SGS 4 - 17

4th Meeting of the Hydrogen Fuel Cell Vehicle (HFCV)
Subgroup on Safety (SGS)
Tokyo

24-26 September 2008

DRAFT Minutes

Place: JASIC Office
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Schedule:

	Wednesday, 24	9:30 – 17:30, reception at 18:30
	Thursday, 25	10:00 – 18:00
	Friday, 26	10:00 – 18:00

1. Welcome and Introductions

Introduction by Mr. Narusawa. Photo was taken for the press release, but the meeting is a closed meeting. Welcome by Minister of Infrastructure and Transportation. Kyoto Accord and next framework - fuel cell vehicles will be part of the solution for global warming. Hope for good discussions and fruitful results.

Representatives from NTSEL, JASIC, Toyota, JAMA, Nissan, Volvo, Daimler, OICA, GM, Germany, TUV, European Commission, USDOT/NHTSA, Transport Canada, China, ISO TC197, Korea, SNL, LANL, USDOE, and BMW.

2. Practical Arrangements

Reception this evening at 6:30pm. 15 minute walk from the meeting place. Seventh floor. Lunch – restaurant map will be distributed (Wednesday 12:30pm for 1 hour). Thursday and Friday, the meeting will start at 10am and lunch will be at 1:00pm for 1 hour)

Friday evening there is a special seminar on hydrogen and fuel cell vehicles at the Center for International Cooperation at 6pm-7:30pm.

3. Approvals
   3.1 Agenda for 4th meeting

No comments, no changes (except for the start time for Thursday and Friday). Order of discussion will be modified in practice, but not in the written agenda

   3.2 Minutes/decisions of the 3rd Meeting

Action item list from 3rd meeting:
- Revised OICA proposal distributed
- Safety philosophy from TUV distributed
- SAE presentation (document has not been submitted, but will be distributed)

- Korea will present an update
- EU regulation on hydrogen vehicles will be presented, and the document will be distributed
- US will give a presentation on NHTSA research
- China report on hydrogen at the Olympics
- Comments on J2579 will be presented
- Canada report on localize fire protection (report will be sent later)
- ISO update

Approval of the minutes of the 3rd meeting (distributed). OICA had a comment and change was made. On page 2 (bottom) – summary of EU presentation, second to last line, Directives have to be transposed (implement in their own legislative procedure) by member state (instead of adopted). Directive is not effective until implemented in the national legislation. Page 3, correction to email address. Additional technical and editorial comments will be distributed.

Corrected document will replace the one currently on the UNECE web site.

4. Reports of UN Activities

4.1 43rd Session of GRSP (May 2008)

Meeting report posted on UNECE site under ECE/TRANS/WP_29/GRSP/43
Page 7 has the report of the 3rd meeting. Terms of reference developed by the Electric Safety Group will be adopted by WP.29 (in November). See agenda item 8. Minutes should be on the website soon.

4.2 145th Session of WP.29 (June 2008)

GRSP report includes the terms of reference of ESG, endorsed these TOR, although not officially approved (that will happen in November). Work can begin.

Mr. Albus gave a report that SGS had agreed on basic structure of the GTR – three parts. Environmental elements (SGE) will not be included in Phase 1, because there is limited activity in this area.

Note: throughout the document:
Q = Question
A = Answer
C = Comment

Q; Who made this decision?
A: There is only one chair of the SGE - European Commission. The lack of progress resulted in this decision. There were no objections to this at the last WP.29 meeting. The technical report will be prepared by the SGE chair. Albus will then prepare a report on both SGs. At the next WP.29 session, it is likely that the vote will be to accept the report.

5. Reports of other activities

5.1 National/Regional

ACTION: All presentations should be sent electronically to the Secretariat (Mr. Nha).

Canada:
Localized Fire Protection Considerations. Report should be available shortly. Powertech studies on: high pressure cylinders – lessons learned from CNG vehicle tank failures (completed in 2007); and localized fire protection considerations (report is not yet complete). Many of the incidents were localized fires with tanks where the PRD did not deploy because the tank structure failed first (even TPRDs do not deploy unless the TPRD is directly in the fire). Proposed localized fire test with temperature ramp.
C: Proposed test may not work well for a safety solution that has been proposed (tube) - Germany Ministry of Materials Research and Testing (concern is that the plastic tube used as a safety device would be compressed and might not operate as designed). The proposed test might still be ok, since the tank is suspended (there is no contact with the test device).
C: PRD failures (or failures to deploy) are the issue. Other test procedures (mostly for CNG tanks) do not destroy the tank (so are less expensive).
Q: Can you get the right temperature profiles and rates with this procedure?
A: Data are from OEM studies – trying to match the profiles. Does seem to work (see the graph presented).

China:
FCVs demonstration at the Olympics.
Q; Are the alarm levels part of a regulation?
A: No, the levels are just for this bus demonstration, and are not part of a regulation.
Q: What is the hydrogen storage pressure in the passenger vehicle?
A: 350 bar.
Q; What standards have been or are being developed?
A: Two draft standards on definitions and safety are completed. Two more should be completed (drafted) by end of year: dynamic test methods and hydrogen consumption.

European Commission:
Update on EU regulation on type approval of HFCV.
Parliament adopted the co-decision Regulation on 3 September 2008. There is an amendment (new recital 7) notes that if/when a GTR is developed, it should be considered to adapt the regulation to match the requirements of the GTR. Comitology regulation is expected to be developed in early 2009.
Possible implementation of GTRs in the EU:

- amend existing UN/ECE regulation
- adopt the EU regulation with the provisions of the GTR
- adopt a new regulation under the 1958 agreement with the provisions of the GTR (requires agreement of 1958 signatories)
- adopt the EU regulation with the provisions of the GTR, amending the current EU type-approval legislation

Q: Implementation date?
A: Depends on publication date, 24 months after publication for new vehicle types (end of 2010), and 12 months after that for all new vehicles (2011). There is a conflict with these timelines and the current vehicle development timelines.
Q: Will the regulation be submitted as a candidate for the compendium of the GTR (as did Japan)?
A: Not at this moment.
Q: What is the driver for a regulation (market is expected to be small for some time)?
A: Make sure hydrogen vehicles are treated the same as conventional vehicles. Need in advance of a GTR, because even with a small market penetration, there needs to be a common treatment for HFCVs throughout Europe.

Japan:
Container maximum pressure in the current regulation: trying to change to 70 MPa (from 35 MPa). Focus on international harmonization once the completion of the development of the draft Japanese standard in October 2008. Additional discussion will be held later in agenda item 7.2.
Q: JARI S-001 and S-002 already exist – other than the change in pressure, what is the regulation that is to be drafted in 10/2008?
A: New standard will address the change in cylinder pressure.

Korea:
Research activities and Rule-making
Q: When will the research on underground garages be conducted?
A: Research will be conducted in Year 2 (next year)
Q: Any existing standards in Korea?
A: No.

USA:
Research plan at NHTSA
Safety level consistent with existing FMVSSs.
Crashworthiness issues:

- Leakage limits: surrogate fills - helium versus hydrogen; pressure level to be used.
- Electrical safety (if using helium, do not have an operating fuel cell)
- High pressure container safety

Timeline presented
Q: When will the final report be released?
A: Each task (there are 5) will have its own final report. Preliminary results will be presented at these meetings. The preliminary budgets being proposed exceed the available budget, so some modifications may be needed.

5.2 Organizations

ISO:
Standard development activities:

- fuel quality Part 1 (standard published in 1999 with some updates) – for HICEs
- fuel quality Part 2 (Technical Specification (TS) published in 2008) – for FCVs
- gaseous hydrogen fuel tanks (TS to be published in 6 months); work will continue with ongoing research
- liquid hydrogen fuel tanks (standard published in 2006)
- refueling connectors (published in 2006)
- hydrogen components – looking to fast-track standards (basing on existing standards)
- hydrogen vehicle fuel system – looking at the strategy
- vehicle safety
- fuel cell system for propulsion (IEC)
- energy consumption

Watermarked versions will be provided (assuming ISO agrees) and can be emailed to members (who will be asked to not forward them). The standards are not to be posted on the website.
ISO Proposal for GTR development:
Harmonization of the ISO and the UN/ECE draft from 2001 was successful (ISO and the EU regulations are very close).

ISO recommends a similar exercise for the GTR under development: ISO proposes to lead the storage system task force (based on EU regulations, Japanese regulations, ISO standards (under development), and SAE standards (under development)).
Q: shouldn't ISO and SAE work out their differences?
A: the GTR needs to harmonize all four standards
C: there is too much activity already that is required – not sure if there is enough time to also work on this task force.
C: this group is already a "task force" and we should focus on the work in the GTR
C: as soon as we get the ISO standards, we can begin to examine the technical aspects and compare to SAE aspects and others. In addition, research may need to be performed to validate the specifications contained in the (draft) standards.

SAE:
J2579 Test Program (TIR published in January 2008 – another version may come out this year)
Storage of gaseous hydrogen on passenger vehicles
Test sequence takes 13-16 weeks (about the same as traditional sequences)
Tanks that have passed other procedures also pass these tests. Tanks that fail other procedures also fail these tests.
Q: How many containers have been tested?
A: Only know of these 4 tanks discussed.
Q: Commercially available equipment?
A: Not all that available (only a very few labs are currently equipped to do all the tests)
Q: When will the report be available?
A: Not sure (contact those named at the end of the presentation)

6. General Discussion on GTR

India position (want 2- and 3-wheelers included). Mr. Albus reports that India should be introduced at a later time.

Environmental issues will not be included in Phase 1 of the GTR, as discussed above.

First draft of the GTR (drafted by Secretary – DOT/NHTSA):
Part A: Justification and Technical Rationale (information taken from previous documents)
Part B: Text of the Regulation (based on the OICA proposal from the 3rd meeting)

Action plan says GTR is to be completed by 2010 – should we change it to 2012? Would be more realistic, but may not be easy to change. Roadmap says 2010, so any change would have to be approved by WP.29. If the group believes this change is needed, we could ask for that change. Maybe wait to see how it goes for a while (change to "2010??" in the text to remind us that we are on a tight and difficult deadline).

To include HICEs, the GTR should refer to Hydrogen/Fuel Cell Vehicles or Hydrogen & Fuel Cell Vehicles. This is in the roadmap. In the EU regulation, they use "hydrogen vehicles" to insure inclusion of both ICEs and FCVs.

Throughout the text, "EC regulation" should be changed to EU regulation, and perhaps should be referred to as EU regulations (EIHP)

Format of a typical GTR (there are 8 so far) see the UN/ECE website for the approved GTRs

Part A: Technical Rationale and Justification (can be very long, could have schematics, references in footnotes, explains everything so that it can be fully understood and documented)
Part B: Text of Regulation (has 7 sections). Performance requirements are in section 5.

7. Key Items for HFCV GTR

NOTE: This discussion was originally under 7.3, but became more general (philosophical), so it was moved here.

TUV approval philosophy: “Prevention is better than cure”
Quality of components and the installation are important – it is not all about surviving a crash.
Specific requirements for components and for the system.
Pyramid for development of GTR

TUV on GTR development:
Questions remain unanswered – are we to address components and system requirements, which components, functional safety, functional quality, documentation, etc.
Proposal for GTR Part 1 (basic requirements for accident prevention for system and components) – storage system
Proposal for GTR Part 2 (requirements and test procedures for limitation of consequences) – vehicle fuel system integrity
Proposal for GTR Part 3 (electrical – up to ELSA to make proposal) – electrical safety

Q: What are the system boundaries? (storage system and propulsion system)
A: It is not defined (needs to be clear) – downstream components (of the shutoff valve) must be included. Include sketch from marker board.

The GTR contains the minimum performance requirements.

GTR needs to contain a clear description of the system and what is included (with high-level system pictures).

Japanese concepts regarding hydrogen gas leaks
1. no leaks
2. sense and shut off
3. no accumulation or entry into passenger compartment.

Construction of requirements
- approval of device
- equipment and structural requirement
- functional requirement
- performance requirement

Q: What is the rationale for adding this additional requirement (protection from environmental factors) to a hydrogen vehicle, and is it required of a gasoline vehicle?
A: There is no specific test, but there is the general requirement for protection of the fuel system in gasoline vehicles.
Q: Why is the detector set to shut off the system when it hits 4% (too high, and may not be taking into account the time lag)?
A: Will be discussed later

What ensures the safety of the vehicle? Component requirements might be quicker, but the risk is that contracting parties might want to add more (system-level) requirements (negating the overall effectiveness of the GTR concept).

US: Must have enforceable and testable/verifiable requirements (compliance test). Recalls are driven by discovery of defects. The US does not have a federal system that requires regular inspections (it is a state issue – some require rigorous safety inspections, some require less rigorous inspections or only emissions testing, some do not require any inspection). US will avoid prescriptive language.

7.1 Definitions

Consistency of definitions is important. Two approaches: we can develop a list of terms and determine definitions up front, or we can develop the list of terms for which there is ambiguity or confusion and determine a consistent definition as we progress with the draft.
C: Better to get going on the GTR drafting
C: Need to work on a few critical definitions
C: Given the amount of effort put into developing pressure definitions during EIHP (nominal and maximum allowable), these should be used.

ACTION: Co-chair from US will go through the existing standards and regulations to collect terms and definitions.

7.2 Storage System

7.3 Vehicle Fuel System Integrity

Proposal from TUV is to discuss the revised OICA proposal, with consideration of additional visual inspection (for example, is there a cover? yes or no) and tightness test (prevention measure).

OICA proposal for hydrogen releases from vehicles
Two changes under Single Failure Conditions section (compared to the version on the web right now): indication of malfunction of the leak detection system was added; demonstration of compliance section – sentence removed. Concentration measurement is needed for the test only. Revised version will be posted (was distributed at the meeting).

(Thursday morning)

US, Canada and Korea use self-certification procedures. The continuing focus on performance-based requirements is perhaps not in conflict with type-approval regulations written for Europe, Japan, and China, so we may not be so far apart. European Fuel System regulation contains similar language to that which would be found in an FMVSS – for example: “Tanks must be made as to be corrosion-resistant.” When considering the government needs (as the regulatory agency) and manufacturer needs (as the developers), we might find that the differences are not so large.
C: Transport of dangerous goods worked for 4 years to come to a compromise on the potential to enhance the regulation with additional provisions only when needed.
C: The idea of the GTR – the differences in the approval processes around the world will perhaps result in differences in the regulations in each country.

C: We are hopeful that this will be avoided (has been the case in the existing GTRs so far).
C: Should be comprehensive, and include all necessary requirements to ensure safe operation of the vehicle.
C: Regulation should be written in such a way as to be understandable by the manufacturer. Approval authority should not be interpreting the regulation for the manufacturer. Technical requirements should be the same for any approval process.
C: In order to avoid problems (conflicts) with the existing regulation, the GTR must result in the same level of safety.
C: Regions have different requirements (non-crash-related) and different approaches.
C: We are discussing policies (done that the last 4 meetings) – we are to develop the technical requirements for a hydrogen vehicle. If we are deadlocked on an issue, the chairs take the issue to AC.3 for resolution. The agreed-upon GTR will be the regulation for everyone. If a region or country wants to add an additional requirement, it should be resolved so that the GTR is acceptable. Will show 3 of the most recent GTRs so that we understand what is contained.

7.3.1 Post Crash

OICA proposal on hydrogen releases from vehicles – need clearly defined boundaries to be able to provide a good quality proposal.
Q: Please explain section 5 of the proposal
A: This section covers a fully functional ("operating as intended") vehicle (not a failure mode). Under section 3 (single failure condition), the vehicle must be safe, therefore a fully functional vehicle must also be safe. Safety performance has to be tested (section 3), so it is also safe under normal operating conditions.
C: Should add fully functional vehicle to the definitions table.
C: Small leaks (not safety-relevant) that do not reduce the safety of the vehicle would be allowed (should include discussion of this in the definition).
C: What about the potential for the small leak to grow into a big leak? That is why the bubble test is being used.
Q: Japan has an air-tightness test to confirm that the vehicle is fully functional. How does this proposal address this?
A: Section 3 (single failure condition) addresses the crash situation. The test requires the measurement of hydrogen concentration. If it is not a failure situation, it is a normal operation. Some leakage (very small, not detectable, not safety-relevant) would actually be considered ok, because it is not an unsafe situation.
C: A fully functional vehicle is actually one that operates with no ***detectable*** leak – not a "safety-relevant" leak.
C: Technical tightness discussion – what is tight? We need to decide. Bubble-free has been the agreed minimum by pressure cylinder industry for years. "Safe enough."
C: During refueling, there are often bubbles.
C: Preventing measures (quality and tightness), and Limiting of Consequences (detection system)
C: Concerns with the gray area in-between. Are there different requirements to be applied? Quality of non-safety-related items should not be part of this discussion.
C: Even a very small leak could be safety relevant. It is not possible to require 0.0% leaks during normal operation (there is no technique for detection at very low levels, therefore it is not realistic to forbid it).
C: Cannot regulate something that you cannot measure.
C: Also should not necessarily regulate everything that can be measured.
C: Leak proof and quality issues. What is acceptable should be decided. "Fully functional" needs to be defined. All safety-related requirements are fulfilled in a fully functional vehicle.

C: Perhaps we need to say “Safe Functional (functioning?) Vehicle” or something similar.

ACTION: OICA draft will be made available in January 2009, if the boundaries are clearly defined.

7.3.2 Pressure Relief System

7.3.3 Single Failure

7.3.4 Fuel Cell Vehicle Exhaust Systems (purge)

8. Electric Safety
   8.1 Report on July Meeting

   8.2 Discussion (if needed)

9. GTR Drafting

The GTR structure is rigidly defined and cannot be changed (it is very design-specific, which is ironic).

Part A: Justification and Technical Rationale
Sections 1 and 2 will not be discussed here – needs work and contributions from participants.
Part A Section 3: Existing regulations, directives and international voluntary standards
Q: Is it permissible to reference technical communications and recommended practices? For some items, this is the only existing documentation. For example, J2578 is a recommended practice and some day might be a standard.
A: In the past, GTRs have referenced international standards. If it is not a standard, it should not be referenced (in this section). Only finalized international standards should be referenced. The other reports or documents can be used in the justification – it is just not listed in this section. We can leave in these documents for now.

ACTION: Provide a list of national and international standards and regulations to the Secretariat (for inclusion in Part A Section 3).

ACTION: Provide list of technical communications and recommended practices that may be included in the introductory material to the Secretariat (for use in Part A Section 1)

Remaining sections of Part A are:
Part A Section 4: Technical Rationale, Economic Impacts, and Anticipated Benefits
4.1 Vehicle fuel system integrity
4.2 Storage systems
4.3 Electrical safety
Part A Section 5: Markings

Part B Text of the Regulation
Section 1. Purpose (start with the purpose found in the action plan). This could be an all-encompassing purpose that would eliminate the need for a separate purpose in each subsection.

ACTION: Secretariat will draft a purpose for discussion on Friday.

Q: What is the definition of equivalent level of safety?
A: For example, the only difference is the fuel, so the same leakage (on an energy basis) is allowed.
Q: What is the measurement of safety level? How is risk incorporated? What is the consequence? How are those consequences different? What is the probability?
A: Safety is the absence of unacceptable risk.
C: Include the definition of safety in the GTR: is this the definition we want to use? If so, we have to discuss risk and acceptable risk. This is not a simple issue. The consequences of failure must also be considered.
C: Do we also have to define "equivalent"? Use "similar" instead?
C: The rationale is included in Part A, so this discussion will likely be there.
C: Hydrogen tanks will have higher level of safety. Gasoline tanks are not burst tested, since this is irrelevant. Compressed gas requirements - similar to the CNGV requirements.

Section 2. Application/Scope (only applies to passenger vehicles)

Section 3: Definitions (collect/develop as we proceed) – action item earlier that indicates that the US co-chair will collect definitions for terms of interest.

ACTION: OICA will provide definitions for the terms that are specific to their proposal.

ACTION: Sandia will provide detailed discussion for Part A on the Lower Flammability Limit.

C: Should say "as specified in this GTR" or "for the purposes of this GTR, the following definitions shall apply"

Section 4: General requirements
C: This GTR will cover HICEs and HFCVs).
C: Should just say "Hydrogen powered vehicles" rather than references to hydrogen/fuel cell vehicles (could also mean that we are supposed to address non-hydrogen fuel cells). We are only focusing on hydrogen-powered vehicles in Phase 1.
C: Changed the name of the GTR to Hydrogen Powered Vehicle. Add the definition that is in the EU regulation.

Section 5: Performance Requirements

C: Need to define upstream (in this context, it means the high pressure section)
C: Need to define vehicle fuel system (what are the boundaries), define system integrity prior to determining what goes in each subsection.
Q; What is covered by the vehicle fuel system? Include definition.
A: Container, PRD, regulator, piping. Also includes the storage system (which should be defined also).
C: At the last meeting, we agreed to the current structure. Co-chair (Japan) wants to keep the current structure.
C: Suggestion is to discuss these changes with Mr. Albus. Original outline had the storage system discussed first, and then the vehicle fuel system integrity (which covered everything other than the storage container). Section 5.2 has been moved to 5.1 and section 5.1 is now 5.2. Now it is consistent with the original outline.
C: The purpose of Vehicle Fuel System Integrity has to reflect the concept that the storage system is part of the fuel system.

C: Draft the definitions so that we are more clear on what is meant.

Japan: Container regulation is separate from the hydrogen safety regulation. Would like the same structure in the GTR.

Proposed definitions:

Vehicle fuel system: all components used to store or supply hydrogen fuel to the vehicle fuel cell or internal combustion engine.

SAE language:
Storage system: consists of the pressurized containers, PRDs, shut off devices, and all components, fittings and fuel lines between the containers and these shut off devices that isolate the stored hydrogen from the remainder of the fuel system and the environment.
Q: Where is the fueling nozzle? The definition of vehicle fuel system is only the supply to the ICE or FC as written above.

Proposed changes:

Vehicle Fuel System: all components used to store or supply hydrogen fuel to the storage system, or to the vehicle fuel cell or internal combustion engine.

Storage System: consists of the pressurized containers, PRDs, shut off devices, and all components, fittings and fuel lines between the containers and these shut off devices that isolate the stored hydrogen from the remainder of the fuel system and the environment.
C: include boil-off system in the storage system definition (see BMW proposal and diagram from 3rd meeting),
C: We agreed during the 3rd meeting to focus only on high-pressure gas storage.

Q: How do we define the fuel cell boundary? Some manufacturers may have low-pressure piping that contains hydrogen, fuel conditioning components, etc.
A: See definition of fuel cell module in J2578 (Section 3.12). There is also a definition from ISO that will be provided.

ACTION: ISO to provide definition of the fuel cell system

C: Are we spending too much time on these details, when a small number of participants could draft some sections for incorporation into the next draft before the next meeting.
C: Should continue, now that we are in agreement, for the most part. Can refine as necessary.

Move the storage container section to 5.1

Change the vehicle fuel system integrity section to 5.2

5.2: Vehicle Fuel System Integrity

5.2.1: Purpose: - this may not be required in each subsection. Other GTRs have this structure, as they are developed in modules, and Mr. Albus had previously suggested this as a structure. Each of the subsections has a fairly similar purpose.
C: Controlled, uncontrolled and unintended releases – define all, or change the wording. Covers all releases, regardless of type.

C: Need to define the fuel system – seems to cover everything, including the storage system.
Q: Reduce implies that there are accidents. Change to minimize or prevent (too strong)?
A: It is standard language in FMVSS, but we are not writing an FMVSS. Change to minimize.
C: Too early to word-smith. Need to focus on getting content.

5.2.2 Requirements – in use

5.2.2.1 Pressure Relief System Installation – change to Hydrogen Discharge Direction

OICA language serves as the current draft.
Release direction – cannot be horizontal, into the compartments, toward the wheel housing or towards the containers
C: The practice of first responders in the US is to approach vehicles at a 45 degree angle.
C: The German first responders want to approach from a single direction for any vehicle. Front of vehicle is the suggestion.
C: Visual inspection rather than a test for compliance.

5.2.2.2 Single Failure Conditions

ACTION: OICA to provide definition of single failure.

OICA language serves as the current draft.
C: Discussion of the language. Change 4% to LFL (which is defined – need a better definition and it is an action item for Sandia). Perhaps change to "up to 4%" - revisit after we have the definition of single failure.

ACTION: OICA and Sandia will write a report in support of the 4% limit (for inclusion in Part A). Japan will look for data from their previous testing.

C: Do we need to do this? The LFL number is accepted, and does not need to be supported by documentation. If there were a suggestion for a higher number, then it would need to be supported with documentation.

Extensive discussion of telltales, indicators, and warnings.

Friday morning:

Proposed purpose: this regulation specifies performance requirements for hydrogen powered vehicles. The purpose of this regulation is to minimize the number of deaths and injuries that may occur as a result of fires or explosions of the vehicle fuel system and/or from electric shock caused by the vehicle's high voltage system

Telltale: the vehicle shall be equipped with a visual tell-tale that provides a warning to the driver in the event of 5.2.2.2.2 (4% hydrogen resulting in the closing of the main shutoff valve) and in the event of a malfunction of the hydrogen leakage detection system.
C: this is a design specific requirement
C: lots of regulations have the requirement for telltales (see GTR on ESC)
C: "telltale" is too design-specific (it is a symbol on the dashboard) and limits how the manufacturer can address the warning. A requirement for a Driver Warning System is included in the European regulation. Should just call it a warning to allow the manufacturer to provide the information to the driver.

C: needs to be more than just an indicator light – audible horn/beep, flashing indicator, both? Should not be too prescriptive, but the idea of a more noticeable and hard-to-ignore indicator of some sort should be included.

ACTION: NHTSA will work to formulate acceptable language for this section

5.2.2.3 Fuel Cell Vehicle Discharge System

OICA proposal serves as the basis.
C: The gas mixture at the fuel cell vehicle point of discharge is oxygen-deficient (mostly nitrogen, water vapor, unreacted hydrogen and any remaining unreacted oxygen) and will not ignite. The exhaust gas at the measurement point may/will have mixed with surrounding air, but this is still not going to be an ignitable mixture.
C: Exhaust is not the (best) term to be used for a fuel cell vehicle.
C: Point of discharge will need to be defined. Discharge system will also require a definition.
C: A schematic might be helpful.

ACTION: OICA will provide a schematic of an example of the fuel cell vehicle discharge system

ACTION: BMW to provide information on unreacted hydrogen from an HICE vehicle

Q: Do we need an alarm if it exceeds 4% (enclosed or semi-enclosed space section)
A: No, it is not an enclosed space (exits into the atmosphere).
Q: What about pockets under the vehicle? Isn't that an enclosed space?
C: Need a good definition of enclosed and semi-enclosed space (includes the passenger compartment)
C: the exhaust system (up to the point of discharge) is included in the vehicle piping, so the hydrogen concentration in this piping is not of concern to this issue

ACTION: Definitions for point of discharge and enclosed/semi-enclosed spaces are needed (EC?).

5.2.3 Requirements – post crash

No additional crash tests are required for Phase 1 (use existing test requirements) – will not attempt to harmonize the crash tests. The paragraph describing this was moved to General Requirements (Section 4).

ACTION: Need to describe the calculation of the limit (OICA?)

ACTION: Japan will provide a description of their calculation, and why it is a different value from the proposed GTR.

Section 6.2 Test conditions and procedures

OICA contribution (which was taken from the Japanese regulation) is used for the draft at present.
C: Validation of the test procedures has been done for CNG vehicles, and this should be directly applicable. There have been some validation tests for hydrogen vehicles also.
C: Need data to validate this. Repeatability is one of the issues.

C: May just need to include references for the equations used in the analysis.

ACTION: Japan will submit test procedure validation data

Discussion of the proposed revisions to the equations (correction for non-ideality). Need a reference for the equations.

Proposal from TUV and Japan for an additional section under Part B Section 4 – General Requirements, related to vehicle fuel system integrity

10. Miscellaneous Administrative Items

10.1 Approval of the Decisions of the 4rh Meeting

10.2 Next Meeting

10.3 Others

Table of Documents from the 4th Meeting of SGS September 2008-Tokyo

Author and Name of the Document	SGS 4 - ##
Draft GTR	SGS 4 – 01
List of Action Items	SGS 4 – 02
List of participants	SGS 4 – 03
Agenda	SGS 4 – 04
Japan Presentation on Current Status of Discussion on New Standards for High-Pressure H Containers in Japan	SGS 4 – 05
Korea Presentation on Research Activities of HFCV Rulemaking	SGS 4 – 06
US Presentation on NHTSA's Hydrogen Research	SGS 4 – 07
BAM Germany Presentation on Container Requirements	SGS 4 – 08
TUV Presentation on TUV Approach to Safety	SGS 4 – 09
Japan Presentation on its National Regulation for Hydrogen	SGS 4 – 10
China Presentation on FCV Demonstration in Beijing 2008	SGS 4 – 11
ISO Presentation on Hydrogen Fuel Tank Standards	SGS 4 – 12
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List of Documents from the 4th Meeting of SGS in Tokyo Sept. '08	SGS 4 - 16
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