

LNG Task Force Teleconference
12 November 2013
16.00-18.00 Central Europe Time

Mr. Dijkhof welcomed the participants to the teleconference and thanked them for their participation.

I. Preventing LNG fuel downstream of the vaporizer. (continuing discussion from the previous LNG-12 teleconference).

1. Peter Murray suggested to incorporate SAE J2343 language that, if the temperature of the fuel migrates to the system then a warning signal would occur in the vehicle to signal the malfunction as opposed to shutting down the entire engine system as proposed in the last meeting of the LNG-TF.
2. What type of action would the driver take if the warning came on? Mr. Murray indicates that the cooling system normally would be the problem and the driver would take the vehicle off the road.
3. Tom Elliger (TUV) suggested there is concern from a safety stand-point, if the cold fuel migrates beyond the vaporizer it could destroy parts downstream.
4. The question is what is the risk and what actions are required if the cold fuel migrates? Mr. Murray indicated that the truck should be taken out of traffic and that a warning light would signal the problem, rather than have a full engine shutdown while in operation on the road (which would create a potential safety hazard).
5. Mr. Dijkhof said that a high flow of CNG can achieve temperatures below -40°C and maybe another type of warning should be included.
6. Mr. Ursan (Westport) asked if the warning light comes on and stays on for a specific period of time then the engine could go into an optional 'limp-home mode', which would allow the driver to get off the road safely.
7. Question (Mr. Dijkhof) if R.110 is suited to take into consideration this type of prescription. Mr. Elliger believes that R.110 should be able to incorporate this aspect because it is a safety issue. He proposes that we have to describe the system as much as possible, not with all the technical requirements but rather with safety requirements in general.
8. Mr. Dijkhof suggested to refer to ISO15501 to determine what is covered in ISO but not in R.110.
9. The LNG system is more complex than the CNG system so this must be considered when we look at amending UNECE R.110.
10. Most vehicle systems have some type of safety system if the pressure regulator malfunctions to protect from higher pressure in the system.
11. **General Discussion continues** about a failure warning controlling the function of the engine or if there is (or should be) an additional safety feature. Does the system need to give a warning signal at, for example, -30°C or is it satisfactory to leave out any reference to a minimum temperature? The temperature can be defined as -40°C . ISO 15501 has a clause about CNG, that components downstream of the vaporizer should be 'protected from cryogenic temperatures.' It would be left to the certifying authority to determine if a safety system has been implemented to prevent downstream migration of LNG.
12. Should the definition be modeled on the ISO language for CNG? There is nothing in R.110 paragraph 17 about protecting the system from cryogenic temperatures. It is possible to put into the language a provision about having the right pressure in the system. TUV believed this is a general refinement and would be helpful to have in the text. But a malfunction of the heat exchanger under high flow must consider this

eventuality. The suggestion was to have a warning light as well as protecting the system. But this is an operational add-on and the regulation is meant for minimum safety.

13. Therefore, we should only address the downstream system from too low temperature and go back to what was discussed during the last teleconference, that a safety system should be provided to prevent cryogenic temperature fuels downstream. It might be that the safety system is driven by a temperature-based system but it might apply to other systems. Mr. Dijkhof asked if we agree on definition 18.14.1?
 14. Peter Murray still objected, that shutting down the system is an overly severe measure. The question is raised if any of the manufacturers have had any experiences with cryogenic fuel migrating into the system. Westport indicated that section 18.14.1 is OK since they have a safety system to prevent the cold fuel flowing. Mr. Ursan said he will investigate the systems and come back to the group. But the system can be shut down if the cryogenic fuel migrates to the rest of the engine system and other engine warnings system ultimately would be activated.
 15. Brenda Smith (Gas Adviser) indicated that most of the equipment would continue to function for some time even at low temperature. But Mr. Murray indicated that a failure of the cooling system will tend to shut down the engine if it is cooling sufficiently. So, should there be a combination of SAE and R.110 or should we continue with the language as it is now?
 16. Language is created in Section 18.4.2 as, "The system shall be designed so that components downstream from the vaporizer shall not be exposed to temperatures lower than designed. If this occurs a device shall warn the driver." There still is a question whether the safety provision is sufficient to prevent damage to the engine so the engine should be shut down. There is continued concern that shutting down the system could create more of a danger than just warning the driver. The potential failure is a safety concern, however, there should be some reliance on the driver's common sense to pull the vehicle off the road and shut down the system. But then is this out of the mandate of R.110 (for safety), as opposed to destruction of the system that might be a safety concern. The question then is at what temperature should the driver be warned to ensure the best advantage of the safety system.
 17. The language then was changed to, "For a vehicle operating on LNG a safety system shall be provided so that components downstream from the vaporizer shall not be exposed to temperatures lower than designed. For a vehicle operating on CNG, a safety system shall be designed so components downstream of the regulator shall not be exposed to pressures higher than designed." This, then, covers both LNG and CNG. If a certification authority wants to see how the safety system works they can require that during the certification process.
- II. **End of meeting.** The other issue about height of an installed LNG tank had been brought up by Scania but, unfortunately, the participant has cancelled his participation in today's teleconference due to illness.
18. Mr. Dijkhof will complete the review of other documents from TUV and make comments. This and the meeting minutes will be provided shortly to the LNG-TF. He asks everyone to consider supplying suggested language that takes into consideration the TUV concern about warning the driver or in any other way enhancing the safety aspect of the system.
 19. We would like to take the first part of the next meeting to settle the language in this section and then we can move on to consider the provisions about the mounting of LNG tanks at a safe height on the truck.

III. **United Nations Update.**

20. Jeff Seisler and Paul Dijkhof made presentations in Geneva to WP15 on the ADR regulations; one presentation on a general LNG truck global market update and another on safety aspects of LNG. We are hoping to have an amendment proposed regarding leaking fuel tanks and the fuel going to ground that instead is accommodated for LNG (which ultimately vaporizes to atmosphere). An amendment will be submitted for the next WP15 meeting in May by the Netherlands delegation with support from the LNG-TF with the hope of adopting it quickly in order to change the ADR regulation for 2015.
21. WP 29 is meeting in Geneva 12-15 November 2013 and will consider the LNG amendments to R.110. The topic is on the agenda tentatively for Thursday, 14th November. Mr. Dijkhof will let people know the outcome of this action as soon as he knows the results.

- IV. **Next meeting.** An email has been sent to the LNG TF members with suggested dates for the next teleconference. Participants are asked to provide their preferred dates to Jeff Seisler so the next teleconference can be organized.

Participants

Paul Dijkhof, Chairman (KIWA)
Jeff Seisler, Co-secretariat (NGV Global/Clean Fuels Consulting)
Tom Elliger, TUEV-SUED
Peter Murray (Chart industries)
Brenda Smith (Gas Advisers)
Andrew Whitehouse (CAP)
Mihai Ursan (Westport)
Jean-Louis Chazalette (Volvo)
Mikhail Demin (JC Carter)