## Summary

Advocating the convergence of Carl Moyer guidelines and ARB verification program to promote advancement in Ultra Low NOx rail propulsion technology for in state rail vehicles starting with switcher locmotives and advancing to passenger rails and intra state freight movement.

* Allow public private partnerships utilizing Carl Moyer lease funding with privatized risks
* Revise ARB verification program for hybrid and battery electric locomotives that don’t put public funds at risk, but also remove regulatory hurdles that are not adding value.

## Justifications

Rail vehicles are the off-road application that ARB and local air agencies have the least ability to coerce into using cleaner technology; they have a solid federal pre-emption. Locomotives built in the 1960’s are simple, reliable and economical to rebuild. Modern replacement gensets purchased at government expense have been a failure due to poor performance and high maintenance costs when compared to older locomotives.

Recent NOx inventories of Rail Equipment in the SCAQMD air basin indicate that rail NOx emissions are going up, not down due to the railroads retiring most of the gensets and bringing older locomotives back into the area.

## Path Forward

Public funding should be more focused on more smaller demonstrations of possible disruptive technologies without increasing risk of wasting public funds.

One missing opportunity is the old Carl Moyer lease program. Appropriately structured leasing programs could actually increase the public benefits from Carl Moyer funding.

By leasing a new technology piece of equipment, the customer is assured they are not losing the equipment they prefer in the process until the new technology is proven to work.

Under Carl Moyer, both purchase and leasing of equipment is based on a yearly calculation of emissions reduction. When Carl Moyer was used to purchase Metrolink F125 locomotives it was based on extrapolating that yearly value for 20 years and investing that amount at the front end to buy the locomotive. On a lease the yearly emissions reduction value is divided by 12 and the lease is paid on a monthly basis as long as the equipment is operating properly. This is how risk is privatized, the leased piece of equipment has to operate properly in order for the lease to be paid and the program to continue. In the case of the F125’s, when the 2 year warranty is up, the public is stuck holding the bag for incrementally improved locomotives that are now two years behind schedule and performing poorly.

## Bigger Opportunity

Seeing that ‘no change’ is the preferred alternative to the rail industry, incremental change has been painful and resistance is incredibly strong. Non-optimal application of public policy and tax payer funds has further entrenched the ‘no change’ alternative.

The bright side is that this industry that was dragging its feet on embracing change is now ripe for a leap frogging technology that will come from a pool of smaller more flexible companies under small pilot programs that are willing to take more risk. This requires smarter public policy and application of incentive funding that leads to private investment covering some of the risk. Leasing equipment for 5 years based on annual cost effectiveness is one promising approach.

## Scrappage Deferral Proposal

Current funding guidelines require scrappage of what potential customers consider perfectly functional and long lasting equipment. As part of a lease proposal, scrappage would be deferred until a decision was made to keep the new technology locomotive after the lease period.

It is proposed that for any locomotive leased under Carl Moyer for a 5 year project, a customer locomotive will have to be set aside so that it can be confirmed that the new locomotive is actually generating excess voluntary emissions reductions. In order to track both locomotives, as part of the project, the set aside locomotive should be equipped with an event recorder similar to the one in the new locomotive that tracks its location and operating conditions continuously.

The Carl Moyer project would specify a minimum work load shift such as 90% and this ratio of work done by both pieces of equipment would be tracked through the event recorders.

As new technology locomotives cost between 3.5 and 12 million dollars, an $8000 event recorder installed on a second locomotive is a negligible cost to the project.

## ARB Verification Requirements

Another challenge to Carl Moyer locomotive projects is the requirement that they be verified by the ARB. At this point ARB does not have a verification procedure for hybrid or zero emissions locomotives.

By leasing equipment and having minimal operational requirements under the lease payments, the locomotive would essentially be operating under warranty for the entire 5 year project.

The 5 year lease project becomes a verification system as a secondary benefit.

## Conclusion

Creative ways of leasing multiple new technology locomotives could be the path to an actual better locomotive the industry will want. Similar to how electric cars and busses are now perceived as higher performance vehicles with lower maintenance and costs, durable hybrid locomotives could become near zero emissions machines with better throttle response, similar range and a lower total cost of ownership. In order to get here we need to leap frog over these high maintenance and more complicated diesel machines that only get us a mediocre improvement in emissions and cost so much it will be painful to scrap them when they are obsolete in 5 years.

## How does Tier 4 look 5 years later

Staff should be reminded of some facts on the ground about the real advancement in locomotive emissions.

1. Tier 4 went into effect Jan 1, 2015
2. Of the two big locomotive manufactures, EMD first put a Tier 4 freight line haul locomotive into service in Nov 2016
3. The second main freight line haul locomotive manufacture, GE Transportation, typically sells a Tier 4 locomotives coupled with selling a credit using Tier 3 locomotive.
4. GE is selling off GE Transportation which doesn’t indicate they have great faith in their product.
5. The Tier 4 locomotive regulation is basically an incremental improvement that hasn’t gone far. Tier 4 locomotives are regulated to generate the same NOx and 3 times the PM of a 2007 truck. The NOx deficit to a 2010 truck is 6.5 times.
6. In reality when a locomotive achieves Tier 4 without a DPF, the 0.03 PM emissions are 30 times the PM emissions of an EPA 2007 truck as the DPF equipment when tested has PM emissions closer to 0.001 grams/hphr