

## Site Overview



Two of the Biltmore's company police vehicles have been converted for propane usage, but Larry Rankine hopes to have the rest of the fleet retrofitted in the near future.

The Biltmore Estate is a United States historical landmark and tourist attraction in the Blue Ridge Mountains of Asheville, North Carolina. The Biltmore House, the main house on the estate, is a Châteauesque-styled mansion built by George Washington Vanderbilt and completed in 1895. It is the largest privately owned house in the United States with 178,926 square feet of floor space, 250 rooms, indoor bowling alley and swimming pool, a two-story library, and elevators that travel all four stories. The grounds include 75 acres of formal gardens, a winery, and the Inn on Biltmore Estate. The Biltmore House was ranked eighth in America's Favorite Architecture by the American Institute of Architects in 2007, received a Grand Award in the Park, Recreation Area, or Playground category of the 2011 Professional Grounds Management Society Green Star Awards, and earned a Triple Bottom Line Award from Sustainable NC in 2008 for demonstrating the successful integration of all three aspects of sustainability - social, environmental and economic.

## The Fleet

The Biltmore Estate has a fleet of company police vehicles that respond to emergencies and keep the grounds safe and secure. Since a vehicle is required for travel between locations on the estate, Biltmore Estate offers a shuttle service from Biltmore House parking lots to the front door of the house. Shuttles from the house to the Conservatory are also available April through December.

## Implementation

In 2013, the Biltmore Estate was awarded a Mobile Source Emission Reduction Grant (MSERG) that went toward the conversion of two company police vehicles and four public shuttles (all solely using gasoline) to bi-fueled propane-gasoline vehicles. They joined two shuttles that were previously converted to bi-fuel through a partnership with Alliance AutoGas, who also installed a propane fueling station on the Biltmore grounds to provide a year-round supply.

The Biltmore's propane-gasoline bi-fuel converted company police vehicles and shuttles have led to the additional improvements and benefits:

- The Alliance AutoGas Prins Vapor Sequential Injection (VSI) system used in the conversions provides equal torque and power to gasoline, but with far greater emissions reductions over the vehicles replaced.
- When a vehicle with the VSI system is eventually retired, the system can be transferred to another vehicle of the same engine platform within the fleet. This will save Biltmore additional costs down the road.
- The ability to displace over 15,000 gallons of gas and significantly reduce Biltmore's carbon footprint.
- Fueling vehicles at Biltmore's fleet base saves more than \$1.35 per gallon compared to gasoline. The average fleet fuel cost reduction with Alliance AutoGas propane is 40%. Also, since propane autogas is produced domestically, this project helps keep funds within North Carolina and promotes U.S. jobs.
- Added convenience and security for drivers because of the VSI system's bi-fuel capacity, which allows drivers to switch back to gasoline if needed.
- Since the propane conversions were done at the Biltmore Estate, Biltmore's mechanics were able to learn about the VSI system and its maintenance from the Alliance AutoGas technicians.

## Adjustments and Conclusion

The Biltmore Estate did not encounter any major problems related to the grant or conversion process. However, the fuel site preparation cost a little more than what the initial quotes indicated, and it was noted that some of the drivers took longer to get in the habit of using the propane than others. Despite the few times that some fine-tuning was needed, the Biltmore Estate would highly recommend this type of project to similar companies and organizations. Between the initial on-site propane tank installation and the follow-up visit, Alliance AutoGas had returned to Biltmore to reinstall a 1,000 gallon tank. This tank holds about two times more propane than the first tank, and will better serve Biltmore’s needs in the present and in the future as the estate would like to eventually convert the entire company police fleet to bi-fuel propane-gasoline.



The 6.8L, V-10 Starcraft Allstar 25 shuttle bus (shown above) now runs primarily on propane and can fill up from the on-site Alliance AutoGas tank (shown below) near the security building.

“Every time we consider a new vehicle, we consider propane.”

- Larry Rankine, Director of Security and Police Services



### Emission Reductions

Nitrogen Oxides (tons/yr)	Fine Particulate Matter (tons/yr)	Carbon Monoxide (tons/yr)
0.377	0.000	13.601