

**Finalizing hydrogen and fuel cell
standards through data projects:**

Hydrogen Vehicle Fueling

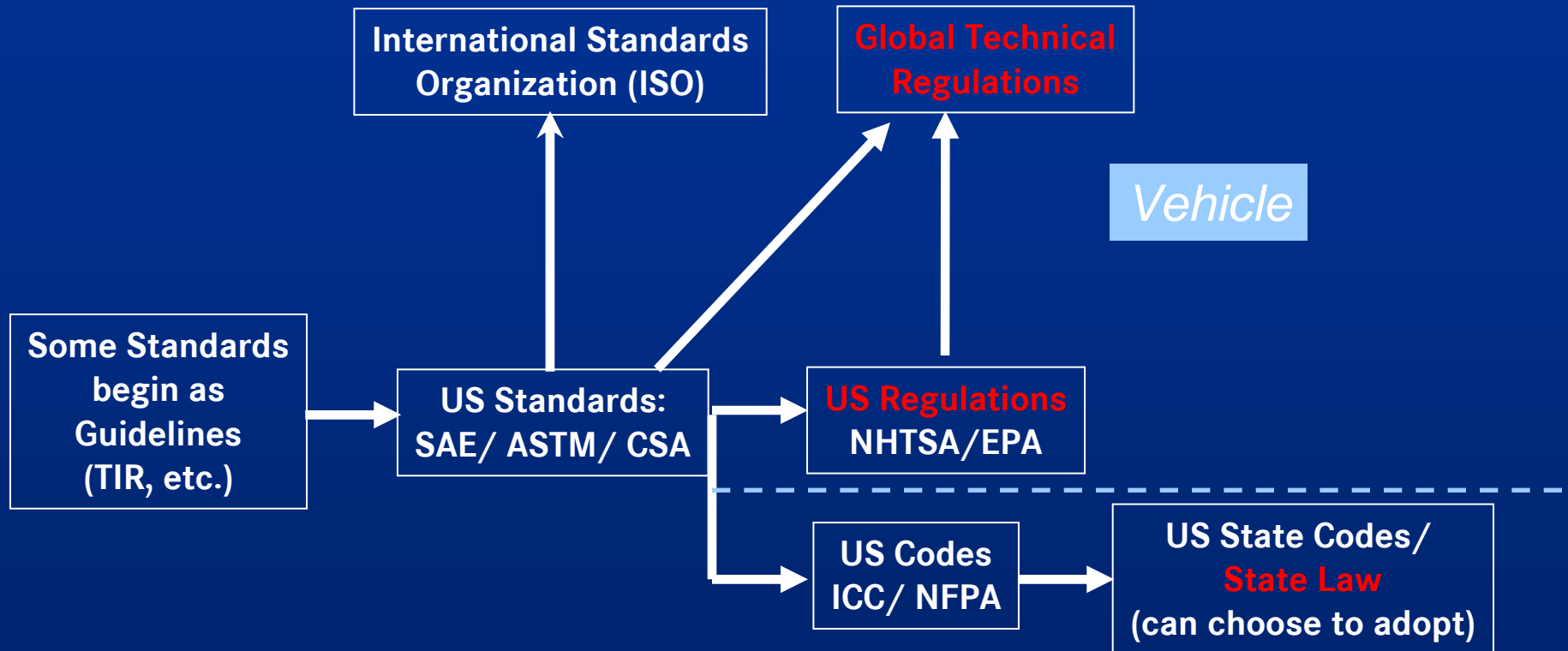
Jesse Schneider

Chrysler

- General Codes & Standards Overview
 - What are C&S
 - Critical data needed for C&S
- Focus of Talk:
 - Standardization Fuel Cell Vehicle Fueling at 70MPa (10,000PSi) with OEM & Fueling Industry and Government Support

H2 Standards & Codes Lead to Regulations & Laws

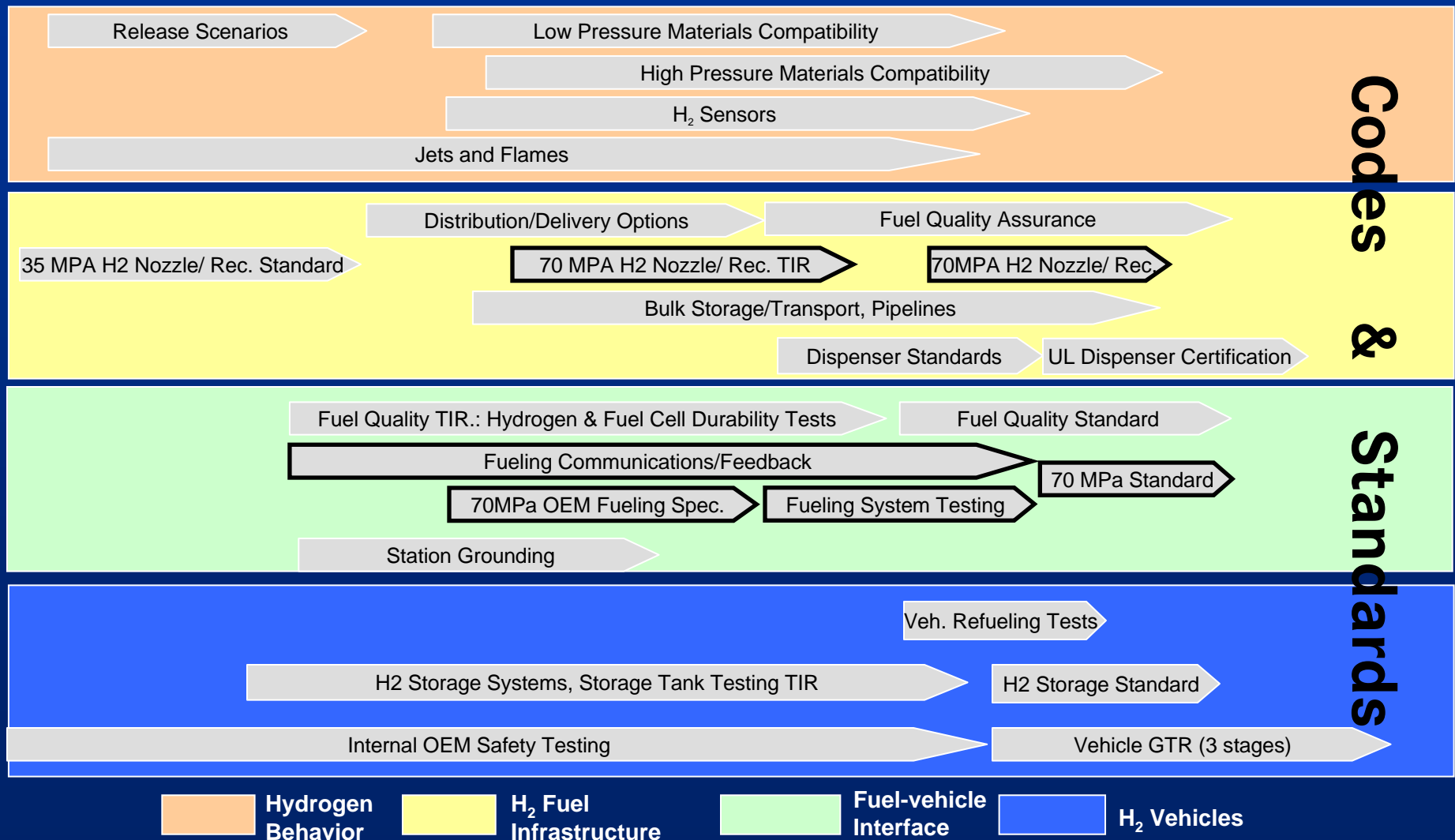
- GTR's are to meant to Harmonize global regulations



- Codes generally utilize Standards
- Sometimes codes are written before standards

*Building/
Station*

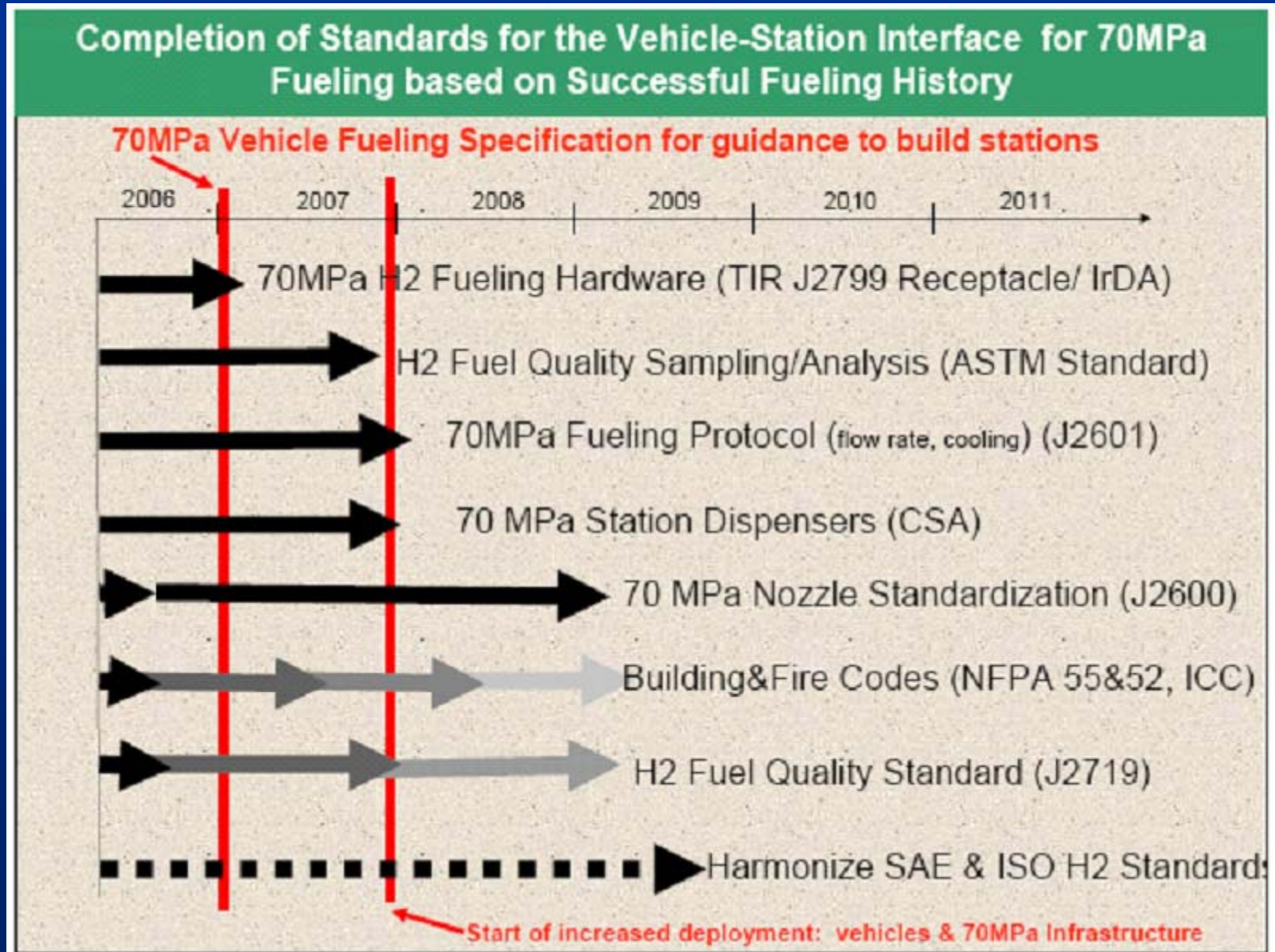
Codes and Standards Commercialization Data Timeline Overview*



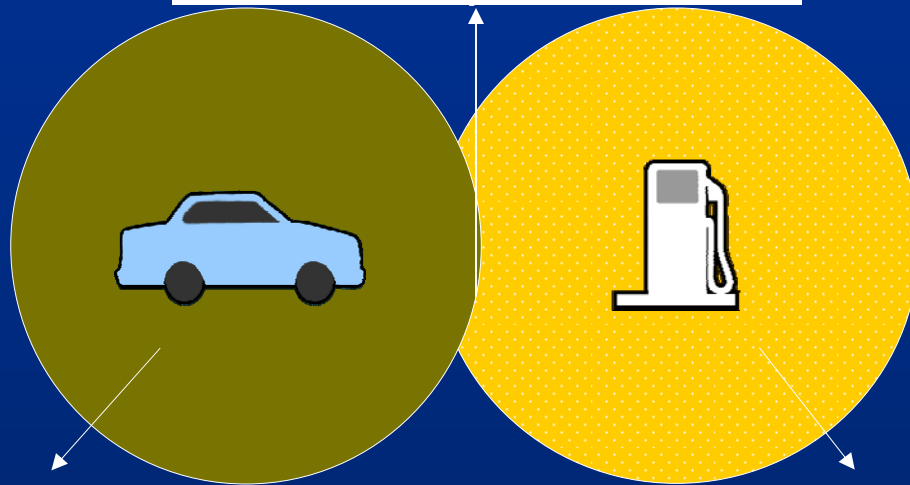
*Supported by US DOE

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Interface Guidelines & Codes
and Standards established
today:



Address safety, user needs, and other issues →
facilitate implementation



- SAE J2600: 35MPa Receptacle
- Draft SAE J2601: Communication & Targets
- SAE J2799: 70MPa Nozzle TIR
- SAE J2719 (&ISO): Hydrogen Quality



- SAE J2600: Nozzle
- CSA 4.3: Dispenser confirmation of SAE J2601
- SAE J2719 (&ISO): Hydrogen Quality
- Codes: ICC, NFPA, State Codes: Adoption of Standards: Grounding, PRV setting, CSA, SAE standards

In 1997, 9 OEMs & H2 Providers created
a “70MPa” Fueling Spec for safety and
performance guidance

Fueling Specification for 70 MPa Compressed Hydrogen Vehicles



General Motors



CHRYSLER

DAIMLER



HYUNDAI · KIA MOTORS



TOYOTA

NISSAN

VOLKSWAGEN

HONDA



USFCC H2 Infrastructure Implementation Discussion
“2010 Roundtable” (J. Schneider)

70MPa Hydrogen Fueling Specification



*Document can be downloaded from NextEnergy.Org Website

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Powertech Testing Plan: Phase 1: Data Guidelines 2007 Phase 2: Data Standards 2008

2 Testing Overview

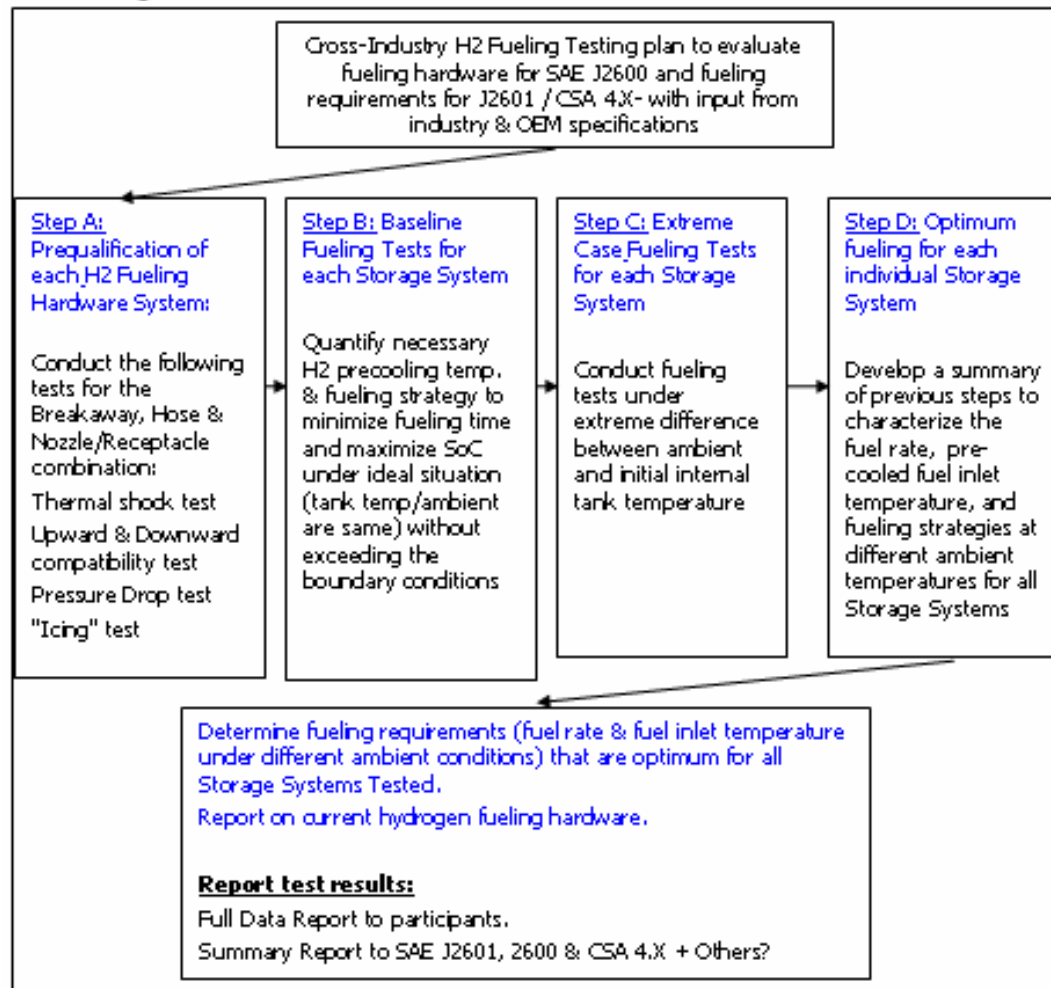


Figure 1: Testing overview flow chart



70MPa Receptacle Geometry

- Either Nitto/ Walter/ Weh to be voted on November SAE Interface Group:



70MPa Fast Fill Test Facility



**2 Environmental Chambers:
Stationary & On-Board
Storage**



**Fast Filling capability
With realistic ground
storage**

70 MPa Pre-cooler

- **70 MPa Fueling Hardware “Technical Information Report”:**
 - 70MPa Receptacle Geometry
 - Optional IrDA Vehicle-to-Station Comm. Hardware & data protocol
 - 2 years further field & lab trial before combining into J2600



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Enabling Hydrogen 70MPa
fueling with safety,
convenience, performance

Good Customer Interface:
70MPa “Conventional-Like” Dispensers
and nozzles example.



Fueling Accessibility:
Public H2 Fueling Station
Example



- * Retail 70MPa Dispenser: Gilbarco with Web Nozzle
- ** First Public H2 Station (35MPa): Shell

70MPa Multi-Client Study Powertech Testing Plan Status: Completion 2008

7 OEMs have agreed to fueling their 70MPa H₂ system under extreme fueling conditions (-40°C to +50°C) and share summary data:

OEM bringing hardware/ data

Daimler & Chrysler (*completed*)

Ford (*slated completion in May*)

GM (*complete in April*)

Honda (*complete in April*)

Nissan (*Complete in April*)

Toyota (*slated completion in May*)

Sponsors:

Shell

BP

Air Liquide

Nippon Oil

US DOE (Sandia National Labs)

Linde



70MPa Receptacle Geometry

- Either Nitto/ Walter/ Weh to be voted on November SAE Interface Group:

Couplings for 70MPa



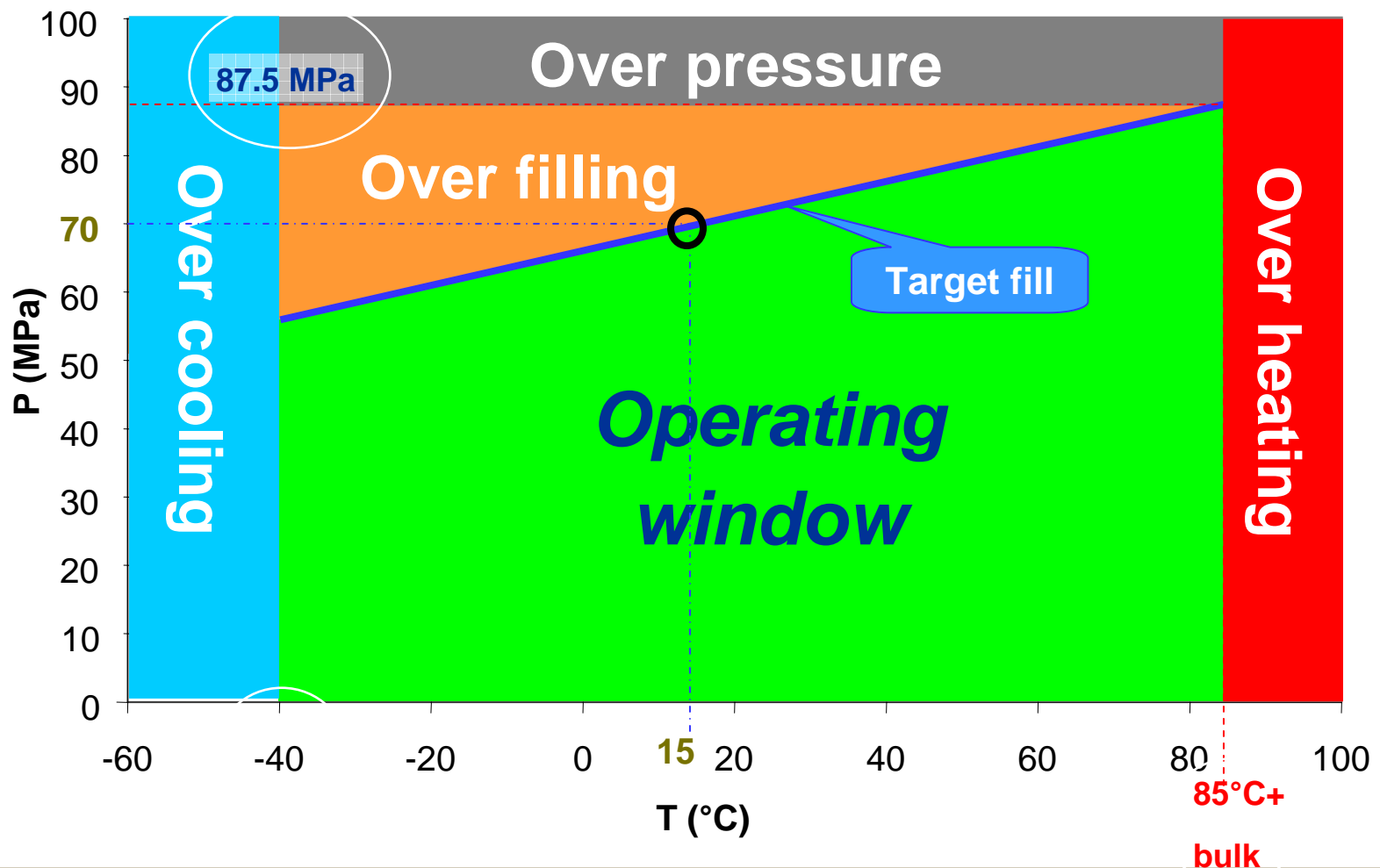
"HHV CUPLA"
(High-pressure Hydrogen for Vehicle)

K17 with Commun

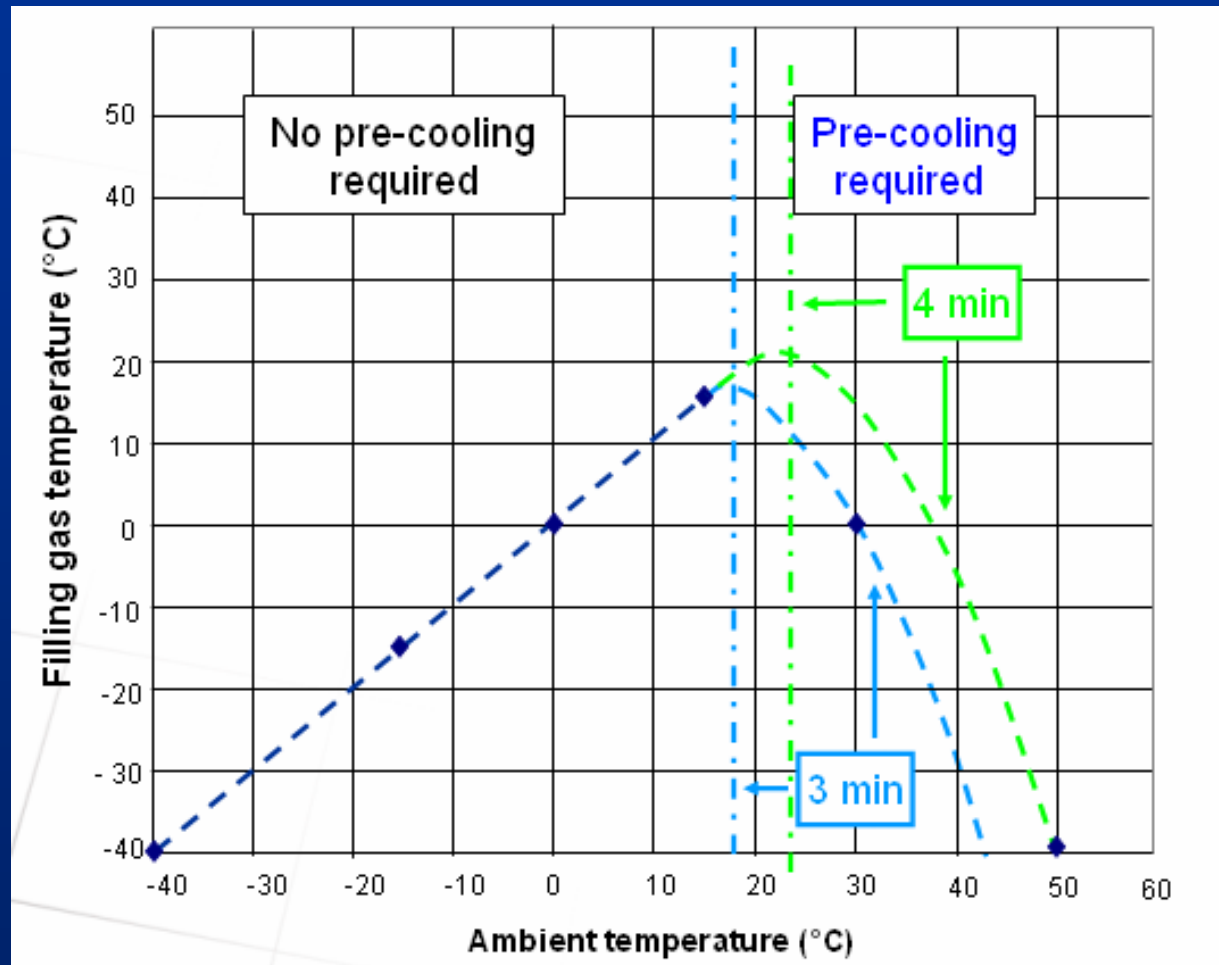


With infrared system for data transmission to SAE J2501

70MPa Gaseous H₂ Fueling Limits

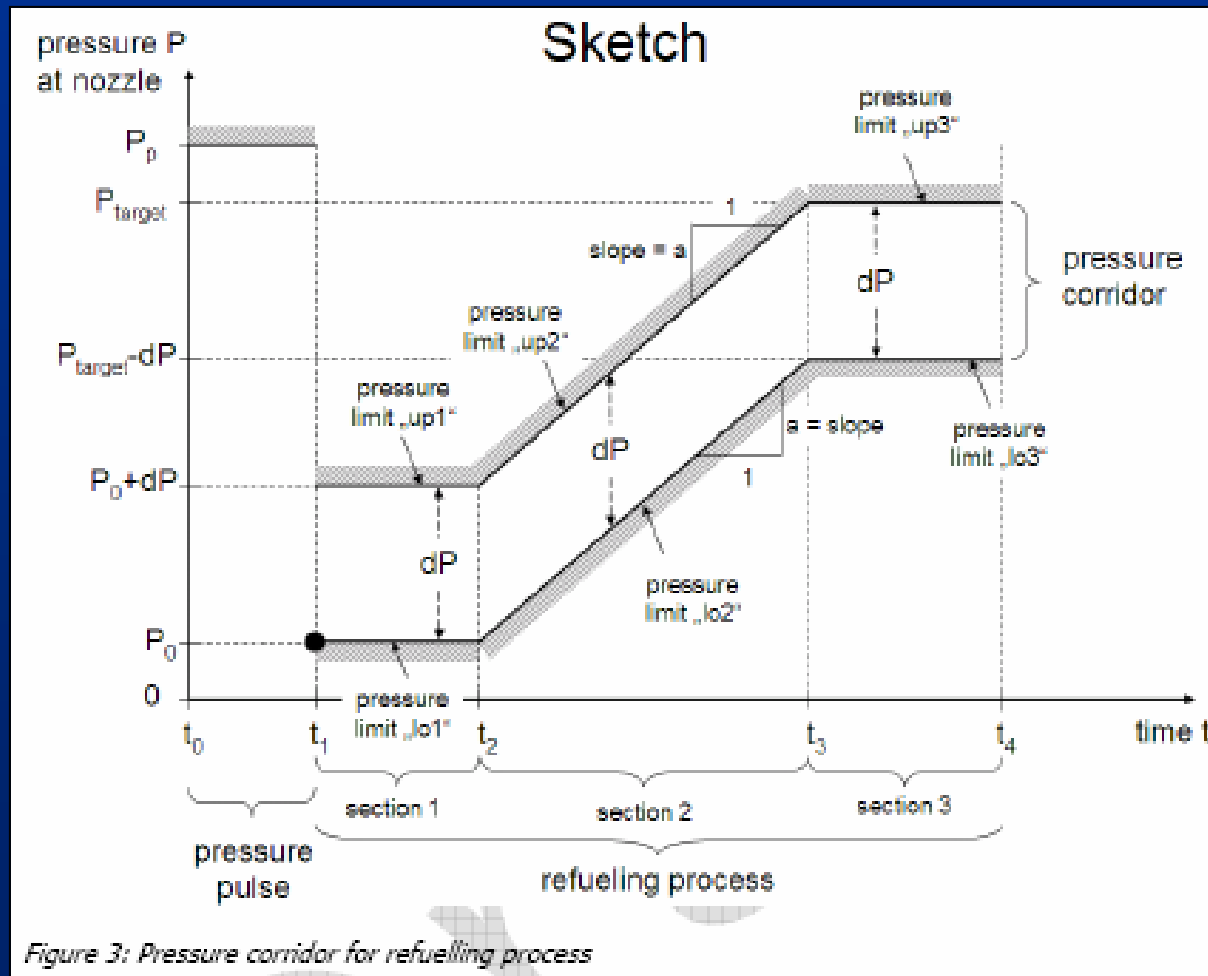


Daimler/Chrysler 70MPa H2 Storage Fueling Results*



* Only for this specific tank system. For standardization- composite data is needed also from other 5 OEMs.

Goal: Establish 70MPa Fueling Corridor



Example:
Daimler/ Chrysler Tank

Temp. (C)

3 min. $-40 > x > 30$

4 min. $30 > x > 50$

Important Outcomes of 70MPa Study for determining fueling protocol*

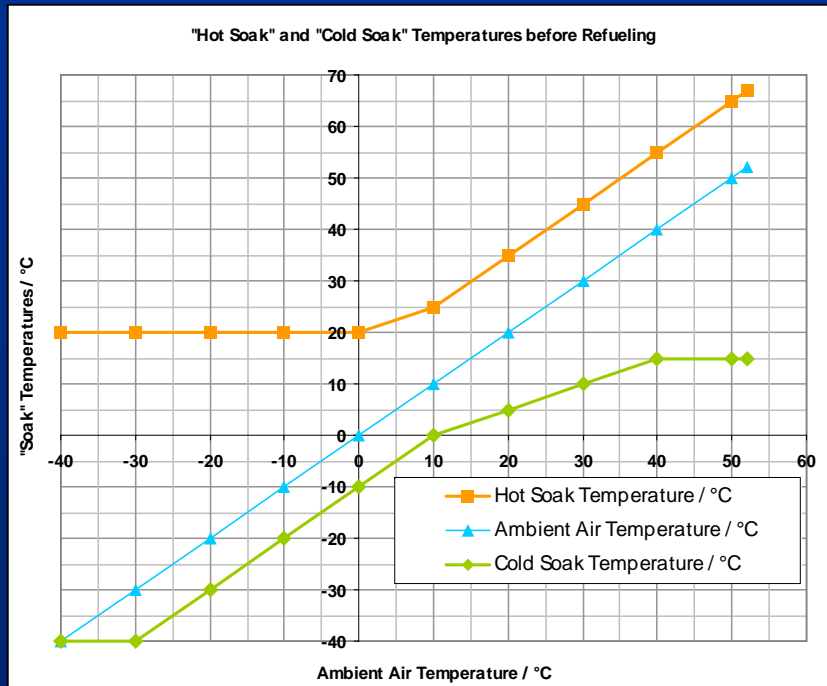
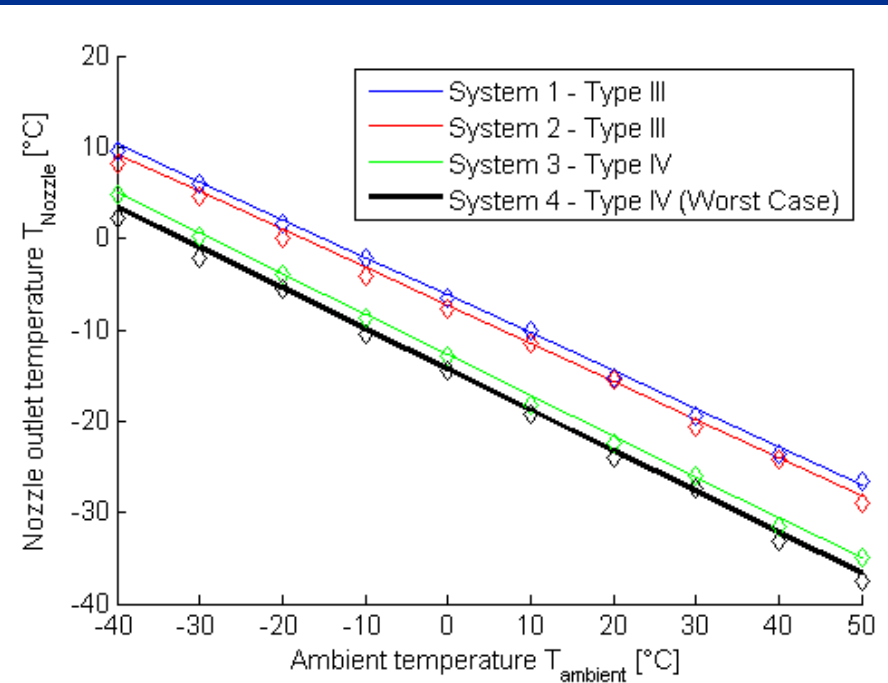


Illustration of "Cold Soak" and "Hot Soak" temperature definition also for determination of non-communications fueling



Example for testing result – nozzle outlet temperature vs. ambient temperature for selected tank systems

* Taken From Powertech 70 MPa Tank Fueling Testing Matrix Testplan

Conclusion

- Guidelines and codes and standards are available in 2008 to establish 70MPa fueling stations
- Codes and Standards are one track to be completed for hydrogen and fuel cell vehicles commercial use by end of 2010
- Multiple Data projects are underway to support program moving forward: funded by US. DOE and other organizations

Thank you

Questions?

What's Next? Feasibility of Hydrogen Home Fueling at 70MPa

High Pressure Hydrogen
Electrolyzer
at medium pressure

Steel DOT or ASME cylinders
for medium pressure storage

High Pressure Ionic
Compressor to 70MPa+
Fueling

6 Hour/ 2 Hour

70 MPa
Hose, Breakaway and nozzle

Hydrogen Residential Fueling



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