

Certification and Aftermarket Conversion Approval Flexibility for Innovative Medium- and Heavy-Duty Engine and Vehicle Technologies (Innovative Technology Regulation)

Public Workshop
March 9, 2015
El Monte, CA



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Agenda

*DRAFT
For Workshop Discussion
Purposes Only*

- Background and Overview
- Regulation Draft Conceptual Framework
- Possible Certification and On-Board Diagnostics (OBD) Flexibility
- Possible Aftermarket Conversion Approval Pathway
- Defining Applicable Sales Thresholds
- Next Steps

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Innovative Technology Regulation

Regulatory Need

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California's Long-Term and Air Quality Challenges

- California needs significant additional NO_x and GHG reductions beyond what can be achieved by existing technologies
 - 90% NO_x reduction needed by 2031 to attain in South Coast
 - 80% GHG reductions needed Statewide for 2050 climate goals
- Broad deployment of zero- and near zero emission technologies needed

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Trucks and Buses

Key Technology Advancing Programs

- Federal/CA GHG Standards
 - Phase 1 (2014 - 2019 MY)
 - Phase 2 standards under development (~2020+ MY)
- Advanced Clean Transit
- Optional Low NOx HD Engine Standards
- Funding for Demo and Early Deployment
 - ARB's Air Quality Improvement Program
 - Energy Commission's Alternative and Renewable Fuels and Vehicle Technology Program
 - Low Carbon Transportation Funding

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Innovative Technology Rulemaking

Regulatory Need

- Certification: Existing certification/OBD requirements geared towards traditional technologies
 - May pose challenge for emerging new vehicle and engine technologies
- Aftermarket Conversions: Formal ARB approval procedures do not exist specifically for technology-advancing aftermarket conversions
 - Case-by-case consideration based upon 1990 regulation

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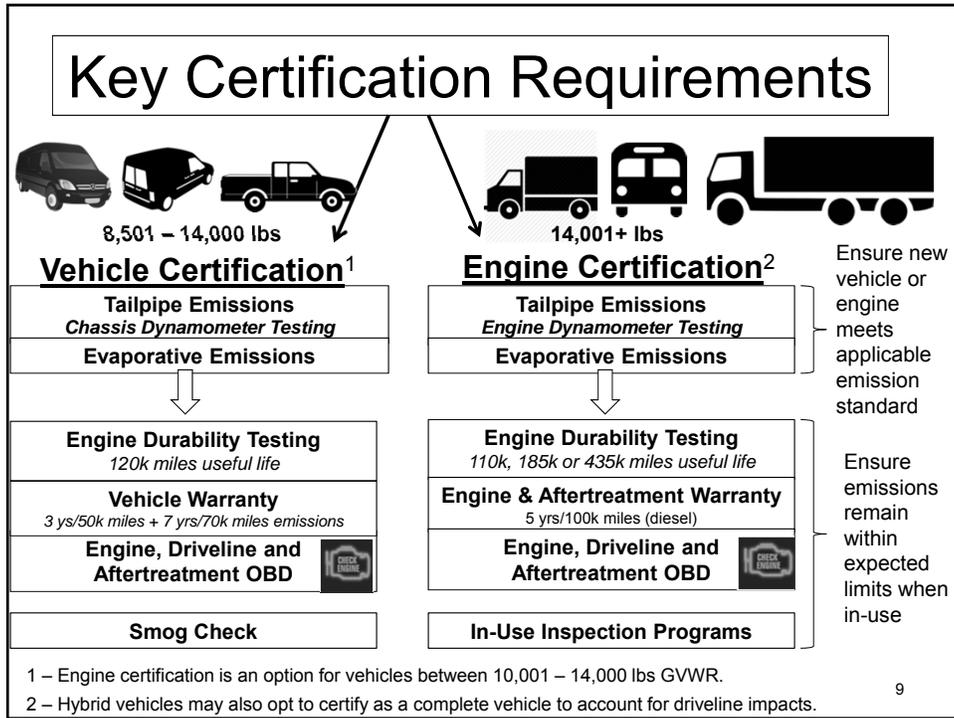
Innovative Technology Regulation Objective

- √ Provide certification/OBD and aftermarket conversion approval flexibility to facilitate market launch of needed truck and bus technologies, while maintaining ability to ensure anticipated air quality benefits



Certification and On-Board Diagnostics (OBD)

Background



OBD Background

- OBD is an important emission control system that is critical to achieving California’s air quality goals
- OBD Systems Required on All Vehicles
 - *Light- and medium-duty* → 1996+ model years (MYs)
 - *Heavy-duty* → Gasoline and Diesel: 2013+ MYs
Alternative Fuels: 2018+ MYs

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OBD Background (cont.)

- Predominantly added software in the relevant powertrain control modules
- Monitors critical components of diagnostic system that can cause an emissions increase
 - Monitors must run with specified minimum frequency
 - Illuminates 'check engine' light when a fault detected
 - Stores info to identify root cause for repair tech and demonstrate diagnostic system compliance to ARB
 - Malfunction criteria
- Standardized (SAE) scan tools for data retrieval

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Draft Conceptual Framework

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Draft Conceptual Framework

- Certification or aftermarket approval flexibility provided to each manufacturer per technology within sales tiers
 - Tier 1: Low volume market launch enables fleet evaluation of new technology
 - Tier 2: OBD and other requirements ramp up
 - Sales volumes beyond Tier 2: Full certification or aftermarket approval requirements apply
- Maximum sales volumes per tier tbd
 - Volumes would be cumulative across model years
 - Staff welcomes stakeholder comment regarding most impactful allowable volumes per tier

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Draft Conceptual Framework (cont.)

- Flexibility sunsets for a technology after an industrywide sales threshold (tbd) is met
 - Sales threshold is inclusive across model years
- Vehicles and engines within Tier 1 and 2 must go beyond existing California air quality requirements, including all applicable vehicle or engine emission standards

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Possible Regulatory Applicability for New Engine or Vehicle Certification

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New Engine or Vehicle Certification

Possible Technology Eligibility Criteria

1. Needed to meet air quality and climate goals
 - Provides pathway to zero-emission technology, or
 - significant NO_x or GHG reductions
 - Considering 50% NO_x, 20% GHG reduction thresholds
 - Provisions to encourage technology diversity
2. Not yet in large-scale deployment
3. Impacts engine or driveline in meaningful way
4. Cleanest feasible technology
 - Dependent upon truck vocation/classification

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Technology Applicability & Readiness

Class 7/8 Tractors



Over the Road



Short Haul/
Regional

- Zero-emission capability needed to meet long-term GHG targets
- Significantly lower NOx engines needed to meet federal ozone standard
- Interstate trucks/operation pose additional complexities

Class 3-8 Vocational Work Trucks



Urban



Rural/
Intracity



Work site
support

Class 2B/3



Pickups/
Vans

- Typically operate in more urban, stop/start environments, maximizing effectiveness of battery technology
- More likely to use centrally located charging or refueling infrastructure.
- Early deployment of EV technology critical to meet AQ and GHG targets, and enable tech transfer to more challenging Class 7/8 tractors
- Vehicles capable of zero-emission operation already in service

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Possible Technology Applicability¹ New Engine or Vehicle Certification

Vehicle Type	Hybrid w/ Significant Zero- Emission Operation	Hybrid w/ Low/No Zero- Emission Operation	>20% GHG Benefits (Non- Hybrid)	Alt NOx Std – ↓50%	Alt NOx Std – ↓75%	Alt NOx Std – ↓90%
Class 2b/3	√	√	TBD	TBD	TBD	TBD
Vocational Truck/Bus	√	√	TBD	TBD	TBD	TBD
Class 7/8 Tractor	√	√	√	√	√	√

Each vehicle type and technology combination (i.e. each green cell) in the graph above represents a discrete 'innovative technology.' Manufacturers would be eligible for certification/OBD flexibility for a defined sales volume for each 'innovative technology.'

1 - Other technologies could apply to be defined as innovative based upon their providing a technology pathway/bridge to zero-emission truck and bus technology.

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Possible Certification Flexibility Provisions

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New Engine or Vehicle Certification

Tier 1

Existing Certification Requirements Apply
Plus the Following New Requirements:

1. Approved application (items 2 – 4 below to be included)
2. ARB approves applicant plan and process for independent PEMS or chassis dynamometer emissions testing (if technology impacts not quantified by engine dynamometer testing)
3. Report California sales to ARB
4. Labeling requirements

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New Engine or Vehicle Certification

Tier 1 (cont.)

Existing Certification Requirements Apply
Plus the Following Flexibility Provisions:

1. Meet basic diagnostic requirements rather than full OBD on base engine and emission control system
 - No diagnostic requirements for innovative technology
2. One new innovative technology per model year is exempt from counting as an additional engine family for the purposes of triggering an OBD demonstration data set
3. Assigned or carryover deterioration factors may be used

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New Engine or Vehicle Certification

Actions to Proceed to Tier 2

1. Independent emissions testing completed, confirms expected emission benefit.*
 - ARB may request manufacturers provide vehicles for independent confirmatory testing
2. Application for Tier 2 approved

* Required only for technologies for which emissions impacts not quantified by existing certification test procedures.

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New Engine or Vehicle Certification

Tier 2 Flexibility Provisions

1. Continue Tier 1 Flexibility Provisions
 2. Basic diagnostics required for innovative technology, may have separate malfunction indicator light (MIL) and use proprietary scan tools
 3. Demonstrate that OBD readiness can be achieved to ensure compatibility with Smog Check or other in-use inspection programs
 4. Monitoring frequency evaluation required after vehicles are on the road for one year, but no enforcement action taken based on the results
 5. Report California sales to ARB
 6. Labeling requirements
- Additional vehicles beyond Tier 2 volumes must meet full certification/OBD requirements

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Possible Technology Diversity Provisions

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New Engine or Vehicle Certification

Technology Diversity Concept

- More modest, targeted flexibility for certification of technologies that provide progress towards zero- or near zero-emissions
 - Heavy heavy-duty engines (33,000 – 80,000 lbs) only
 - Must provide engineering analysis demonstrating NOx or GHG benefit
 - Applies to technologies for which CA sales threshold (tbd) has not yet been met
- *Example: Waste Heat Recovery*

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New Engine or Vehicle Certification

Technology Diversity Provision Flexibility

Existing Certification Requirements Apply
Plus the Following Flexibility Provisions:

1. Basic diagnostics (i.e., circuit and functional checks) required for the innovative technology
2. One new innovative technology per model year may be exempt from counting as an additional engine family for the purposes of triggering an additional OBD demonstration data set
3. Greater flexibility to use assigned or carryover deterioration factors

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New Engine or Vehicle Certification Technology Diversity Provisions

- Flexibility sunsets for each technology *for a manufacturer* once the technology reaches a California sales threshold (tbd)
- Flexibility sunsets for each technology *for all manufacturers* once the technology reaches an industrywide California sales threshold (tbd)

Staff welcomes stakeholder comment regarding most effective allowable thresholds

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Aftermarket Conversions

Background

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Aftermarket Conversions

Background

- California certification requirements ensure new engines and vehicles meet expected emission limits when new and in-use
- Anti-tampering requirements prohibit modification of a certified vehicle or engine without an aftermarket exemption
 - Anti Tampering
 - Federal Regulation: Clean Air Act Section 203
 - State Regulation: Vehicle Code Section 27156
 - Must demonstrate no emission increase from original vehicle or engine design and no adverse impact to emission controls and OBD

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Aftermarket Conversions

Key Considerations

- Modifying emission-certified vehicles
- Sensors and system designed to evaluate potential issues related to the OEMs specific vehicle design
- Emissions can increase
 - Potential for more engine cold starts
 - Must consider evaporative canister breakthrough
 - Issues related to conversion failures
 - OBD may not function properly after conversion

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Aftermarket Conversions

Existing Provisions

- Two main categories of aftermarket exemptions
 1. Legal Add-On or Modified Parts
 2. Catalytic Converters
- Neither of these apply specifically to hybrid drivelines or other technologies that provide a technology bridge to zero-emissions

ARB has adopted aftermarket part regulations for two specific conversion technologies

- Hybrid to Plug-In Hybrid Conversion Procedures
- Alt Fuel Conversion Procedures

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Hybrid to Plug-In Hybrid Conversions (May 2009)

LD or MD non plug-in hybrid → plug-in hybrid

- Requirements for each converter ramp up with three volume tiers: 1-10, 11-100, 100+
- Includes warranty, OBD, durability data, and other requirements
- Regulation sunsets after 5,000 industrywide conversions

Alt Fuel Conversion Procedures (Sept 2013)

Traditionally-fueled → alt-fueled vehicle

- Defines required emission testing, OBD, etc.
- Includes small volume manufacturer flexibility
- Many provisions sunset in 2018

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Other Programs: *Diesel Emission Control Strategies Verification*

- Procedures ensure technology achieves PM or NOx emission reductions from in-use diesel engines
- Rigorous verification process
 - Technical Review
 - Emission Reductions
 - Durability and In-Use Performance
 - Warranty Protections
- Over 60 on-road, off-road, and stationary systems verified

For more information:
www.arb.ca.gov/diesel/verdev/vt/cvt.htm

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*Possible Aftermarket Conversion
Flexibility Provisions*

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Aftermarket Conversions Conceptual Framework

- Defines ARB approval pathway for potentially transformative aftermarket conversions
 - Approval pathway ensures no emission increase
- Requirements increase within volumetric tiers
 - Tier 1: Basic requirements facilitate tech launch
 - Tier 2: Emissions, OBD requirements ramp up
 - Tier 3: Full aftermarket approval requirements
Tiers 1 & 2 sunset once market threshold (tbd) is met

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Aftermarket Conversions Possible Eligibility Criteria

- Provide a technology pathway to zero-emission trucks and buses
 - Hybrid technologies
 - Enable development, commercialization, and consumer acceptance of zero-emission technology
 - Must demonstrate potential for >20% GHG benefit
 - Other technologies on case-by-case basis if provide a technology pathway to zero-emissions
- Not yet in large-scale deployment

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Aftermarket Conversions Tier 1 Requirements

1. Approved application
2. Engineering analysis showing potential for emission reductions, no adverse impact on emissions
3. No false MILs from the base vehicle OBD
4. ARB may require a prototype system be provided for evaluation
5. Installation and System Warranties: 3yr/50K mi
6. Labeling requirements
7. Report California sales to ARB
8. ARB approves applicant plan for independent PEMS or chassis dynamometer emission testing

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Aftermarket Conversions Actions to Proceed to Tier 2

1. Independent emissions testing completed, confirms no emissions increase
 - ARB may request manufacturers provide vehicles for independent confirmatory testing
2. Application for Tier 2 approved

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Aftermarket Conversions

Tier 2 Requirements

1. No false MILs from the base vehicle OBD
2. Basic diagnostics (i.e., circuit and functional checks) required for the innovative technology or system
3. ARB approval of manufacturer plan/roadmap to meet Tier 3 OBD requirements
4. Provide in-use duty cycle data for all deployed vehicles to confirm expected in-use emission benefits
5. Installation & System Warranties: 5yr/75K mi
6. Labeling requirements
7. Report California sales to ARB

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Aftermarket Conversions

Actions to Proceed to Tier 3

1. Manufacturers' in-use duty cycle data for vehicles in Tier 2 confirms/consistent with identified emission benefits identified from vehicles in Tier 1
 2. ARB may request conversion manufacturers provide vehicles for independent confirmatory testing
 3. Application to Tier 3 approved
- Tier 3 become default requirement for all aftermarket conversions of a specific technology once an industrywide California sales threshold (tbd) has been reached

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Aftermarket Conversions

Tier 3: Full Aftermarket Approval

Base vehicle fully OBD compliant and basic diagnostics for conversion technology:

1. Meet requirements identified in Tier 1 and 2
2. Demonstrate that OBD readiness can be achieved to ensure compatibility with Smog Check or other in-use inspection programs
3. Show of readiness indicators set and no OBD MIL/DTC during emission tests
4. Full OBD required for the full vehicle; must light single MIL and use standardized scan tools
5. Demonstrate IUMPR compliance
6. ARB may request durability test data to vehicle useful life

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Sales Tiers and Thresholds

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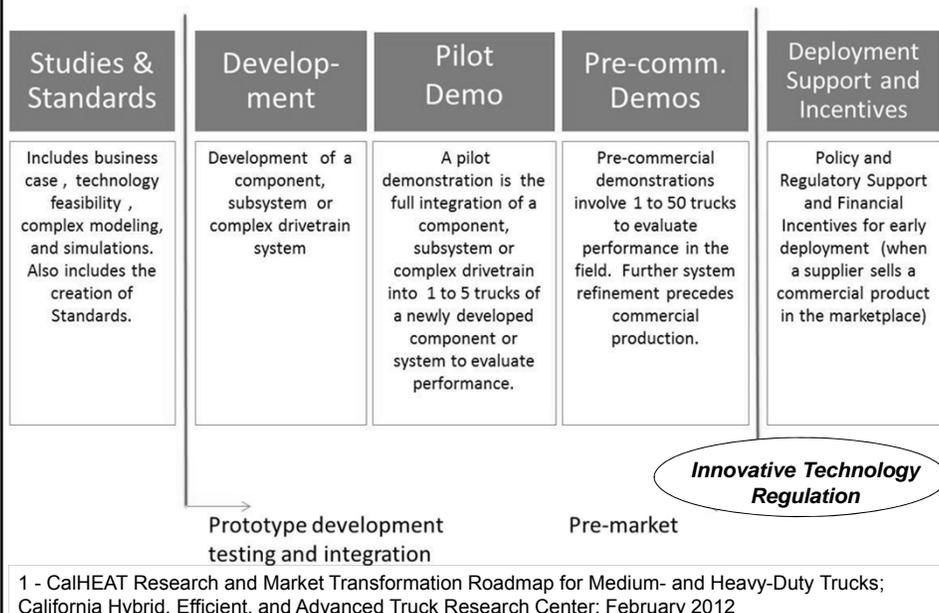
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Defining Applicable Sales Thresholds

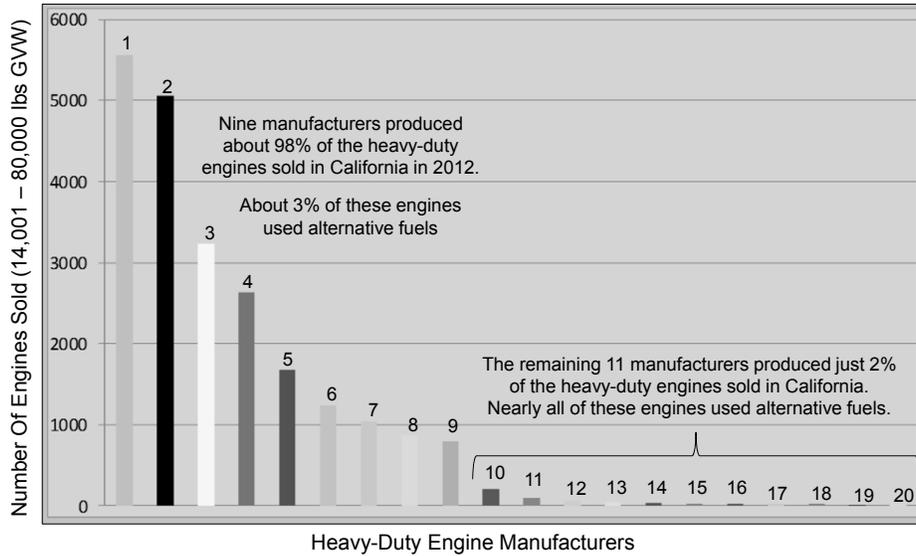
- Manufacturer and industry California sales thresholds per technology to be determined based upon factors such as:
 - Ability to encourage manufacturer participation, technology maturation, and consumer acceptance
 - Number of vehicles needed for fleets to evaluate technology
 - Annual industry sales volume per vocation
 - Extent of flexibility offered per sales tier
- Staff welcomes stakeholder input regarding most effective allowable thresholds

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CalHEAT Study Technology Evolution¹



Number of Heavy-Duty Engines Sold by Manufacturer in CA (2012 MY)



Next Steps

Next Steps

Ongoing

Stakeholders meet with ARB

Spring - Summer 2015

Public Workgroup Meetings: Informal, group discussion on specific topics

First Meetings (by teleconference only)

<u>Certification Work Group</u>	<u>Aftermarket Work Group</u>
March 24, 2015	April 2, 2015
1:30 – 3:30 pm PDT	1:30 - 3:30 pm PDT
Tel. 800-369-2178	Tel. 888-989-4570
Passcode: 40520	Passcode: 36159

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Next Steps (cont.)

Summer 2015

- Second Public Workshop

October 2015 (tentative)

- Proposed Regulation released for 45-Day Public Comment Period

November 2015 (tentative)

- Board Consideration of Proposed Regulation
- If adopted, ARB to request early effective date

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Key Contacts

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Discussion