



## SMART's Clean Diesel Trains

*White Paper No. 6*

If your idea of a passenger train starts with a behemoth locomotive pulling a long line of rail cars and belching dirty smoke, it's time for you to meet a 21<sup>st</sup> Century passenger railroad.

Far from proposing a replica of the trains of yesteryear, Sonoma-Marín Area Rail Transit will provide the cleanest, most up-to-date and most practical rail technology available to the North Bay.

SMART's trains not only will *look* cleaner than traditional locomotives, but they will actually *be* far cleaner than most vehicles on our roads. In fact, on a per-passenger-mile basis, SMART will be a cleaner way to travel than just about anything on Highway 101.



*Bombardier "Talent" DMU*

Like other Bay Area passenger rail systems such as Caltrain, the Altamont Commuter Express (ACE), the Capitol Corridor and even the proposed new BART extension into eastern Contra Costa County, SMART has proposed using diesel-powered trains. But rather than using traditional engines pulling a line of passenger cars, SMART proposes to use self-propelled rail cars known as Diesel Multiple Units (DMUs) to improve efficiency, flexibility and capacity.

Each DMU car has its own diesel power and is, in effect, a mini-engine. It can operate as a single car or, as in SMART's proposal, in two- or three-car train-sets that can transport hundreds of passengers with one operator.

Combining large passenger capacity with modern fuel technology results in some remarkable air-quality benefits. According to calculations by Willard Richards, PhD, a Santa Rosa-based air quality expert, passengers using SMART can cut their transportation emissions to a tiny fraction of those emitted by most drivers on Highway 101. Specifically, when compared with other vehicles now in use, an entire two-car, 200-seat SMART train would emit:

- particulate matter (black smoke) equal to that emitted by *one* automobile and only 1/20<sup>th</sup> the particulate matter of a 40-seat transit bus.
- smog-producing nitrogen oxides (NO<sub>x</sub>) equal to the emissions of just 8 autos and just 1/5<sup>th</sup> the NO<sub>x</sub> of one 40-seat transit bus.
- CO<sub>2</sub> equal to that from 12 autos, despite carrying many more people, and about the same CO<sub>2</sub> as two 40-seat transit buses.

The key to achieving these lower emissions is the use of the latest diesel fuels and technology. While diesel engines have always been more fuel efficient and produced less carbon monoxide (CO) and carbon dioxide (CO<sub>2</sub>) than gasoline engines, they've historically had the downside of higher nitrogen oxide (NO<sub>x</sub>) and particulate matter (PM) emissions.

The United States and California, however, are mandating a transformation in diesel emissions. New rules now require the use of ultra-low sulfur diesel (ULSD) fuel, which contains 15 parts sulfur per million, a huge reduction from the 500 parts per million previously allowed.

Ultra-low sulfur diesel makes it possible to add advanced emission control technology to diesel engines, a technology that doesn't work with high-sulfur diesel.

Rules that require new DMUs to use these advanced emission control systems take effect in 2011. SMART already is committed to using "high-efficiency catalytic after treatments, such as catalyzed diesel particle filters, selective catalytic reduction systems, [and] NO<sub>x</sub> absorbers" (see page 5-31 of SMART's Draft EIR).



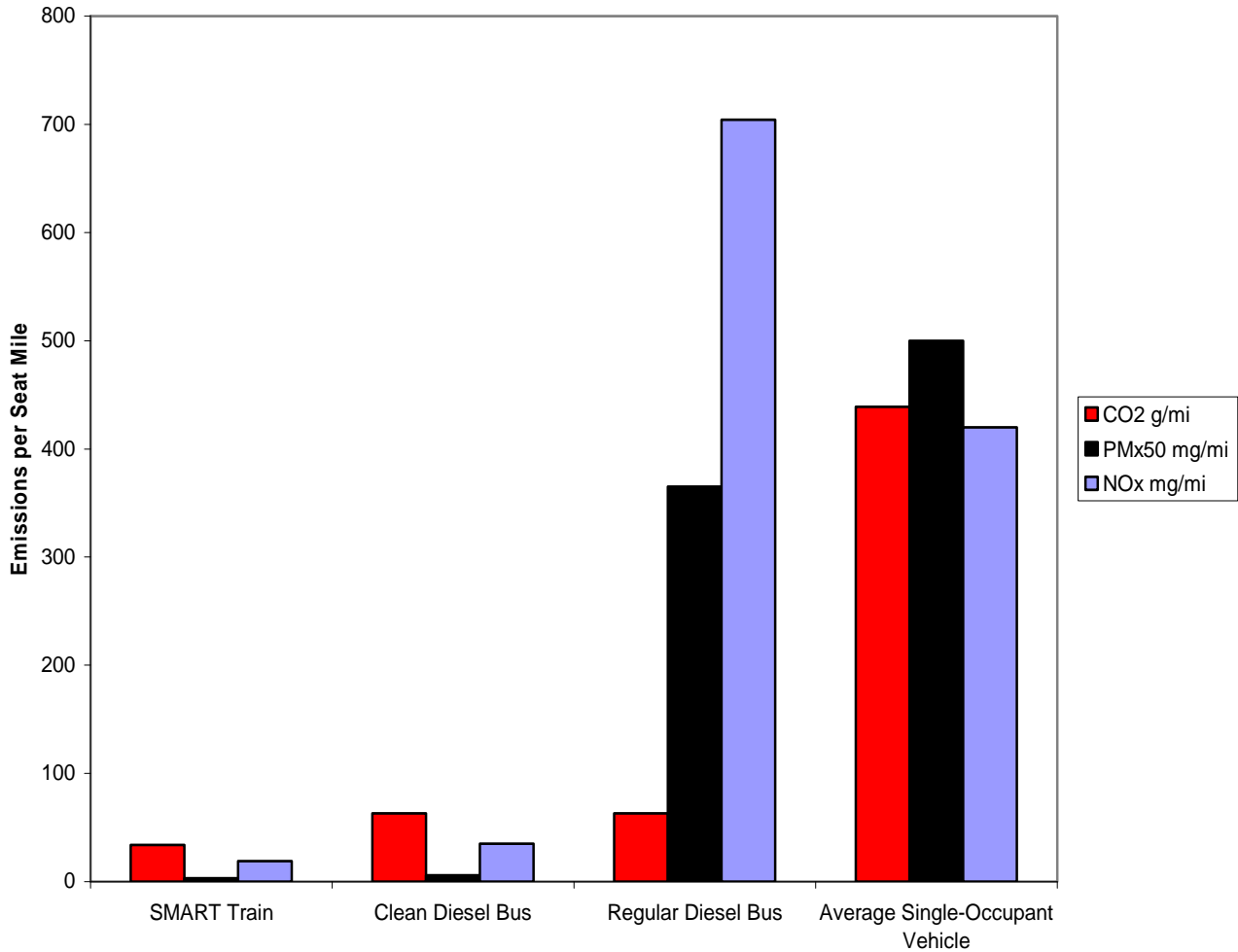
*Siemens "Desiro" DMU*



*Colorado Railcar DMU*

Tests on prototypes of these new "clean diesel" engines have shown particle levels in the engine exhaust that are even lower than the particle levels measured in the air entering the engines. Combined with ULSD fuel, they will make the SMART train an extremely clean vehicle; much cleaner than today's buses and trains, and – on a per-passenger-mile basis – even cleaner than 21<sup>st</sup> Century diesel buses using similar technology.

Dr. Richards prepared the following chart, which compares on a per-seat basis a SMART train, an advanced clean-diesel bus, an average public transit bus now in use, and a typical single-occupant automobile. Per seat, the SMART rail vehicle is a vast improvement over a typical single-occupant automobile and most of today's buses, and also will be much more efficient than the "clean diesel" buses of future North Bay transit fleets.



To make the chart easier to read, PM (black smoke) emissions have been multiplied by a factor of 50

With these new technologies, diesel doesn't have to be a dirty word. The combination of 21<sup>st</sup> Century fuels, catalytic systems and particulate traps will make the SMART train one of the cleanest ways to travel in Sonoma and Marin counties.

*For more information about the SMART rail and trail project, go to [www.sonomamarintrain.org](http://www.sonomamarintrain.org) or call SMART's information lines in Marin, 415-419-3510, or Sonoma County, 707-583-2323.*