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## About TeachHy

As the FCHT industry gradually emerges into the markets, the need for trained staff becomes more pressing. TeachHy2020, or short TeachHy, specifically addresses the supply of undergraduate and graduate education (BEng/BSc, MEng/MSc, PhD etc.) in fuel cell and hydrogen technologies (FCHT) across Europe.

TeachHy2020 will take a lead in building a repository of university grade educational material, and design and run an MSc course in FCHT, accessible to students from all parts of Europe. To achieve this, the project has assembled a core group of highly experienced institutions working with a network of associate partners (universities, vocational training bodies, industry, and networks). TeachHy offers these partners access to its educational material and the use of the MSc course modules available on the TeachHy site. Any university being able to offer 20 to 30% of the course content locally, can draw on the other 80 to 70% to be supplied by the project (and its successor entity that will support the platform post-project).

This will allow any institution to participate in this European initiative with a minimised local investment. TeachHy will be developing solutions to accreditation and quality control of courses, and support student and industry staff mobility by giving access to placements. Schemes of Continuous Professional Development (CPD) will be integrated into the project activities. We expect a considerable leverage effect which will specifically enable countries with a notable lack of expertise, not only in Eastern Europe, to quickly be able to form a national body of experts.

TeachHy will offer some educational material for the general public (e.g. MOOC's), build a business model to continue operations post-project, and as such act as a single-stop shop and representative for all matters of European university and vocational training in FCHT. The project partnership covers the prevalent languages and educational systems in Europe. The associated network has over 70 partners, including two IPHE countries, and a strong link to IPHE activities in education.



## Deliverables Abstract

This deliverable summarises the activities directed towards both the 'associated partners', as the potential future offtakers of teaching content, and additional network collaborators, such as the TIME network, in aligning and delivering (online) teaching.

## 1 Background

As described in the proposal, the objectives of the Network Management were to manage and further expand the Associate Network. Associate members of the network will benefit from access to the wealth of existing teaching and training material available on the repository and will be expected to share and contribute with their own content. This will help to expand and enable FCH knowledge transfer across Europe and, as feasible, the world in an effort to supplement the teaching and training material.

The initial associated network set-up at the beginning of the project (see deliverable D7.1), contained 4 vocational training partners, 2 networking partners, and 20 university network partners mainly from Europe but also from Brazil, South Korea, China, and Singapore (IPHE partners). During the project, all these partners were informed via the TeachHy newsletters on the progress of the project and were invited to the project gatherings (see task 7.3). The network of associated partners did not receive any funding. It would have been a positive signal, if at least the travel expenses of the associated network members had been covered by the project budget. Nevertheless, to remain below the 1.25 MEUR recommended budget limit for the project, this had to be abandoned.

## 2 Managing partner engagement

A continual effort has been made to further expand the associate network through dissemination and engagement with FCH stakeholders, such as presentations at Programme Review Days, conferences, workshops, and Summer Schools.

### 2.1 Other networks

#### 2.1.1 EIT-KIC InnoEnergy

Contacts with the European Institution of Innovation & Technology (EIT) were established and maintained throughout the project duration. The EIT is an independent EU body that intends to increase Europe's ability to innovate by nurturing entrepreneurial talent and supporting new ideas. The EIT-KIC InnoEnergy works in the education sector to help create an informed and ambitious workforce that understands the demands of sustainability and the needs of industry in the field of energy. Inside the EIT KIC Innoenergy, Professor Torsten Fransson was coordinating the building of a Micromaster in energy storage. This stackable Micromaster will be available on the Learnify platform (<https://innoenergy.learnify.se/>) and will be open to all persons interested in learning how to store energy. The cooperation with Professor Fransson (also see following section) intends to ensure that hydrogen and fuel cells technologies will be covered by modules in this Micromaster.

#### 2.1.2 EUBBC-Digital

Professor Torsten Fransson is also responsible for the Erasmus+ project EUBBC-Digital (The "Europe-Brazil-Bolivia-Cuba Capacity Building Using Globally Available Digital Learning Modules" project). The countries involved in the project are Brazil, Bolivia, and Cuba. The partners involved in the project are: Universidade de Sao Paulo (USP-Coordinator), Federal University of Rio de Janeiro (UFRJ), Universidad de Pinar del Rio (UPR), Universidad de La Habana (UH), Universidad Central Marta Abreu de Las Villas (UCLV), Universidad Tecnológica de la Habana José Antonio Echeverría (CUJAE), San Simon University

(UMSS), Universidad Privada Boliviana (UPBB), Royal Institute of Technology (KTH), Mälardalen University (MDH), Universiteit Twente (UT), Riga Technical University (RTU), Universitat Politècnica de Catalunya (UPC), Université Libre de Bruxelles (ULB), EXPLORE Energy Sweden AB (EES), Learnify, AudiComPendax AB (Aupx), Politehnica University of Bucharest (UPB). The underlined partners are members of the TeachHy project or of its associated network. The contacts of these partners with the EUBBC-Digital partners enlarge the field of application of fuel cells and hydrogen technologies to new countries. Online modules devoted to hydrogen and fuel cells have been developed on the time.learnify platform in order to be included in the list of available materials for building the education programmes in the above-mentioned Erasmus+ project EUBCC-Digital. In comparison with the modules developed in the TeachHy project these modules are simplified and give a broad picture of hydrogen and fuel cell uses in energy storage.

Discussions were held to make reference to the TeachHy Master programme and/or to include some of the TeachHy modules in the list of reference materials. This could indeed open access to fuel cells and hydrogen technologies to a worldwide community of students.

### 2.1.3 EEDA

Contacts were continued on improving the interactions between the TeachHy project and the Explore Energy Digital Academy (EEDA) developed by Professor Torsten Fransson (see above). Two presentations on the EEDA were delivered: the first one on the 12th of July 2022 during the workshop organised by the Hydrogen Europe Working Group on Skills and the second one on the 26th of October 2022 during the final gathering event of the TeachHy project.

Professor Fransson oversees two ongoing Erasmus+ CBHE (Capacity Building for Higher Education) projects:

- EUSL-Energy Europe – Sri Lanka Capacity Building in Energy Circular Economy
- EUBBC-Digital Europe – Brazil – Bolivia – Cuba Capacity Building using globally available digital learning modules (see above)

He submitted two other Erasmus+ CBHE projects which were accepted recently:

- One project with Bolivia, Ecuador, Guatemala, and Peru
- One project with Cameroon, Ethiopia, Mauritius, and Mozambique

These projects will start in January 2023.

For all these projects, the teachers and learners interested in the modules devoted to hydrogen energy and fuel cells will be informed of the Master programme developed during the TeachHy projects. A strong interaction exists between the EEDA learning modules devoted to hydrogen and fuel cells and the TeachHy lectures even if the TeachHy lectures are much more developed (master's degree level) than the EEDA modules. These contacts expand the teaching content towards international partners outside Europe and from IPHE countries.

### 2.1.4 T.I.M.E.

Contacts with the T.I.M.E (Top Industrial Managers for Europe) network were continued. In view of its end, a report on the results achieved by the TeachHy project was presented during the last meeting of the network in Brisbane (Australia) last October. This feedback was appreciated by the audience.

### 2.1.5 U.N.I.T.E.!

Contacts with U.N.I.T.E! (Grenoble INP, Technische Universität Darmstadt, Universidade de Lisboa, Politecnico di Torino, Universitat Politècnica de Catalunya, Royal Institute of Technology in Stockholm, Aalto University), with the University of Agder (Norway), the University of Newcastle (UK) and the University of Graz (Austria) were developed. On 9 April 2021, contacts were taken with Prof. Jean-Luc Schanen from INP-Grenoble as representative of the association U.N.I.T.E! in order to evaluate how the TeachHy modules could be used in the programmes developed by UNITE!. Unfortunately, this did not result in further activities.

### 2.1.6 EUREC

In September 2021, contacts with the new Secretary general of EUREC (the Association of European Renewable Energy Research Centers), Greg Arrowsmith, were initiated. Towards the end of 2022 the case for including the TeachHy MSc programmes within the EUREC remit were explored. This process is ongoing.

EUREC contributed to both TeachHy Project Gatherings in 2021 and 2022.

## 2.2 Growing the network

### 2.2.1 University of Trakia - ISTD

On the 17th November 2021, the TeachHy coordinator received an official letter from the Institute for Sustainable Transition and Development (ISTD) towards Trakia University – Stara Zagora requesting to join the TeachHy associated network. This was immediately accepted. The Institute has got a division devoted to Hydrogen Technologies and Energy Systems which should be responsible for the education. Although established in March 2021, the Institute can use the educational structure of the University which strongly supports the initiative. The Institute is in a coal mining region that would like to turn into a renewable energy leader in Bulgaria. It needs then to promote high level education in renewable energy and energy storage, notably via hydrogen and fuel cells technologies. It would like to benefit from the TeachHy modules for developing their curriculum.

### 2.2.2 Rijksuniversiteit Groningen

Due to the move of one partner of the TeachHy project to the University of Groningen (RUG), this university will be introduced via an amendment, as a new partner of the project.

### 2.2.3 The KICStartH2 project

Together with UNITE! partners Politecnico di Torino and Universitat Politècnica de Catalunya, along with KIT and UBHAM, adding a number of project and associate partners, specifically UPB, University of Chemnitz, Trakia and Udine University, and University of Louvain la Neuve, the Ukrainian Institute for Problems in Materials Sciences, the Bundesamt für Materialforschung Berlin, and Future.Solutions, a Swiss SME, an application was submitted to the EIT-KIC HEI call with the goal of creating a number of additional, hydrogen-centric modules to complement the TeachHy MSc optional modules and allow for a more hydrogen based programme to be built at partner universities.

This project has been ongoing since July 2022, growing the number of institutions involved in developing the TeachHy curriculum. Specifically the C7b Hydrogen Safety module and O9 Hydrogen Policies and Markets have benefited from the cooperation, seeing them used both in the JESS Summer School and the MSc programme using similar content.



#### 2.2.4 Ukraine

In Ukraine, several Universities are interested in extending their programmes on Fuel Cell and Hydrogen Technology MSc course. These universities are:

- National Technical University of Ukraine "I. Sikorsky Kyiv Polytechnic Institute » (already involved in the High Temperature Fuel Cell module)
- National University of "Kyiv-Mohyla Academy »,
- Ivano-Frankivsk National Technical University of Oil and Gas,
- National Aviation University, and
- Lviv Polytechnic National University.

They have started the preparations for using the MSc course materials developed by the TeachHy Project Team.

An active participation in the meeting of the Scientific and Technical Council of NJSC Naftogaz of Ukraine (The largest Ukrainian Energy Company) on the prospects of Hydrogen Energy in Ukraine took place. A report of the project partner from the University of Ulster on hydrogen safety was presented.

The Energy Center of the Future at the Paton Institute for Materials Science and Welding of NTUU "I. Sikorsky KPI" was established for further dissemination of knowledge concerning Fuel Cells and Hydrogen Technologies, as well as to promote the TeachHy project.

Members of the TeachHy project participated in the meeting at the Ministry of Energy and Ecology of Ukraine on the issues of the accession of the Ukrainian institutions to the road map related to the transition of the European Union energy sector to the Hydrogen Economy.

#### 2.2.5 Further interest

The following institutions have signalled their interest in working with the consortium

- Aalto University (Finland)
- Technion University (Israel)
- University of Agder (Norway)
- University of Newcastle (UK)
- University of Graz (Austria)

In view of the end of the project these contacts will be carried over into the European Hydrogen Academy project to be further explored.

### 3 Summary

The expansion of the associated network was based on individual contacts of the TeachHy partners and on the development of the networking partners (EUREC and T.I.M.E.). The main network TeachHy linked to was the EIT-KIC MicroMaster, EEDA, and EUBBC-Digital projects coordinated by Prof Fransson. The main contact was held through ULB with limited transferrability of material due to considerable differences in level of teaching and approach to qualifications.

Transfer of material to network partners was held back until the full MSc programme had been developed and tested, which eventually was only complete by the end of the project. Future activities will be completed within the framework of the follow-up project European Hydrogen Academy.