

# VOLKSWAGEN

GROUP OF AMERICA

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February 15, 2019 Date

Re: *Notice of Request for Comments: V2X Communications, Docket No. DOT-OST-2018-0210*

Dear Mr. Fulton,

Volkswagen Group of America (VWGoA) is pleased to provide a response to the Department of Transportation's (DOT's) Request for Comment (RFC) published in the Federal Register on Dec 26<sup>th</sup> 2018. Driver safety and safety of road users in general is of the utmost importance for VWGoA and we believe that Vehicle-to-Everything (V2X) Communication has the potential to greatly enhance safety for road users.

As stated in the RFC, there have been new developments within the automotive industry in the past year regarding the specific technology used for V2X communications – mainly that Cellular V2X (C-V2X) has been introduced as a competing technology to accomplish the use cases traditionally done with Dedicated Short Range Communications (DSRC). This has created uncertainty within the automotive Original Equipment Manufacturers (OEMs) as to which technology should be deployed.

As of now, a leading OEM has deployed DSRC in the USA and has also announced to expand their deployment in 2021 while a second leading OEM has announced to deploy DSRC 2023. In addition, a third leading OEM recently announced that they would deploy C-V2X starting in 2022. The obvious implications of this is a fragmented technology deployment in the American market and a potential delayed adoption of the technology by other OEMs as well as consumers.

Since VWGoA does not have a large market share within the American market and since direct V2X Communication requires a large deployment before benefits can be realized, VWGoA looks toward clear market decisions before deploying any V2X technology. In Europe, some VW Group brands are in the process of deploying DSRC because the VW Group has a much larger market share in that region. And a regulatory framework from the European Commission (EC), currently under discussion, plans to ensure interoperability for safety applications and avoids fragmentation of the market for defined day-1 applications. In addition, the VW Group is also preparing for a future deployment of C-V2X in the Chinese market as indications signal that the Chinese regulators might require C-V2X deployments.

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VWGoA believes that in order for V2X communications to be most effective, the most important factor to consider regarding improving road safety or efficiency by V2X Communication technologies is that whichever services are deployed (e.g. safety, convenience, etc....), that those services be interoperable and backward compatible. This ensures continuity of service since the technology benefits greatly from large scale deployments. Individual OEMs choose a specific technology based on various criteria including but not limited to:

- Technical performance characteristics
- Interoperability, scalability and real world performance
- Integration cost
- Intellectual property
- Security and privacy
- Availability of suppliers
- Availability of communication partners (e.g. infrastructure availability)
- Availability of spectrum frequency
- Regulatory framework (if applicable)

It is our opinion that given the complexity of topics surrounding V2X Communications (e.g. spectrum availability, interoperability, co-existence, etc...), there are not any practically feasible technical solutions to resolve the technology fragmentation. Some methods may, in theory, show some possibility to resolve this issue, but these are not ideal solutions and not recommended by VWGoA because they add cost and uncertainty, negatively impact the effectiveness of the spectrum and therefore potentially delay deployment of V2X Communications. Some of those technical approaches to deal with the fragmentation are listed below in no particular order. We would like to stress again that we do not endorse these methods and are simply listing potential methods for clarity:

- All vehicles implement both a DSRC and C-V2X device and they communicate with each other via the respective protocol/technology. The communication technologies would not be interoperable, but might attempt to coexist with each other by sensing the transmission Radio Frequency (RF) energy of the other technology so that the two technologies do not transmit simultaneously. This would obviously add extra cost to each vehicle. In addition, the technical implications and limitation of this method are unknown and might impact the efficient use of the spectrum. Lack of mutual synchronization in the two V2X technologies limits simultaneous use of the two technologies which would very likely make this approach impractical.
- The industry agrees to deploy each technology for a specific set of use cases. For example DSRC could be designated as the technology for safety use cases and C-V2X for convenience or vice versa. Unless an OEM would choose to only deploy convenience use cases or only safety use cases, this approach is also impractical, for the same reasons as given above.

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- A Road-Side-Unit (RSU) or cellular base station is used to do the message translation between DSRC and C-V2X messages and (re)transmit the messages using the respective technology for nearby devices to receive. For example, the stationary device would receive a C-V2X message and retransmit the message in the DSRC format. The drawbacks limiting this solution are:
  - In areas that do not have coverage, the message translation would not be possible
  - With RSUs, it is uncertain who would be responsible for deploying the RSUs.
  - With cellular base stations, it would be unclear who would be responsible for the costs.
- If the industry is not able to come to an agreement about which technology to use, the available frequency band might be partitioned and over time the market would decide which technology to use. This option also has challenges as partitioning the spectrum may delay deployment of V2X technology, may impact those that have already deployed V2X previously and may cause the spectrum to be utilized in an inefficient manner. This would require further testing to ensure that the two technologies don't interfere with each other when operating in adjacent channels – known as Out of Band (OOB) interference.

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The options described above all require further testing and pose challenges because the two technologies are fundamentally different and not interoperable at the radio level. In an ideal scenario, all of the OEMs would agree to deploy a single technology per market which would then eliminate the issue of technology fragmentation and ensure interoperability. However given the announcements from the various OEMs in the market, the industry may not be able to come to such an agreement on its own.

On behalf of VWGoA, I would like to thank you for the opportunity to provide our feedback. If you have any questions or require further clarification, please feel free to contact me, or Tigran Khatchatrian, a member of my staff at 248-754-6498, at your earliest convenience.

Sincerely,  
VOLKSWAGEN GROUP OF AMERICA, INC.



Thomas Zorn  
Senior Director  
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