
# Comprehensive Report on Propane School Buses in Minnesota

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MINNESOTA CLEAN CITIES

# Introduction

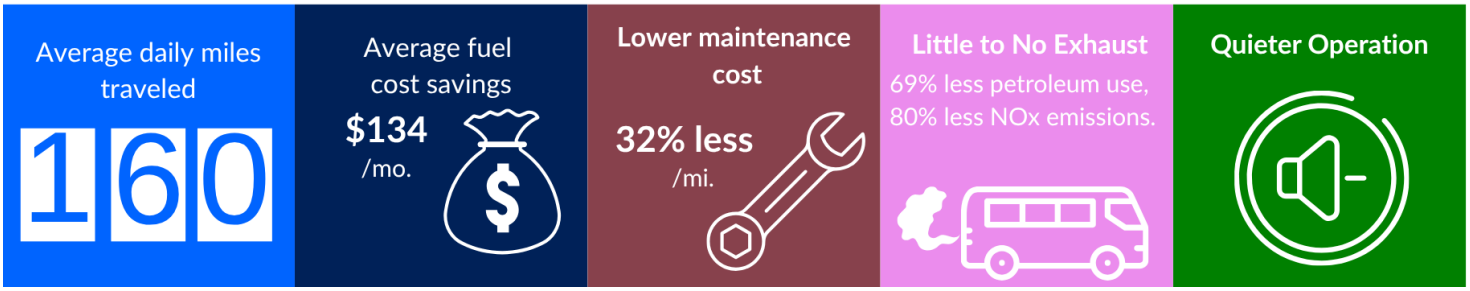
This report provides a comprehensive overview of propane school buses in Minnesota, exploring their operational characteristics, environmental benefits, cost implications, and overall suitability for school transportation fleets. Propane autogas has become a well-established alternative fuel, providing distinct advantages in various operational contexts, including those with challenging climate conditions. Six fleets were invited to participate in this report, including one operating on rural routes and another on a mixed route encompassing urban, rural, and suburban areas. The fleets featured began using propane autogas in 2018 and 2022.

### Executive Summary

Propane school buses represent a mature and widely adopted alternative fuel technology that presents a balance of economic benefits, environmental advantages, and reliable performance. Compared to traditional diesel buses, propane buses can provide significant reductions in harmful emissions, lower fuel and maintenance costs, and quieter operation. While their range and performance can be affected by extreme cold, these challenges are generally manageable with established infrastructure and operational practices. The continued availability of strong fuel and service networks makes propane a great choice for school districts looking to modernize their fleets and reduce their environmental footprint.

### Propane School Bus Results:

- The interviewed propane school buses travel an average of 160 miles per day.
- Average fuel cost savings were approximately $134 per month per bus, based on cost and maintenance differences.
- Maintenance costs were approximately 32% lower compared to diesel buses ($0.21/mi vs. $0.31/mi).
- Propane buses produced 69% less petroleum annually and reduced NOx emissions by over 80%.
- The average total cost of ownership was approximately $43,500 less than diesel alternatives over the vehicle lifetime.



**Key Findings**

- Propane buses produce significantly fewer particulate matter (PM), nitrogen oxides (NOx), and greenhouse gas (GHG) emissions compared to diesel buses, contributing to cleaner air around schools and communities.
- Districts often experience lower fuel costs due to the stable pricing and efficiency of propane autogas. Additionally, propane engines typically require less maintenance than diesel engines, leading to reduced operational expenses. Fleets interviewed experienced 2 day "out of service days" in fleets.
- Propane buses provide quiet operation, which enhances driver and student comfort, and smooth acceleration. They demonstrate reliable performance across various climates, with specific considerations for cold weather.
- The fueling infrastructure for propane is relatively straightforward to install and maintain, with widespread availability of propane suppliers and service technicians.
- Drivers generally appreciate the quieter ride, reduced exhaust fumes, and simpler fueling process compared to diesel buses.

## Operational Performance

Propane school buses typically provide a sufficient range for standard daily routes, with the exact range being dependent on factors such as tank size, specific driving conditions, and the use of auxiliary loads. Fleet drivers noted the driving experience of a propane bus compare to diesel and electric buses in terms of acceleration, brake, and handling was excellent. While their per-tank range might be less than some diesel counterparts, propane buses can be refueled quickly, which effectively mitigates any concerns about range anxiety. When discussing if there are noticeable differences in fuel efficiency when operating on different type routes one fleet said no and one fleet noted there is highway vs city variation of 6 mpg to 4 mpg. In terms of cold weather performance, propane vehicles are known to operate effectively in low temperatures. Fleets interviewed rated driving propane bus on a 5 star rating of 5, being excellent. Neither fleet has experienced operational challenges in extreme cold.

Fleet managers also observed no differences in performance between buses parked indoors versus outdoors overnight. Unlike diesel, propane does not gel in cold weather, ensuring reliable starts. However, extremely cold conditions can lead to a slight reduction in fuel efficiency (one fleet noted about 10% and another fleet noted about 1/3 difference) and may necessitate the use of specific cold-weather additives or engine block heaters to ensure optimal performance and starting reliability. Propane engines are highly efficient, converting a substantial percentage of their fuel into usable energy, although real-world efficiency can vary based on terrain, driving style, and the utilization of auxiliary heating systems. Furthermore, propane buses utilize the same fuel source for cabin heating, drawing directly from the propane

tank. This design means that heating does not impact the main propulsion system's energy reserves in the same way an electric heater would affect an electric bus's battery range.

## Reliability and Maintenance

Propane buses generally demonstrate high reliability, largely due to their robust engine design and simpler emissions systems compared to modern diesel engines. They typically require less time in the shop for maintenance tasks associated with complex diesel particulate filters (DPFs) or selective catalytic reduction (SCR) systems, which are common issues with diesel vehicles. Fleets participating in this report noted a typical 2 day out of service experience. Many school districts have reported lower overall maintenance costs for their propane bus fleets. This reduction is often attributed to propane being a cleaner-burning fuel, which results in less engine wear, extended oil life, and fewer components that are prone to failure. Despite these advantages, regular preventive maintenance remains crucial for ensuring continued reliability. The propane bus sector benefits from a well-developed network of propane suppliers and certified technicians, which ensures that necessary parts and services are readily available to support fleet operations.

## Cost Savings

Historically, propane autogas has maintained a more affordable and less volatile price point compared to diesel fuel, allowing school districts to realize significant long-term fuel cost savings. When evaluating the total cost of ownership (TCO), propane school buses often present a highly competitive option. This is due to a combination of factors, including a lower initial purchase price (especially when compared to electric buses), reduced fuel expenses, and decreased maintenance costs throughout their operational lifespan. Additionally, various federal, state, and local incentives or grants may be available to help school districts offset the initial investment in propane buses and the necessary fueling infrastructure, further enhancing their economic appeal.

**Total Cost of Ownership (TCO) Calculator Output**

| | Diesel | Propane |
|---|---|---|
| Depreciation | $47,336 | $44,656 |
| Fuel | $70,381 | $86,600 |
| Diesel Exhaust Fluid | $1,208 | $0 |
| Maintenance & Repair | $170,127 | $115,049 |
| Insurance | $22,821 | $22,046 |
| License & Registration | $1,914 | $1,914 |
| TCO | $313,787 | $270,265 |

*Table 1 Price data to compare propane and diesel medium-duty vehicles.*

Data in table 1 provides price data to compare propane and diesel medium-duty vehicles which was compiled from the Argonne National Laboratory's (ANL) Alternative Fuel Life-Cycle Environmental and Economic Transportation (AFLEET) Tool (https://afleet.es.anl.gov/). ALFLEET is the go-to tool to calculate and compare the environmental and economic costs and benefits of alternative fuel vehicles and internal combustion engine vehicles.
AFLEET uses data from ANL's Greenhouse gases, Regulated Emissions, and Energy use in Technologies ("GREET") fuel-cycle model to generate necessary well-to-wheels petroleum use and greenhouse gas (GHG) emission co-efficients for key fuel production pathways and vehicle types.

## Infrastructure

Establishing on-site fueling infrastructure for propane autogas is a relatively straightforward process, characterized by ease of installation and maintenance. Interviews noted that drivers only required additional training for the fueling procedure. A typical setup includes a storage tank, a dispenser, and necessary safety measures, allowing districts to conveniently and efficiently refuel their entire fleet directly at their own facility. The infrastructure for propane fueling is also highly scalable, meaning it can be easily expanded to meet the growing needs of a fleet, whether it involves a single dispenser or multiple high-capacity units.

## Driver Comments

- The driving experience of a propane bus compared to diesel and electric buses in terms of acceleration, breaking, and handling is excellent.
- Drivers like them once they start driving them. No warm-up time needed, the cabin heats quickly as well as great performance and quiet driving.
- The fleet drivers recommend propane buses to other districts.
- Additional insights, observations, or lessons learned from experience with propane school buses. No possible ground water contamination from fueling stations or buses.

## Summary

Propane school buses are a proven solution for Minnesota school districts aiming to reduce operational costs, minimize environmental impact, and maintain reliable transportation services. Their established performance, relatively low total cost of ownership, and accessible fueling infrastructure make them a strong and practical alternative to diesel. They effectively bridge the gap towards a cleaner transportation future while districts also consider the evolving landscape of propane vehicle technology. More than 30 counties and communities are currently using propane in over 1,200 school buses which shows the value of propane school buses in Minnesota. For opportunities on funding or to showcase your fleet visit Minnesota Propane Association or CleanAirChoice.org/grants

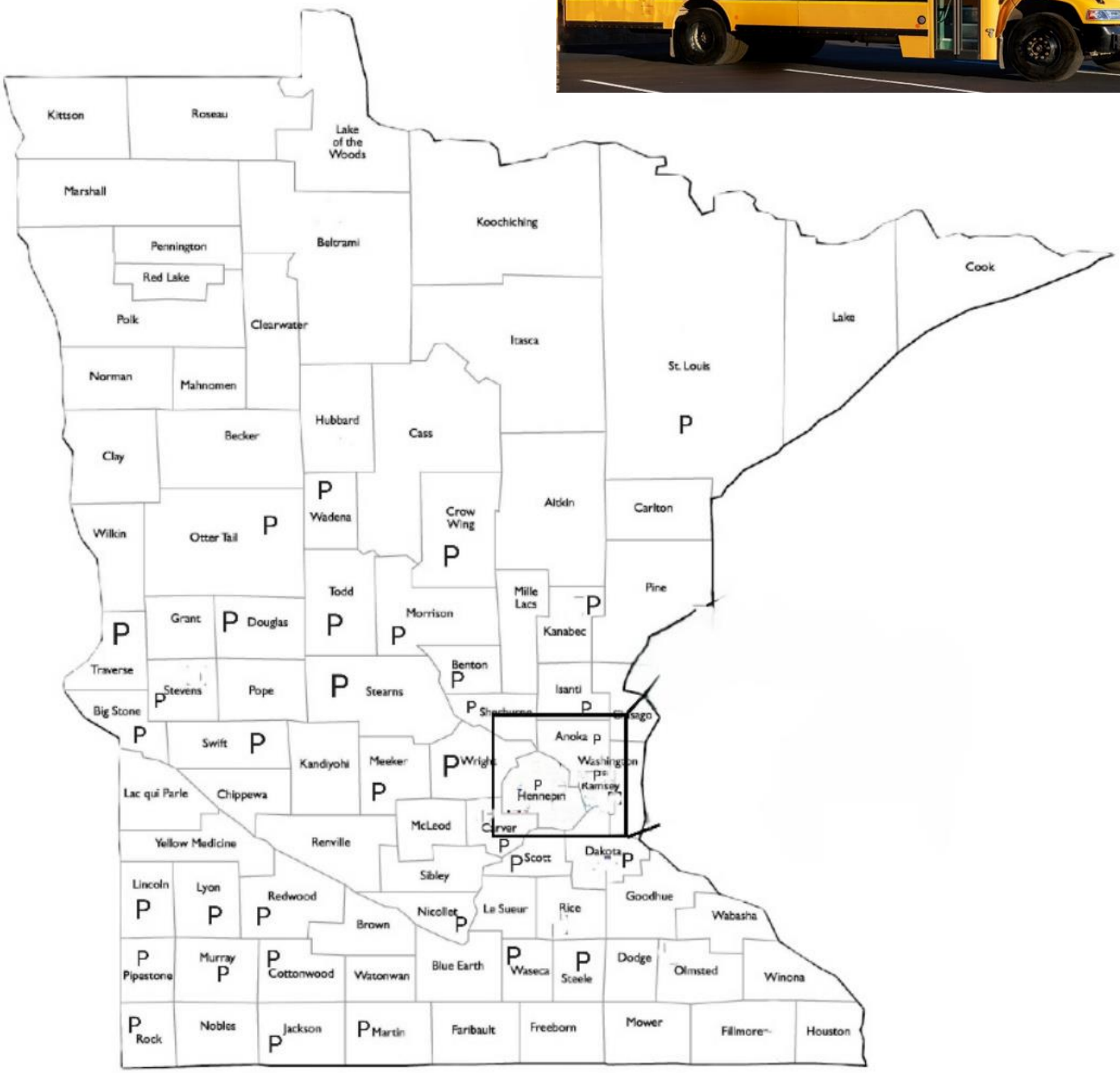




*Figure 1. Counties in Minnesota with propane school bus deployment or planned activity as of 2025.*

# References


Fleets invited to participate: ISD 2142 – ISD 712, Palmer Bus, Northdale Oil, Voigt Bus, ISD 15, and Eastern Carver/ District 112. Voigt Bus and Palmer Bus provided feedback.

Funding opportunities: Minnesota Propane Association https://discoverpropanemn.com/autogas

MotorWeek fleet showcases MN propane bus fleet in video https://youtu.be/_kZz_IxCsQA

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