



FUEL CELLS AND HYDROGEN
JOINT UNDERTAKING

TeachHy
Teaching Fuel Cell and
Hydrogen Science and
Engineering Across Europe



Robert Steinberger-Wilckens

University of Birmingham

www.teachy.eu

r.steinbergerwilckens@bham.ac.uk

Programme Review Days 2019

Brussels, 19-20 November 2019

PROJECT OVERVIEW



- Call year: 2017
- Call topic: FCH-04-3-2017
- Project dates: 01 Nov 2017 – 31 Oct 2020
- % stage of implementation 01/11/2019: 75%
- Total project budget: 1 289 658 €
- FCH JU max. contribution: 1 248 528 €
- Other financial contribution: 1 000 000 €



- **Partners:** University of Birmingham, Technical University of Delft, Politecnico di Torino, National Technical University of Ukraine 'Kyiv Polytechnic Institute' – KPI, Denmark Technical University - DTU, University of Chemistry and Technology, Prague – UCPT, École Polytechnique Fédérale de Lausanne - EPFL, Université libre de Bruxelles - ULB, University POLITEHNICA of Bucharest, Grenoble institute of technology – INP, Ulster University, Karlsruhe Institute of Technology - KIT



PROJECT SUMMARY



TeachHy - Teaching Fuel Cell and Hydrogen Science and Engineering Across Europe

Objectives

- establishing a blended learning MSc course to be delivered by a network of European universities
- establishing a focal point of advanced education in FCH technologies
- offering CPD and public educational materials and certified professional courses
- developing means of offering virtual and distance access to laboratory facilities
- implement the MSc course material on the NET-Tools platform
- offering subscription of universities to the TeachHy concept

State of the Art

- no comparable online or blended learning offerings



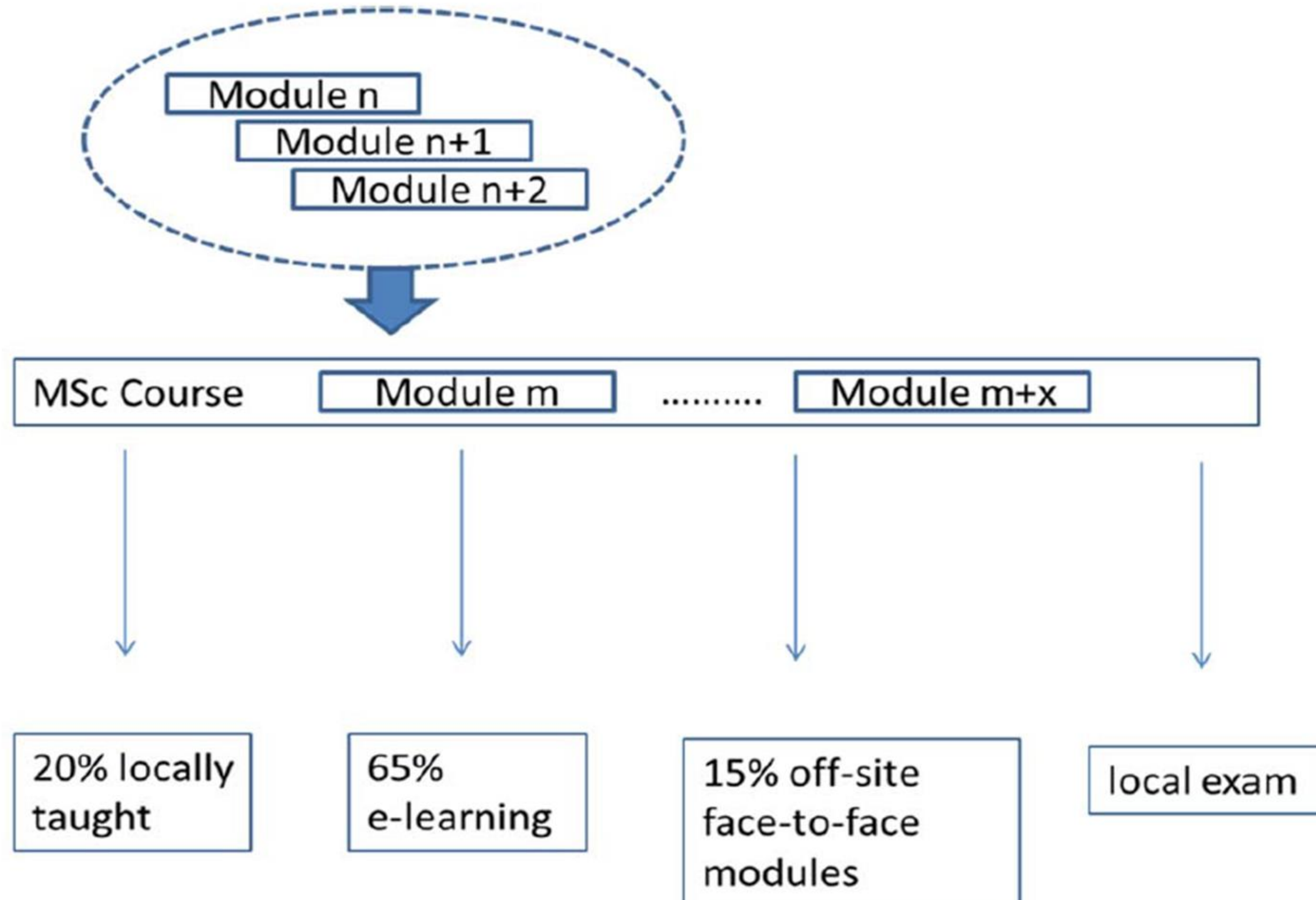
PROJECT CHALLENGE - University FCH training in Europe



- many universities cover single topics in FCH in courses such as Physics and Chemistry (thermodynamics, electrochemistry), Materials Sciences, Chemical & Mechanical engineering etc.
 - within the EU only one (!) university offers an FCH MSc degree
 - many universities are willing to participate but can only cover about ~30% of the necessary lecturing material and capacity
 - a number of 50 to 200 university courses are needed to cover the HR demands by 2030
- how can the missing ~70% be supplied?
- how can quality of teaching be assured in a high number of newly developed courses?



PROJECT CONCEPT – Implementing MSc training



PROJECT CONCEPT 2 - The MSc Course Offer



- any participating university can 'buy' into the network
- currently on a 'tit for tat' basis – you take, you give (e.g. by translating material)
- later as a sustainable business model
- from the modules available an individual MSc course can be built, deciding what to deliver locally (face-to-face) and what online
- organise lab work locally (or in collaboration with other uni) and exam
- locally/nationally accredit the course
- participate in student / staff exchanges

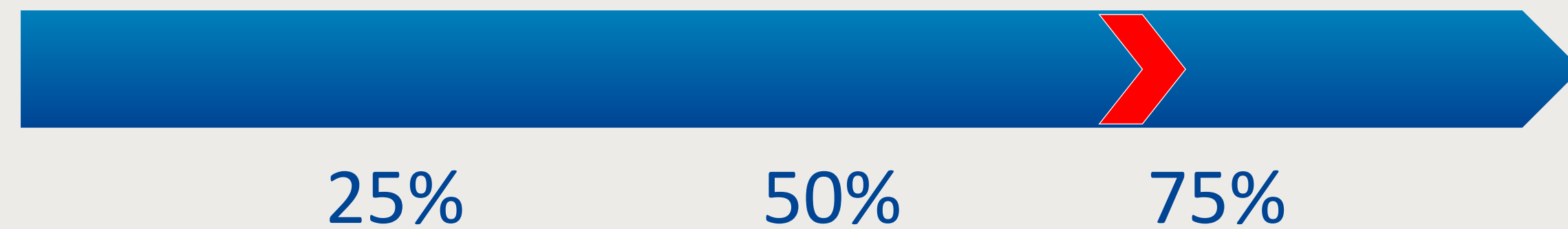


PROJECT PROGRESS – Developing Educational Content



Achievement to-date

start from
scratch



19 modules
x 15 lectures =
285 learning
units

Accomplished

- collection of pre-existing lectures and educational material
- structuring of content into 7 compulsory and 5 optional modules (out of 12)
- establishment of additional material to fit 12 / 18 / 24 month MSc programmes across Europe

Ongoing

- testing of modules
- preparation of test run

Outstanding

- first test run in 2020 and first full course from Oct 2020

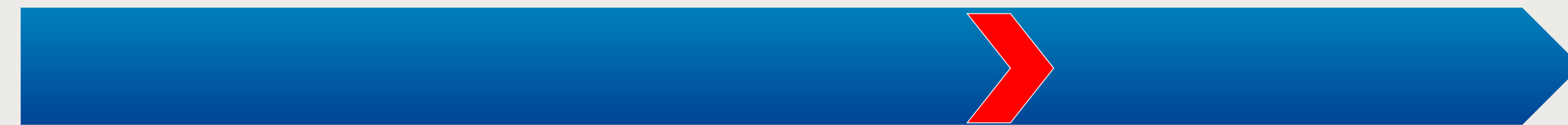


PROJECT PROGRESS – Implementing the Course



Achievement to-date

start from
scratch



25%

50%

75%

structured
course
implemented
on LMS

Accomplished

- modules recorded and implemented on CANVAS
- complete set of modules documented, programme prepared for accreditation

Ongoing

- testing on different LMS platforms (CANVAS, NET-Tools)
- accreditation at UoB
- hybrid course delivery at TU Delft and Grenoble INP

Outstanding

- translation of material
- accreditation at multiple universities



PROJECT PROGRESS – Implementing the Course (2)



The screenshot displays a multi-tabbed web browser with three open tabs, all pointing to the Canvas LMS at <https://canvas.bham.ac.uk/courses/32407>. The active tab shows the course page for 'C2 - 2 Basic Introduction to Electrochemistry and Thermodynamics'.

Course Page Content:

- Learning outcomes:**
 - A recap of the previous module on Electrochemistry & Thermodynamics
 - Applied to fuel cells and electrolysis
- Lecture 2: A Basic Introduction to Electrochemistry and Thermodynamics**
 - Please make sure you use the **full screen feature** to watch the video lesson.
 - Begin by watching the **video lesson** for this unit.
 - The lecture slides can be downloaded below.
- Primary Sources:** A video player is embedded, showing a graph of Max Efficiency vs. Temperature. The graph includes curves for FC (LHV), FC (HHV), and Carnot efficiency. The temperature range is $T_{\text{fuel}} = 0, 20, 50, 100$.
- Summary:** A section with an 'Expand all' button.
- Resources:** A link to 'Presentation: A Basic Introduction to Electrochemistry and Thermodynamics'.
- References:** A section for additional reading.

Slide Content (Introduction to Thermodynamics and Electrochemistry):

- UNIVERSITY OF BIRMINGHAM
- Introduction to Thermodynamics and Electrochemistry
- Dr. Shangfeng Du
- Centre for Fuel Cell and Hydrogen Research
- School of Chemical Engineering
- Courtesy to Jens Oluf Jensen

Taskbar and System Information:

- The Windows taskbar at the bottom shows various application icons including Start, Word, Firefox, and others.
- The system tray in the bottom right corner displays the date and time: 08:06, 06/11/2019.

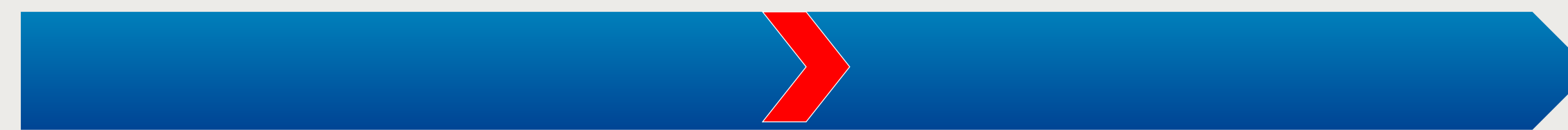


PROJECT PROGRESS – Continuous Professional Development



Achievement to-date

start from
scratch



25%

50%

75%

XXX

Accomplished

- identification of compatible modules / lectures

Ongoing

- events at TU Delft and KPI
- preparing topical MOOCs

Outstanding

- full implementation of pilot courses
- accreditation with CPD bodies across consortium countries



SYNERGIES WITH OTHER PROJECTS AND PROGRAMMES



Interactions with projects funded under EU programmes

- TrainHy – MSc course based on syllabus developed by TrainHy
- HySafe – Hw safety module from HySafe
- KnowHy – blended learning and CPD approach



Interactions with national and international-level projects and initiatives

- IPHE – Educational Activities – represented by Jürgen Garche on Advisory Board
- EPSRC Supergen H2FC Hub – use of Educational Portal
- T.I.M.E. network – network partners



Interactions with private projects and initiatives

- JESS – Joint European Summer School – cooperation on module development and delivery



Risks and Challenges



Accreditation procedures

- diversity of accreditation models at universities
- reluctance of university administrations to accept external contributions
- 'ownership' of modules

Financial issues

- divergence of university financing models and tuition charges
- reluctance of funding of educational activities –
under-funding, considerable unpaid and unrecognised university input



Communications Activities



- Facebook group



- LinkedIn entry



- Twitter feed



dedicated web site

- www.TeachHy.eu
- with blog and regular newsletter

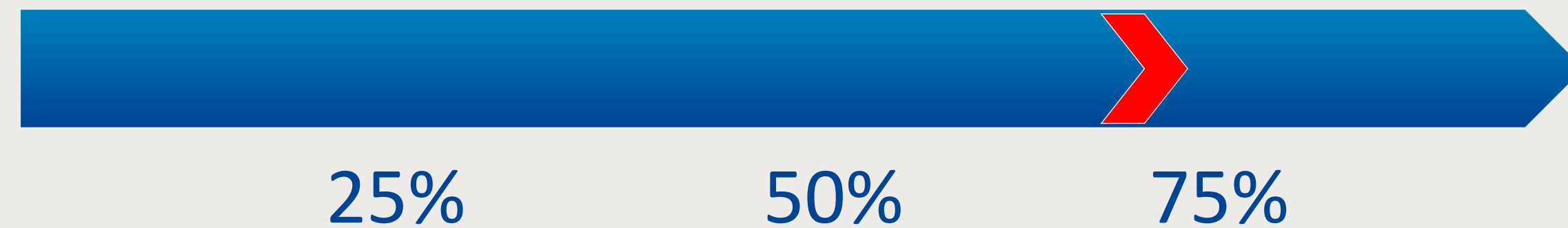


PROJECT PROGRESS – Business model post-project



Achievement to-date

start from
scratch



agreements
with network
universities in
place

Accomplished

- first draft of business model post-project established
- license model to access to training material

Ongoing

- negotiations with partner network on licensing conditions
- collection of EoI's and MoU's

Outstanding

- agreements in place across partner network



EXPLOITATION PLAN/EXPECTED IMPACT



Exploitation

- roll-out of the MSc course implementation across the partner network
- establishment of a post-project business entity to maintain and update educational material database
- implementation of CPD schemes

Impact

- access to MSc- and professional level FCH educational material across EU
- option for a multitude of universities to offer FCH-related courses and specialisation
- adaptation of university-course material to technician training and CPD
- broader public, stakeholders and politician education





FUEL CELLS AND HYDROGEN
JOINT UNDERTAKING

TeachHy
Teaching Fuel Cell and
Hydrogen Science and
Engineering Across Europe



Robert Steinberger-Wilckens

University of Birmingham

www.teachy.eu

r.steinbergerwilckens@bham.ac.uk

Programme Review Days 2019

Brussels, 19-20 November 2019