

HIAD 2.0: HYDROGEN INCIDENT AND ACCIDENT DATABASE

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**The European Commission's
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HIAD: goals

Collaborative and communicative web-based information platform: repository of data defining events related, directly or indirectly, to hydrogen safety

- To enable a return-of-experience and provide safety lessons learned on the do's and the don'ts
- to keep industry and research updated with recent hydrogen events
- to assist all stakeholders in better understanding hydrogen-related undesired events and...
- ... eventually to contribute to facts-based type-approval and permitting procedures

HIAD: history

HIAD was originally developed in the European Network of Excellence for Hydrogen Safety (**HySafe** 2004-2009)



After the end of HySafe, the International Association for Hydrogen Safety **IA-HySafe** became the focal point for all hydrogen safety related issues. HIAD was further developed with an analysis module



HIAD has been maintained, updated and funded by the **Joint Research Centre of the European Commission**



New HIAD versions

HIAD FP7
2003-2006

H2 events

  European Commission

Registration & log-in 

HELLEN
2016

 **FUEL CELLS AND HYDROGEN**
JOINT UNDERTAKING  European Commission

Project events

Restricted only FCHJU 

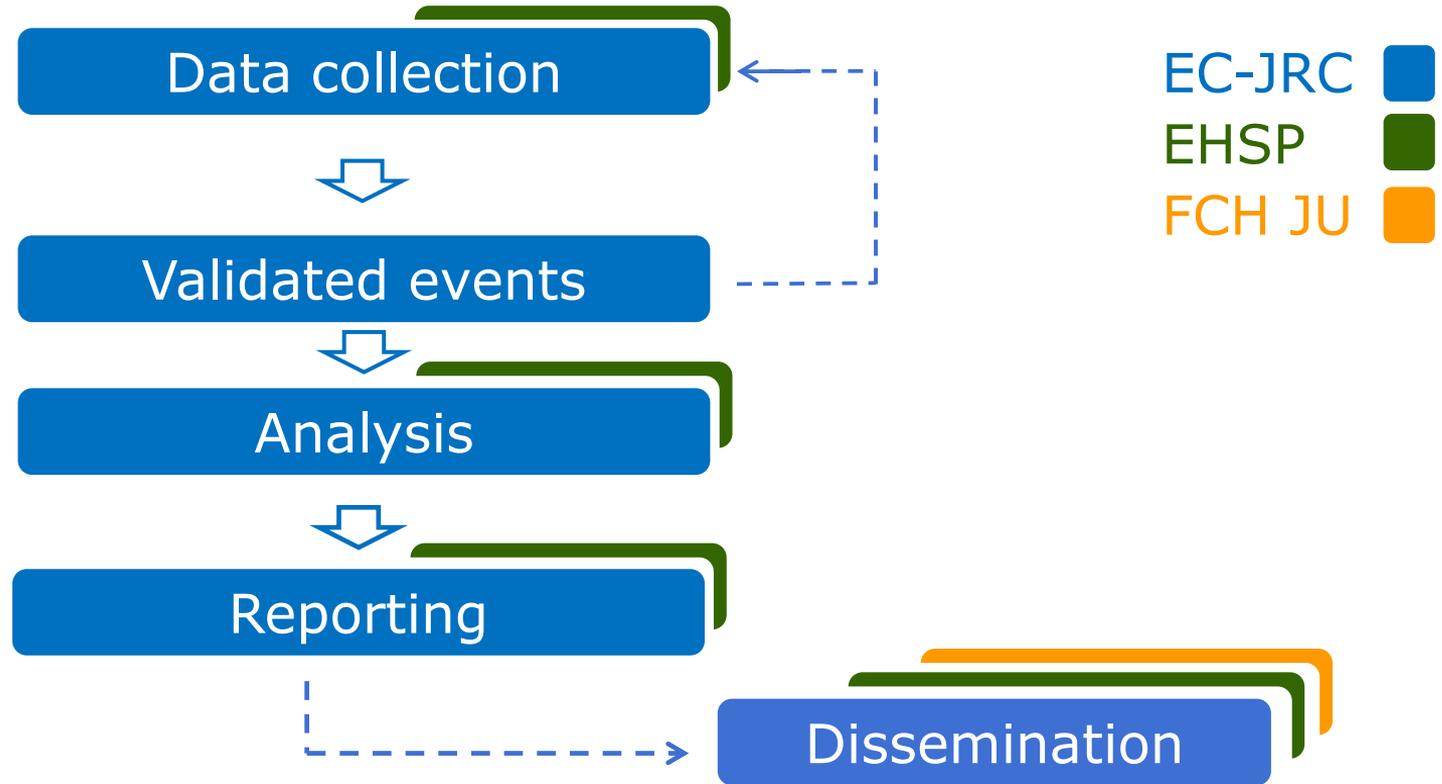
HIAD 2.0
2017

 European Commission

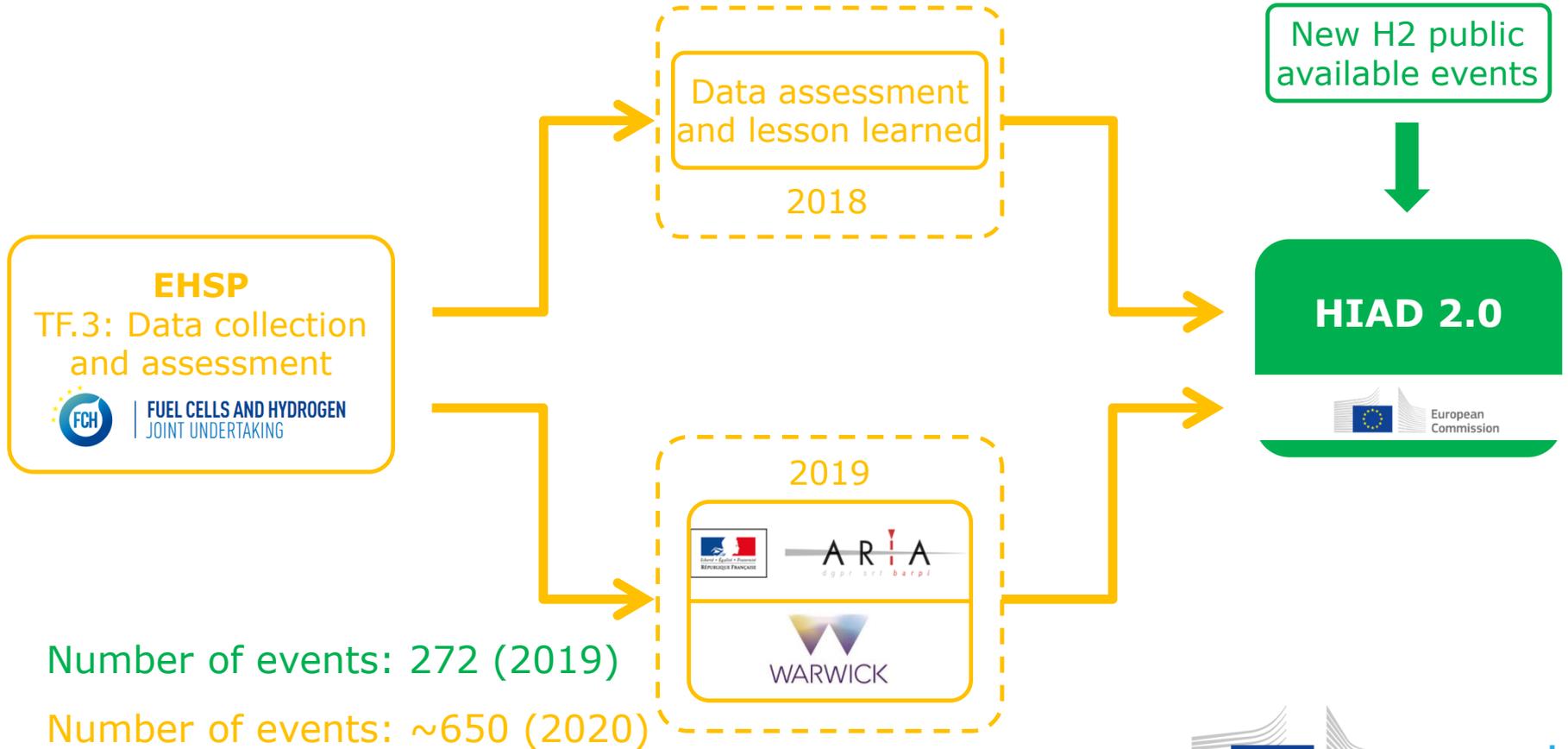
New H2 public available events

Free access 

HIAD 2.0: data collection/analysis process



HIAD 2.0: current status & future steps



Number of events: 272 (2019)

Number of events: ~650 (2020)

Recent public events (*still under investigation*)

23/05/2019

Hydrogen tanks at ceramics company at Gangneung Science Park (Solar-to-Hydrogen facility, South Korea) exploded

- An engineer was demonstrating the system, feeding hydrogen from the tanks to FC units for generation.
- Two people at site visit were dead, and six were injured



02/06/2019

An explosion at a chemical plant in Santa Clara (California, USA) during the filling of hydrogen distribution trailers

- No fatalities and no on-site injuries



10/06/2019

Explosion at Kjørbo hydrogen filling station outside Oslo (Norway)

- No fatalities and no on-site injuries
- Stations within the same product family on a temporary standby until the root cause has been identified; this includes stations both in Europe and in the US, on a total of 10 sites



HIAD 2.0: home page



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HIAD 2.0 : Hydrogen Incidents and Accidents Database

[European Commission](#) / [EU Science Hub](#) / [ODIN](#) / **HIAD 2.0**



HIAD

The Hydrogen Incidents and Accidents Database, is an international open communication platform collecting systematic data on hydrogen-related undesired events (incidents or accidents)

DATA RETRIEVAL



The data retrieval module allows you to select and view HIAD events.

REPORT AN EVENT



If you are interested in submitting HIAD events, please provide details of the event via this link.



HIAD 2.0: data retrieval

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HIAD : Event Selection

European Commission / EU Science Hub / ODIN / HIAD / Event Selection

SELECT LIST OF EVENTS EVENT DETAILS

Event classification

- Hydrogen system initiating event
- Non-Hydrogen system initiating event
- False positive

Physical Consequences

- Jet Fires and Explosions
- No Hydrogen Release
- Unignited Hydrogen Release

Application stage

- Chemical/Petrochemical industry
- Hydrogen production
- Hydrogen refuelling station
- Hydrogen transport and distribution
- Laboratory / R&D
- Non-Road vehicle

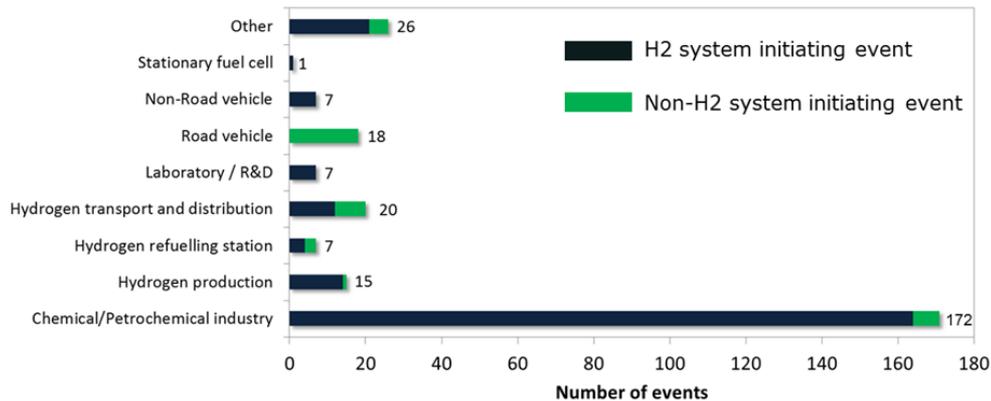
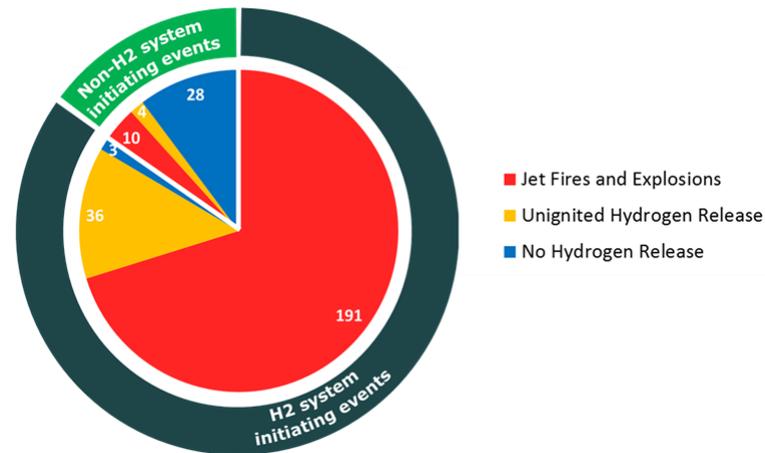
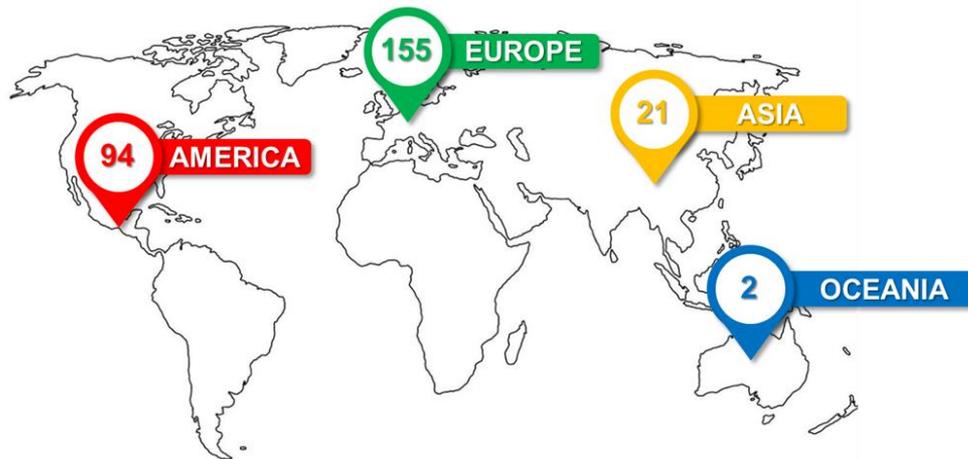
CURRENT EVENT COUNT: 272

ADVANCED SELECTION RESET SELECTION GENERATE REPORT

Event classification (definition):

- Non-hydrogen system initiating event:** event not directly caused by the hydrogen system (e.g. sudden, unintended damage to hydrogen vehicles, installations or plants caused by impact, high voltage, failure of conventional components, etc.)
- Hydrogen system initiating event:** event triggered directly by system containing hydrogen (e.g. rupture of hydrogen pipe, valve, tank)
- False positive:** emergency alarm or procedure triggered in the absence of any actual problem; a hydrogen sensor giving a false alarm, for instance, falls in this category

HIAD 2.0: data analysis



HIAD 2.0: results from EHSP analysis 1/3



Inspection and maintenance

- Regular inspection before and during service to detect:
 - materials/components/process defects
 - faulty connections
 - materials failure
 - ...
- Some cases indicated the need for:
 - the revision of the inspection plan
 - increasing the inspection frequency
- Corrosion has also been the cause of several accidents
- Periodic verification/audit of the structural integrity of the hydrogen tank
- Need for regular check of safety equipment, regular leakage tests, inspection on hydrogen embrittlement

HIAD 2.0: results from EHSP analysis 2/3



Personnel

- Staff training and supervision are key to safety
 - Quite a few incidents were caused by human error
- The training procedures should be made more stringent and updated
 - regular intervals for the personnel responsible for plant operation
 - even for operation considered "routine"
- Process instructions have to be made readily available
- Human errors cannot be completely prevented
 - it might be useful to insist that some key interventions critical for plant operation cannot be bypassed, ignored or silenced (blockage devices, alarms of extreme intervention, etc.)

HIAD 2.0: results from EHSP analysis 3/3



Cascading events

- Some accidents might consist of several causal events which
 - if occurred separately, might have little consequences
 - but if these minor events occurred simultaneously, they could still result in extremely serious consequences.

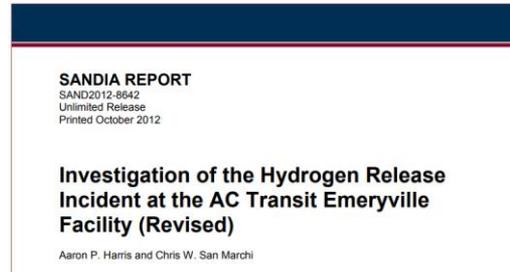
Miscellaneous

- Adequate risk assessment should be conducted for installations concerning potential chemical reactions leading to hydrogen gas production
- Safe venting of hydrogen and installation of hydrogen sensors should be emphasized
- Clear guidance should be established about the lifetime of critical components in addition to their regular inspection and replacement

HIAD 2.0: challenges

- It is very difficult to obtain a full cause-consequence analysis of complex events.
 - investigations aiming at identifying responsibility (legal, criminal and also insurance-related) are usually never published
 - also the collection of technical details needed for a scientific analysis are hindered

- **GOOD** example:



Date of the event 04/05/2012

- **BAD** example: fatal forklift explosion at customer plant hits Plug Power's Stock (24/05/2018)
 - No public information so far...

HIAD 2.0: next steps

Database ready to be used:

<https://odin.jrc.ec.europa.eu/giada/>



Your feedback is very important!



Share among colleagues



Populate the databases with events
(using the on-line event report form)

Stay in touch



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