

## Potential General Concepts: Innovative Technology Regulation (ITR) Eligibility and Implementation

**Objective:** Provide near-term, targeted certification and on-board diagnostics (OBD) compliance flexibility to accelerate market launch of key truck and bus technologies California needs to meet its long term air quality and climate goals.

### 1) Optional Low NOx Heavy-Duty Engines

Six Technology Categories			
Engine Type	g/bhp-hr NOx		
	0.10	0.05	0.02
CI	√	√	√
Otto Cycle	√	√	√

Within each of the six potential low NOx engine technology categories (above), an engine family would be eligible for two model years (MY) of Tier 1 flexibility and two MYs of Tier 2 flexibility.

- **Tier 1:** Modest OBD flexibility
- **Tier 2:** Progress towards full OBD

**Sunset Provisions:** Eligibility for each of the low-NOx technology categories would sunset four MYs after two low-NOx engines within that technology category are first certified.

**Annual Sales Allowance:** Each manufacturer's California sales allowance of *either* low-NOx engines or hybrid engines receiving ITR flexibility in a MY, respectively = 10% of its annual California heavy-duty engine sales volume, or 200 engines, whichever is greater.

Each manufacturer's California sales allowance for *both* low-NOx + hybrid engines receiving ITR flexibility in a MY = 12.5% of its annual California heavy-duty engine sales volume, or 250 engines, whichever is greater.

### 2) Hybrid Heavy-Duty Engines

Six Technology Categories and Associated Tier 1 Sales Allowance		
	<35 Mile All-Electric Range (AER)	35+ Mile AER
Vocational (Class 4+)	100	200
Class 8 Urban Bus	tbd	100
Class 8 Tractor	50	100

Within each of the six hybrid engine technology categories (above), a manufacturer would be eligible to sell Tier 1 California sales volumes of engines meeting EMD rather than OBD. Vehicle/chassis emission testing must demonstrate no criteria pollutant increase prior to proceeding beyond Tier 1 volumes. Tier 2 would require significant progress towards full OBD.

**Sunset Provisions:** Engine families with <35 mile AER would receive at least four MYs and those with 35+ miles AER at least six MYs of Tier 1 and 2 flexibility.

### 3) Heavy-Duty Engine Technology Diversity Provisions

Engine families with an innovative engine technology that achieves a NOx or CO<sub>2</sub> emission benefit may apply to the Executive Officer for ITR flexibility.

Flexibility would depend on level of innovation:

- **Existing Engine Architecture:** One MY each of modest Tier 1 and Tier 2 flexibility. Maximum 200 engines per manufacturer per MY. *Examples:* Waste heat recovery, engine downsizing, predictive cruise
  - Would sunset two MYs after technology first certified.
- **Novel HD Propulsion Technology:** Two years of significant Tier 1 and Tier 2 flexibility. Maximum 200 engines per manufacturer per MY. *Examples:* microturbine, camless engine, hybrid off-road engine range extender (steady-state operation powers generator, would not propel vehicle)
  - Would sunset four MYs after technology first certified.

#### 4) Hybrid Aftermarket Conversion Systems

Six Technology Categories and Associated Tier 1 and Tier 2 Sales Allowances				
	<35 Mile AER		35+ Mile AER	
	Tier 1	Tier 2	Tier 1	Tier 2
Class 2b/3	10	500	25	1,000
Vocational (Class 4+)	10	500	25	1,000
Class 8 Truck	10	500	25	1,000

Within each of the six hybrid conversion system technology categories (above), a manufacturer would progress through Tier 1 → chassis dynamometer or PEMS testing (indicating no criteria pollutant disbenefit) → Tier 2 → Tier 3 with increasing diagnostics, warranty, and other requirements in each tier.

- Tier 3 would require base vehicle be fully OBD compliant and conversion system use basic diagnostics
- Tier 3 would have no sales volume restriction.
- Potential for ARB to certify CO<sub>2</sub> benefit of conversion systems meeting more robust durability requirements in Tier 3.
- No criteria pollutant benefit would be recognized given potential NO<sub>x</sub> issues with hybridization.
- Tier 2 flexibility would sunset for each of the six technology categories above four calendar years after two conversion systems within the category first come to market.