

**POTENTIAL INNOVATIVE TECHNOLOGY RULEMAKING:
ARB STAFF DISCUSSION DOCUMENT
*July 7, 2015 Aftermarket Conversion Work Group Meeting***

The potential Innovative Technology Regulation (ITR) is intended to provide defined, near-term California Air Resources Board (ARB) certification and aftermarket conversion approval flexibility to help facilitate market launch of the next generation of truck and bus technologies that California needs to meet its long-term air quality and climate goals. ARB's existing certification and on-board diagnostics (OBD) requirements provide a critical and effective mechanism for ensuring a vehicle's expected emission benefits are achieved and maintained. However, ARB's medium- and heavy-duty engine and vehicle approval paradigm, geared towards traditional technologies, may deter some manufacturers from developing promising new technologies if they are uncertain to achieve market acceptance. In addition, ARB does not have an approval protocol specifically for hybrid technology medium- and heavy-duty vehicle aftermarket conversions.

This discussion document updates potential staff concepts regarding development of potential hybrid truck and bus aftermarket conversion approval requirements, and will focus on a potential technology approval pathway that would enable commercialization of robust hybrid systems with maximum engine and vehicle diagnostics capability.¹ This potential aftermarket conversion technology approval pathway could include two elements – Early Deployment Flexibility Provisions and Default Aftermarket Conversion Approval Requirements.

1. Potential Early Deployment Flexibility Provisions could encourage market launch of eligible hybrid aftermarket conversion kits and systems by enabling initial manufacturers of such equipment to make steady progress towards Default Aftermarket Conversion Approval Requirements as California sales volumes increase. The Early Deployment Flexibility Provisions could potentially be available for at least four years for each eligible vehicle vocation and aftermarket technology combination, and could include a manufacturer volumetric sales limit.
2. Potential Default Aftermarket Conversion Approval Requirements could define more robust ARB-approval criteria for eligible hybrid aftermarket conversion kits and systems after each manufacturer's eligibility for the Early Deployment Flexibility Provisions has sunset.

Together, the possible Early Deployment Flexibility provisions and Default Aftermarket Conversion Approval Requirements are intended to provide each eligible vehicle vocation and hybrid conversion kit combination with an opportunity to enter the California market and ramp up system diagnostics and other capabilities as sales volumes increase. This discussion document provides background on the need for the ITR, describes potential eligible vehicle vocation and technology combinations, and explores potential ITR Early Deployment Flexibility Provisions and Default Aftermarket Conversion Approval Requirements. This

¹ Staff's initial potential aftermarket conversion concepts for the Innovative Technology Regulation can be found at: http://www.arb.ca.gov/msprog/itr/documents/030915_itr_workshop_concept_paper_final.pdf

discussion document is intended to encourage public stakeholder feedback at the July 7, 2015 ITR Aftermarket Conversion Work Group meeting.

Background

California has made substantial progress in reducing emissions from all mobile sources, with many vehicles sold today being over 90 percent cleaner than those sold just a decade ago. However, ARB must continue to identify opportunities to stimulate development and deployment of the cleanest feasible technologies for all vehicle and equipment sectors to meet California's long term air quality, climate change, and petroleum reduction goals. These goals include:

- Meeting the federal health-based ambient air quality standards for ozone by 2023 and 2031 as well as the fine particulate matter air quality standards. ARB staff estimates that meeting the 2031 ozone standard could require oxides of nitrogen (NOx) emission reductions of up to 90 percent compared to 2010 levels.
- Reducing transportation sector petroleum use by 50 percent by 2030, as directed in Governor Brown's 2015 inaugural address. This petroleum reduction target is one of five key strategy pillars identified by the Governor for meeting California's climate goals.²
- Reducing greenhouse gas (GHG) emissions to 40 percent below 1990 levels by 2030, as directed in Governor Brown's Executive Order B-30-2015.³
- Reducing GHG emissions from the transportation sector to 80 percent below 1990 levels by 2050, as directed in Governor Brown's Executive Order B-16-2012.⁴

Achieving each of these goals will require a transition to zero- and near-zero emission technologies in all mobile source sectors, including medium- and heavy-duty vehicles. Hybrid-electric technology can play a key role in this transition by helping to accelerate the development, commercialization, and consumer acceptance of more advanced zero-emission battery-electric and fuel cell technologies.

Aftermarket Conversions.

Once ARB has certified a new engine or vehicle, no one may install, sell, offer for sale, or advertise any device, apparatus, or mechanism that alters or modifies the original design or performance of that engine or vehicle emission control system unless that device, apparatus or mechanism has been exempted by ARB.⁵ ARB is only authorized to exempt modifications to a certified configuration if ARB finds the modifications will not reduce the effectiveness of required motor vehicle pollution control devices or cause the emissions from the modified or altered vehicle to exceed applicable emissions standards for the model year of the vehicle being modified or converted.

2 Governor Brown's 2015 Inaugural Address; <http://gov.ca.gov/news.php?id=18828>

3 Governor Brown's Executive Order B-30-2015; <http://gov.ca.gov/news.php?id=18938>

4 Governor Brown's Executive Order B-16-2012: <http://gov.ca.gov/news.php?id=17472>

5 ARB Aftermarket, Performance and Add-On Parts Regulations;
<http://www.arb.ca.gov/msprog/aftermkt/aftermkt.htm>

ARB's existing aftermarket part approval process is structured to address two specific categories of aftermarket parts: legal add-on or modified parts and catalytic converters. Neither of these processes is tailored specifically to evaluate and potentially approve hybrid aftermarket conversions.⁶ The Innovative Technology Regulation being developed for Board consideration would define this process for eligible hybrid aftermarket conversion systems and kits.

Technology Verification. ARB also implements a robust technology verification program. ARB's technology verification procedures were developed, in part, to support California's in-use fleet rules, which require fleets to reduce emissions through vehicle turnover, retirements, and/or installation of retrofit devices. For these retrofit devices, such as diesel particulate filters, the verification procedures dictate the process manufacturers must follow to demonstrate their effectiveness. *Technology verification* differs from *aftermarket part approval* in that verification must demonstrate that a technology achieves real, durable reductions of particulate matter (PM) and/or NOx emissions from the applicable engine or vehicle, while, as mentioned previously, aftermarket part approval requirements are geared to ensure no emissions increase.⁷ Furthermore, ARB technology verification has traditionally targeted filters, parts, or other technologies that reduce post-combustion tailpipe emissions, rather than technologies that impact how the engine or driveline operates.

Possible ITR Eligible Vocation-Technology Combinations

This regulation being developed for consideration is intended to provide ARB certification and aftermarket conversion approval flexibility for those transformational zero- and near-zero emission technologies that California needs to meet its long-term air quality, climate, and petroleum reduction goals. For aftermarket conversions, this includes robust hybrid drivelines, since hybrid technology helps enable the development, commercialization, and consumer acceptance of more advanced zero-emission technologies. Staff suggests limiting this rulemaking proposal to two broad categories of hybrid aftermarket technology – hybrid technology that provides significant zero-emission range and hybrid technology that provides moderate or no zero-emission range.

Potential Hybrid Technology Providing Significant Zero-Emission Range

A hybrid conversion system or kit that provides for significant zero-emission range represents the most advanced type of aftermarket technology potentially addressed by the ITR proposal. Increasing the application of zero-emission propulsion technology can provide significant emissions benefits, encourage battery innovation in higher power demand zero-emission

⁶ ARB's Plug-In Hybrid Electric Vehicle Test Procedure Amendments and Aftermarket Parts Certification Requirements, adopted in May 2009, address non-plug-in hybrid to plug-in hybrid vehicle conversions only; <http://www.arb.ca.gov/regact/2008/phev09/phev09.htm>.

⁷ *The Regulation for the Verification Procedure for In-Use Strategies to Control Emissions from Diesel Engines* identifies stringent requirements to ensure real emission reductions are achieved in-use, and an emission control system that is durable and compatible with various engines and applications. Technology verification requires robust in-use testing, including after the diesel emission control devices have been in operation for a certain period of time. Annual warranty reporting is also required of each manufacturer, for each of their verified products. For more information, visit: www.arb.ca.gov/diesel/verdev/verdev.htm.

applications, and help support supply chains for zero-emission components like controllers, motors, and electricity converters. Because this technology would enable zero-emission operation, it can also help foster fleet acceptance of zero-emission technologies and drivetrains.

In order to be eligible as a hybrid conversion system or kit with significant zero-emission range for the purposes of the ITR under consideration, a manufacturer would potentially be required to provide an engineering analysis or credible, independent data to ARB demonstrating that the vehicle achieves a minimum thirty-five mile zero-emission range. Staff believes this zero-emission range is practical, technically-feasible, and makes practical sense for many fleet applications. This is the approximate zero-emission range of some more robust plug-in hybrid passenger cars, and, given the typical daily mileage of most vocational vehicles, would enable a majority of operation to occur with no fuel usage and no tailpipe emissions.

Hybrids with No/Low Zero-Emission Range.

For the purposes of this potential regulation, a hybrid aftermarket conversion system with low or no zero-emission range must have potential to achieve at least 20 percent carbon dioxide (CO₂) emission reduction from the base vehicle or chassis. In order to be eligible as a hybrid conversion system or kit with no or low zero-emission range for the purposes of the ITR under consideration, a manufacturer would be required to provide an engineering analysis or credible, independent data to ARB demonstrating that the vehicle achieves at least 20 percent CO₂ emission reduction from the intended base vehicle or chassis.

Staff recognizes that hybrid conversion systems could potentially be categorized utilizing other factors instead of, or in addition to, zero-emission range capability. Other potential hybrid technology categories for the purposes of ITR implementation could include battery-electric and hydraulic hybrids, parallel and series hybrids, and/or pre- and post-transmission hybrids. However, staff believes an approach that is agnostic to these technology differences but recognizes and rewards more advanced hybrid systems (with greatest potential to foster development of zero-emission technology) may provide the most simple, transparent and effective mechanism for differentiating among hybrid technologies for the purpose of the ITR. Staff welcomes stakeholder comment regarding this potential approach.

Table 1, below, illustrates potential ITR vehicle vocation-technology combinations for the purposes of the ITR. Vehicles within each of the three identified vehicle vocation categories typically have similar duty cycles and operational characteristics, resulting in similar technology adoption opportunities and challenges. Staff believes it may therefore make sense to group these six possible vocation-technology combinations for the purposes of ITR implementation, providing each potential vehicle-technology combination with its own possible set of discrete manufacturer aftermarket conversion kit sales volume limits and Early Deployment Flexibility Provision timelines.

**Table 1:
Possible Eligible Vehicle Vocation-Technology Combinations**

	Hybrid with No/Low Zero-Emission Operation	Hybrid with Significant Zero-Emission Range ¹
Class 2b/3	√	√
Vocational Truck/Bus	√	√
Class 8 Tractor	√	√

Work Group Discussion Topic #1:

Possible ITR Vehicle Vocation-Hybrid Technology Combinations

Do stakeholders have any questions or comments regarding potential ITR hybrid technology categories, vehicle vopcatons, and vocation-hybrid technology combinations?

Potential Hybrid Aftermarket Conversion Kit Approval Requirements

Staff is considering a tiered ARB aftermarket conversion approval pathway concept that would enable market launch of innovative hybrid aftermarket conversion systems and concurrent progress of these systems towards more robust, comprehensive engine and vehicle diagnostic capabilities. This potential approach would provide hybrid conversion system manufacturers a defined ARB aftermarket approval process, with performance criteria (i.e., technology validation and diagnostic capabilities) ramping up as volumes of each manufacturer’s hybrid conversion system increase. As mentioned earlier, this potential aftermarket conversion technology approval pathway could include two elements – Early Deployment Flexibility Provisions and Default Aftermarket Conversion Approval Requirements. These two potential ARB-approval pathways are described below.

Potential Early Deployment Flexibility Provisions

Potential Early Deployment Flexibility Provisions would allow each manufacturer to deploy “Demonstration Volumes” of an eligible hybrid aftermarket conversion system by meeting “Tier 1” conditional ARB-approval requirements (identified in Table 3) This ARB-approval would be conditional in that it would require completion of chassis dynamometer or portable emissions measurement system (PEMS) in-use testing within 18 months on vehicles conditionally approved under Tier 1. This emissions testing must meet ITR requirements confirming no increase in criteria pollutant emissions and 20 percent reduction in CO₂ emissions relative to a base vehicle. ARB could request manufacturers provide vehicles for independent confirmatory testing of a hybrid aftermarket system. Systems not meeting emissions requirements would be evaluated to determine the cause of system non-performance, with potential for the manufacturer to address potential non-performance issues prior to additional emission testing of the system. Should retesting continue to indicate emissions are higher than intended, ARB would also have the authority to recall the aftermarket system.

Once the Demonstration Volume of aftermarket systems has been sold and emission testing requirements have been met, the manufacturer must meet more stringent “Tier 2” ARB-

approval requirements to sell a “Pilot Volume” of the system. Table 2, below, identifies potential manufacturer Demonstration and Pilot Volume limits for each of the six potential vehicle vocation and technology combinations.

Table 2: Aftermarket Conversions: Possible Technology Applicability¹

	Hybrid with No/Low Zero-Emission Operation		Hybrid with Significant Zero-Emission Range ¹	
	Demonstration Volume	Pilot Volume ²	Demonstration Volume	Pilot Volume ²
Class 2b/3	~50	~500	~100	~1,000
Vocational Truck/Bus	~50	~500	~100	~1,000
Class 8 Tractor	~50	~500	~100	~1,000

1 – Vehicle would have to be capable of a minimum of thirty-five miles zero-emission range to be eligible for these sales volumes.

2 – Pilot Volumes do not apply to possible default approval pathway identified in Table 2. Pilot Volumes are part of possible early deployment approval pathway (Tier 2 requirements) identified in Table 3 only.

Once a manufacturer has reached its Tier 2 volumetric limit per possible vocation-technology combination, that manufacturer would have to meet potential default, full ARB aftermarket approval requirements (i.e., Tier 3) for hybrid medium- and heavy-duty vehicle aftermarket conversions. A manufacturer may also be subject to reporting of warranty claims for their hybrid aftermarket systems sold to date prior to Tier 3 approval, with systems with significant warranty claims rate being subject to remedial action to be eligible for Tier 3 approval. Aftermarket systems meeting full ARB aftermarket approval requirements (i.e., Tier 3) would possibly have no volumetric sales limits. Table 3, below, identifies a potential ARB early deployment approval pathway for hybrid aftermarket conversion systems, including potential Tier 1, Tier 2, and Tier 3 requirements.

**Table 3: Possible Early Deployment Flexibility Provisions
for Hybrid Aftermarket Conversion Systems**

Tier	Number sold in California per Manufacturer	Requirements Prior to Sale in the Tier
1	<p align="center"><i>*Conditional Approval*</i></p> <p align="center">Demonstration Volume (Potential Allowable California Sales Volume Identified in Table 2)</p>	<ol style="list-style-type: none"> 1. Approved application 2. Engineering analysis or data shows potential for 20 percent CO₂ emission reduction, no adverse impact on criteria pollutant emissions 3. SHED evaporative test for plug-in Class 2b/3 otto cycle vehicles, or engineering analysis for Class 4 and heavier plug-in otto cycle vehicles demonstrates no increase in evaporative emissions 4. No false MILs from the base vehicle OBD 5. ARB may require a prototype system be provided for evaluation 6. Installation and System Warranties: 3yr/50K mi 7. Labeling requirements 8. Report California sales and customer warranty claims to ARB 9. ARB approves applicant plan for independent PEMS or chassis dynamometer testing. Sale of Demonstration Volumes is conditional, requiring emission testing be completed within 18 months of Tier 1 approval.
2	<p align="center">Pilot Volume (Potential Allowable California Sales Volume Identified in Table 2)</p>	<ol style="list-style-type: none"> 1. Application for Tier 2 approved 2. Independent emissions testing completed, confirms 20 percent CO₂ benefit and no criteria pollutant increase. ARB may request manufacturers provide vehicles for independent confirmatory testing. 3. No false MILs from base vehicle OBD 4. Basic diagnostics (i.e., circuit and functional checks) required for the innovative technology or system 5. ARB approval of manufacturer plan/roadmap to meet Tier 3 OBD requirements 6. SHED evaporative test for non-plug-in Class 2b/3 otto cycle vehicles, or engineering analysis for Class 4 and heavier non-plug-in otto cycle vehicles demonstrating no increase in evaporative emissions. 7. Provide in-use duty cycle data for all deployed vehicles to confirm expected in-use emission benefits 8. Installation & System Warranties: 5yr/75K mi 9. Labeling requirements 10. Report California sales and customer warranty claims to ARB
3	<p align="center">Full After-Market Approval Requirements; Unlimited Sales Volume</p>	<p><u>Tier 3 Concept: Base vehicle must be fully OBD compliant and the conversion technology must utilize basic diagnostics.</u> Requirements include:</p> <ol style="list-style-type: none"> 1. Meet requirements identified in Tier 1 and 2 (above). 2. Manufacturers' in-use duty cycle data for vehicles in Tier 2 confirms/ consistent with identified emission benefits identified from vehicles in Tier 1 3. Installation and System Warranties: 5 yr/120K miles 4. ARB may request conversion manufacturers provide vehicles for independent confirmatory testing 5. Demonstrate that OBD readiness can be achieved to ensure compatibility with Smog Check or other in-use inspection programs 6. Show of readiness indicators set and no OBD MIL/DTC during emission tests 7. Full OBD (i.e., circuit and functional checks) required for the full vehicle; must light single MIL and use standardized scan tools 8. Demonstrate in-use monitoring performance ratio compliance 9. ARB may request durability test data to vehicle useful life 10. Report customer warranty claims (above a defined threshold) to ARB

Possible Requirements for Reporting of Warranty Claims

Staff believes it may be appropriate for the ITR to include warranty claims reporting provisions for hybrid aftermarket systems. The potential ITR may ultimately not require a hybrid aftermarket system be fully integrated into the comprehensive vehicle OBD system, since this may be infeasible for many aftermarket manufacturers who lack key proprietary information from the base vehicle or chassis OBD system. A possible warranty claims reporting requirement for hybrid conversion kits would help ARB identify and address potential aftermarket system defects, in lieu of a comprehensive OBD system.

Manufacturers of light-, medium- and heavy-duty engines and vehicles, and manufacturers of ARB-verified in-use control strategies (such as diesel particulate filters) are all subject to reporting of customer warranty claims rates to help identify and address potentially faulty parts and systems that could lead to increased in-use emissions.⁸ ARB's *Verification Procedure, Warranty and In-Use Compliance Requirements for In-Use Strategies to Control Emissions from Diesel Engines* requires applicants to submit an annual warranty report to ARB identifying their customer warranty claims, and submit a supplemental warranty report if warranty claims exceed a four percent threshold for any specific part or component. This existing warranty reporting requirement may provide a good starting point for development of potential warranty claims reporting requirements for hybrid conversion kits. Staff will work with interested stakeholders to define potential ITR aftermarket conversion kit warranty reporting requirements.

Possible Recall Provisions

Light-, medium- and heavy-duty vehicles, and diesel particulate filters and other ARB-verified emission control devices are also subject to ARB recall provisions, which require corrective action by a manufacturer of a defective product or system that may result in increased emissions. Staff is evaluating potential similar recall provisions for the potential ITR to identify and address the following: potential for catastrophic failures, failure to meet conditions for passing in-use compliance testing, valid warranty claims for the same part or component that exceed four percent of the number of deployed systems, or if a substantial number of units experience failure of a specific operational feature. If a recall is necessary to address one or more of these issues, the manufacturer could be required to submit a recall plan within 60 days specifying remedial actions.

Staff anticipates that potential warranty claims reporting requirements and recall provisions would be the same for both the possible Early Deployment Flexibility Provisions and the possible Default Aftermarket Conversion Approval elements of the ITR under development for Board consideration.

Work Group Discussion Topic #2: Possible Demonstration and Pilot Sales Volumes

Staff believes these possible ITR sales thresholds provisions would provide a reasonable pathway for hybrid aftermarket conversion systems to successfully enter the California market, while making reasonable progress towards more comprehensive and robust diagnostic capabilities. However, staff recognizes that other approaches

⁸ Title 13, California Code of Regulations (CCR), Sections 2141-2149 and CCR, Sections 2700-2711.

could be used, and welcomes stakeholder comments regarding the potential sales thresholds and sunset provisions identified in this discussion document. Do stakeholders have questions or comments regarding the possible Early Deployment Flexibility Provision hybrid conversion system sales volumes identified in Table 2?

Work Group Discussion Topic #3: Possible Early Deployment Flexibility Provisions

ARB staff has not received any stakeholder comments regarding the possible ITR Early Deployment Flexibility Provisions identified in Table 2 during the March 9, 2015 public workshop and April 2, 2015 work group meeting. Some stakeholders have commented that potential Demonstration and Pilot sales volumes are needed to inform their feedback regarding the associated potential flexibility provisions. Given the potential Demonstration and Pilot sales volumes identified in Table 2, do stakeholders have questions, comments or suggestions regarding the potential ITR Early Deployment Flexibility Provisions identified in Table 3?

Work Group Discussion Topic #4: Possible Early Deployment Flexibility Provisions: Potential Tier 3 Requirements

ARB staff has not received any stakeholder comments regarding the possible full ARB aftermarket approval (Tier 3) requirements of the potential Early Deployment Flexibility Provisions identified in Table 3. These potential requirements would apply to each manufacturer once it has met its possible Pilot Volume California sales limit for a technology-vocation combination. Potential Tier 3 provisions would not sunset and aftermarket conversion systems meeting Tier 3 requirements would have no sales limit.

Work Group Discussion Topic #5: Development of Potential PEMS Testing Protocols

Full chassis or vehicle emission testing of hybrid conversion systems to determine criteria pollutant emission impacts of hybridization is one of the most critical elements of a potential ITR. Hybrid conversions with excess emissions of NO_x or other criteria pollutants would potentially not be eligible for a Tier 2/Pilot Volume approval. While chassis dynamometer emissions testing procedures have been developed and defined in multiple regulatory documents (including ARB's Hybrid-Electric Vehicle Certification Procedures), more work must be done to develop effective and robust regulatory PEMS testing procedures, particularly for vocational vehicles. Federal regulations provide some guidance regarding PEMS testing. However, these are geared towards demonstrating heavy-duty tractor trailer compliance with Not-To-Exceed (NTE) in-use engine emission limits, and are primarily geared towards identifying gross polluters. Potential ITR PEMS protocols would have to define the key required elements to ensure robust and statistically valid PEMS testing while being applicable to the wide range of potential duty cycles. Staff welcomes stakeholder comment on the following questions:

- Staff believes A to B testing and emissions comparison (i.e., for a base and hybrid vehicle) testing are needed to determine CO₂ benefits and potential criteria pollutant impacts. What do stakeholders think?
- How should a proposed ITR potentially define eligible PEMS equipment, equipment calibrations, and verification of emission testing results? Staff is evaluating whether

40 Code of Federal Regulations, Part 1065, Subpart J - Field Testing and Portable Emission Measurement Systems, might provide the appropriate guidance for these potential PEMS testing elements.⁹

- *How many vehicles and/or hours of emissions testing are needed to ensure statistically-relevant results?*
- *What specifically should constitute an acceptable duty cycle for emissions testing? Is there a minimum or maximum number of cold starts, idle time, average speeds, etc?*
- *What is the pass-fail protocol for potential PEMS testing results? If five vehicles with hybrid conversions are tested and four show NOx emission benefits and one shows a disbenefit, how would this be assessed?*
- *If a hybrid system is deemed to fail its PEMS testing, under what circumstances could it retest? One possible approach would be to allow retesting only after the ARB Executive Officer determines that the manufacturer has identified and addressed the cause of the emission disbenefit.*

These and other PEMS-related questions will likely require significant additional discussion and stakeholder feedback. Staff recommends convening a discrete ITR Work Group dedicated to defining potential ITR PEMS testing protocols.

Work Group Discussion Topic #6: Possible Warranty Reporting and Recall Provisions
Do stakeholders have any comments regarding possible requirements for reporting of warranty claims and development of potential recall provisions? These potential provisions are intended to help ARB identify system defects or other issues that could result in an unanticipated systematic increase in emissions.

Possible Early Deployment Flexibility Provision Sunset Criteria

Staff agrees with stakeholder comments that possible sunset provisions for a potential ITR early deployment flexibility should be simple and predictable, enabling hybrid conversion kit manufacturers to anticipate and plan for development and market launch of innovative new hybrid conversion systems. Staff is considering an approach in which the potential ITR Early Deployment Flexibility Provisions would sunset for new aftermarket systems in each of the possible six vocation-technology combinations identified in Table 2 four full calendar years after the first two manufacturers have received Tier 2/Pilot Volume approval for that vocation-technology combination. For example, if as of June 2017, the first two aftermarket conversion manufacturers are Tier 2-approved to sell Pilot Volumes of a hybrid aftermarket system that provides no or low zero-emission range for a Class 2b or 3 vehicle (one of the possible six eligible vocation-technology combinations identified in Tables 1 and 2), possible Early Deployment Flexibility provisions for this potential vocation-technology combination would sunset by January 1, 2022 (i.e., four full calendar years after 2017). Manufacturers already Tier 2-approved for a Class 2b or 3 vehicle hybrid conversion kit that provides low or no zero-emission range as of this sunset date could continue to sell that conversion system after the potential sunset date if its Pilot Volume sales threshold has not yet been met, and until this

9 - 40 Code of Federal Regulations, Part 1065, Subpart J - Field Testing and Portable Emission Measurement Systems; <http://www.epa.gov/oms/emisslab/testing/regulations.htm>.

sales threshold is met. In this example, all other Class 2b or 3 vehicle hybrid conversion kits that provide no or low zero-emission range that are not already Tier 1 or Tier 2 approved as of January 1, 2022 would have to meet potential Default Aftermarket Conversion Approval Requirements beginning on that date. Class 2b or 3 vehicle hybrid conversion kits that provide no or low zero-emission range that are already Tier 1 or Tier 2 approved as of this sunset date would be able to complete sales of Demonstration or Pilot Volumes, respectively. Attachment 1 provides an example of potential ITR sunset provisions.

*Work Group Discussion Topic #7: Potential Early Deployment Flexibility Provisions:
Potential Sunset Criteria*

Do stakeholders have any questions or comments regarding potential Early Deployment Flexibility Provisions sunset criteria identified in the section above?

Potential Default Aftermarket Conversion Approval Requirements

After possible Early Deployment Flexibility Provisions sunset for a potential vehicle vocation-technology combination, it would have to meet possible Default Aftermarket Conversion Approval Requirements. Table 4, below, identifies potential default approval requirements hybrid aftermarket conversion systems.

Table 4: Possible Default Aftermarket Conversion Approval Requirements for Hybrid Aftermarket Conversion Systems

Tier	Number sold in California per Manufacturer	Requirements Prior to Sale in the Tier
1	<p><i>*Conditional Approval*</i></p> <p>Demonstration Volume (Potential Allowable California Sales Volume Identified in Table 2)</p>	<p>Approved application.</p> <ol style="list-style-type: none"> 1. Engineering analysis showing potential for emission reductions, no adverse impact on emissions 2. SHED evaporative test for Class 2b/3 otto cycle vehicles, or engineering analysis for Class 4 and heavier otto cycle vehicles demonstrating no increase in evaporative emissions. 3. No false MILs from the base vehicle OBD 4. Basic diagnostics (i.e., circuit and functional checks) required for the innovative technology or system. 5. ARB approval of manufacturer plan/roadmap to meet Tier 3 OBD requirements. 6. ARB may require a prototype system be provided for evaluation. 7. Installation & System Warranties: 5yr/75K mi. 8. Labeling requirements. 9. Report California sales and customer warranty claims to ARB. 10. ARB approves applicant plan for independent PEMS or chassis dynamometer testing. Sale of Demonstration Volumes is conditional, requiring emission testing be complete within 18 months of Tier 1 approval.
N/A	<p>Default After-Market Approval Requirements; No volume limit</p>	<p><u>Default Approval Concept: Base vehicle must be fully OBD compliant and the conversion technology must utilize basic diagnostics.</u> Requirements include:</p> <ol style="list-style-type: none"> 1. Approved application 2. Meet requirements identified in Tier 1 (above). 3. Independent emissions testing completed, confirms 20 percent CO₂ benefit and no criteria pollutant increase. ARB may request manufacturers provide vehicles for independent confirmatory testing. 4. Installation and System Warranties: 5 yr/100K miles. 5. Demonstrate that OBD readiness can be achieved to ensure compatibility with Smog Check or other in-use inspection programs. 6. Show of readiness indicators set and no OBD MIL/DTC during emission tests 7. Full OBD (i.e., circuit and functional checks) required for the full vehicle; must light single MIL and use standardized scan tools. 8. Demonstrate in-use monitoring performance ratio compliance. 9. ARB may request durability test data to vehicle useful life. 10. Report customer warranty claims (above a defined threshold) to ARB

Work Group Discussion Topic #8: Possible Default Aftermarket Conversion System Approval Requirements

Do stakeholders have any questions or comments regarding potential Default Aftermarket Conversion System Requirements identified in this document? Do these potential default requirements provide for adequate diagnostics and other system and vehicle capabilities, given that there would possibly be no limit on sales volumes?

Next Steps

Staff invites stakeholders to provide feedback regarding the concepts identified in this discussion document, both at individual meetings and during this and future work group meetings and workshops. Staff anticipates the following opportunities for additional public feedback:

- Summer – Fall 2015: Additional Work Group meetings, as needed, including first PEMS Work Group meeting.
- Fall 2015: Final ITR Public Workshop to solicit stakeholder feedback regarding potential draft regulatory language.
- Late 2015/Early 2016: 45-Day Notice and Proposed Rulemaking Documents Released for comment.
- Early 2016: Board Consideration of Proposed Innovative Technology Regulation.

ITR Contacts

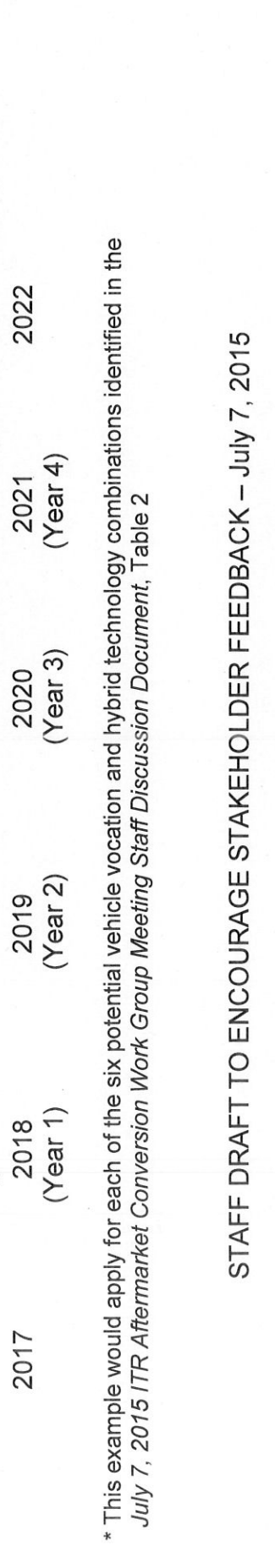
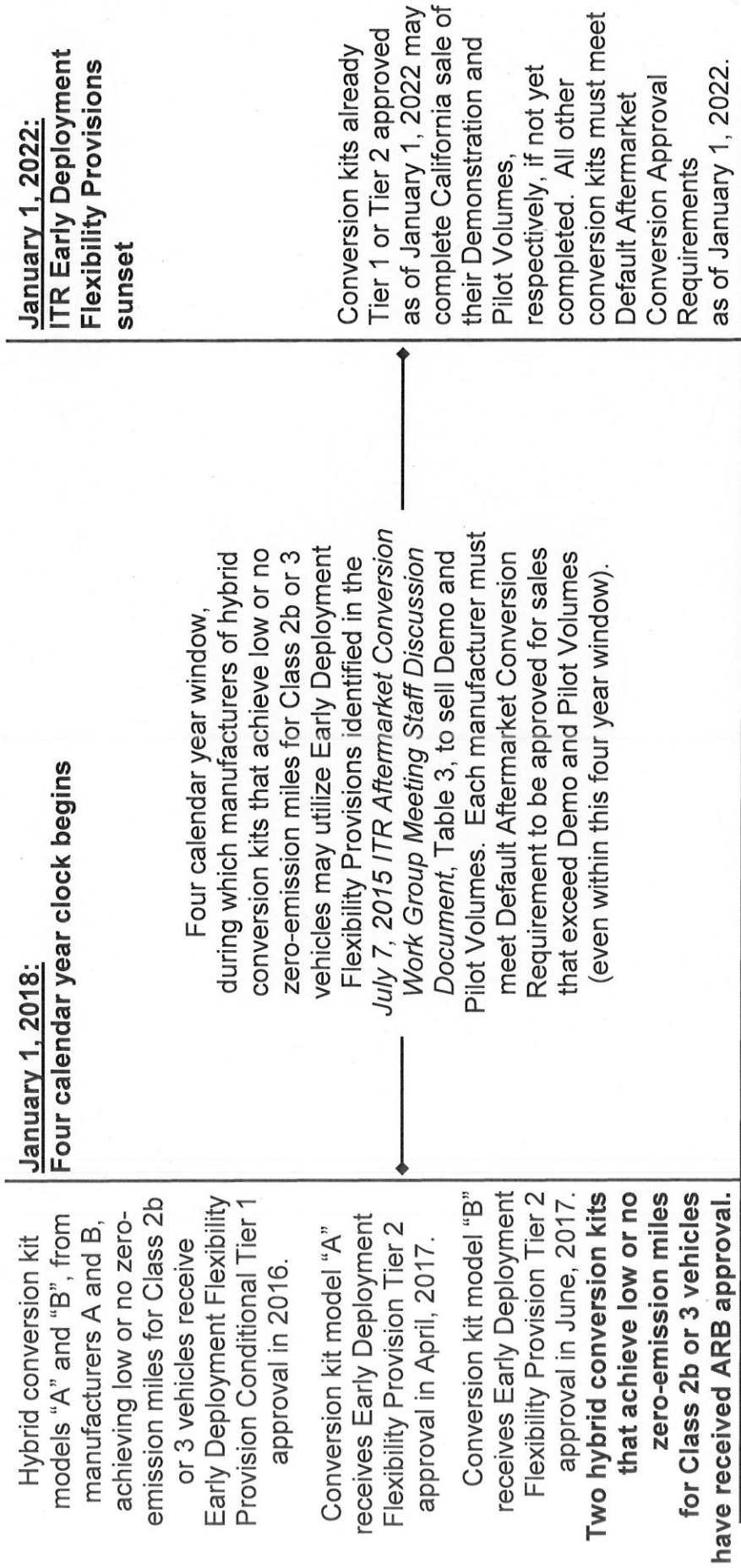
Mr. Joe Calavita, Lead Staff
Tel. 916-445-4586
jcalavit@arb.ca.gov

Mr. David Chen, Manager
Tel. 626-350-6579
David.Chen@arb.ca.gov

Ms. Tess Sicat Branch Chief
Tel. 626-459-4435
Maritess.Sicat@arb.ca.gov

For more information regarding the potential Innovative Technology Regulation, including instructions on how to be apprised of upcoming ITR public work group meetings and workshops, visit: <http://www.arb.ca.gov/msprog/itr/itr.htm> .

JULY 7, 2015 ITR WORK GROUP MEETING STAFF DISCUSSION DOCUMENT, ATTACHMENT 1
Possible Scenario: Potential ARB Approval Process for Hybrid Aftermarket Conversion System
that Achieves Low or No Zero-Emission Miles as Applied to Class 2b or 3 Vehicles*



* This example would apply for each of the six potential vehicle vocation and hybrid technology combinations identified in the July 7, 2015 ITR Aftermarket Conversion Work Group Meeting Staff Discussion Document, Table 2