July 2, 2021

Chairman Jerry Litt
Washington State Transportation Commission
2404 Chandler Ct. SW
Suite 270, 2nd Floor
Chandler Plaza Bldg.
Olympia, WA 98502-6052

Dear Chairman Litt and members of the Transportation Commission,

It is my understanding that on May 24, 2020, the Washington State Transportation Commission received an industry coalition letter ("Coalition Letter") signed by the following organizations: ACES Northwest Network, Alliance for Automotive Innovation, Internet Association, Milligan Partners, Self-Driving Coalition, and TechNet expressing concerns with regard to the ANSI/UL 4600 Standard for Safety for the Evaluation of Autonomous Products.

The purpose of my letter to is to provide the committee with correct information regarding the content and potential application of ANSI/UL 4600. I am a voting member of the Standards Technical Panel (STP) for ANSI/UL 4600. I was also the principal technical author of the initial full draft of that standard. That draft went through an industry consensus standardization process and was issued as a standard in April 2020. I remain actively involved in activities to keep that standard current to track evolving technology and best practices.

The Coalition Letter contains substantively inaccurate and potentially misleading information regarding the standard. Indeed, the level of misstatement of what is actually written in the standard makes me question whether the authors of that letter understand ANSI/UL 4600 at all. Or whether they consulted the technical experts at their member companies who played a large role in ensuring that the standard states things that are the direct opposite of what the Coalition Letter claims. (Especially: there is NO requirement for 3rd party evaluation, and there is NO requirement for public disclosure of sensitive technical information in an assessor-issued conformance report.)

For purposes of discussion, quotes from the Coalition Letter are included for rebuttal.

> *Coalition Letter: "However, [UL 4600] has some notable limitations. The standard is not a regulatory document, nor has it been adopted into legislation or regulation by any government entity anywhere, in the U.S. or abroad. UL 4600 is in the process of being revised and parallels work on other AV standards being developed around the world today at SAE, ISO, IEEE, and other key standards bodies."*

Response:

- The fact that UL 4600 is not a regulatory document and has not been adopted into legislation is true of other safety standards in the US as well, including ISO 26262 and ISO 21448. This is not a "limitation" in any sense.
- UL 4600, like all standards, is revised over time. That is not a limitation. Rather, the flexible update timeline for UL 4600 ensures it will keep up to date with the industry rather than weigh down companies with potentially obsolete requirements. Moreover, unlike most standards, UL 4600 has an explicit mechanism to give companies a reasonable time to transition to new practices as appropriate for their situation as the standard evolves.
- Any implication that UL 4600 is redundant to other standards is incorrect. UL 4600 is designed to be compatible with other standards to provide a holistic view of system level safety beyond the scope of any of the other standards. In other words, it helps integrate a set of standards into a unified approach. UL 4600 has been specifically designed to not conflict with other automotive safety standards.

> *Coalition Letter: "In particular, during a presentation to the Washington AV Working Group joint subcommittee meeting, a proponent of UL 4600 stated that in the evaluation and certification process, there would be a "role for outside experts" to decide if there is "adequate evidence" of system safety. When asked if such outside experts would have access to confidential business information, the proponent of UL 4600 stated that officials evaluating ADS would have "proprietary insights" and would need to keep such information confidential."*

Response:

- This is a potentially misleading set of quotes that seems taken out of context (and is indeed taken out of context if it is me that is being quoted, which is possibly the case).

<u>UL 4600 DOES NOT REQUIRE EXTERNAL ASSESSORS.</u> Rather, assessors are required to be "independent" and can definitely be internal to the AV company.

- External assessors would have a role ONLY IF the AV company wishes to use them. There is thus no requirement whatsoever to disclose proprietary information or insights to any external party, because there is no requirement to use an external party to achieve ANSI/UL 4600 conformance.

> *Coalition Letter: "UL 4600 is a very new ADS standard with a significant update planned for 2021 to address comments provided on the initial version released in April 2020. UL 4600 thus far has very little adoption among ADS developers, and further updates to it will likely be needed as ADS developers leverage concepts from UL 4600 into their design and safety methodology processes and share learnings from their experiences.*

Response:

- As mentioned previously UL 4600 (and other standards) will need to evolve to keep pace with the industry. This is a feature rather than a limitation. All AV standards are "new" and indeed ANSI/UL 4600 is already older than other standards that are about to be issued or are in development.
- Essentially the same criticism of newness and potential change can be made against ISO 21448, which is a standard that works with ANSI/UL 4600 with application to AV safety. ISO/PAS 21448 was issued in January 2019, and already there is a very significant update (I would say a bigger comparative change than for UL 4600) to ISO 21448, which is targeted for release in 2021. This is to be expected for a fast-evolving technical area.
- To suggest that standards that have been formally issued through an accredited industry consensus process (true of both ANSI/UL 4600 and ISO 21448) should not be adopted because they are new or might change is tantamount to saying that no standard should ever be adopted in the AV field.
- Consider that at least some of the companies behind the Coalition Letter are voting members for ANSI/UL 4600 and/or ISO 21448. Why would they not want to follow standards they themselves helped write?

Coalition Letter: "The UL 4600 standard is a helpful tool for ADS developers, but it requires a significant interpretation by the technical engineering teams. Therefore, any third-party assessment could only be an audit to confirm that all the elements of 4600 were addressed, not a technical evaluation of the quality or sufficiency of the evidence provided for each of the elements."

- Any notion that a "third party assessment" is the way to ensure conformance with ANSI/UL 4600 misapprehends the fundamental nature of the standard. ANSI/UL 4600 conformance requires BOTH an internal technically sophisticated team to ensure the technical decisions are correct AND an independent group to ensure that the technical evaluation team did a thorough job. The combination of these two evaluative processes is a core concept in the standard. Therefore, conformance definitely does require "a technical evaluation of the quality or sufficiency of the evidence provided for each of the elements/"
- The discussion of "any third-party assessment" is a red herring. No such assessment is required by ANSI/UL 4600.

Coalition Letter: "If mandated, UL 4600 would require third-party certification of autonomous vehicles. This would be unique at the state level, inconsistent with the existing federal self-certification system for vehicles, and contribute to fragmentation of design, construction, and performance standards across jurisdictions."

- This is simply untrue. ANSI/UL 4600 does not require third-party certification. Period.
- Additionally, ANSI/UL 4600 only defines "conformance" and does not define a method of establishing "compliance."
- This point and the purported implications seem to be made up entirely out of whole cloth with regard to the actual content of ANSI/UL 4600.

Coalition Letter: While UL 4600 is a valuable contribution to the dynamic and still-evolving landscape of ADS standards, there are numerous other best practices and standards from SAE, AVSC, ISO, and IEEE that address other aspects of ADS safety.

While these organizations are working actively to develop them, there is not yet any widely accepted, proven safety methodologies for ensuring safety across all phases of development, testing and deployment of ADS.

- ANSI/UL 4600 is acknowledged by the US DOT as the leading candidate for the role of a system level safety standard. (NHTSA ANPRM document 85 FR 78058) Indeed, it is the only standard identified by US DOT as an attractive candidate that addresses the goal of "ensuring safety across all phases of development, testing and deployment of ADS" equipped vehicles.

Coalition Letter: "UL 4600 can be a useful tool to assist ADS companies in their development processes, encouraging companies to structure their safety approach. However, requiring developers to adhere to UL 4600 would potentially create a sense of compliance that discourages more robust processes for establishing safe internal engineering standards or organizational processes that prioritize safety."

- This statement effectively argues that no industry standards should ever be required for fear of a "compliance" culture. This specious reasoning does not support an argument that the automotive industry should be exempt from conforming to their own industry consensus standards. It is important to note that other industries are in fact required to comply with their industry standards (e.g., aviation, rail, petrochemical processing) with commendable safety outcomes overall.
- The statement seems to suggest, without evidence, that internal processes and standards are somehow "more robust." If member companies want to claim that this is the case, they should offer some transparent basis for such a claim. Regardless, if they exceed the requirements of ANSI/UL 4600 then there should be no problem establishing conformance to it.
- ANSI/UL 4600 defines neither engineering standards nor organizational processes. There there is no basis for claiming that it could somehow "discourage more robust processes."
- ANSI/UL 4600 specifically requires both defining and measuring the health of safety culture, which is the usual antidote for any potential "compliance" mentality.

Coalition Letter: For these reasons and without even addressing the concerns regarding protection of confidential business information and intellectual property, at this time UL 4600 does not lend itself as a regulatory tool for safety assessments and determinations.

- Again, there is no requirement whatsoever to disclose confidential business information nor intellectual property outside any AV company seeking ANSI/UL 4600 conformance.
- Conformance reports generally contain information about the qualifications of the assessor and whether all the requirements of ANSI/UL 4600 have been met. There is no requirement whatsoever for a report stating ANSI/UL 4600 conformance has been achieved to contain any proprietary technical information. There is no requirement for 3rd party nor public disclosure of the safety case. (See ANSI/UL 4600 clause 17.3.3)
- Rather, ANSI/UL 4600 has specifically been written to support the "self-certification" model favored by the automotive industry.

Coalition Letter: "The undersigned organizations appreciate the assurance that such information would be kept confidential. We are concerned, however, that there is no guarantee within the structure of UL 4600 that such information would be protected. Therefore, we encourage the Commission to reconsider its interest in UL 4600 as a basis for developing AV regulations."

- Since ANSI/UL 4600 does not require the disclosure of any confidential information outside the AV organization, it makes no sense for it to address the topic of confidentiality. (If the authors of the Coalition Letter believe there is such a requirement, they should inform their voting members on the STP, since no such requirement was intended. To date they have raised no such concern since the standard was issued.)
- Any imputed "assurance" (again assuming I'm the speaker being referred to) is a statement taken out of context. Rather, industry practices ensure that AV companies are in control of the confidentiality of their own information. ANSI/UL 4600 does not change this, nor does it have any relevance to this topic other than to not force any proprietary disclosures.

- If any organization should elect to involve a third party assessment organization on a purely voluntary basis, the AV company is not restricted by the standard from taking any steps it deems appropriate to protect its confidential information. The third party assessment industry routinely deals with proprietary information from many sources, including full access to design materials for car companies, and has been doing so for decades. Again, options for ensuring protection of IP include not actually using third parties at all, since there is no requirement whatsoever for third party involvement in creating an ANSI/UL 4600 conformance report.

Based on the above, requiring submission of an ANSI/UL 4600 independent assessment conformance report according to clause 17.3.3 of that standard would require no disclosure of substantive technical information, and no involvement of any 3rd party. Rather, it would amount to a requirement for a self-certification of conformance.

The Commission should be aware that ANSI/UL 4600 provides the following:

- A uniform set of rules to help ensure that essential aspects of safety have been thoroughly considered before deployment.
- Uses feedback loops to permit managing the risk of "unknowns."
- Transparent assessment. The entire standard is written from an assessment point of view to help ensure completeness and clarity. If the designers have produced a valid safety case, there should be no surprises during assessment.
- Plays well with existing safety standards (e.g., ISO 26262 and ISO/PAS 21448) while filling potential gaps, such as deployment of machine learning.
- Supported by U.S. DoT and acknowledged in the January 2021 U.S. DoT Comprehensive Plan as the standard to address overall ADS Safety.

As this technology advances and companies look to governments for a "pathway to deployment" by removing the human driver, the Commission is now aware that ANSI/UL 4600 is an available, industry-created safety standard that addresses the safety design of driverless vehicles

and providing companies a roadmap to safe autonomous vehicles. Additionally, the Commission can find additional resources on the standard from Underwriters Laboratories and the technical contributor, Philip Koopman. Useful web site references include: https://ul.org/UL4600 and https://edge-case-research.com/ul4600/.

Finally, industry stakeholders, including members of the Commission, have the opportunity to be UL 4600 stakeholders receive the direct communication and access to the updated standard. To receive more information regarding the role of stakeholders, please contact Heather Sakellariou at Heather.Sakellariou@ul.org.

Respectfully,

Philip Koopman, Ph.D.

Associate Professor, Carnegie Mellon University