Ulster University

PRESLHY

Work Package 6

Implementation: Exploitation and Dissemination

Kick-off meeting: 17th April 2018, KIT, Karlsruhe, Germany

ulster.ac.uk

HySAFER
Staff

- **Prof Vladimir Molkov**, Professor of Fire Safety Science, HySAFER director
- **Dr Dmitriy Makarov,** Reader in Safety of Hydrogen Production and Storage
- **Dr Sile Brennan,** Lecturer in Safety of Hydrogen and Fuel Cell Technologies
- **Dr Volodymyr Shentsov,** Research Associate
- **Dr Sergii Kashkarov,** Research Associate
- **Dr Mohammad Dadashzadeh**, Research Associate
- **Mr Mohamed Sakr,** PhD student
- **Miss Donatella Cirrone,** PhD student
- **Mr Harem Hussein**, PhD student
- **Mr Wulme Dery,** PhD student

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Ongoing projects (€ 2.5M)

- EPSRC SUPERGEN Challenge: Integrated safety strategies for onboard hydrogen storage systems (2013-2017, ext. 2018).
- EPSRC Centre for Doctoral Training in Fuel Cells and their Fuels - Clean Power for the 21st Century (2014-2019).
- FP7 MCA GENFUEL: Addressing Fundamental Challenges in the Design of new generation fuel (2014-2018).
- H2020, FCH JU, NET-Tools Novel Education and Training Tools based on digital applications related to Hydrogen and Fuel Cell Technology (2017-2020).
- EPSRC SUPERGEN Hydrogen and Fuel Cells Hub Extension (2017-2019).
- Invest NI: Composite tank prototype for onboard compressed hydrogen storage based on novel Ulster's leak-no-burst safety technology (2017-2018).
- H2020, Interreg, HYLANTIC Atlantic Network for Renewable Generation and Supply of Hydrogen to promote High Energy Efficiency (2017-2020).
- H2020, FCH JU, PRESLHY: Pre-normative research for safe use of liquid hydrogen (2018-2020).
- H2020, FCH JU, TeacHy: Teaching fuel cell and hydrogen science and engineering across Europe within Horizon 2020 (2017-2020).

External funding since 2004 is €6.5M

List of PRESLHY WPs

WP6 is led by UU

WP Number[9]	WP Title	Lead beneficiary[10]	Person-months[11]	Start month[12]	End month[13]
WP1	Management of the Project and Consortium	1 - KIT	11.50	1	36
WP2	Technical Strategy and State-of-the-Art	2 - AL	10.50	1	36
WP3	Phenomena Release and Mixing	6 - NCSRD	42.00	1	36
WP4	Phenomena Ignition	3 - HSE	33.00	1	36
WP5	Phenomena Combustion	1 - KIT	40.00	1	36
WP6	Implementation - Exploitation and Dissemination	8 - ULster	18.00	1	36
		Total	155.00		

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WP6

Summary of efforts

	WP6
1 - KIT	3
2 - AL	4
3 - HSE	0.50
4 - HySafe	2
5 - INERIS	0.50
6 - NCSRD	1
7 - PS	0.50
8 - ULster	6
9 - UWAR	0.50
Total Person/Months	18

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WP6
Objectives

- Compile a chapter on LH2 safety for the Handbook of Hydrogen Safety.
- Develop novel guidelines for safe design and operation of LH2 systems and infrastructure.
- Prepare recommendations for relevant Regulations, Codes and Standards (RCS).
- Describe engineering correlations and tools for implementation into hazards and risk assessment tools.
- Formulate a White Paper on the use of LH2.
- Organise the Dissemination Conference.

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WP6 structure

Leaders and contributors

- Task 6.1 Handbook of Hydrogen Safety: chapter on LH2 safety (**HySafe**; All; M1-34)
- Task 6.2 Guidelines for safe design and operation of LH2 infrastructure (**AL**; All; M7-36)
- Task 6.3 Recommendations for RCS (**AL**; All; M19-36)
- Task 6.4 Engineering correlations and tools (**UU**; All; M7-36)
- Task 6.5 White paper on the use of LH2 (**KIT**; All; M18-36)
- Task 6.6 Dissemination conference (**UU**; All; M6-36)

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WP6 reporting

Deliverables and Milestones

WP6 Implementation: Exploitation and Dissemination.

D/MS	Title	Task	Lead	Due
MS25	ToC of Handbook of Hydrogen Safety: chapter on LH2 safety	6.1	UU	M12
D6.1	Handbook of Hydrogen Safety: chapter on LH2 safety	6.1	HySafe	M34
MS26	ToC of Guidelines for safe design and operation of LH2 infrastructure	6.2	UU	M14
D6.2	Guidelines for safe design and operation of LH2 infrastructures	6.2	AL	M35
MS30	Discussion draft of recommendations for RCS	6.3	UU	M28
D6.3	Recommendations for RCS	6.3	AL	M35
MS27	ToC of White paper	6.5	UU	M18
D6.4	White Paper	6.5	KIT	M35
MS29	Detailed description of novel engineering tools for LH2 Version 1	6.4	UU	M24
D6.5	Detailed description of novel engineering tools for LH2 safety	6.4	UU	M35
D6.6	Plan for the dissemination, communication and exploitation	6.6	UU	M6
D6.7	Plan for the dissemination, communication and exploitation-1st update	6.6	UU	M18
MS28	Brochure and preliminary programme of the dissemination conference	6.6	UU	M22
D6.8	Plan for the dissemination, communication and exploitation-2nd update	6.6	UU	M36
D6.9	Report on the communication activities carried out to the general public	6.6	UU	M36

Task 6.1: Handbook…

Duration: M1-34 Lead: HySafe Partners: All

Gathering of information on up-to-date knowledge, gaps and progress on LH2 and cryo-compressed H2 in a publishable report:

- Internal collaboration: PRESLHY partners. Alignment to the review of the state-of-the-art, strategies produced in WP2 and new knowledge generated in WP3-5.
- External collaboration: HySafe experts.

MS25 ToC of Handbook of Hydrogen Safety: chapter on LH2 safety M12 (UU)

D6.1 Handbook of Hydrogen Safety: chapter on LH2 safety M34 (HySafe)

Task 6.2: Guidelines…

Duration: M7-36 Lead: AL Partners: All

- Facilitation of inherently safer design and operation of LH2 systems and infrastructure in Europe.
- Focus on areas where LH2 specific standards are not available or suitable for use in public areas.
- Inclusion of innovative safety strategies and engineering solutions and tools developed in WP3-5.

MS26 ToC of Guidelines for safe design and operation of LH2 infrastructure M14 (UU)

D6.2 Guidelines for safe design and operation of LH2 infrastructures M35 (AL)

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Task 6.3: Recommendations for RCS

Duration: M19-36 Lead: AL Partners: All

Implementation of the project outputs in relevant RCS. The program will include:

- Identification of existing RCS in WP2.
- Formulation of guidelines developed in Task 6.2 according to the standard developing organisations (SDO).
- Presentation and submission of the recommendations to SDOs, such as CEN/CLC Technical Committee 6, ISO Technical Committee 197, etc…

MS30 Discussion draft of recommendations for RCS M28 (UU)

D6.3 Recommendations for RCS M35 (AL)

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Task 6.4: Engineering correlations and tools

Duration: M7-36 Lead: UU Partners: All

Correlations developed in WP3-5 will be brought into a unified format suitable for implementation into integrated platforms for hazards and risk assessment.

UU: Development of detailed unified template for description of correlations and tools developed in WP3-5 (suggestion M7).

ALL: Detailed description of correlations and tools developed in WP3-5 according to the unified template (on quarterly basis as a tool is available).

ALL: Inclusion of developed tools into safety engineering design, education and training platforms.

MS29 Detailed description of novel engineering tools for LH2, Version 1 M24 (UU)

D6.5 Detailed description of novel engineering tools for LH2 safety M35 (UU)

Task 6.5: White paper

Duration: M18-36 Lead: KIT Partners: All

The White Paper will include:

- Discussion on general economics and safety of LH2.
- Comparison of hazards and risks of LH2 systems against gaseous H2 systems.
- Contribution of external experts.

MS27 ToC of White paper M18 (UU)

D6.4 White Paper M35 (KIT)

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Task 6.6 Dissemination conference

Duration: M6-36 Lead: UU Partners: All

This task will comprehend:

- Organisation of dissemination conference at the end of the project to present the detailed project outcomes to the H2 safety community (M36):
  - Issue budget: €10,000 (DoA T6.6)
- Dissemination of project findings through journal publications and project website, and promoting conference presentations and special sessions at conferences.

D6.6 Plan for the dissemination, communication and exploitation M6 (UU)

D6.7 Plan for the dissemination, communication and exploitation-1st update M18 (UU)

D6.8 Plan for the dissemination, communication and exploitation-2nd update M36 (UU)

D6.9 Report on the communication activities carried out to the general public M36 (HySafe)

MS28 Brochure and preliminary programme of the dissemination conference M22 (UU)

Ulster contribution to WPn

WP 1-3

WP1 Management of the Project and Consortium (0.5 p/m)

WP2 Technical Strategy and State-of-The-Art (1 p/m)

- Contribution to reports composition.

WP3 Phenomena Release and Mixing (4 p/m)

- Analysis of the applicability of notional nozzle theory for prediction of concentration decay in cryogenic under-expanded jets.
- Simulations of experiments on multi-phase releases from LH2 storage with inclusion of conjugate heat transfer.
- Use of the validated CFD model as contemporary engineering tool for evaluation of mass flow rate for releases from LH2 tank.

Ulster contribution to WPn
WP 4-5

WP4 Phenomena Ignition (2 p/m)

- Spark ignition simulations of cryogenic H2-air mixtures.
- Diffusion ignition simulations of cryogenic releases.
- Numerical studies on formation and ignition of cryogenic H2/O2 mixtures.

WP5 Phenomena Combustion (4 p/m)

- Development and validation of models for simulation of radiation from cryogenic jet fires.
- Use of CFD model for assessment of thermal hazards aside cryogenic jets.
- Development of UDF for evaluation of thermal dose.

WP6 Implementation: Exploitation and Dissemination. Leader: UU (6). KIT(3) AL (4) HSL (0.5) HYSAFE (2) INERIS (0.5) NCSRD (1) PS (0.5) UWAR (0.5)

Work Packages (WP), Deliverables (D) and Milestones (MS)		Resp	2018												2019												2020											
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
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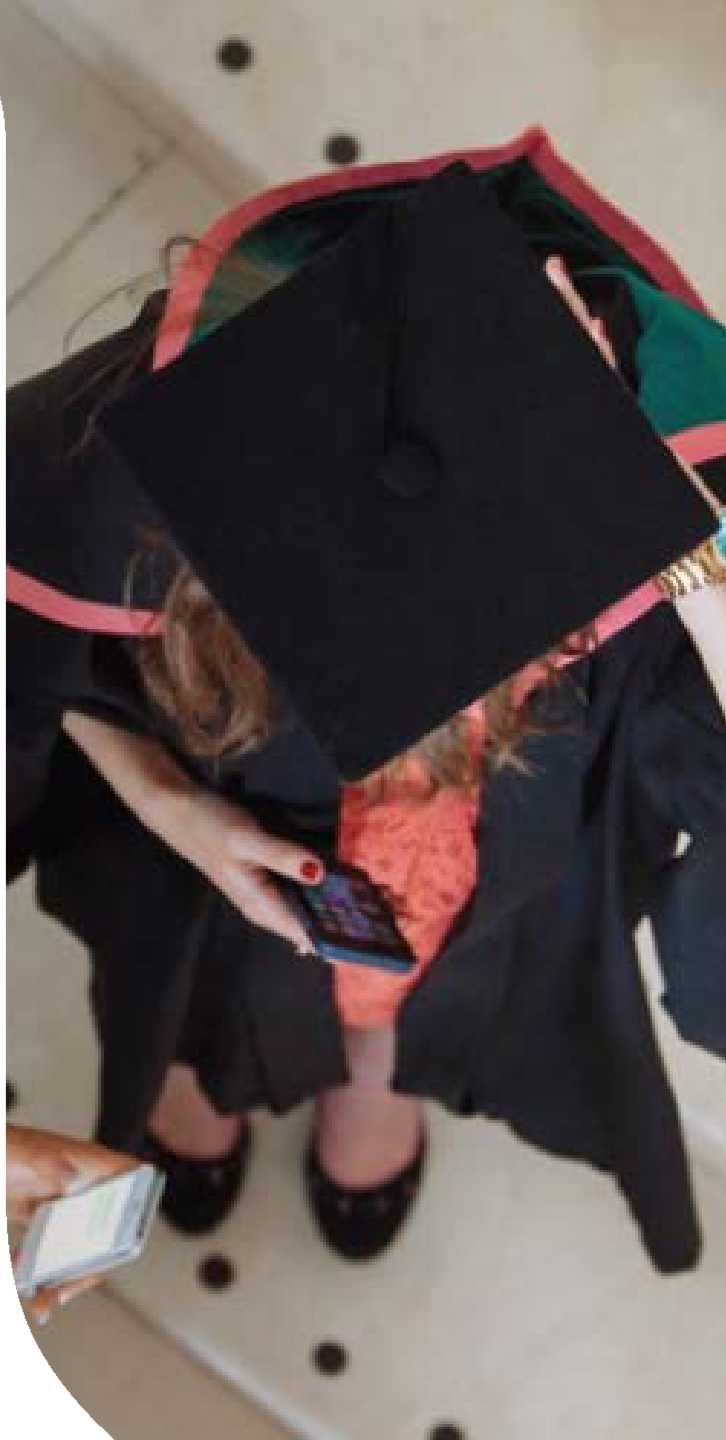
Thank you for your attention!

Any suggestions?



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