

**Draft Meeting Minutes of the 10th Meeting of the Informal Working Group on
Electrical Vehicle Safety - Global Technical Regulation
(EVS-GTR)**

Location: Tokyo, Japan
Time / Date: March 2-4, 2016
Chair: Mr. Nha Nguyen (USA)
Vice Chair: Mr. Aleksander Lazarevic (EC), Mr. Liu Minghui on behalf of Ms. Chen
Chunmei (China)
Secretary: Mr. Kazuyuki Narusawa (Japan)

Day 1: March 2, 16:00 – 17:30 (Japanese Standard Time)

Some representatives joined the meeting by telephone.

1. Welcome and Introductions

- Welcoming remarks: Mr. Kenji WANI, the Director General for Engineering Affairs Road Transport Bureau of the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) welcomed the EVS IWG members in Tokyo and expressed hopes for a fruitful meeting.
- On behalf of the IWG and cosponsors, the IWG Chairman, Mr. Nguyen, the IWG Vice-Chairs Mr. Lazarevic, Mr. Liu of China and the IWG Secretary, Mr. Narusawa all expressed thanks to MLIT and JASIC for the kind generosity and warm hospitality in providing the facility and support during the meeting. Dr. Kawai, as the head of Japan delegation and a host, expressed greetings to all participants.
- Self-introduction of participants.

2. Approvals

- Approval of the agenda
The agenda of 10th EVS meeting was approved. (EVS-10-06e)
- Approval of the previous meeting minutes

The meeting minutes of the previous (9th) EVS meeting was unanimously approved. (EVS-09-25e)

- Action items

The action items from the 9th EVS meeting was shared and agreed by all the participants. (EVS-09-24e)

3. Reports of UN Activities

- The Chairman reported on the 167th Session of the WP29 in November 2015. The representative of the United States, on behalf of the IWG, presented a progress report, specifically, the outcome of the 9th IWG meeting hosted by China in September 2015. Regarding the timeline, AC.3 and WP.29 approved the 2-phase approach as well as an extension of Phase 1 completion to December 2016.
- The Secretary, Mr. Narusawa, provided a summary of 17th EVE IWG activities. It contains two main parts: Part A as recommendations for future activities; and Part B as new GTR candidate. As an example: Part A might include energy consumption of Electric vehicle, Part B might include the EV power determination process, vehicle durability test of hybrid vehicles. The latter will be coordinated with the WLTP working group. The results will be reported to the GRPE in June 2016.

4. Update on on-going and planned research and rulemaking activities (EVS-09-11e)

The United States reported its progress of rulemaking at NHTSA on the barrier option for FMVSS 305. The NPRM will be published shortly, following with a 60 days comment period. All members are encouraged to review and provide comments as appropriate.

Each contracting parties verbally expressed their plans in adopting the GTR into their national regulation:

- EC informed the transportation of the GTR would require a revision of the UN R100-02 series, but will need to obtain the Member States' mandate first. The EU intends to transpose Phase 1 of the GTR independently from the finalization of Phase 2. The earliest date for transposition would be in 2019, also depending on the transposition schedule of other contracting parties.
- China is considering to introduce the GTR into their national regulation as GB (mandate). The current vehicle standards are mainly GB/T (recommended). GTR based future GB requirements should not be seen as problematic as they would be

largely compatible with the existing national requirements. No particular timeframe for the adoption.

- Japan has the intention to introduce the GTR into their national requirement after UN R100.02 is revised accordingly. Transposition of Phase 1 may proceed without having to wait for Phase 2 completion.
- Korea EV requirements have been amended in 2014 but intend to transpose Phase 1 of the GTR without having to wait for Phase 2.
- Canada will wait for a completion of Phase 2 of the GTR before the requirements would be adopted into the national regulation. Both FMVSS and UN R 100 would be considered.
- The United States also proposed to adopt the entire GTR, implying postponing transposition until the completion of Phase 2. However, adopting Phase 1 of the GTR is a possibility since it currently doesn't have safety provisions for Li-Ion batteries.

OICA ask to all contracting parties to consider sufficient lead times for the implementation.

Day 2: March 3, 9:30 – 18:00 (Japanese Standard Time)

Some representatives joined the meeting by telephone.

5. Development of draft GTR

Report from Task Force 1 – Protection against Water: (EVS-10-10e)

- Mr. Liu (China), on behalf of the task force leader, reported on the progress of the Task Force 1. China reported that field data on the risk of loss of isolation is not available.
- The TF1 agreed that its scope and target as “Identifying potential risk of electric shock caused by water, drafting the requirements for the GTR”.
- Washing and driving through a flooded road are examples of common conditions during vehicle in-use operation. The vehicles are required to maintain their isolation resistance value to prevent electric shock. When isolation resistance is compromised, it is possible that a person can be electrocuted and in some cases, may cause an external short that could pose a safety condition to the REESS.
- The TF recognized the purpose of the isolation monitoring system is to provide a warning should the isolation be compromised. However, some of the contracting parties maintained that it doesn't prevent the safety hazard affects caused by water.
- The United States proposed that all EVs should be certified with water flood test even vehicles that are equipped with an isolation monitoring system installed on the vehicles. They also proposed an observation 24 hours period after the water exposure test to

ensure the REESS is not adversely affected by water. However, this requirement can be recognised as a REESS safety test against fire, and be deferred to phase 2 when the pack immersion requirement will be addressed.

- European Commission did not oppose the test as such, but emphasized the test would be required regardless of whether the vehicles are equipped with the isolation monitoring system, in line with the U.S. proposal.
- China showed its intention to keep current flood test for EVs without isolation monitoring system and isolation monitoring vehicle exemption can be considered if the reliability of the monitoring system is verified.
- Japan reiterated its position that they need to have the current proposed flood test with the exemption for isolation monitoring equipped vehicles.
- Canada agreed with US proposal.
- Korea had no specific position.
- All contracting parties agreed with including the water exposure test in Phase 1 and the GTR draft as presented by China in principle.
- The IWG agreed to ask TF1 to continue the discussion and find a compromise for the application of the water exposure tests. TF1 will provide the proposal to the 11th EVS meeting.

Report from Task Force 2: (EVS-10-07e)

- Mr. Schmidt (OICA) provided a progress summary of the TF2 (EVS-10-07e) and proposed a “contracting party option” for the low energy option.
- The United States reported again on its NPRM activity on physical barrier option which could lead to an agreement to the current proposal in the draft GTR. However, it raised a study-reservation on the OICA proposal for low energy option as contracting party option. They cited the energy option does not have the equivalent safety level as the resistance isolation option.
- EC requested OICA to study for a possible lower energy value to obtain an equivalent safety level. OICA agreed and will investigate on a possible low energy value ahead of the next meeting.
- One manufacturer is currently using low energy option for ensuring electrical safety.

Report from Task Force 3 – Electrolyte leakage: (EVS-10-08e)

- Mr. Tripathy (OICA) provided a progress report of TF3 (EVS-10-08e).
- All members were asked to provide comments on the proposed text for the draft GTR (EVSTF-07-16e).

- European Commission, the United States, Japan, Korea and Canada support to extend the post-crash observation period for electrolyte leakage from 30 to 60 minutes. China expressed it that the GTB standard currently recommends 30 minutes observation time but they may consider the extended time. China will report at the next IWG meeting.
- OICA raised its concerns regarding the extension of 30 minutes based on effectiveness and cost. UTAC explained that from a testing centre perspective the extension of observation time does not have any material impact on the cost of testing, whereas the vehicle handling requirement mandates a vehicle under the test not to be touched for 60 minutes.
- IWG members agreed that for Phase 1 the observation time is applicable for non-aqueous electrolyte leakage and that gas toxicity/venting verification would be deferred to Phase 2.
- TF3 leader thanked Japan, JRC and OICA for their contribution to venting issue.

Report from Task Force 4 – REESS in Use: (EVS-10-11e)

- Mr. Schmidt (OICA), as the new TF 4 leader, provided a progress report of the TF4 (EVS-10-11e).
- Japan is requested to provide a better definition for a “vehicle protective structure” as used under the mechanical integrity test. Japan will propose the text by 13th May.
- Regarding the short circuit test, JRC provided additional rationale (EVSTF-07-11e). As this was agreed it will be added to the draft GTR.
- The current vibration profile is acceptable for Phase 1. The profile will be re-visited in Phase 2 based on an updated profile which is currently under discussion at ISO.
- Thermal Shock and Cycling was agreed.
- China explained that the drop and rotation tests are currently included in the Chinese national standards GBT but are not mandatory. Drop test is required for swappable battery vehicles. Rotation test is required for all EVs equipped with liquid coolant. After consideration, China agreed not to propose the drop test and will prepare a detailed proposal for the rotation test including rationale/justification and test data by May 13. TF4 will discuss and decide whether it could be included in Phase 1 or deferred to Phase 2.
- European Commission asked whether these two recommended tests might become mandatory in China. Ms. Wang/Mr. Liu were unable to confirm this but reminded of on ongoing discussion on standards that could become compulsory in China.
- Regarding NHTSA's BMS functionality proposal (EVSTF-07-26e), TF4 members agreed to provide comments by April 13th or earlier. This is a vehicle based test, and

the US maintains that any component level requirement would be optional for a contracting party.

- TF4 leader will set up a TF conference call to discuss it on April 28th.
- The US indicated that the BMS functionality at vehicle level and their comparable component tests may not be equivalent. They also expressed that the vehicle level tests should supersede the component tests. However, they acknowledged that the component tests might be required for type approval, thus they could be “contracting party option” requirements.

Report from Task Force 5 – Thermal propagation: (EVS-10-12e)

- Ms. Wang (China) on behalf of TF5 leader presented the status of TF5.
- Definitions of “thermal runaway” and “thermal propagation” are under discussion.
- China and Canada presented their research results. Propagation (between cells, but not between the modules) was observed in all samples where thermal runaway could be initiated. IWG members confirmed the importance and necessity of thermal propagation test and agreed that thermal propagation test will be kept in the scope of EVS GTR whether it will be included Phase 1 or Phase 2.
- China will provide additional rationale, test data where propagation occurred, and revise the test method for its proposal and request constructive suggestions and comments to improve the Chinese proposal. China also requested all members to conduct tests in according to the China proposed procedures. OICA questioned the feasibility of the proposed timeline to conduct the testing.
- Some members raised concerns regarding the repeatability and effectiveness of proposed initiation methods. The U.S. expressed that the nail penetration test could be gamed and resulting in no initiation. Also, it would be extremely difficult to precisely penetrate a cell with a nail from the outside of a battery pack.
- China proposed in case that the group would not get enough data to support the right method, basic requirements could be kept in Phase 1 and initiation method(s) could be clarified in Phase 2.
- Japan understands that JARI can do the test.
- JRC suggested having a discussion to clarify the purpose of the test, the safety risks, and to improve rationale and justification before getting into a detailed test procedure discussion.
- OICA underlined that they are against the internal short circuit test, which does not necessarily lead to propagation and pass-fail criteria should also be clarified.
- Japan expressed that defective cells are an inherent issue and propagation test is an effective way to evaluate the safety of REESS performance to provide protection to

passengers from a thermal propagation event. They stressed that this is not internal short circuit test but rather, a thermal propagation test.

- OICA expressed that industries are working on production taking into account new technology under development to eliminate product failure (e.g. by adding more separators, changing the electrolyte). OICA is concerned that test procedure proposed would restrict technology development.
- Chairman concluded that most members are not convinced of the proposed initiation methods and asked members to carefully review the forth coming rationale and test data from China. We need to make a decision to whether continue the discussion in Phase 1 or defer to Phase 2 at the next IWG meeting. In case the propagation is deferred to Phase 2, OICA suggested an alternative scenario whereby a procedure on OEM's work with the manufacturer could be described. However it remains to be seen what kind of information a manufacturer could provide.
- All members provide comments (including past comments) and alternative requirement(s) to China TF5 leader by 15th April.
- China will address comments and provide a complete proposal including test data (or test plans) and detailed test procedure by 15th May.
- TF5 will schedule a teleconference and continue the discussion including the decision for their recommendation whether it will go to Phase 1 or Phase 2 by 23rd – 27th May.
- 11th EVS-GTR IWG meeting; TF5 will provide report.

Report from Task Force 6 – State of Charge: (EVS-10-09e)

- Dr. Kawai reported the progress of TF6 and the final proposed draft for the GTR.
- IWG members agreed with the modified proposal from the U.S. – 90 % SOC for hybrids and 95% for externally charged EVs. The method of measuring SOC to be confirmed by the manufacturers.
- A final draft including the rationale will be distributed shortly for a final review.

Report from Task Force 7 – Fire resistance: (EVS-10-13e)

- Ms. Li of Korea on behalf of TF7 leader provided a progress report.
- The group agreed with the proposed LPG burner and the burn rate as an alternative method to the gasoline pool fire.
- United States and Canada do not agree that the proposed fire test is necessary that would address the safety risk based on the proposed fire duration (2 minutes) and pass/fail criteria. They cited that the 130 seconds exposure time is not sufficient to

cause an explosion of the pack. In addition, Canada's long duration fire tests did not result in pack explosion (though arcing was observed). Therefore, they would support to make this requirement as a "contracting party option" in GTR.

- OICA requested to include a vehicle level test and will provide rationale and LPG test parameters by 30 April.
- European Commission expressed that it might not require this test, as it does not seem to address any safety specific risk based on the proposed method. If the idea is to demonstrate that EVs are equally safe as conventional vehicles then the test is possible but no added value in terms of safety. Considering deregulation could be a positive sign.
- Japan and Korea confirmed they would need a short term test with options.
- China confirmed the necessity for having a short term test on component level, whereas the vehicle level test still needs to be proved.
- The Group has not yet agreed on whether to have a short time duration test in GTR as an option.
- TF7 leader will submit a proposal for GTR draft with two component based and one vehicle based test by 30th March.
- All members will provide comments on the proposal by 30th April.
- OICA will provide proposal on the vehicle level parameters by 30th April.

Report from Task Force 8 – Bus and Truck scope study: (EVS-10-14e)

- Mr. Tan of China on behalf of TF leader provided a progress report.
- OICA will update the proposal, which will be annexed to the GTR.
- It was proposed to make this section a "contracting party option" giving the complexity and limited time for members to fully evaluate the proposed requirements.
- Also, category 2 (Trucks) is needed to be considered for the draft GTR.
- China stated that they are not in favor of the contracting party option as they deem the requirements very important.
- As a general comment, EC stated that it is important to make efforts as much as possible to reduce the number of contracting party options.

Day 3: March 4, 9:30 – 16:00 (Japanese Standard Time)

Some representatives joined the meeting by telephone.

Report from Task Force 9 – Warning system (EVS-10-15e)

- Mr. Sanchez of NTHSA joined by phone conference and explained the status of TF9 accordingly, including the warning for BMS functionality and warning for a thermal event.
- China strongly recommends TF9 incorporate a low energy indicator requirement due to critical safety concerns. However some members of the task force do not feel it is necessary to require a low energy indicator given that conventional vehicles today do not have such a requirement.
- After the discussion at the IWG level, the IWG agreed to have the low energy warning for BEVs only as a general requirement without additional specific requirements regarding vehicle's lighting and remaining energy to drive the vehicle. China will update its proposal for by 30th April.
- OICA presented information on how a BMS would be tested and provided a summary table of some manufacturers' methods to detect a thermal event in the REESS in order to provide a warning to the driver. The team members are requested to provide comments at next TF meetings.
- The representative of OICA strongly recommended that TF5 and TF9 should be working closely since thermal event is a key parameter to trigger the warning system, which should be a sufficient safety requirement. As a result thermal propagation test might not be needed in Phase1.
- The US and Japan supported this proposal, whereas China indicated they would continue with their research.
- TF5 will jointly work with TF-9 to determine the parameters for safety warning issues..

GTR Outline table: (EVS-10-17e)

- IWG discussed and updated the requirements in the outline table.
- Scope and application will be discussed and drafted by co-sponsors (EC lead).
- The table was revised and uploaded as EVS-10-xxe.

Development of draft GTR:

- Secretary uploaded the latest GTR draft according to the action item in Changchun meeting but it contains many discrepancies between draft GTR and current TFs discussions.
- The U.S. will clean up the GTR draft. Secretary will then upload it on UN website. TF leaders should submit the latest drafts as available.
- OICA will provide a listing of industry standards.

Organizing drafting (editorial) group:

- Editorial group should include cosponsors and TF leaders and other experts.
- The group will start working during the next IWG meeting in June. The group will start with the proposed text submitted by TF leaders.
- The group will coordinate teleconference and face to face meetings of the drafting team to the extent possible in conjunction with future IWG meetings.

Time line:

- December 2016: draft GTR will be submitted to GRSP as an informal document
- February 2017: draft GTR will be submitted for translation as a formal document for the May 2017 GRSP session.
- June 2017: Draft GTR will be submitted as an informal document to WP29 session for review.
- November 2017: Possible vote to establish GTR

Future meetings:

- 11th EVS meeting will be held in Washington DC, United states during the week of 13th -17th of June. Detailed schedule for TFs, IWG and the drafting group will be determined later.
- 12th EVS meeting is scheduled for end of September 2016. Location will be decided at the 11th meeting. Canada has been requested to consider hosting the meeting.
- Possible drafting team meetings could take place already between the 11th IWG and December 2016.
- Possible EVS meeting or editorial meetings could be required in January or February 2017 according to the progress of the work.

Action items ;(EVS-10-16e)

- Action items are reviewed and agreed by the IWG.
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