

PLEASE REFER TO THE GENERAL FAQs SECTION OF ARPA-E'S WEBSITE ([HTTP://ARPA-E.ENERGY.GOV/?Q=FAQ/GENERAL-QUESTIONS](http://arpa-e.energy.gov/?Q=FAQ/GENERAL-QUESTIONS)) FOR ANSWERS TO MANY GENERAL QUESTIONS ABOUT ARPA-E AND ARPA-E'S FUNDING OPPORTUNITY ANNOUNCEMENTS. ADDITIONAL QUESTIONS SPECIFIC TO THIS FOA ONLY ARE INCLUDED BELOW. PLEASE REVIEW ALL EXISTING GENERAL FAQs AND FOA-SPECIFIC QUESTIONS BEFORE SUBMITTING NEW QUESTIONS TO ARPA-E.

I. Questions for week ending: APRIL 15, 2016

Q1. I have a question regarding the fuel economy targets set by in the FOA. Regarding the FE improvement of 20%, does that apply to all market segments (LD, MD, HD)? A lot of simulation analysis papers show that 20% could be achievable for LD, but for HD a 20% improvement is very high and potentially unrealistic. Truck fleets are very excited on technologies that provide 1-3% FE given the high amount of miles that Class 8 trucks drive per year. Just wanted to clarify if the 20% applies to all or is there a tiered target for LD, MD and HD

ANSWER: As stated in Section I.E. (Technical Performance Targets) of the FOA, the proposed technology must deliver at least a 20% reduction in energy consumption when compared to the selected 2016 baseline vehicle without changing its defining features. This metric is applicable to target vehicles of all classes including light-duty, medium-duty and heavy-duty vehicles.

Q2. Will there be a Teaming Partner List released?

ANSWER: Yes, please see the "RFI-000022 Announcement of Teaming Partner List for an upcoming Funding Opportunity Announcement: Energy Efficiency Optimization for Connected and Automated Vehicles" announcement on the ARPA-E funding Opportunity Exchange website <http://arpa-e-foa.energy.gov>.

II. Questions for week ending: APRIL 29, 2016

Q3. The second paragraph on Page 18 of FOA states "..... without explicitly requiring extensive powertrain architecture or vehicle hardware modification." How do we assess if a particular powertrain hardware architecture modification constitutes an "extensive" change for the purposes of this FOA?

ANSWER: Please refer to Section I.C (Program Objectives) of the NEXTCAR FOA. Section I.C states that "Vehicle efficiency improvements should be achieved with minimal or no powertrain or vehicle hardware improvements or modifications beyond those offered by the 2016 baseline vehicle. The total cost of the technology improvements (both hardware and software) must meet the cost metric as outlined in Section I.E of the FOA."

Please also refer to Section I.E. (Technical Performance Targets) of the FOA. Section I.E. states that "Applicants may assume that the baseline vehicle will be equipped for and capable of operation up to the L3 level of operation through the use of enabling technologies such as DSRC, stereoscopic cameras for machine vision, radar, LIDAR, and acoustic/ultrasonic sensors, etc.

Section I.E further states that “Any additional hardware beyond that described above should be justified from a technology and cost point of view.”

Q4. Are mechanical upgrades to the engine which improve engine efficiency, independent of connectivity, considered to be in scope in this FOA? If so, is there a limit of how much of the 20% improvement comes from the engine alone, versus synergies with being connected?

ANSWER: ARPA-E will review compliant and responsive concept paper submissions and provide feedback either encouraging or discouraging submission of a Full Application. Concept Paper submissions are compliant if they meet the requirements of “Compliant Criteria” in Section III.C.1 of the FOA, and are responsive if they meet the Program Objectives and other requirements set forth in the “Technical Performance Targets” in Section I.E of the FOA and do not fall under the list of “Responsiveness Criteria” or “Submissions Specifically Not of Interest” in Sections III.C.2 and III.C.3 the FOA. Applicants must review the technical requirements of the FOA and independently determine whether their proposed concept warrants a submission.

Q5. The stated technical area of interest is on both vehicle dynamics and powertrain control with a good description of the powertrain control issues in Section [I.]B.3, but Section [I.]D which lists the CAV applications of interest appear to be primarily vehicle speed control topics related to external collaborative conditions (e.g. controlling speed in relation to close platooning operation with other vehicles, controlling speed in relation to traffic conditions, controlling speed in relation to stop intersection lights, etc...) and appear to have little to do with coordination with powertrain energy optimization (control of fuel rate, air rate, engine speed). It seems like there should also be some Section [I.]D applications that are more about the individual vehicle energy optimization given a travel path and a driver manually controlling vehicle speed vs time even if that vehicle is using information from other vehicles and external sources. Can you explain the Section [I.]D relation to Section [I.]B.3 and stated desire for both vehicle and powertrain control study in more detail?

ANSWER: Section I.D (Technical Category of Interest) and specifically Table 3 of the NEXTCAR FOA, describe the CAV Applications and Simulation or Testing Factors for the Design, Development, Testing and Validation for the Technology to be developed under the Program. The CAV Applications shown in Table 3 include a range of transient and nominally steady vehicle dynamic operation including, for example, “City Driving and Highway Cruise Operation”. As stated in Sections I.B.2 (Background) and I.B.3 (Motivation) of the FOA, it is assumed that the dynamic control of any target vehicle under a range of CAV Applications and Testing Factors, including varying speed and road load, will require the optimal transient control of the powertrain that provides the necessary propulsive force for the vehicle.

III. Questions for week ending: MAY 6, 2016

Q6. On page 24 of the FOA, it is mentioned that “the Technology to be developed under this Program must be designed, simulated, physically implemented, and ultimately tested and validated (either in a vehicle on the road or on a chassis dynamometer).” Would ARPA-E consider a proposal where a vehicle prototype is not available and therefore no vehicle testing is proposed, and instead other methods of validation are used, such as engine hardware-in-the-loop, as long as it is demonstrated the methods capture most of uncertainties associated with in-vehicle testing?

ANSWER: Please see Section I.D (Technical Category of Interest) of the NEXTCAR FOA. Section I.D (page 25) states that “For the purposes of simulation, the performance and efficiency of the Technology must be simulated across as wide a range of CAV applications and simulation and testing factors in Table 3 as is possible. Actual field testing and validation must include at least two CAV applications, and at least two testing factors.”

ARPA-E will review compliant and responsive concept paper submissions and provide feedback either encouraging or discouraging submission of a Full Application. Concept Paper submissions are compliant if they meet the requirements of “Compliant Criteria” in Section III.C.1 of the FOA, and are responsive if they meet the Program Objectives and other requirements set forth in the “Technical Performance Targets” in Section I.E of the FOA and do not fall under the list of “Responsiveness Criteria” or “Submissions Specifically Not of Interest” in Sections III.C.2 and III.C.3 the FOA. Applicants must review the technical requirements of the FOA and independently determine whether their proposed concept warrants a submission.

Q7. We have a question related to the NEXTCAR program that is not clear to us from reading the FOA. Is it possible that powertrain hardware changes (e.g. larger turbocharger, further engine displacement downsizing) can be considered if the improved powertrain control system enables them? In other words, does the 2016 vehicle baseline have to maintain the same hardware configuration and the 20% fuel economy gain come only from improved controls?

ANSWER: Please see the response to Q&A No. 3 above.

IV. Questions for week ending: MAY 13, 2016

Q8. THIS QUESTION IS REGARDING COST SHARE REQUIREMENTS FOR FUNDING OPPORTUNITY NO. DE-FOA-0001564.

A NON-PROFIT US RESEARCH UNIVERSITY, IS INTERESTED IN LEADING A TEAM TO SUBMIT A PROPOSAL IN RESPONSE TO FUNDING OPPORTUNITY NO. DE-FOA-0001564. WE ARE PLANNING TO PARTNER WITH [A LARGE BUSINESS] AND A NATIONAL DOE LAB FOR THIS PROPOSAL AND HAD SOME QUESTIONS REGARDING THE COST-SHARE REQUIREMENTS GIVEN THIS PLANNED TEAMING ARRANGEMENT.

- 1. THE ACADEMIC INSTITUTION LEAD MUST OFFER 5% COST SHARE FOR THE AMOUNT THAT CMU WOULD SPEND. THAT IS, FOR EXAMPLE, EVEN IF THE TOTAL AWARD IS \$100K, BUT WE ONLY SPEND \$40K OF THE TOTAL AWARD, WE ONLY NEED TO PROVIDE 5% COST SHARE OF THE \$40K SHARE OF THE AWARD, AND NOT ON THE TOTAL \$100K AWARD.**
- 2. THE LARGE COMPANY, MUST OFFER (AT LEAST) 20% COST SHARE FOR THE AMOUNT THAT IT GETS FROM THE AWARD. IN THE ABOVE EXAMPLE, IF IT RECEIVED \$40K AS A SUB-CONTRACT, THEY WOULD NEED TO PROVIDE COST SHARE OF (AT LEAST) 20% ON THEIR \$40K SUBCONTRACT, AND NOT ON THE TOTAL \$100K AWARD.**
- 3. THE NATIONAL DOE LAB WILL NOT HAVE ANY COST-SHARE REQUIREMENTS. AGAIN, IN THE ABOVE EXAMPLE, IF THE NATIONAL DOE LAB RECEIVED, \$20K AS A SUB-CONTRACT, THEY WOULD NOT NEED TO PROVIDE A COST-SHARE.**

IS THE ABOVE SET OF INTERPRETATIONS VALID?

ANSWER: ARPA-E does not provide pre-submission assessments on a project team's specific cost sharing requirement. Applicants should carefully review the cost sharing requirements for this FOA found at Section III.B (Cost Sharing). ARPA-E has also published responses to a number of questions regarding this topic on its website. These may be found at http://arpa-e.energy.gov/?q=faq%2Fgeneral-questions&field_faq_category_tid=995&=Apply+Filter. In particular, refer to FAQ 4.12.

Q9. ON THE CONCEPT PAPER TEMPLATE THERE IS A REQUEST FOR TECHNICAL CATEGORY BUT WE DO NOT SEE ANY TECHNICAL CATEGORIES IN THE FOA OR ON THE ARPA-E SUBMISSION SITE. PLEASE ADVISE IF WHAT IS REQUIRED.

ANSWER: Since there is only one technical category, you do not need to indicate a technical category.

Q10. WE HAVE THE QUESTIONS LISTED BELOW:

- 1. DOES THE BASELINE VEHICLE NEED TO BE A VEHICLE IN PRODUCTION AND/OR ON SALE TODAY OR CAN IT BE A 2016 VEHICLE THAT HAS BEEN RETROFITTED AND USES THE SHELL (OUTSIDE) OF A VEHICLE WITH DIFFERENT HARDWARE AND SOFTWARE INSIDE? FOR EXAMPLE, AN ELECTRICAL DRIVE TRAIN SUCH AS ELECTRICAL MOTORS AND HIGH VOLTAGE BATTERIES ARE FITTED INTO A TOYOTA SUV AFTER THE EXISTING POWERTRAIN (SUCH AS INTERNAL COMBUSTION ENGINE AND TRANSMISSION, BATTERY AND MOTOR) ARE REMOVED.**
- 2. CAN THE BASELINE VEHICLE BE A PRODUCTION VEHICLE MANUFACTURED BEFORE 2016 BUT RETROFITTED IN 2016?**
- 3. CAN THE 20% ENERGY CONSUMPTION SAVINGS BE ACHIEVED THROUGH A COMBINATION OF POWERTRAIN IMPROVEMENTS AND CONNECTED/AUTOMATED TECHNOLOGIES? CAN THE EFFICIENCY IMPROVEMENTS BE ACHIEVED SOLELY THROUGH THE CONNECTED/AUTOMATED ADDITIONS INTEGRATED INTO AN ALREADY EFFICIENT 2016 POWERTRAIN?**
- 4. IS 20% ENERGY SAVINGS COUNTED AS BEING FOR ONE SINGLE VEHICLE, OR IF OPERATING IN A FLEET ENVIRONMENT, IS THE DATA FOR THE FLEET IN AGGREGATE?**
- 5. HOW SHOULD WE IDENTIFY PROPRIETARY INFORMATION IN OUR CONCEPT PAPER?**
- 6. IS THE 20% ENERGY SAVINGS LIMITED TO THE SELECTED CAV SCENARIOS, OR CAN IT BE MEASURED ACROSS ALL SELECTED AREAS OF VEHICLE OPERATION?**

ANSWER:

1. Please refer to the baseline vehicle guidance in Section I.E of the FOA (Technical Performance Targets). The baseline vehicle must be a 2016 or 2017 specification vehicle. The only allowable modification to this vehicle pertain to L3 operation, as specified in Section I.E.
2. No.
3. Please refer to Section I.D. of the FOA (Technical Category of Interest) that states that “ARPA-E is specifically interested in supporting the development of new and emerging VD&PT control technologies that employ vehicle connectivity to extend beyond the automation of vehicle dynamic control functions, to the powertrain control level, for the purposes of reducing overall vehicle energy consumption.” Additionally, please refer to Section III.C.3 (Submissions Specifically Not of Interest) that includes “Technologies that rely solely upon collaborative vehicle behavior, such as platooning, without the modification of individual vehicle and powertrain energy efficiency” as an item that is not of interest for this FOA.
4. The 20% energy savings is for one single vehicle.
5. Refer to FOA Section VIII.E (Marking of Confidential Information).
6. As stated in Section I.D. (Technical Category of Interest) of the FOA, “Table 3 [Example CAV applications and test factors] is not intended to be a fully comprehensive or prescriptive list of vehicle operational applications and simulation and testing factors, and it is up to the Applicant to expand on the

information listed in the Table, or to state where deviations from those recommended applications, simulation or testing scenarios are justified.”

Q11. THE NEXTCAR FOA STATES THAT THE RESULTS SHOULD USE A 2016 VEHICLE BASELINE. WE HAVE A HYBRID VEHICLE CHOICE THAT IS OUT FOR SALE IN 2016 BUT IS CONSIDERED A 2017 MODEL BY THE COMPANY. IS THAT A VALID BASELINE?

ANSWER: Yes. Also refer to the baseline vehicle guidance in Section I.E (Technical Performance Targets) of the FOA.

Q12. I HAVE TWO QUESTIONS ABOUT THIS FOA:

- 1. THE DESCRIPTION OF THE BASELINE VEHICLE ON P. 26 REFERS TO TECHNOLOGIES THAT ARE "LIKELY TO BE AVAILABLE ON ALL VEHICLES BEFORE 2025". PLEASE CLARIFY WHETHER THIS IS INTENDED TO REFER TO AVAILABILITY ON ALL NEW VEHICLES BY 2025 OR AVAILABILITY ON ALL VEHICLES OPERATING ON THE ROAD BY 2025 (IT MAKES A BIG DIFFERENCE).**
- 2. THE CONCEPT PAPER INSTRUCTIONS ON P. 43 STATE THAT "EACH CONCEPT PAPER SHOULD BE LIMITED TO A SINGLE CONCEPT OR TECHNOLOGY." HOWEVER, THE INSTRUCTIONS IN THE MAIN BODY OF THE FOA EMPHASIZE THE IMPORTANCE OF COMBINING CONNECTED AND AUTOMATED VEHICLE CONCEPTS AND TECHNOLOGIES WITH POWERTRAIN TECHNOLOGIES, WHICH MEANS THAT IT WOULD HAVE TO ADDRESS MULTIPLE TECHNOLOGIES. PLEASE CLARIFY WHETHER THIS SUPERSEDES THE GENERAL INSTRUCTIONS ON P. 43.**

ANSWER:

1. As stated in Section I.E. (Technical Performance Targets) of the FOA, the baseline vehicle may be equipped only with a L0 level of automation but the CAV Technology implementation can assume a L1-L3 level of capability if the enabling technologies are likely to be available on all vehicles before 2025. This refers to new 2025 specification vehicles.
2. Prospective applicants must review the technical requirements of the FOA and independently determine whether their proposed concept warrants a submission. A single concept can include a collection of technologies.

Q13. TWO QUESTIONS:

- 1. ON THE BOTTOM OF P.7 OF THE FOA IT STATES "THE OPTIMIZATION OF THE OPERATION OR ENERGY EFFICIENCY OF L4 VEHICLES IS BEYOND THE DESIRED SCOPE OF THE NEXTCAR PROGRAM, WHICH EMPHASIZES APPLICATIONS FROM L0 TO L3 LEVELS OF AUTOMATION." WHILE FIGURE 2 SEEMS TO IMPLY THAT ONLY L3 AT A MINIMUM IS THE SCOPE OF THIS FOA. WHAT IS THE MINIMUM LEVEL (L0, L1, L2, OR L3) AT THE END OF THE PROJECT THAT IS WITHIN THE SCOPE OF THIS FOA, ASSUMING THE PROJECT MEETS ALL OTHER OBJECTIVES?**
- 2. CAN YOU CONFIRM THAT CONVENTIONAL PLATOONING ITSELF AND THE ASSOCIATED FUEL SAVINGS IS NOT WITHIN THE SCOPE FOR THIS FOA BUT IS ONE OF SEVERAL CANDIDATE INTEROPERABILITY APPLICATIONS THAT CAN BE TESTED AND EVALUATED WITH CO-OPTIMIZATION TECHNOLOGIES DEVELOPED UNDER THIS FOA THAT ACT ON THE POWERTRAIN TO SAVE FUEL? THEREFORE IS ONLY THE CHANGE IN FUEL SAVINGS BETWEEN CONVENTIONAL PLATOONING AND THE CO-OPTIMIZED FUEL SAVINGS IS BOOKKEPT AS PART OF THE 20% SAVINGS TARGET?**

ANSWER:

1. There is no minimum required level of automation. Please refer to the Technical Performance Targets in Section I.E (Technical Performance Targets) of the FOA.
2. Please refer to Section III.C.3 (Submissions Specifically Not of Interest). As written in this section, "technologies that rely solely upon collaborative vehicle behavior, such as platooning, without the modification of individual vehicle and powertrain energy efficiency" are not of interest. However, platooning can be used as a CAV application, as indicated in Table 3 of Section I.D (Technical Category of Interest) of the FOA.

V. First question submission deadline: MAY 18, 2016

Q14. I HAVE A FEW QUESTIONS:

- 1. I AM CURRENTLY WORKING IN AN INDUSTRIAL COMPANY AND MY FULL-TIME FACULTY POSITION AT THE ACADEMIC INSTITUTION WILL START ON AUG. 1ST, 2016. WILL I BE ELIGIBLE FOR PARTICIPATING IN THE NEXTCAR PROGRAM AS A FACULTY MEMBER?**
- 2. IF I DO NOT PARTICIPATE IN THE CONCEPT PAPER, CAN I STILL PARTICIPATE IN THE FULL APPLICATION LATER?**
- 3. What is the submission deadline for full application?**

ANSWER:

1. ARPA-E makes financial assistance awards to institutions, not individuals. Assuming the application is: (i) submitted by an eligible institution or individual (refer to FOA Section III.A (Eligible Applicants)), (ii) selected for award negotiations, and (iii) negotiations are successfully completed, the agency will make award to the institution submitting the application or an entity that is formed by the individual

submitting the application. An individual employed by an organization that receives an ARPA-E financial assistance award may be eligible to work on the award even if the individual was not employed by the organization at the time the Concept Paper or Full Application was submitted.

2. Yes, for participation in preparation of a Full Application of an institution/entity that submitted a compliant and responsive Concept Paper.
3. The Full Application submission deadline will be published in the Funding Opportunity Announcement at the completion of the Concept Paper Merit Review process.

Q15. I AM WORKING ON CACC TRUCK PLATOONING AND LOOKING TO SUBMIT A CONCEPT PAPER FOR THE NEXTCAR ON HEAVY TRUCK PLATOONING THAT [DESCRIPTION OF TECHNOLOGY] THE FOA STATES THAT AT LEAST TWO CAV APPLICATIONS MUST BE ADDRESSED. HOWEVER, MOST TRUCK FUEL SAVINGS WILL BE GAINED ON HIGHWAYS AND IT APPEARS THAT MORE OF THE APPLICATIONS ARE CITY/URBAN/TRAFFIC RELATED (WHICH DOES NOT LEAD TO MUCH OPPORTUNITY FOR FUEL SAVINGS WITH TRUCKS).

MY QUESTION IS HOW IMPORTANT IS IT TO ADD A CITY/URBAN/TRAFFIC COMPONENT TO MEET THE TWO APPLICATIONS? FINALLY, CAN WE ADD COMPONENTS/TEAM MEMBERS AFTER THE CONCEPT PAPER SUBMISSION TO ADDRESS FEEDBACK ON THE CONCEPT PAPER?

ANSWER: The CAV application and test factors should be appropriately suited to the class of vehicle proposed. As specified in Section I.D (Technical Category of Interest) of the FOA, "Table 3 is not intended to be a fully comprehensive or prescriptive list of vehicle operational applications and simulation and testing factors, and it is up to the Applicant to expand on the information listed in the Table, or to state where deviations from those recommended applications, simulation or testing scenarios are justified." Regarding the second question, the team may include components/team members in its Full Application that were not included in the Concept Paper.

Q16. WE HAVE SOME QUESTIONS

- 1. IN CASE OF HYBRID POWERTRAINS, DOES ARPA-E DEFINE A SPECIFIC METRIC FOR ENERGY CONSUMPTION? BOTH FUEL AND ELECTRIC ENERGY MUST BE ACCOUNTED FOR; HOWEVER, WHILE FUEL CONSUMPTION IS EASY TO MEASURE, ELECTRIC ENERGY CONSUMPTION IS TO BE QUANTIFIED FROM THE OBSERVED VARIATION IN THE BATTERY STATE OF CHARGE. THIS QUANTIFICATION IS NOT UNAMBIGUOUS: ONE MAY CONSIDER THE STORED ELECTRO-CHEMICAL ENERGY, OR THE ELECTRICAL ENERGY SPENT IN THE CHARGING PROCESS (HENCE ACCOUNTING FOR CHARGING EFFICIENCY) ...**
- 2. ON A SIMILAR FRONT, ARPA-E DEFINE A SPECIFIC METRIC FOR EMISSIONS IN HYBRID POWERTRAINS? AGAIN, WHILE LOCAL EMISSIONS FROM THE THERMAL ENGINE ARE EASILY QUANTIFIED, THE ESTIMATION OF EMISSIONS DUE TO ELECTRICAL ENERGY CONSUMPTION IS NOT UNAMBIGUOUS.**
- 3. WHEN PURSUING ENERGY CONSUMPTION MINIMIZATION IN A HYBRID POWERTRAIN, THE RELATIVE WEIGHT BETWEEN FUEL AND ELECTRICAL ENERGY MUST BE DECIDED. CHOOSING A SUITABLE RELATIVE WEIGHT, ONE CAN MINIMIZE THE TOTAL ENERGY CONSUMPTION (I.E. EXPRESS THE OBJECTIVE FUNCTION IN KWH), THE ENERGY PURCHASE COST (I.E. EXPRESS THE COST FUNCTION IN \$), THE CO2 EMISSIONS,... DOES ARPA-E SUPPORT ANY OF THE ABOVE CHOICES?**

ANSWER:

1. As stated in Section I.E. (Technical Performance Targets) of the FOA, "A $\geq 20\%$ reduction in energy consumption relative to the baseline ... vehicle must, by the end of the Program, be demonstrated to ARPA-E over each of the real-world scenarios selected by the Applicant from Table 3 and validated first through simulation, and ultimately through real-world testing (on a chassis dynamometer or on-road, as applicable)."
2. As stated in Section I.E. (Technical Performance Targets) of the FOA, the technology "must demonstrate no degradation in tail-pipe out exhaust emission levels over the 2016 Federal regulations and a pathway for significant future reductions."
3. Prospective applicants must review the technical requirements of the FOA and independently determine whether their proposed concept warrants a submission. The applicant is encouraged to fully explain the approach taken to determine the reduction in energy consumption, cost and emissions. Feedback will be provided following the concept paper submissions.

Q17. WE HAVE THE FOLLOWING QUESTION ON SELECTION OF THE BASELINE VEHICLE: DOES THE VEHICLE HAVE TO BE A PRODUCTION TRUCK FROM 2016 AND ARE WE LIMITED TO TECHNOLOGY OPTIONS ON THE MODEL YEAR 2016 VEHICLE? FOR EXAMPLE, IF TECHNOLOGY LIKE [TECHNOLOGY IN DEVELOPMENT] IS NOT IN PRODUCTION CURRENTLY BUT IS EXPECTED TO BE IN PRODUCTION IN A FEW YEARS, CAN WE INCLUDE [TECHNOLOGY IN DEVELOPMENT] AS A PART OF THE BASE VEHICLE?

ANSWER: The baseline vehicle must be a 2016 or 2017 specification vehicle. The only allowable modification to this vehicle pertain to L3 operation, as specified in Section I.E (Technical Performance Targets) of the FOA:

“Applicants must select a baseline ... vehicle and specify and describe the following: Vehicle class (LD, MD or HD), powertrain type (e.g. engine-only, hybrid electric, battery-only, etc.) and fuel/energy type. The above mentioned characteristics of the baseline vehicle cannot be modified to achieve the metrics of this Program. However, for the purposes of cost assessments, Applicants may assume that the baseline vehicle will be equipped for and capable of operation up to the L3 level of operation through the use of enabling technologies such as DSRC, stereoscopic cameras for machine vision, radar, LIDAR, and acoustic/ultrasonic sensors, etc.”

Q18. SEVERAL ADDITIONAL QUESTIONS CAME UP IN REGARD TO THIS SOLICITATION:

- 1. ARE THERE ANY REQUIREMENTS WITH RESPECT TO THE OWNERSHIP OF INTELLECTUAL PROPERTY IN AND TO TECHNOLOGIES OR SYSTEMS DEVELOPED AS A RESULT OF THIS PROJECT?**
- 2. CAN THE INFRASTRUCTURE COMPONENT, FOR DEMONSTRATION PURPOSES, BE SOMETHING OTHER THAN WHAT CURRENT RESEARCH IS SUGGESTING?**

ANSWER:

1. Refer to FOA Sections VIII.F (Title to Subject Inventions), VIII.G (Government Rights in Subject Inventions), and VIII.H (Rights in Technical Data) for applicable requirements.
2. Infrastructure is not addressed in this FOA. However, vehicle-to-infrastructure operation is within scope. Concept papers may involve concepts other than what current research suggests, as long as those concepts are justified in the submission.

VI. Full Application Phase Questions:

Q19. In our team, we are likely to have international organizations as our partners. We are wondering if this is permitted by ARPA-E and if the answer is yes, are there specific regulations that we have to follow with respect to IP and export control?

ANSWER: Refer to FAQ 3.1, found in the General FAQ Section of ARPA-E's website ([HTTP://ARPA-E.ENERGY.GOV/?Q=FAQ/GENERAL-QUESTIONS](http://arpa-e.energy.gov/?Q=FAQ/GENERAL-QUESTIONS)), regarding the participation of foreign entities, including participation of those entities as sub-recipients. Awardees are responsible for compliance with applicable Federal, state, and local laws and regulations when performing work under any ARPA-E award, including those regarding export control and intellectual property matters. Refer to Attachment 1, Clauses 4 and 12 and Attachment 2 respectively of ARPA-E's model cooperative agreement for additional information. These attachments may be found at [http://arpa-e.energy.gov/arpa-e-site-page/award-guidance#Cooperative Agreements](http://arpa-e.energy.gov/arpa-e-site-page/award-guidance#Cooperative%20Agreements).

Q20. We are proposing a partial solution which involves ***and therefore were not planning field testing. We were going to take our solution as far as hardware in the loop (HIL) simulation. Is this acceptable or are we required to run an actual vehicle.**

ANSWER: ARPA-E does not provide pre-submission assessments on a project team's proposed technology. Applicants must review the technical requirements of the FOA and independently determine whether their proposed concept warrants a submission. In particular, Full Applications are compliant if they meet the requirements of "Compliant Criteria" in Section III.C.1 of the FOA, and are responsive if they meet the Program Objectives and other requirements set forth in the "Technical Performance Targets" in Section I.E of the FOA and do not fall under the list of "Responsiveness Criteria" or "Submissions Specifically Not of Interest" in Sections III.C.2 and III.C.3 of the FOA. Please also refer to Section I.D (Technical Category of Interest) of the NEXTCAR FOA. Section I.D of the FOA states the following:

"ARPA-E also encourages applications stemming from ideas that still require proof-of-concept R&D efforts. Submissions requiring proof-of-concept development and demonstration may propose a project with the final deliverable being an extremely creative, but partial solution. However, Applicants are required to provide a convincing vision as to how these partial solutions would enable the realization of the full Program metrics with further development.

All Submissions should contain an appropriate cost estimate, project duration and a project plan that is described in sufficient technical detail to allow reviewers to meaningfully evaluate the proposed project. Proof-of-concept (or partial) solutions must at the very least demonstrate a 10% reduction in energy consumption over a comparable 2016 baseline vehicle (with a defined vehicle class, powertrain configuration and fuel), using connectivity and automation. ARPA-E may make one, multiple or no awards that will qualify as partial solutions, and only a small portion of the total amount to be awarded under the NEXTCAR Program is likely to be allocated to partial solutions."

Q21. We proposed *** as a part of our concept. Since that was included in the concept, including the title, do we have any flexibility to propose another technology?**

ANSWER: Refer to FAQ 7.23, found in the General FAQ Section of ARPA-E's website ([HTTP://ARPA-E.ENERGY.GOV/?Q=FAQ/GENERAL-QUESTIONS](http://arpa-e.energy.gov/?Q=FAQ/GENERAL-QUESTIONS)).

Q22. We proposed to include *** in our team. Is it permissible for us to add/remove/replace team members?**

ANSWER: Yes, refer to FAQ 7.11, found in the General FAQ Section of ARPA-E's website ([HTTP://ARPA-E.ENERGY.GOV/?Q=FAQ/GENERAL-QUESTIONS](http://arpa-e.energy.gov/?q=faq/general-questions)).

Q23. We have the following questions

a. Will a natural gas plug-in hybrid electric vehicle (which may be repowered from a conventional natural gas engine vehicle) be eligible as a baseline 2016/2017 vehicle?

b. Are the recipients required to conduct emissions testing to demonstrate meeting the Vehicle Emissions Target on p. 27 of the FOA?

c. In case of plug-in hybrid electric vehicles, is the Energy Consumption Reduction Target referred to fossil fuel consumption reduction or total energy consumption (fossil fuel + electricity) reduction?

d. Is the "20% energy reduction" requirement applied to the entire driving cycle or some specific regions where all the VDPT controls are activated?

e. In addition, does this requirement need to be satisfied at any level of the testing factors, e.g., light traffic condition, medium traffic condition and heavy traffic condition?

ANSWER: a. Yes. Please refer to Section I.B.2 (Background) of the NEXTCAR FOA. Particularly, Section I.B.2 states that: "The fuels used will presumably continue to include gasoline, diesel fuel, electricity (for BEVs and plug-in HEVs, or PHEVs), hydrogen, natural gas and biofuels. For the purposes of the ARPA-E NEXTCAR Program, no preference is expressed for any particular fuel or energy source for propulsion." Please also refer to the definition of the Baseline Vehicle in Section I.E (Technical Performance Targets) of the FOA, which states "**Baseline Vehicle: Applicants must select a baseline 2016 vehicle and specify and describe the following: Vehicle class (LD, MD or HD), powertrain type (e.g. engine-only, hybrid electric, battery-only, etc.) and fuel/energy type. Applicants should note that appropriate 2017 model year vehicles are also considered suitable as Baseline Vehicles. The above mentioned characteristics of the baseline vehicle cannot be modified to achieve the metrics of this Program."

b. Yes. Please refer to Section I.E (Technical Performance Targets) of the NEXTCAR FOA. Applicants must demonstrate no degradation in tail-pipe out exhaust emission levels over the 2016 Federal regulations by emissions testing and further propose a pathway for significant future reductions.

c. The 20% Energy Consumption Reduction Target over the 2016 (or 2017) baseline vehicle refers to the reduction in the total energy consumption of the target vehicle that is to be achieved by the Technology to be developed under this Program, through the use of connectivity and vehicle automation.

d. The reduction in energy consumption should be demonstrated under real-world testing. Please refer to Section I.C (Program Objectives) of the NEXTCAR FOA. Section I.C states that: “The primary objective of the NEXTCAR Program is to fund the development of deployable VD&PT control technologies that can achieve, through the use of connectivity and automation, at least a 20% reduction in the energy consumption of LD, MD and HD vehicles under real-world operation, when compared to a 2016 baseline vehicle.” Please also refer to Section I.E (Technical Performance Targets), which describes the Program’s “Target Vehicle Applications/Operating Scenarios” and which states further that: “Applicants will be required to demonstrate via real-world testing that these targets have been met by their Technologies, by the end of the award period.”

e. Please refer to Section I.D (Technical Category of Interest) of the NEXTCAR FOA and in particular, Table 3 of the FOA. Section I.D of the FOA states that: “For the purposes of simulation, the performance and efficiency of the Technology must be simulated across as wide a range of CAV applications and simulation and testing factors in Table 3 as is possible. Actual field testing and validation must include at least two CAV applications, and at least two testing factors”. Section I.D also states that: “Table 3 is not intended to be a fully comprehensive or prescriptive list of vehicle operational applications and simulation and testing factors, and it is up to the Applicant to expand on the information listed in the Table, or to state where deviations from those recommended applications, simulation or testing scenarios are justified.”