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Mail-Out #MSC XX-XX

TO: ALL PASSENGER CAR ALTERNATE FUEL CONVERSION VEHICLE  
MANUFACTURERS  
ALL LIGHT-DUTY/MEDIUM-DUTY ALTERNATE FUEL CONVERSION  
VEHICLE MANUFACTURERS  
ALL OTHER INTERESTED PARTIES

SUBJECT: DRAFT Guidelines for Alternate Fuel Vehicle On-Board Diagnostic II  
(OBD II) Certification

In order to help alternate fuel vehicle (AFV) conversion manufacturers understand how to comply with OBD II requirements and apply for certification, staff has developed the guidelines presented in this mail-out for new vehicle and engine conversions offered for sale in California. These guidelines supplement the existing information detailed in the ARB Mail-Out #MSC 06-23 "Guidelines for On-Board Diagnostic II (OBD II) Certification Data." OBD-related Mail-Outs and other information can be found at ARB's website: <http://www.arb.ca.gov/msprog/obdprog/obdupdates.htm>.

Most AFV conversions involve redesigning a gasoline-fueled vehicle to operate on compressed natural gas (CNG), liquefied petroleum gas (LPG), or a blend of conventional and alternate fuels. While, historically, the most common AFV conversions in the light- and medium-duty sector have consisted of gasoline vehicles converted to dedicated CNG or LPG, California's OBD II requirements apply to all conversion fuels, and includes vehicles that operate on one or more alternate fuels (either separately or simultaneously). The guidance below is intended to address typical OBD II-related questions and issues that arise during conversion system development and certification.

1. Development/Calibration Work for Compliant Systems:
  - a. OEM Vehicle Selection Considerations and Model Year Designation

AFV conversion manufacturers are encouraged to start with a California OBD II certified package. In many cases, converting Federal OBD certified vehicles can cause problems because the base system needs additional monitors and/or recalibration to bring it up to compliance with the California OBD II requirements. The complexity

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involved and effort required to convert a non-US certified system (e.g., a European EOBD system) can be extremely extensive and is likely beyond the practical capability of an AFV conversion manufacturer. In these cases, most, if not all of the base monitors would need to be redesigned and recalibrated and several monitors would need to be added because non-US systems have significantly fewer monitors, and the monitors that are present typically meet less stringent monitoring requirements.

Moreover, AFV conversion manufacturers are strongly encouraged to use OEM vehicles of the same model year as the model year intended for the AFV under review for certification. For example, if attempting to certify a 2014 model year CNG van, the conversion should start with a 2014 model year van. Attempts to take a previous model year OEM vehicle (e.g., 2013) and recertify it as a current model year (e.g., 2014) AFV are highly likely to fail because there are often OBD II requirements that change or phase-in from year to year, even within different product offerings from a single OEM. These changes can include items called out in the OBD II regulation as well as changes that the OEM manufacturer is implementing to address deficiencies, concerns, or other issues that have been identified. Some of the changes may appear in the form of running changes or additional phase-ins agreed upon with ARB staff. The application review process takes longer, is more complicated, and historically, nearly always results in rejection of the application when a manufacturer tries to cross over model years because of the difficulties in identifying and implementing all the changes that need to be done just to the base system to make it compliant with the next model year.

b. Control strategy/calibration interaction with OBD

It is important for the AFV conversion manufacturer to be knowledgeable of the impacts of changing the Original Equipment Manufacturer (OEM) calibration values. If a manufacturer changes base emission control strategies (e.g., EGR rates or cold start strategies such as spark retard for catalyst light-off), there is an increased chance of impacting the OBD system compliance for the corresponding system monitors. For example, increasing the use of one of these strategies could make tailpipe emissions more sensitive to degradation of that component or system which means that the fault threshold for the monitoring strategy may need to be set more stringently. As another example, changing the strategy could also reduce the in-use monitoring frequency (discussed further below), for example, by altering the ability of the monitor to run (provide less opportunity within the enable conditions of the monitor) or the ability to detect a fail (e.g., reduce the separation between good and bad).

c. Calibration of Emission Threshold Monitors

Not all OBD II monitors are calibrated to an emission threshold, but for each one that is (e.g., misfire, fuel system, catalyst, etc.) the AFV manufacturer must verify with emission testing that these thresholds will still be met after the alternate fuel

conversion, or recalibrate as necessary to meet the emission threshold requirements. In general, the monitors with emission thresholds are covered in sections (e)(1)-(e)(13)<sup>1</sup> for gasoline vehicles and would also apply to alternate fuel conversion of gasoline vehicles. When it comes to an AFV conversion, base engine out emissions can be significantly different with an alternate fuel as compared to the original fuel. Therefore, the correlation from tailpipe emissions to the inferred diagnostic parameters (e.g., EGR flow, oxygen storage level of the catalyst, or the oxygen sensor response time) will also likely be different. With a given level of deterioration simulated by the implanted malfunction, the AFV conversion could have tailpipe emissions that are significantly higher or lower than the OEM configuration.

Threshold calibrations for some monitors on alternate fuel may be more sensitive (requiring a tighter calibration) or may be less sensitive (allowing the emission threshold to be less stringent), depending on the monitor and fuel. For cases where the threshold is more sensitive (i.e., a component must be detected at a lesser level of deterioration to meet the emission threshold), the AFV conversion manufacturer is required to recalibrate the OEM malfunction criteria. For cases where the threshold is less sensitive (i.e., allowing further degradation of the component before reaching the emission threshold), the AFV conversion manufacturer is not required to modify the OEM malfunction criteria, but may choose to do so. AFV conversion manufacturers should be aware when tightening thresholds to detect a less deteriorated part that adequate separation still needs to be maintained between good and bad parts (as measured by the monitor) such that the recalibration does not risk false detection of faults. In cases where a monitor has been significantly tightened to comply, AFV manufacturers should be prepared to provide data showing sufficient separation in monitoring results between good and bad parts still exists.

In some cases, control strategy changes could impact a component or system's impact on emissions to the point where its monitoring strategy will need to change from a functional monitor (detects when system is no longer functioning, but is not calibrated to an emission threshold) to an emission threshold monitor that requires correlation of the component's performance to its impact on emissions. Bringing the monitoring strategy into compliance could require additional monitoring strategies to be added and/or recalibrated. For example, an OEM system might have a functional monitor of the EGR system for low flow per the regulation because complete blockage of flow causes an emission impact that is less than the OBD II threshold (1.5 times applicable FTP standards in this case).<sup>2</sup> However, upon changes by the conversion manufacturer, EGR could now have a much bigger tailpipe impact and require a fault to be detected at some partial level of blockage that equates to the OBD II threshold. Depending on the monitoring strategy implemented by the OEM, this may simply require recalibration of the existing monitor to detect that amount of blockage while in other cases, it may

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<sup>1</sup> Unless otherwise noted, all regulation references are to title 13, CCR, section 1968.2.

<sup>2</sup> See section (e)(8.2) in the OBD II regulation.

require the addition of a more complex monitor that has the capability to detect partial blockage.

OEMs are required to calibrate emission threshold monitors to meet the OBD requirements throughout the vehicle's useful life (typically 120,000 miles for current model year vehicles). During development and calibration, these manufacturers run iterative emission tests with implanted faults representing varying degrees of deterioration to identify the level of deterioration that equates to the emission threshold and then identify a parameter that can be monitored and correlated to this level of deterioration (e.g., one might implement varying degrees of restriction in an EGR system and design a monitor that measures EGR flow via pressure sensors to correlate to the level of restriction at which the emission threshold is reached). Given that the requirements have to be satisfied throughout the vehicle's useful life, manufacturers do such calibration work on vehicles representative of or aged to full useful life, which typically represents the worst case conditions for detecting emission faults.

Certifying the converted AFV to the same tailpipe standard as the OEM vehicle should generally reduce the complexity of the conversion process and minimize the need to recalibrate. If the AFV conversion manufacturer is certifying the converted vehicle to a more stringent emission standard, it is likely that more of the emission thresholds will need to be recalibrated because the absolute emission level at which malfunctions must be detected will be lower. However, even if an AFV conversion manufacturer chooses to certify at the same emission level, there is a high probability that a few monitors will need to be recalibrated.

d. Demonstration Testing

The OBD regulation requires each test group certified by OEM manufacturers to comply with all OBD requirements including the emission thresholds described above. Monitoring system demonstration testing, as described in section (h) of the OBD regulation, is one of the mechanisms ARB uses to verify that the emission threshold requirements are satisfied. This testing allows ARB to spot-check that the emission thresholds are indeed calibrated correctly by requiring FTP emission testing of every one of the OBD threshold monitors (with a fault implanted) on one to three vehicles per manufacturer, per year. Tested vehicles are aged to be representative of full useful life mileage. The test groups that must be demonstrated are selected in advance by ARB and the number of vehicles selected per manufacturer is based on the number of test groups being certified by the manufacturer and is called out in the regulation. The testing either shows that the monitors do detect faults for the required emission controls before the emission thresholds are exceeded (demonstrating compliance) or that one or more monitors do not meet the required thresholds and the monitoring system design(s) need to be improved.

Accordingly, AFV manufacturers must also perform demonstration testing of OBD II monitors on test groups selected by ARB for demonstration. Testing is required for each emission threshold monitor, as called out in section (h), including monitors for which the AFV manufacturer determines that recalibration is not necessary to comply. Because alternate fuel use can very significantly impact the correlation of emission control system performance with emission levels, it is not possible to accurately predict how each monitor will be affected by the AFV conversion or to decipher which monitors will require recalibration without using the same process employed by the OEM. That process consists of implanting a degraded part for each monitor, conducting emission testing, and where necessary, repeating the testing in an iterative manner to determine the level of degradation that equates to the tailpipe emission threshold value. It is not acceptable to implant a gross malfunction (degraded significantly over the threshold value) and then show that a fault can be detected. Such data does not demonstrate that the OBD II system will reliably detect a malfunction *before* the emission threshold is exceeded as required by the regulation. AFV conversion manufacturers do have opportunity to take advantage of the OEM's work in that they can start with a component degraded exactly to the monitoring threshold used by the OEM and conduct further iterative testing (with a less degraded component) only if the emission threshold is exceeded.

The vehicle used for demonstration testing must comply with section (h)(2.3) (e.g., it must be representative of an AFV at full useful life). It is not acceptable to use a low mileage vehicle and apply tailpipe deterioration factors to the emission testing results because this process does not provide accurate data regarding emission levels in the presence of a malfunction. In some cases, the OEM manufacturer will have an alternative durability procedure (ADP) approved by ARB and will allow an AFV conversion manufacturer partial access to use the same procedure. For example, the OEM may give permission to its approved suppliers to age the applicable components in accordance with the OEM's ADP (without disclosure to the AFV conversion manufacturer) at the expense of the AFV conversion manufacturer. OEMs are not required to do this nor are they obliged to disclose their confidential ADP process to AFV conversion manufacturers. However, to the extent the OEM is willing to accommodate the AFV conversion manufacturer, ARB will allow it even though it was derived on gasoline operation instead of alternate fuel operation. Other than the ADP process, AFV conversion manufacturers can use standard aging provisions (e.g., the Standard Road Cycle or Standard Bench Cycle) to achieve full useful life mileage on a vehicle. Use of some other representative high mileage vehicle may also be acceptable, subject to approval by ARB.

e. Added Emission/OBD-Related Components

Each emission-related component (e.g., sensors, valves, ECUs/processors, injectors, etc.) added by an AFV conversion manufacturer must be monitored in accordance with

the OBD II regulation. This includes meeting the requirements for the specified failure modes that need to be detected, MIL illumination and fault code storage protocols, and standardized communication to an off-board diagnostic tool. It is not acceptable to have a separate MIL, diagnostic connector, or communication protocol for monitoring strategies carried out, for example, by an additional AFV ECU module. In addition, it is not acceptable to rely on other higher-level system monitors (like fuel system or misfire) to monitor emission-related components added by the AFV conversion. Instead, the AFV conversion manufacturer must introduce monitoring strategies as necessary to comply with the OBD II regulation. As an example, AFV conversion manufacturers may not rely on the OEM misfire detection strategy to detect circuit faults in added electronic injectors. The manufacturer must instead design and implement monitoring strategies that directly evaluate circuit continuity.

f. Modified Emission/OBD-Related Components

Some conversion system components are intended to replace OEM components. For example, the conversion system may require a different fuel level sensor in place of the OEM component. In this case, the AFV conversion manufacturer must verify that all OEM monitors for the modified component work correctly, and recalibrate where necessary. Specifically, the manufacturer must ensure that the circuit and out of range diagnostics are still appropriate and that the rationality monitor continues to work properly (i.e., it has not been rendered significantly more or less sensitive as a result of the change). In addition, the AFV conversion manufacturer must ensure that diagnostics depending on information from those modified components continue to function as designed. For example, if other diagnostics are enabled or disabled based on high or low fuel level, or if any other diagnostics have a fault threshold that is a function of fuel level, the AFV manufacturer must verify that the other diagnostics are still properly enabled, disabled, and/or calibrated as required by the OBD regulation.

g. Deleted Emission/OBD-Related Components

For OEM emission- or OBD-related components that are removed as part of the conversion (e.g., the evaporative (EVAP) system purge valve, canister vent valve, gasoline injectors, etc.), AFV conversion manufacturers need to verify that the integrity of the OBD II system is maintained. This verification must include investigating and demonstrating that the diagnostics of the deleted and/or disabled components have been appropriately modified or disabled such that they do not adversely affect (e.g., disable, reduce monitoring frequency) any other diagnostics that rely on information from these components as an entry condition or a malfunction threshold. Adverse impacts include, but are not limited to, disablement or reduced in-use monitoring frequency. As an example of this type of verification, the conversion manufacturer may need to verify that a deleted EVAP purge valve and/or its disabled diagnostics do not

have an impact on a fuel system monitor that may require some amount of accumulated purge before detecting fuel system faults.

#### h. In-Use Monitoring Frequency (Rate-Based) Requirements

Per section (d)(3.2), OEM vehicles are required to be designed to ensure that monitoring of specified components occurs frequently during real world, in-use driving by the vehicle owners. Monitors that run too infrequently or not at all, undermine the purpose of OBD, which is to alert drivers in a timely manner to the presence of a malfunction. Poor in-use monitoring frequency can subject the OEM to recalls for noncompliant vehicles. To verify that adequate monitoring frequency is being met, vehicles report standardized information per sections (d)(4), (d)(5), and (g)(5), collectively known as “rate-based” data. The data track how often various monitors have run relative to how often the vehicle has been driven. AFV conversion manufacturers need to be aware of these requirements and ensure that calibration changes or other modifications will not adversely affect monitoring frequency such that the vehicle no longer complies. One mechanism ARB uses to verify sufficient frequency is called Production Vehicle Evaluation (PVE) testing (section (j)(3)) and is described in further detail below. AFV conversion manufacturers, like OEMs, are required to collect and submit this data from actual in-use vehicles within one year from the start of production. While not very common, staff has seen AFV conversions where rate-based data revealed that calibration changes inadvertently disabled required monitors. In such cases, the AFV conversion manufacturer was required to address in-use vehicles with the issue.

#### i. Standardization Requirements

Storing and communicating OBD-related information in a standardized format is an important aspect of the OBD requirements. This information is used for various purposes by vehicle owners, repair technicians, inspection/maintenance programs, and ARB enforcement staff. The requirements for communication are identified and detailed in section (g) of the regulation. Modifications made during conversion can potentially affect this data. Therefore, AFV conversion manufacturers must verify that accurate data is still being properly reported.

Data stream information (including readiness data) communicated by the vehicle to scan tools includes real-time outputs from many of the sensors and measured values.<sup>3</sup> AFV conversion manufacturers need to be aware of the required data especially when adding, modifying, or deleting emission or OBD-related components, and must take action where necessary to ensure the data is being reported correctly. For example, AFV manufacturers that use a different fuel level sensor on vehicles that use the sensor for OBD-related purposes will need to verify the modified fuel level sensor still reports

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<sup>3</sup> See sections (g)(4.1) through (g)(4.4)

accurately to a scan tool. Manufacturers that delete components may similarly need to modify the data stream to stop reporting values associated with that deleted component (e.g., commanded purge valve position on vehicles that have had the purge valve eliminated, EVAP system readiness changed from supported to unsupported on vehicles that have the EVAP system removed, etc.). Other data may also need to be modified including data indicating the fuel type currently being used by the vehicle.

Fault code information, MIL command status, and freeze frame data are similarly standardized in sections (g). AFV conversion manufacturers must ensure that fault information, even for added components, is properly output to a scan tool in accordance with the standardization requirements. The assignment of additional fault codes may be necessary when new components have been added or diagnostics changed in AFV conversions. A primary objective of OBD II is to reliably pinpoint the likely component or system at fault (and its failure mode) to repair technicians. Given the small volume of AFVs, conversion manufacturers will likely need to consider using manufacturer specific codes (as allowed by SAE J2012 and the OBD regulation) for some added component diagnostics.

Recalibrated emission threshold monitors need to report the new emission threshold values (test limits) in the relevant test results required by section (g)(4.5). In most cases this happens automatically, but compliance needs to be verified by the AFV conversion manufacturer. Similarly, controllers that still report test results associated with deleted monitors will need to be modified to stop reporting results that are no longer valid.

Calibration identification (CAL ID) and calibration verification number (CVN) data must also be stored and reported as required in sections (g)(4.6) and (g)(4.7). CAL ID uniquely identifies the particular version of software the emission-related control units are currently using AFV manufacturers will need to change the CAL ID to an AFV-manufacturer defined value if any calibration or software changes are made to the OEM system. Subsequent calibration releases by the AFV manufacturer would also need to change this value to reflect that a new version of software being used. The CVN is computed by the emission-related control units and is typically a more complex variation of a check-sum calculation to verify the integrity of the data in the control unit. For modified software or calibration, the CVN should typically change automatically and require no further work on the part of the AFV manufacturer. AFV manufacturers, per section (g)(4.7.4) and Mail-Out #MSC 06-23, updated February 24, 2011, will need to report to ARB the CAL ID and associated CVN for each version of software released at the end of each calendar quarter in the format specified in the referenced Mail-Out.

j. AFVs Utilizing Two or More Fuels Separately or Simultaneously

AFVs have to be fully OBD II compliant when operating on all fuels or combination of fuels on which they are designed to operate.



An invalid assumption some AFV conversion manufacturers have made is that OBD compliance is not required when using the alternate fuel if the vehicle uses a strategy that reverts back to the OEM configuration and fuel when a problem occurs. Using this logic, some AFV conversion manufacturers argue that there is no need for MIL illumination or conformance to OBD II requirements while operating on the alternate fuel because any failure will result in a return back to the same operation as the base OEM vehicle before it was converted. However, such an implementation would not be in compliance with California requirements. OBD monitoring is required to detect faults that increase emissions from the level emitted from a properly operating certified vehicle. By certifying an AFV conversion, the vehicle as converted becomes the new certified configuration, and any increase relative to proper operation of the AFV is an emission increase for purposes of the regulation. Further, such an approach would require a comprehensive diagnostic system on the alternate fuel to ensure all required faults are detected at the appropriate emission levels and in a timely manner—exactly what an OBD II system is required to do. Default actions taken by the manufacturer after fault detection (e.g., defaulting back to OEM fuel operation, defaulting to a limp-home mode, etc.) are neither required nor prohibited by OBD II and the presence or absence of such strategies does not change the OBD II requirements that the vehicle is subject to.

AFV conversion manufacturers need to ensure that monitors capable of running on multiple fuels have robust fault detection and are capable of making accurate decisions with respect to all fuel combinations the vehicle is designed to run on. Robust detection of faults for all fuel combinations is needed to ensure consistent MIL illumination. An AFV conversion manufacturer needs to ensure against situations where, in the presence of a fault, the diagnostic will make conflicting decisions based on which fuel it is operating on (e.g., with the same failed part present, the diagnostic consistently detects a fault on fuel A and consistently makes a passing decision when operated on fuel B).

When gasoline is one of the fuels in a multiple fuel AFV, conversion manufacturers need to ensure that the EVAP system components are still monitored properly, and with adequate frequency, regardless of the typical fuel usage of a given vehicle. EVAP emissions from gasoline systems occur even when the vehicle is not operating on gasoline and as such, faults that lead to increased EVAP emissions (such as a leak in the EVAP system) must be detected in a timely manner.

For vehicles that have the OEM fuel still available as one of the fuels to operate on (e.g., a gasoline vehicle converted to one that can run either on gasoline or CNG), the ARB will not require recalibration or demonstration of the emission threshold monitors on the original OEM fuel if the system truly is identical in all respects to the OEM

configuration when operating on that fuel (e.g., emission-control hardware, base emission control strategies and diagnostics, certified emission standard, etc.).

2. Certification:  
a. OBD II Certification Application

An OBD II certification application consists of the documentation required by section (i), including the monitoring system demonstration data specified in section (h) of the regulation. ARB staff has developed guidelines and templates for use in preparing various elements of the certification application<sup>4</sup>. Where applicable, all OBD II certification information needs to be submitted in accordance with these templates. AFV conversion manufacturers need to accurately and fully disclose any changes to a base emission control strategy in their certification application and ensure that such changes have not altered the OBD II requirements the system is subject to.

From experience, staff has found that the certification review process is expedited if the AFV conversion manufacturer provides a calibration comparison table to identify all emission- and OBD II-related calibration changes between the OEM calibration and the AFV calibration. This table should use either a side-by-side format showing the OEM and AFV calibration with changes highlighted or a strike-out/underline format to show the OEM calibration values that have been changed. Each change should include a rationale/explanation as to the purpose and impact of the change.

Section (i)(2.5) and Mail-Out #MSC 06-23 require submission of misfire data demonstrating the probability of detection for several misfire patterns. In lieu of submitting a complete set of this information as OEM vehicle manufacturers are required to do, ARB will provide some relief since the AFV conversion manufacturer is starting with a certified system. The AFV conversion manufacturer is allowed to conduct testing to 'spot-check' and partially populate the data required in (i)(2.5.2) instead of taking data for every speed and load cell required per the referenced Mail-Out. Specifically, subject to ARB approval, AFV conversion manufacturers may fill in a representative sample of the cells (i.e., a number of cells distributed across the engine speed and load region and for each of the required patterns) to verify the OEM misfire detection capability has not been adversely impacted.

After certification, any subsequent emission-related changes to the certified system (e.g., calibration changes, hardware changes, etc.) need to be reported to ARB for review through the running change process. Changes that affect OBD II monitors need to be sent directly to ARB's OBD certification staff for review as part of the running change process. Fast review of these running changes is facilitated when the manufacturer provides a summary of the changes in a strike-out/underline format along with a detailed explanation as to their necessity.

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<sup>4</sup> Mail-Out #MSC 06-23

OBD II certification approval is granted specific to the model year (e.g., if approval is granted for a conversion of a specific 2014 model year OEM test group to a 2014 model year AFV test group, that approval only covers such conversions and does not automatically cover conversion of 2013 or 2015 model year vehicles or other 2014 model year test groups). Each subsequent model year requires a new application and approval. There are no 'carry-over' provisions that invoke a separate or distinct process for certification based on an AFV conversion manufacturer's representation about similarity to a previously certified product. However, AFV conversion manufacturers that seek to certify a subsequent model year application that is very similar to a previous model year application are encouraged to use a strike-out/underline format from the previous year's application to show changes (both in the OEM calibration and the AFV conversion calibration) from the previous to the current model year to expedite the certification review.

Further, AFV conversion manufacturers need to diligently identify differences in the base OEM vehicle from the previous model year because subtle changes in calibration both to emission control and OBD diagnostics often occur from year to year even though the product appears to be identical to the previous year. Relying on marketing materials, dealership personnel, test group names, or even tailpipe certification levels to conclude an OEM vehicle is identical to the previous year is insufficient. In cases where there are no material OBD changes (which is very rare), or minor changes that have already been addressed by the AFV conversion manufacturer, certification of subsequent model years is generally faster and can often, at least partially if not largely, rely on test data provided as part of the previous model year application. As noted above, AFV conversion manufacturers should start with a baseline vehicle that is the same model year as the AFV conversion is being certified as. Attempts to rebadge a previous model year to a newer model year or apply software or calibrations developed for a previous model year to a subsequent model year nearly always fall short of compliance.

b. OBD Groups, Representative Test Groups, and Demonstration Vehicle Selection

Sections (h) and (i) describe the method for defining OBD II groups and ARB selection of demonstration vehicles. Every test group (and vehicle) that an AFV conversion manufacturer seeks to certify must be compliant with the OBD II regulation. However, a separate application is not necessarily needed for each test group. ARB allows for the grouping of some similar test groups and submittal of a single application per grouping. Section (i)(1.1) allows manufacturers to propose the use of an OBD II group to cover multiple individual test groups to the ARB for approval. An OBD II group includes test groups with similar OBD II strategies, monitoring conditions, and calibrations such that the in-use monitoring performance of all included test groups is expected to be similar.

AFV conversion manufacturers planning to certify more than a few test groups in a single year are encouraged to identify all test groups planned for conversion in a production year, and where appropriate, submit a plan for ARB approval of OBD II groupings well in advance of certification. It is important to remember that approval for a grouping does not alter in-use liability or the responsibility to calibrate each individual test group appropriately. An approved grouping, for example, of three test groups as a single OBD II group does not give an AFV conversion manufacturer approval to develop a single calibration to be used in all three test groups or give approval to calibrate only one of the groups and carry the calibration across to the others. Each test group still needs to be appropriately and individually calibrated to comply with OBD II. An approved grouping simply means ARB has agreed that these test groups are similar enough that the AFV conversion manufacturer can submit a single OBD II application describing the changes to one test group and ARB will consider the documentation to be representative in reflecting the types of changes made to each of the individual test groups.

When submitting a plan for an OBD II group, the plan should identify one of the individual test groups within that grouping as the proposed test group for which the actual application/calibration data will be submitted. The proposed test group should be the one that the AFV conversion manufacturer considers to be the most representative of the OBD II group, and should take into consideration highest sales, most stringent emission standard, highest number of emission control components, etc. ARB staff will ultimately decide which of the test groups within an OBD II group will be the representative test group for which the AFV conversion manufacturer must submit actual data in the certification application.

Even if an AFV conversion manufacturer does not plan to use OBD groups and will submit applications for each test group, the AFV conversion manufacturer still needs to identify all test groups planned to be certified for that model year well in advance of certification. ARB staff will use the list of groups to select the group(s) for which demonstration testing is required pursuant to section (h) (and for production vehicle evaluation testing required in section (j)(2), discussed in further detail later in this document). The number of test groups selected is determined by the regulation. While ARB will ultimately decide which test groups are selected for the testing, AFV conversion manufacturers are encouraged to propose selections and provide the rationale for them. In general terms, ARB selects test groups based on the following considerations: the stringency of the emission standards being met, new or complex products, models with high projected sales volumes, groups that have additional emission controls relative to others, and whether or not the group has been demonstrated in previous years.

When submitting a listing of all the planned test groups for ARB selection, the listing should identify the OEM test groups being converted, the AFV conversion

manufacturer's test group designation, the vehicle models covered by that test group, whether the OEM test group is chassis or engine dynamometer certified, and the certification standards and weight class for both the OEM test group and for the converted test group. Additionally, a listing should be included of the emission controls (similar to what is included on the under hood label), any current OBD II regulatory phase-ins (if applicable) and which test groups do and do not meet the new monitoring requirements subject to the phase-in, and projected sales volume for each test group. Manufacturers who do not identify all test groups adequately ahead of time will likely be required to do demonstration testing on more test groups in that model year because they did not provide ARB with the opportunity to select the most appropriate test group(s) ahead of time.

Similar to what was noted above when discussing OBD groups, regardless of the selection of one or more test groups for demonstration testing, compliance for non-selected test groups is still the responsibility of the AFV conversion manufacturer, and the in-use liability is not reduced for groups that do not undergo demonstration testing as part of the certification process. All test groups certified must meet the requirements and ARB can ask for additional data to prove compliance on any and all test groups as part of the certification application.

c. Deficiencies for Noncompliance and Fines

Section (k) defines a process for manufacturers to be certified with one more deficiencies in cases where the OBD system design falls short of satisfying individual OBD II requirements. Per the regulation, however, there are several criteria that have to be satisfied to qualify for deficiency consideration including making a good faith effort to comply in full and to come into full compliance as expeditiously as possible. Additionally, there are per vehicle certification fines associated with vehicles that have more than two deficiencies and there are prohibitions on granting deficiencies for systems that meet the criteria for mandatory recall in the OBD II enforcement regulation (title 13, California Code of Regulations, section 1968.5(c)(3)). Examples of noncompliance that would be subject to mandatory recall include emission threshold monitors that cannot detect a fault before emissions are double the OBD II threshold, or issues that prevent the vehicle from properly being inspected during an Inspection and Maintenance program test such as California's Smog Check Program.

If a deficiency is granted to the AFV conversion manufacturer, the AFV conversion manufacturer will need to re-apply for approval of a deficiency in the subsequent model year if it has not yet been corrected. Carry-over of a deficiency is not automatic. In considering whether to allow carry-over of a deficiency, ARB looks at the level of continued progress and good faith effort to meet the requirements and come into compliance as expeditiously as possible. Further, manufacturers, including AFV conversion manufacturers, are not allowed to carry over deficiencies for more than two

model years unless it can be demonstrated that substantial vehicle hardware modifications and additional lead time beyond two years would be necessary to correct the deficiency. Even in cases where these criteria are met, the Executive Officer can only allow the deficiency to be carried over for a total of three model years.

Deficiencies and concerns related to the based OEM vehicle diagnostics are also identified and part of the certification of the AFV. ARB staff understands that the AFV conversion manufacturer does not have the resources or capability to address issues in the underlying OEM system and will be dependent on the OEM correcting them in the base test group. However, the AFV conversion manufacturer is responsible for any deficiencies, concerns, or issues that are caused by the AFV conversion.

Requests by an AFV conversion manufacturer for carry-over of a deficiency related to the base OEM vehicle from a previous model year to the current model year due to the OEM no longer supporting/offering/certifying the test group for the current model year are not likely to meet the criteria of a good faith effort to comply, and are not likely to be granted. This is further reason to always start with a base OEM vehicle that is the same model year as the conversion is being certified as.

3. Testing after Certification:  
a. Production Vehicle Evaluation (PVE) Testing

There are three distinct PVE test requirements in sections (j)(1), (j)(2), and (j)(3), that apply to production vehicles after certification. AFV conversion manufacturers are required to conduct and report results for all three PVE tests.

AFV conversion manufacturers are required to conduct testing on actual production vehicles in accordance with (j)(1) to verify compliance with the standardization requirements for communication of required emission-related messages to a generic scan tool. Details of the testing, equipment, and time frame for testing are identified in the regulation. Manufacturers must submit the results of such testing to ARB and include the raw log files generated by the test equipment along with documentation describing each issue identified, and whether the issue constitutes an instance of noncompliance. If a noncompliance issue is identified, the documentation should identify what the root cause is and what the manufacturer proposes to do to address it. While basic communication is rarely compromised as a result of the AFV conversion, this testing often does reveal mistakes made by the AFV conversion manufacturer with respect to the standardized data requirements discussed above in this document.

Prior to certification of any test group for a particular model year, the AFV conversion manufacturer needs to identify all of the test groups planned to be certified for that model year to facilitate ARB selection of vehicles for PVE (j)(2) testing. Typically, this is done by use of a model-year production plan submitted in conjunction with

information required for ARB to select monitoring demonstration vehicles as noted above. The number of test groups selected for this testing is determined by the regulation. While ARB will ultimately decide which test groups are selected for the testing, AFV conversion manufacturers are encouraged to propose selections and provide the rationale for the proposed selections. Prior to conducting the testing, the AFV conversion manufacturer is required to submit a plan for ARB approval for each monitor that will be tested and how each fault will be implanted. In cases where the the manufacturer is requesting exemption from testing specific monitors in accordance with the regulation, identification of each such monitor and the rationale as to why it qualifies for the exemption must be included. In lieu of testing every diagnostic on the vehicle (both OEM diagnostics and any added diagnostics by the AFV conversion manufacturer), ARB will allow manufacturers to propose additional monitors for exclusion from testing. ARB will approve additional exemptions for diagnostics that have not been added, altered, modified, or otherwise likely impacted by the AFV conversion.

Section (j)(3) of the regulation describes collection and reporting of in-use monitoring performance data representative of every test group from actual in-use vehicles. Section (j)(3) testing needs to be conducted and submitted within twelve months from either the time the vehicles in the test group were first introduced into commerce, or at the start of normal production for such vehicles, whichever is later. As mentioned earlier, this data is used to help identify issues with in-use monitoring frequency (rate-based) data. The required data format for collected data is available at: <http://www.arb.ca.gov/msprog/obdprog/obdupdates.htm>

#### 4. Summary:

Staff has provided these guidelines to help expedite the OBD II AFV certification process. Staff may periodically modify this information to further facilitate certification. Staff will send out an email informing manufacturers of modifications and provide appropriate lead-time when necessary to incorporate the modifications. Manufacturers interested in receiving future emails should follow the instructions to subscribe to the On-Board Diagnostics Program list at the following website: <http://www.arb.ca.gov/msprog/obdprog/obdprog.htm>. Click on "Join the OBDprog Email List" on the left side of the page and enter the requested information. By signing up for this list serve, subscribers will also receive a notice whenever changes are made to the ARB On-Board Diagnostics Program website.

Should you have questions or comments regarding this Mail-Out, please contact Mr. Mike McCarthy, Manager, Advanced Engineering Section, at (626) 771-3614, or by email at [mmccarth@arb.ca.gov](mailto:mmccarth@arb.ca.gov).

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