# Energy and Emissions Impacts of Operating Higher Productivity Vehicles

## The Problem

By U.S. DOT estimates, there will be a near doubling of the amount of freight to be moved on our nation's transportation system within the next 15 years. With truck transportation accounting for the vast majority of shipments, significant growth in truck tonnage, mileage and trips is expected over the next decades.

The challenge facing the U.S. transportation system is how to accommodate this growth while at the same time improving energy efficiency and reducing emissions. One option for addressing this challenge is to increase the maximum operating weight for over-the-road trucks.

## Our Research

ATRI and industry partner Cummins Inc. teamed up to investigate the energy and emissions impacts which result from operating commercial vehicles at weights equal to or greater than the existing federal limits. Using a sophisticated Vehicle Mission Simulation (VMS) model and a simplified algorithm to estimate emissions, six different vehicle configurations and four different gross vehicle weights (GVWs) were modeled over a representative route. The vehicle configurations and GVWs used in the model included:

### Baseline Vehicles

- Standard Tractor-Semitrailer
- Standard Double

### Higher Productivity Vehicles

- 6-Axle Tractor-Semitrailer
- Rocky Mountain Double
- Triple Trailer Combination
- Turnpike Double

### Gross Vehicle Weights

- 80,000 pounds
- 100,000 pounds
- 120,000 pounds
- 140,000 pounds

The results of this analysis provide a comparative estimate of the potential energy and emissions impacts from operating different vehicle configurations at various weights.

## What We Found

Increasing GVWs above the current federal maximum limit of 80,000 pounds has the potential to decrease energy consumption and emissions. In this research, fuel consumption and tailpipe emissions generally decreased for each ton-mile of freight transported when compared to two standard configuration vehicles at 80,000 pounds GVW. With the exception of one configuration, decreases in fuel consumption and emissions per ton-mile ranged from:

- 4 to 19% at 100,000 pounds GVW;
- 15 to 22% at 120,000 GVW;
- 27% at 140,000 pounds GVW

The lone exception to the findings was for the Turnpike Double loaded to 100,000 pounds GVW. In this instance there was an increase in fuel consumption and emissions per ton-mile when compared to the two standard configurations. At this weight, the added payload weight was insufficient to offset the additional fuel consumption demands of the heavier vehicle. Other than this exception, operating Higher Productivity Vehicles to accommodate higher GVWs can be expected to decrease fuel consumption and emissions on a ton-mile basis when compared to standard configuration vehicles at 80,000 pounds GVW.

## Next Steps

As the nation is forced to address the continuing demands placed on our transportation system from freight growth and an aging infrastructure, industry and government must explore alternatives that prevent gridlock without reducing our economic vitality. Higher productivity vehicles provide one option for meeting the freight demands of the future. This research demonstrates that there are fuel efficiency and emissions benefits that can be attributed to utilizing higher productivity vehicles.

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