

Clean Energy Green Truck Launchpad



ANNOUNCING THE GREEN TRUCK LAUNCHPAD

Green Trucks—powered by renewable energy—are coming soon!

- ✓ Wipe out air pollution
- ✓ Cut carbon
- ✓ Replace diesel
- ✓ Slash the noise of big trucks

WHY IS A LAUNCHPAD NEEDED?

Green Trucks are ready to hit the road and replace dirty diesel trucks. Green Trucks need the Launchpad to stage their operation and compete against diesel. Every community will want to support Green Trucks.

WHAT IS THE LAUNCHPAD?

- Secure, monitored, attractive parking for driver cars during the day and truck cabs at night.
- There will be no trailer parking.
- Plug-in connections at parking stalls will fill the cabs overnight.
- Fast refueling to supplement overnight filling.
- Facility is secure and monitored with restricted and controlled access and no overnight stays.

WHAT ARE THE LAUNCHPAD OPERATIONS?

- Drivers arrive in their personal cars in the morning and park in the secure lot.
- Drivers take their truck cab out for the day to do their job delivering important goods for the community.
- Drivers return in the evening, connect their cab, and depart in their personal car.
- A 50-unit operation will only have 50 car arrivals and departures and 50 truck cab arrivals and departures per day to access the parking facility.

HOW DOES OUR COMMUNITY BENEFIT?

- Every Green Truck replaces a dirty diesel truck.
- Every Green Truck is a good job for a driver and generates other jobs at businesses in the community.
- Every Green Truck is good for the environment, the community, and our planet.

HOW IS THE LAUNCHPAD BETTER?

- 25+ year track record of safety with stringent safety standards.
- No soil contamination like diesel and gasoline.
- Minimum amount of storage onsite unlike diesel and gasoline.
- Monitoring and automatic systems ensure safe operations.

Compressed Natural Gas (CNG)

Introduction, Benefits, Equipment & Operations

- CNG vehicles deliver tremendous community benefits compared to diesel trucks:
 - NOx air pollutants are reduced by 90% compared to the current EPA standard for trucks.
 - Carbon (GHG) emissions from renewable CNG are reduced by 70% to over 300%, meaning climate pollutants are negative – less than zero.
 - CNG eliminates the use of petroleum fuels.
 - CNG trucks are far quieter, compared to a diesel truck that is 10x noisier than a CNG truck.
 - CNG is produced above-ground and there is no underground storage of CNG or contamination of soil or groundwater.
- Natural gas comes from the local utility's infrastructure and is the same gas that is used for heating and cooking in homes and restaurants.
- CNG is produced when the supplied natural gas is compressed by means of an electric driven compressor to 3,600 PSI.
- Compressing natural gas increases the amount of the gas stored in vehicles.
- Approximately 137 standard cubic feet (SCF) of CNG provides the same energy as 1 gallon of diesel.
- CNG is the cleanest burning alternative fuel to gasoline and diesel for all types of vehicles such as semitrucks, transit and school buses, refuse collection trucks, box trucks and delivery vans.
- CNG is less expensive than gasoline and diesel, which means reduced fuel costs for CNG vehicles.



CNG Station Equipment

Compressor Skid



Gas Dryer



CNG Storage Vessels



CNG Equipment Operation

Gas Dryer:

- The first equipment that the natural gas will encounter is the system's Dryer.
- The Dryer removes moisture and debris in the gas supply and conditions the gas for the next system component, the Compressor.

Compressor:

The natural gas provided by the local utility is provided at a varied pounds per square inch (PSI) range such as 50 PSI or 100 PSI as examples. The compressor is used to boost the gas to 3,600 PSI for dispensing in the vehicle.

- Sensors and safety systems are installed to detect if a gas leak should occur and take immediate automatic corrective action.
- Natural gas is lighter than air and in the unlikely event of a leak, the gas rises and naturally dissipates in the air.

Storage Vessels:

A small amount of CNG is stored in one to three storage vessels depending on the anticipated volume at a particular location. Each storage vessel holds approximately 30 gallons of CNG.

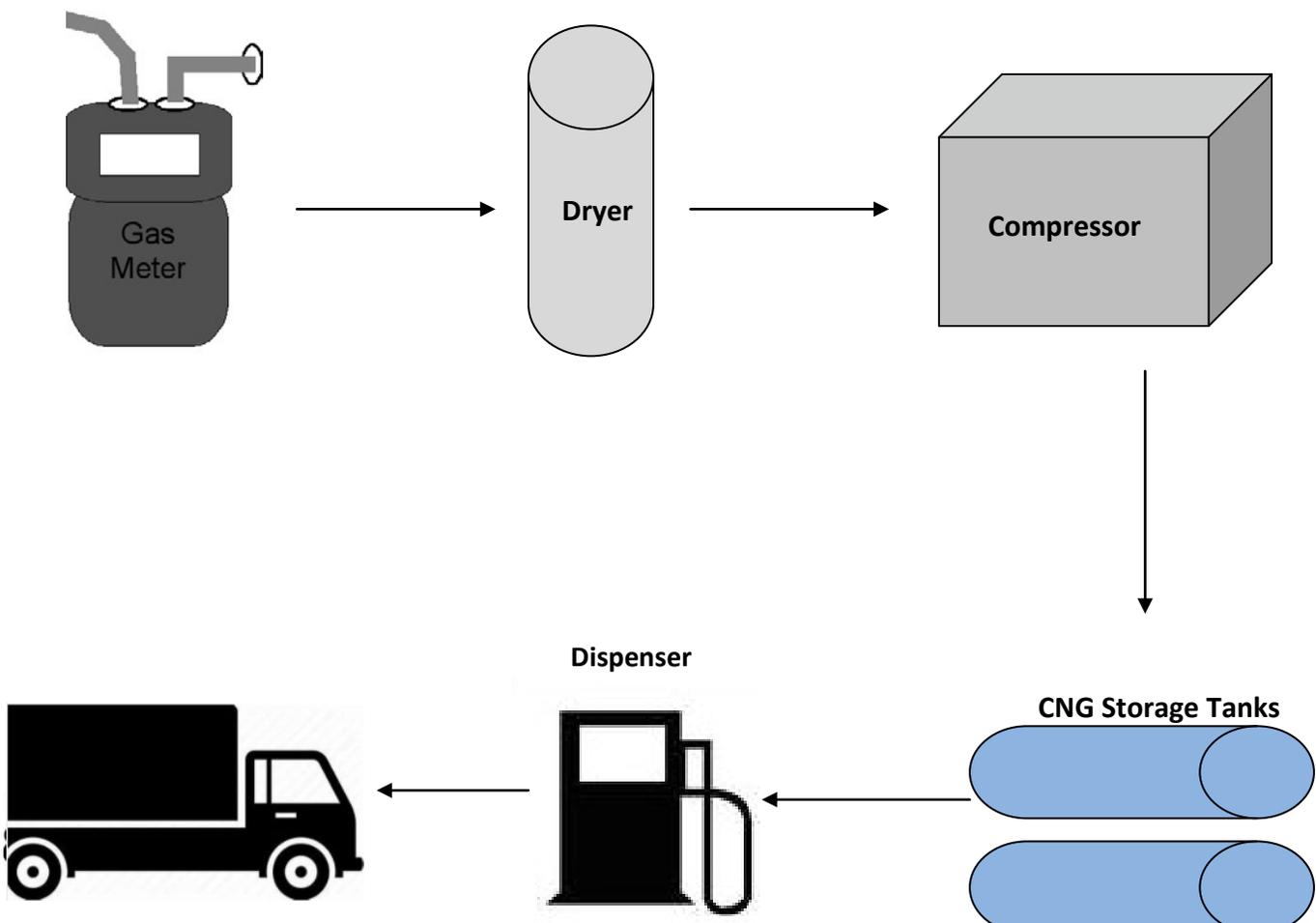
- Storage Vessels are above-ground.
- Storage Vessels are made of high-grade steel and rated up to 5,500 PSI.
- Pressure relief valves prevent over-pressurization.

CNG Station Types

CNG stations can be "Fast-Fill", "Time-Fill", or both. Fast-Fill refers to on-demand fuel dispensing like how gasoline or diesel are dispensed to fuel a vehicle tank. The vehicle operator performs the fueling operation and attends the vehicle while fueling is completed in a matter of minutes. Time-Fill refers to fueling vehicles over a period of time while the vehicle is parked. For example, a truck or bus that is parked overnight can be gradually filled during that time.

Using Time-Fill for CNG is a simple procedure, similar in concept to charging an electric vehicle:

1. Vehicles connect to time-fill dispensers when they return to the yard.
2. The compressor begins operating and flowing CNG to the connected vehicles.
3. The vehicle with the lowest initial pressure begins fill first.
4. As the vehicles with lower initial pressures equalize with higher pressure vehicles, the flow is split between all connected vehicles.
5. When the system determines that all vehicles are full, the compressor shuts down.



CNG Fast-Fill



CNG Private Access Time-Fill





CNG Station Safety Overview

CNG Safety

CNG is produced from the same natural gas used in homes for cooking and heating. CNG is a safe fuel with a safe track record that spans decades. CNG is safer than gasoline or diesel if there is a leak. Gasoline and diesel puddle on the ground and become a serious fire hazard. Natural gas is lighter than air and dissipates into the air. CNG has no risk of ground contamination like gasoline and diesel.

Natural gas requires a very high temperature to ignite, about 1,000 to 1,200 degrees Fahrenheit, compared to only about 500 degrees Fahrenheit for diesel and gasoline. Natural gas has a narrow range of flammability, making it difficult to ignite outdoors. Natural gas only burns in concentrations in air between 5 percent and 15 percent. The high ignition temperature and limited flammability range make accidental ignition or combustion of natural gas unlikely at a CNG station. Natural gas is not toxic or corrosive. An odorant is added to natural gas so that a leak can be easily recognized.

Vehicle Driver Fueling Safety

CNG is used as a commercial fleet fuel rather than by consumers. Commercial vehicles are operated by professional drivers that often drive medium- and heavy-duty trucks. The drivers receive training on how to fuel their CNG vehicle as part of their vehicle training. CNG fueling is not difficult, in fact it is quite easy. The training is necessary simply because fueling with CNG is similar to but different from fueling with diesel and gasoline.

Codes & Standards

CNG stations are designed and constructed under national codes and standards that have been in use for over 30 years. Clean Energy, as the nation's largest CNG fueling company with over 550 locations, has technical staff that participate in the standards organization. The specific CNG station standard is National Fire Protection Association (NFPA) 52, Vehicular Natural Gas Fuel Systems Code. There are more than another dozen standards that govern everything from lighting to life safety to electrical to safety signage.

Station Equipment Safety

The standard equipment in a CNG station includes the utility's gas supply pipeline and gas meter, gas dryer to remove moisture, compressors to create CNG, CNG storage bottles, and CNG dispensers. CNG is primarily produced on demand by the compressor when a vehicle begins fueling. A CNG truck typically fuels with 50 to 100 gallons during each fueling. A small amount of CNG is stored onsite in the storage bottles. The storage bottles serve as a buffer between the compressor and the vehicle for smooth equipment operation. These storage bottles are heavy cylinders with thick steel walls that are built to be crash proof. A cylinder weighs about 10,725 pounds! A common station configuration has three storage bottles. Each bottle holds 137 gallons of CNG, of which about 40 gallons is usable for dispensing. For comparison, a gasoline or diesel station will store 10,000 to 100,000 gallons (or more) of fuel onsite in aboveground or belowground tanks.

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Safety Features

CNG stations are built with many layers of inherent safety features. Methane detectors in the equipment compound and other indicated areas monitor the air and automatically shut down the station if methane (i.e., natural gas) is detected in the air.

Stations can be automatically shut down by the monitoring and control system or if there is a power outage. When the station is shut down, automated valves close and stop the flow of gas to the dispensers and to the compressors.

Emergency shutdown can be manually activated by pressing an Emergency Shutdown (ESD) button. The ESD buttons are located near the fueling dispensers for easy access.

ESD buttons are located at required spacing along the time-filling hoses. If one ESD is activated, power and fuel to the entire system is shut down. The system can only be restarted by a manual reactivation at the fueling facility.

The onsite Master Control Center is programmed to remain shut down until manually activated or reset after a safe condition is restored. The station remains shut down until a technician arrives onsite and verifies that the station is safe to restart. Restarting is through a manual process by the technician.

Every dispenser hose has a breakaway fitting. If a vehicle drives away without disconnecting the fueling hose, the hose disconnects at the breakaway fitting. The breakaway fitting has a valve that automatically closes and stops any gas from flowing.

If there is an accident where a vehicle crashes through a dispenser, the station monitoring system will automatically stop the flow of gas.

Command Center

Clean Energy operates a remote Command Center that monitors stations 24 hours per day, 7 days per week, 365 days per year. The Command Center automatically receives station alerts and alarms. The Command Center can also be contacted by phone or email. Drivers often call the Command Center while at a station and receive immediate assistance from an agent. The Command Center agent can take a variety of actions, depending on the situation, including dispatching a service technician and alerting emergency responders.

The Command Center and Clean Energy technicians have access to the site monitoring cameras for views of the CNG station equipment and the fuel dispensing areas.

Service Technicians

Clean Energy directly hires and manages a nationwide crew of service technicians. Technicians are highly trained in station operation, maintenance and repair. Technicians perform routine scheduled maintenance to maximize station uptime and safety. Technicians also provide 24/7 response to station incidents. Technicians can typically arrive onsite within an hour or two of dispatch.