

4<sup>th</sup> Webcon | 20 SEPTEMBER 2021

# ***PRHYDE-Protocol for heavy-duty hydrogen refuelling***

Call Identifier FCH-04-2-2019:

Refuelling Protocols for Medium and Heavy-Duty Vehicles



Horizon 2020  
European Union Funding  
for Research & Innovation



# AGENDA, 4<sup>th</sup> Webinar



Time (UTC)	Subject
12:45	<i>Join webinar</i>
13:00	Introduction <ul style="list-style-type: none"><li>• Introduction to PRHYDE</li></ul>
(15:00 CET)	<ul style="list-style-type: none"><li>• Status public deliverables available to date: see <a href="https://prhyde.eu/progress/">https://prhyde.eu/progress/</a></li></ul>
13:05	Presentation: WP3 protocol development update
14:00	Questions
14:15	Presentation: WP4 & WP5 update on testing
14:40	Questions
14:55	Closing remarks
15:00	<i>End</i>

- *PRHYDE-Protocol for heavy-duty hydrogen refuelling*  
Refuelling Protocols for Medium and Heavy-Duty Vehicles
- 01 JAN 2020 - 31 DEC 2021 (*proposed project extension by nine months*)
- The PRHYDE project has received funding from the Fuel Cells and Hydrogen 2 Joint Undertaking under grant agreement No 874997.  
This Joint Undertaking receives support from the European Union's Horizon 2020 research and innovation programme.

# PRHYDE project partners



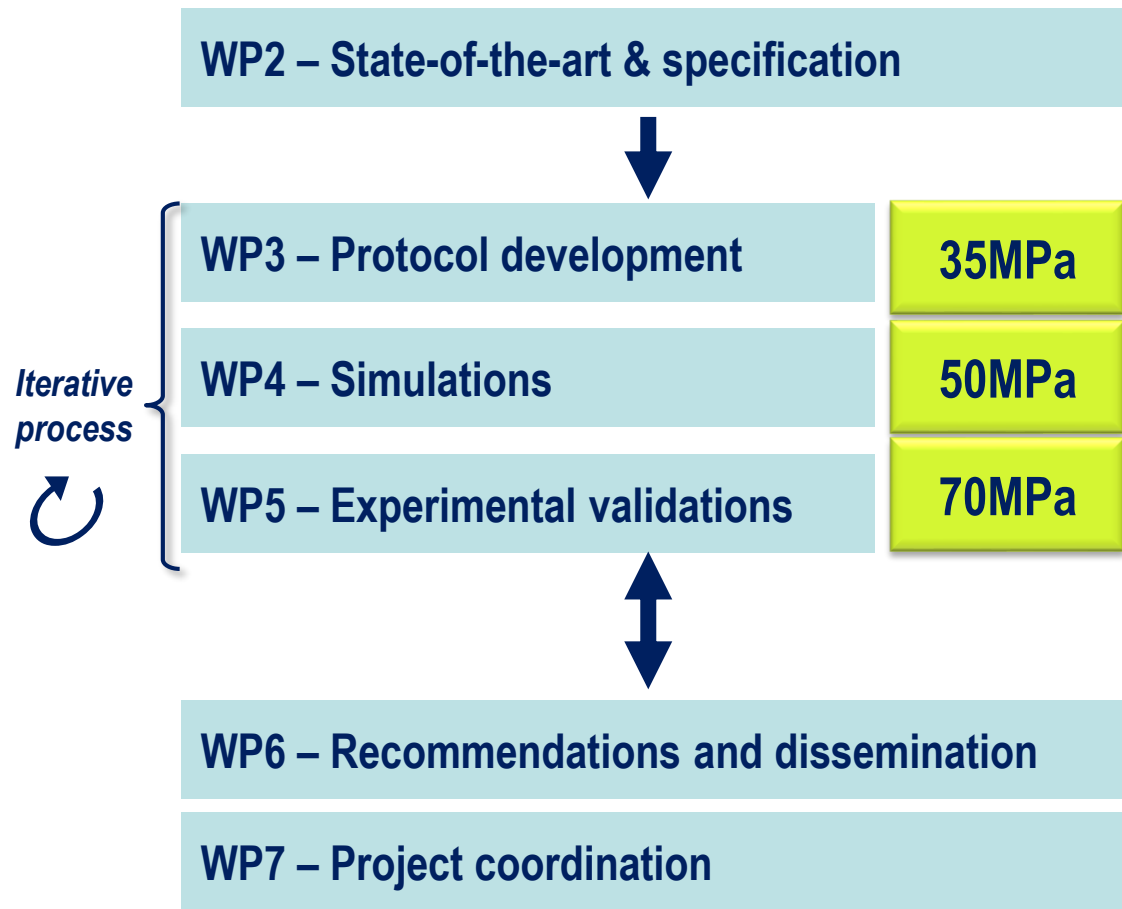
No.	Participant organisation name	Short name	Country
1	Ludwig-Bölkow-Systemtechnik GmbH (Coordinator)	LBST	DE
2	Zentrum für BrennstoffzellenTechnik GmbH	ZBT	DE
3	Air Liquide SA	AL	FR
4	Engie Lab CRIGEN	ENGIE	FR
5	Toyota Motor Europe NV	TME	BE
6	ITM Power (Trading) Limited	ITM	UK
7	NEL Hydrogen AS	NEL	DK
8	Shell Deutschland Oil GmbH	SHELL	DE
9	Commissariat à l'énergie atomique et aux énergies alternatives	CEA	FR
10	Nikola Motor Company	Nikola	USA



Linked third partners: MAN and Toyota North America

We also thank the following companies and institutions for their contribution: NREL, National Technology & Engineering Solutions of Sandia, LLC ("NTESS"), Savannah River National Laboratory ("SRNL"), Hexagon Purus, LiffeH2, Risktec, Luxfer, and FirstElement Fuel, Daimler, and Honda

# Work plan



**WP2:** Defining state-of-the-art on protocols, vehicles and component capabilities, gap analysis of current protocols, Specifying (new) tank categories, boundary conditions (flow temperature, connections etc.) target fueling times and quantities for the three pressure levels

**Outcome:** A detailed specification guiding the following protocol development and test efforts

**WP3:** Develop protocol approaches for the three pressure levels

**Outcome:** Protocol approaches for simulations (WP3) and test (WP4)

**WP4:** Modeling and Simulations of tank systems/categories to determine flow/temperature/pressure aspects

**Outcome:** Simulation results in order to assess impact of different protocol approaches

**WP5:** Experimental validation of protocol approaches at HRS(s)

**Outcome:** Validation of technical feasibility of protocol approaches

**WP6:** Formulate recommendations for standardization forums and dissemination

**Outcome:** Specific recommendations that can help create international standards on HDV hydrogen fueling

# Introduction: Format of webinar



- Intended to disseminate the work carried out to date in the PRHYDE project on the developments towards a fueling protocol approach for heavy duty vehicles
- Any questions that you may have: please put them in the “chat” box (or email them to [info@PRHYDE.eu](mailto:info@PRHYDE.eu) after the event)
- **Important note:** Webinar being recorded for internal purposes (from now)

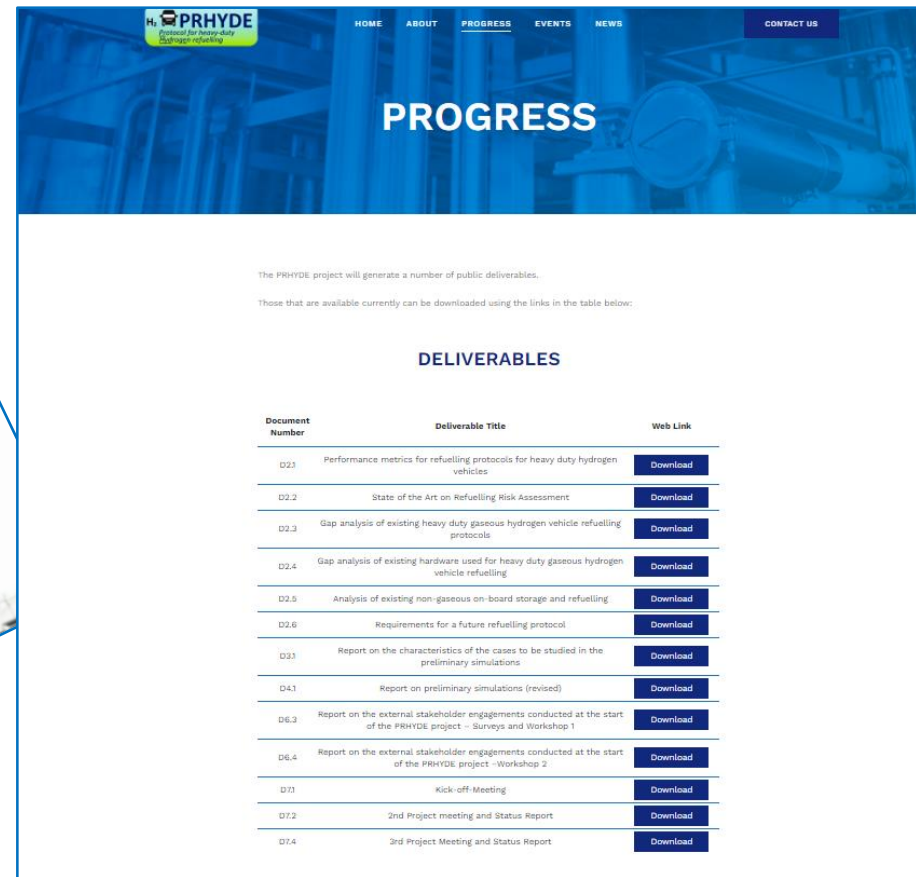
# WP2 progress



- Covers “State of the Art” and benchmarks in hydrogen refuelling as a “snap-shot” at the start of the project
- Used to:
  - set metrics to evaluate outcome of project
  - give key inputs to the development of the protocol
- 5 public deliverables, all published

# Status: Public deliverables

- Public deliverables available to date: see <https://prhyde.eu/progress/>

The PRHYDE project will generate a number of public deliverables. Those that are available currently can be downloaded using the links in the table below:

Document Number	Deliverable Title	Web Link
D2.1	Performance metrics for refuelling protocols for heavy duty hydrogen vehicles	<a href="#">Download</a>
D2.2	State of the Art on Refuelling Risk Assessment	<a href="#">Download</a>
D2.3	Gap analysis of existing heavy duty gaseous hydrogen vehicle refuelling protocols	<a href="#">Download</a>
D2.4	Gap analysis of existing hardware used for heavy duty gaseous hydrogen vehicle refuelling	<a href="#">Download</a>
D2.5	Analysis of existing non-gaseous on-board storage and refuelling	<a href="#">Download</a>
D2.6	Requirements for a future refuelling protocol	<a href="#">Download</a>
D3.1	Report on the characteristics of the cases to be studied in the preliminary simulations	<a href="#">Download</a>
D4.1	Report on preliminary simulations (revised)	<a href="#">Download</a>
D6.3	Report on the external stakeholder engagements conducted at the start of the PRHYDE project - Surveys and Workshop 1	<a href="#">Download</a>
D6.4	Report on the external stakeholder engagements conducted at the start of the PRHYDE project -Workshop 2	<a href="#">Download</a>
D7.1	Kick-off Meeting	<a href="#">Download</a>
D7.2	2nd Project meeting and Status Report	<a href="#">Download</a>
D7.4	3rd Project Meeting and Status Report	<a href="#">Download</a>





# Continued work / extension of project



- A number of factors encountered over the course of the project to date has led to later than expected availability of testing facilities and instrumented vessels, and other delays within the project.
- We anticipate a project extension of 9 months in order to complete the suite of practical tests necessary, and the outline of next steps in WP3, WP4 and WP5 takes this extension into consideration.
- As a result, further dissemination webinars planned at the end of the project are anticipated to be held in summer 2022 (rather than the end of 2021).

## WP3 Protocol Development Update

Presenters: Claus Sinding / Steve Mathison / Spencer Quong

Slides: See separate slide pack

# WP4 – Modelling / simulations + WP5 - Testing



## WP4 & WP5 Update on testing

Presenter: Fouad Ammouri / Arnaud Charolais / Alexander Grab / Christian Spitta

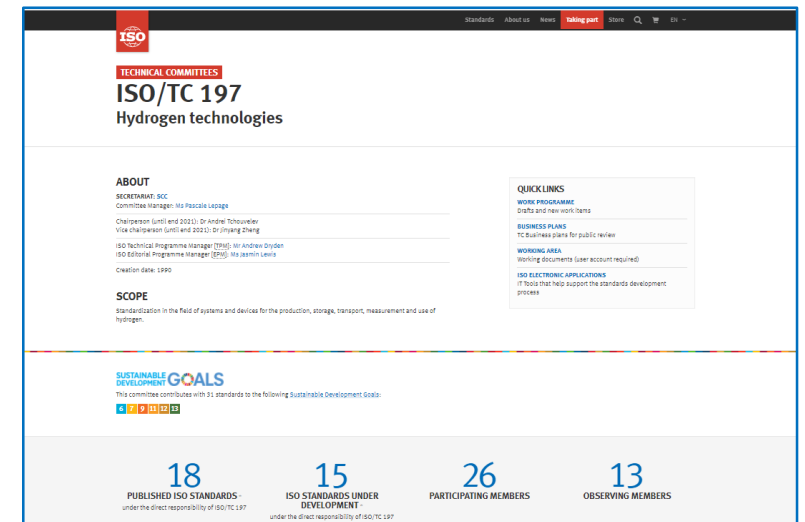
Slides: See separate slide pack

# Status: Standards development



## ISO/TC 197: Hydrogen Technologies

- Standardization in the field of systems and devices for the production, storage, transport, measurement and use of hydrogen.
  - <https://www.iso.org/committee/54560.html>
- Preparation of 3 documents in ISO/TC 197/WG24:
- ISO 19885 series of documents:
  - ISO 19885-1, Design and development process for fuelling protocols
  - ISO 19885-2, Definition of communications between the vehicle and dispenser control systems
  - ISO 19885-3, High Flow Hydrogen Fuelling Protocols for Heavy Duty Road Vehicles



# Next steps



- Further feedback and inputs requested from stakeholders:
  - E-mail list for PRHYDE stakeholders  
(→ please send e-mail to [info@prhyde.eu](mailto:info@prhyde.eu) if you want to receive or not to receive info / news)
  - PRHYDE deliverables & presentation will be made available for comments / feedback  
(→ to be downloaded from the PRHYDE website)
- Further webinars / workshops at end of project

→ Please provide your comments / inputs any time to [info@prhyde.eu](mailto:info@prhyde.eu)

# THANK YOU!



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