

41 level. It seems quite likely that larger, multi-site fleets may simply choose to purchase and license
42 their non-ZEV's in other states and yet still drive them in to California, completely bypassing the
43 ruling and negating the intended results.

44 Jacobs feels that CARB's narrow focus on ZEV's will, unfortunately, keep California from
45 attaining its air pollution reduction goals. We would like to see CARB put in place additional
46 legislation and attention to continuing to improve the efficiency and lowering the emissions from
47 ICE-based vehicles via funding additional studies and improvement demonstrations. This will result
48 in an excellent return on investment for Californians in the long run.

49 Jacobs Vehicle Systems has continued to invest in emissions-reduction technologies for
50 application to internal combustion engines. The good news is that these technologies are rather
51 "fuel-agnostic," and can be applied to combustion engines fueled by gasoline, diesel, bio-diesel,
52 natural gas, hydrogen, dimethyl ether and various other alcohol mixes. Many of these cleaner-
53 burning, synthetic, renewable, and "carbon-neutral" fuels are not proven and need research to
54 demonstrate that they can meet the needs of the customers who purchase and use these engines.
55 Further, there has to be a certain market adoption in order to incentivize the development of the
56 infrastructure to be able to provide these alternative fuels. All this will take time and effort.

57 An anticipated bridge between full-ICE and full-ZEV is the hybrid vehicle which will certainly
58 contain some form of ICE prior to full-ZEV's becoming an economical reality. The industry tends to
59 define this period as the "messy middle" and even the most optimistic estimates say this will
60 continue to be a large segment of heavy-duty vehicles from 2027 through 2040. Considering these
61 engines, their expected wide-spread application, and their impact on the environment will be
62 critical to making these vehicles as efficient and clean as possible.

63 There is a case to be considered that some of the CARB local emissions goals not being reached,
64 can be attributed to a ZEV-heavy focus, where the market has neither largely adopted it, or found
65 the economic value to pursue it. Therefore, a sound strategy would be pursue multiple pathways
66 that allow the market to more easily adopt technology that will achieve CARB's overall objective.
67 There are continued concerns that the process of making BEVs produces a higher carbon output
68 that the current ICE, because of the high energy intensity of the manufacturing process of the
69 components for the BEV. Additionally, the energy source and process of generating sufficient
70 electricity to power these vehicles needs to be considered, as it does no good to generate clean
71 electricity using a high-carbon fuel as the energy source. The immediate and intermediate
72 deployments of BEVs and ZEVs may improve local use emissions, but total emissions will increase
73 world-wide.

74 These well-to-wheel, or cradle-to-grave studies offer that the ICE with renewable, alternative
75 fuels and combined with various levels of hybridization in the vehicle can provide a valuable carbon
76 and emissions improvement for this 'messy middle', and potentially offer overall carbon neutral
77 operation. We ask that CARB also continue to investigate the Life Cycle Analysis of these various
78 powertrains with industry partners, and to consider changing long term goals to a more carbon
79 neutral system approach. CARB has exclusively equated ZEVs to be BEV or HEV through its recent
80 rules. We ask that you consider that alternative fuels and powertrains can support the ultimate
81 *emissions* goal, by including program initiatives that expand that understanding to include
82 renewable fuels in ICEs.

84 **Conclusion**

85 Jacobs supports CARB's overall goals, but California will need market-driven solutions to drive
86 the ICE to be cleaner, as it will be with us long after the 2035 mandate of all ZEV's sold in California.
87 We would like to see discussion start for the next phase of emissions reductions beyond the Heavy-
88 Duty Omnibus ruling's timeframe.

89 These standards will help drive adoption of cost-effective emissions reduction technologies to
90 the marketplace and provide better real-world emissions performance for HD powertrains that can
91 be realized before 2035, and due to the life cycle of a HD vehicle, will affect air quality for many
92 years after.

93 For more information, please do not hesitate to contact Robb Janak, Director of New
94 Technology at robb.janak@jakebrake.com or Steve Ernest, VP Engineering & Business Development
95 at steve.ernest@jakebrake.com

96 Respectfully submitted:

97

98



99 Steve Ernest
100 VP Engineering & Business Development



Robb Janak
Director, New Technology