



ISO/TC 197  
Hydrogen technologies

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Secretariat: SCC (Canada)

**Mini round table H2 quality 2016-12**

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# ISO TC197, Mini round table H2 Quality

**December 9<sup>th</sup> 2016**

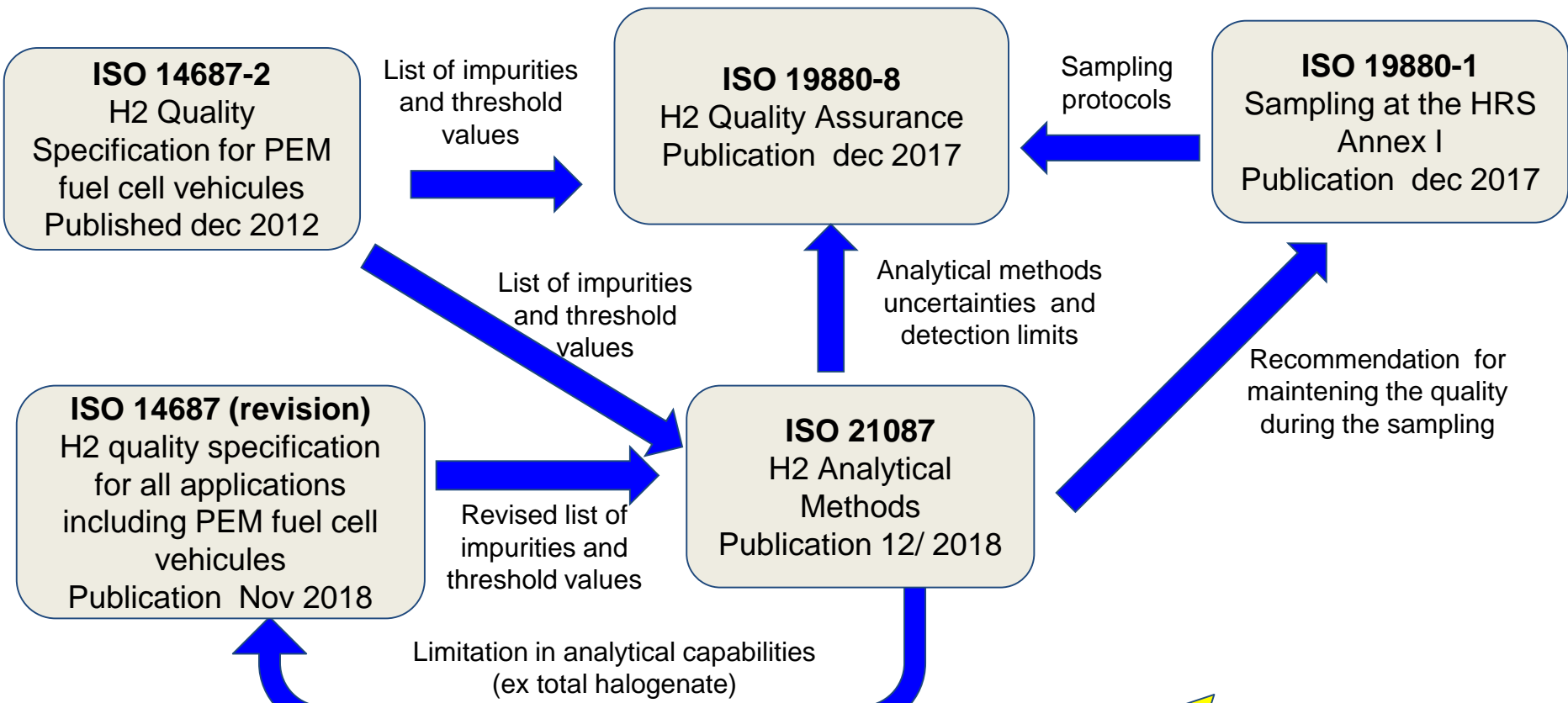
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# ISO H2 Quality Standards status



**Avoid Gaps and overlaps  
Need good coordination**



### **The scope of ISO 14687 Grade D:**

**This International Standard specifies the quality characteristics of hydrogen fuel in order to assure uniformity of the hydrogen product as produced and distributed for utilization in PEM FCV applications.**

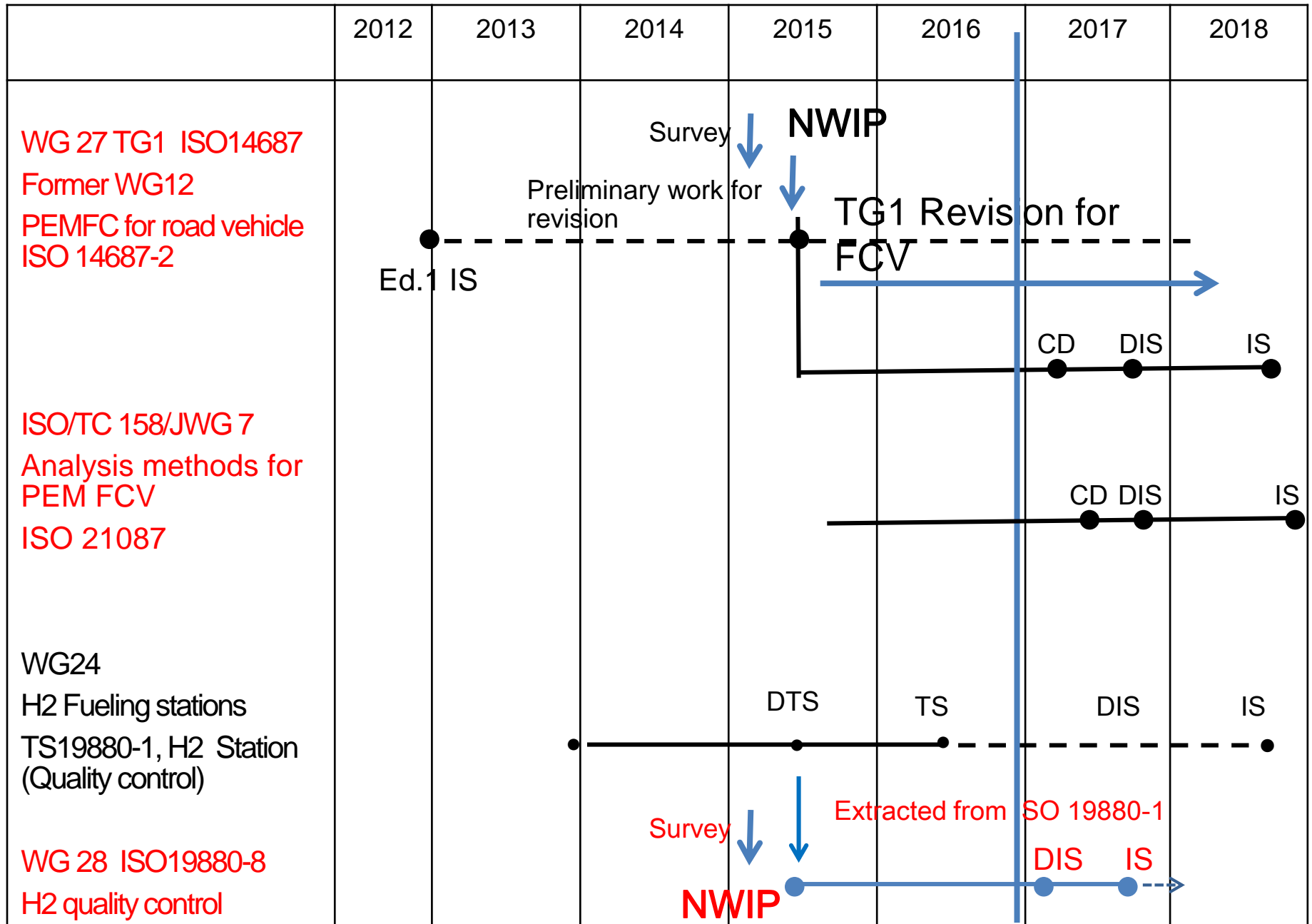
### **The scope of ISO 21087:**

**This International standard specifies the analytical methods for ensuring the quality of the hydrogen quality at hydrogen distribution bases and hydrogen fuelling stations for PEM fuel cells for road vehicles.**

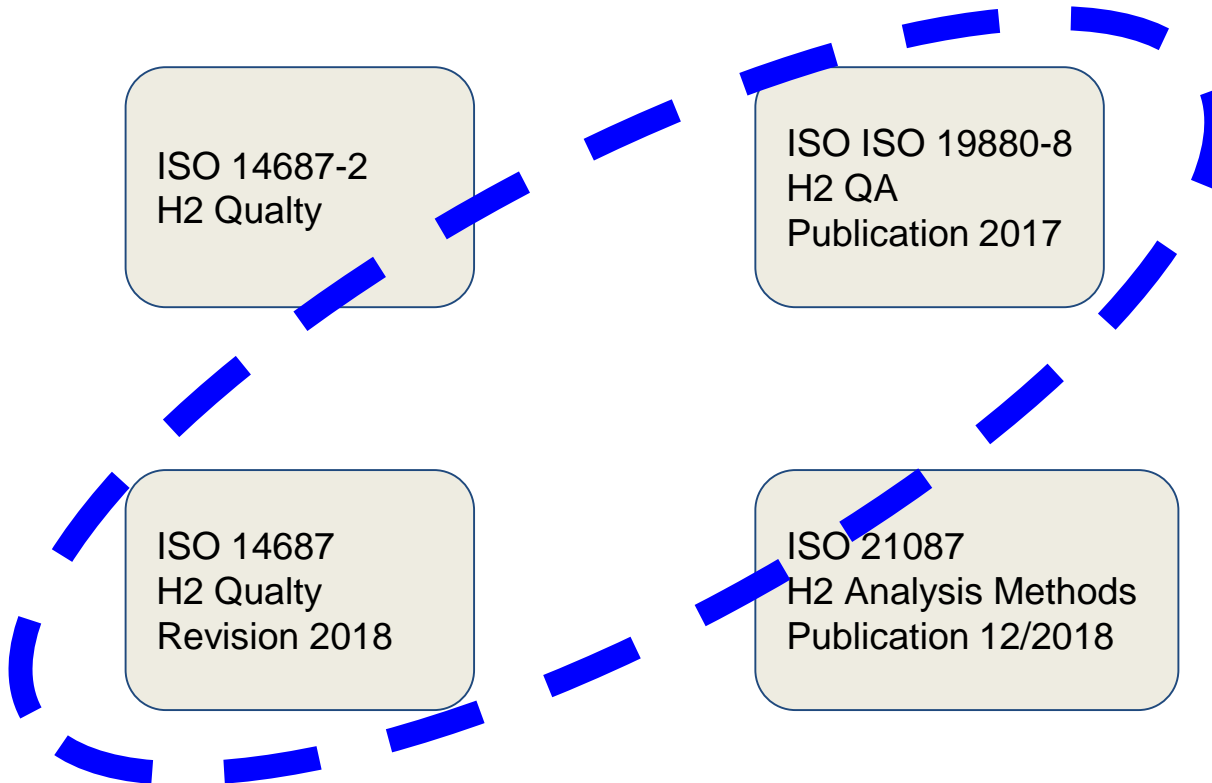
### **The scope of ISO 19880-8:**

**This International standard specifies the protocol for ensuring the quality of the gaseous hydrogen quality at hydrogen distribution bases and hydrogen fuelling stations for PEM fuel cells for road vehicles.**

# Schedule for developing H2 quality standards



# CEN H2 Quality Standards statu



Anticipate on revision  
of ISO 14687.  
Include guidance for  
QA

To avoid disparity on  
MS regulations.

CEN Std defined by CEN TC268 WG5 under mandate M533

To be published end of 2017.

Draft developed by EIGA WG11 with the participation of OEMs based on TC197 WG27 and 28 work

# Real life data needed

- Real data on actual H<sub>2</sub> quality supplied by HRS
  - production
  - transport
  - HRS
- Results of long time test from OEMs
- Effect of impurities observed in real life on FCEV

Sensitive data.

# A risk assessment approach to H2 quality



OCCURRENCE CLASS	CLASS NAME	OCCURRENCE OR FREQUENCY	OCCURRENCE OR FREQUENCY
0	<u>Very unlikely (Practically impossible)</u>	Contaminant above threshold never been observed for this type of source in the industry	Never
1	<u>Very rare</u>	Heard in the Industry for the type of source/ Supply chain considered	1 per 1 000 000 refueling
2	<u>Rare</u>	Has happened more than once/year in the Industry	1 per 100 000 refueling
3	<u>Possible</u>	Has happened repeatedly for this type of source at a specific location	1 out of 10 000 refueling
4	<u>Frequent</u>	Happens on a regular basis	<u>Often</u>

SEVERITY CLASS	FCEV Performance impact or damage	Impact categories		
		Performance impact	Hardware impact temporary	Hardware impact permanent
0	<ul style="list-style-type: none"> <li>No impact</li> </ul>	No	No	No
1	<ul style="list-style-type: none"> <li>Minor impact</li> <li>Temporary loss of power</li> <li>No impact on hardware</li> <li>Car still operates</li> </ul>	Yes	No	No
2	<ul style="list-style-type: none"> <li>Reversible damage</li> <li>Requires specific procedure, light maintenance.</li> <li>Car still operates.</li> </ul>	Yes or No	Yes	No
3	<ul style="list-style-type: none"> <li>Reversible damage</li> <li>Requires specific procedure and immediate maintenance. Gradual power loss that does not compromises safety</li> </ul>	Yes	Yes	No
4	<ul style="list-style-type: none"> <li>Irreversible damage</li> <li>Requires major repair (e.g. stack change).</li> <li>Power loss or Car Stop that compromises safety</li> </ul>	Yes	Yes	Yes or No <sup>1</sup>

		Severity				
		0	1	2	3	4
Occurrence As the combined probabilities of occurrence along the whole supply chain	4					
	3					
	2					
	1					
	0					
Key	Unacceptable risk ; additionnal control or barriers are required	Further investigations are needed: existing barriers or control may not be enough		Acceptable risk area Existing controls acceptable		



# TCO approach of quality

		Severity				
		0	1	2	3	4
Occurrence As the combined probabilities of occurrence along the whole supply chain	4					
	3			X		
	2					
	1					
	0					
Key	Unacceptable risk ; additional control or barriers are required		Further investigations are needed: existing barriers or control may not be enough		Acceptable risk area Existing controls acceptable	

# TCO approach of quality

		Severity				
		0	1	2	3	4
Occurrence As the combined probabilities of occurrence along the whole supply chain	4					
	3			X		
	2			↓		
	1					
	0					
Key	Unacceptable risk ; additional control or barriers are required		Further investigations are needed: existing barriers or control may not be enough		Acceptable risk area Existing controls acceptable	

Reduce probability of occurrence,

# TCO approach of quality

		Severity				
		0	1	2	3	4
Occurrence As the combined probabilities of occurrence along the whole supply chain	4					
	3			X		
	2					
	1					
	0					
Key	Unacceptable risk ; additionnal control or barriers are required		Further investigations are needed: existing barriers or control may not be enough		Acceptable risk area Existing controls acceptable	

or mitigate severity for the vehicle,  
(e.g. On board purification)

# TCO approach of quality

		Severity				
		0	1	2	3	4
Occurrence As the combined probabilities of occurrence along the whole supply chain	4					
	3			X		
	2					
	1					
	0					
Key	Unacceptable risk ; additionnal control or barriers are required		Further investigations are needed: existing barriers or control may not be enough		Acceptable risk area Existing controls acceptable	

Reduce probability of occurrence,  
or mitigate severity for the vehicle,  
(e.g. On board purification)

What is the lowest cost for end user? ⇒ Sensitive data

# Conclusion

- Real life data
  - H2 quality along the supply chain
  - Long time tests by OEMs
  - Actual effect of impurities on FCEVs
- TCO approach
  - Adding barriers against contaminants
  - Adding mitigation system on board

Sharing sensitive data  $\Rightarrow$  common project,

Clean room mechanism?

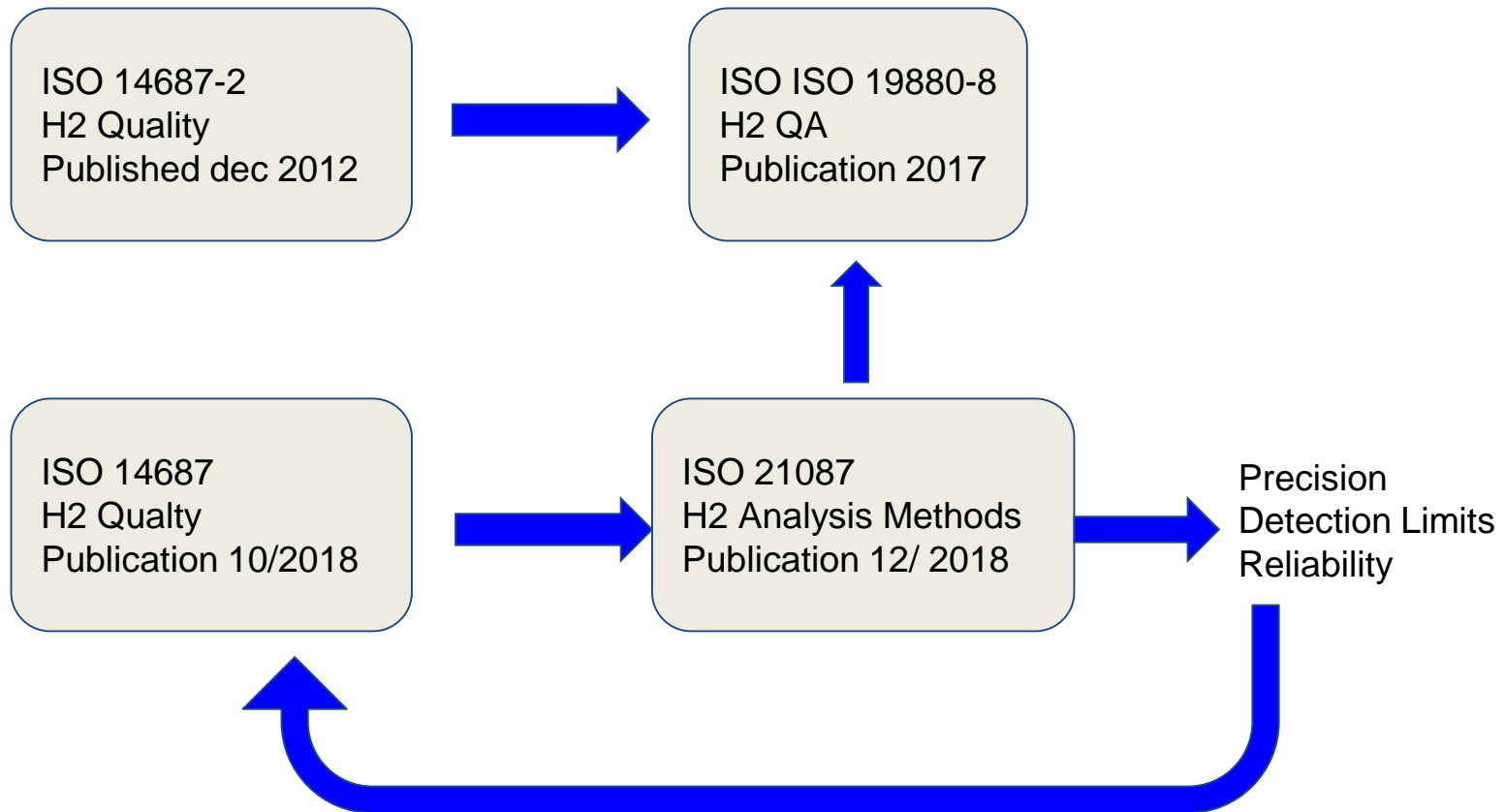
Standardized reporting

Data validation





# ISO H2 Quality Standards status



**Avoid Gaps and overlaps**

# AFI Status

Today AFI refers to ISO 14687-2 2012.

Change to reference CEN std (Delegated Act) in the AFI will be initiated after publication.

Process duration unclear (1y).

Discrepancy between CEN std schedule and AFI. CEN std should have been ready at least 1 year before the coming into force of AFI

Discrepancy between ISO revision schedule and





# TCO approach of quality

		Severity				
		0	1	2	3	4
Occurrence As the combined probabilities of occurrence along the whole supply chain	4	Green	Red	Red	Red	Red
	3	Green	Yellow	X	Red	Red
	2	Green	Green	Yellow	Red	Red
	1	Green	Green	Green	Yellow	Red
	0	Green	Green	Green	Green	Green
Key	Unacceptable risk ; additional control or barriers are required		Further investigations are needed: existing barriers or control may not be enough		Acceptable risk area Existing controls acceptable	

Reduce probability of occurrence,  
or mitigate severity for the vehicle,

Revisit On board purification

What is the lowest cost for end user? ⇒ Common WG