon Capture and Storage Research Council (UKCCSRC) and later the Engineering and Physical Research Council (EPSRC), the proof-of-concept was reached, to develop gas-solid reactions in low-carbon applications primarily for steel industry. In parallel, the University of Manchester were also coordinating H2020 GLAMOUR, an EU project which aimed to convert waste glycerol into syngas using chemical looping. The research then led to a feasibility study being successfully completed in Phase I of the RECYCLE project, concluding that RECYLE has very favourable performance in terms of thermal and net efficiency through reduction in operating costs, with a

reduction in environmental impacts by 45 to 53% when compared to SMR post-combustion CCS. The successes in the feasibility report led to the start of Phase II in 2023.

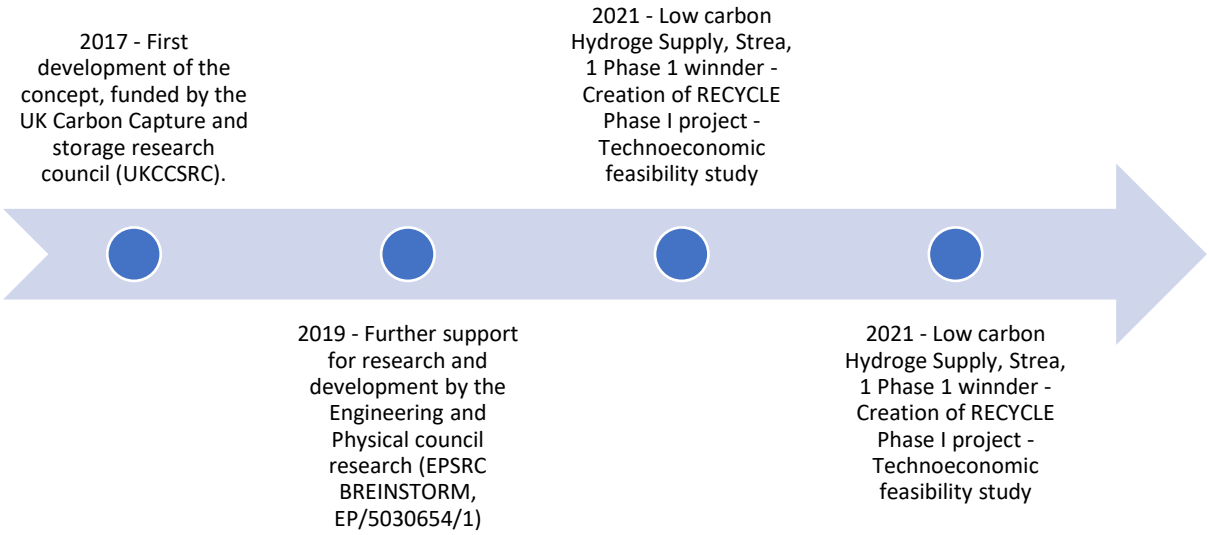

Figure 1. A timeline showing the historical context of the project for the University of Manchester.

The University of Manchester have worked closely with the RECYCLE consortium, having also led Phase I of the project. On the benefits and importance of working in collaboration as a consortium, Vincenzo Spallina said *"The clear role and responsibility of each of six Partners, the longstanding collaboration among people involved in the project, and the experience of Phase I has created a very good and pleasant team. The advanced progress associated with the design and installation of the demonstrator plant guarantee that the project will successfully achieve its objectives."*

Phase II of the RECYCLE project is currently in its early stages, with the pilot operation of the technology still to come. The technology has the potential to support the UK target of 8 TWh/yr of hydrogen per year by 2050, and can be used not only as a method to provide hydrogen and syngas-based products to industry, but potentially with sustainable aviation fuels, CO2 valorisation and low carbon industrial heat.

Looking to the future, Vincenzo Spallina said *"Academia and industry are pushing towards the limit of their innovation since global warming requires action now. There are several similar and related technologies which will emerge in the next years. As researchers, our role is to link and bridge knowledge to provide ideas and rigorous study".*