

Natural Gas Fueling Stations



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Station Types

- CNG
- LNG
 - ◆ Fixed / Mobile
- LNG / LCNG
 - ◆ Fixed / Mobile



Typical Refueling Station Configuration

- CNG
 - Compressor
 - CNG Storage
 - Dispense, card reader, optional ticket printer
- LNG
 - Storage
 - Pump module
 - Dispenser, card reader, optional ticket printer
- LCNG
 - LNG Storage
 - LCNG Pump Module
 - Vaporizer
 - Odorizer
 - CNG Storage
 - CNG Dispenser, card reader, optional ticket printer

Dallas Area Rapid Transit, Texas



LNG Fleet Station Features

- Storage Tank Allows For Full Transport Offload (10,000 gallons)
- CA/OSHA Compliant
- Dispensing Pump Can Be Used To Offload A Transport
- LCNG Ready



Modest Investment (supports ~20 vehicles)



- <15,000 Storage
 - ◆ Higher fuel costs due to freight economics
- Site Requirements
 - ◆ Flat Ground
 - ◆ 460VAC
 - ◆ Secure Area (Unit has self containment)
- Controls and Alarms
 - ◆ Automatic Control
 - ◆ Methane Detection
 - ◆ Shutdown on Fire

Full Scale Permanent Station



Station Shown has two 30,000 gallon Storage

- **Equipment**
 - ◆ Customer specific
- **Site Requirements**
 - ◆ Site Civil Work and Containment
 - ◆ Permitting for Permanent Installation
- **Controls and Alarms**
 - ◆ Automatic Control
 - ◆ Methane Detection
 - ◆ Shutdown on Fire
 - ◆ Weights/Measures Metering



LCNG Stations

(Liquid to Compressed Natural Gas)

- Cost-effective due to 10-15 times lower pumping cost
- Higher purity!
 - ◆ Longer tank life
 - ◆ Lower emissions
 - ◆ Better running vehicles
- Odorized to meet requirements
- Not tied to pipeline
- Fast Fill, Full Fill
 - ◆ >250 cfm, like largest fast-fill compressors
 - ◆ Low temperature gas allows full fill of CNG tanks

Ontario, CA

- Example of public / private station layout
 - ◆ UPS has LCNG access on private side
 - ◆ Public has LNG or LCNG access on public side





Mobile LNG/LCNG

- Tank, LNG Dispenser, and LCNG Dispenser on Truck or Trailer
- Governed by DOT
- Useful for small fleets
- Redundancy (backup) for refueling stations in a region
- Helps justify demonstration projects

ERVING



Mobile Fuelers





Refueling Stations Considerations

- Sizing/Utilization
 - Fleet size
 - LNG/LCNG/CNG
 - Frequency of refueling
 - Fueling window for the fleet - (time to fuel each vehicle &/or fleet)
- Siting
 - Accessibility (fueler and fuelee)
 - Property availability for the equipment and distance requirements for permitting
- Equipment
 - Design and performance for your needs
- Maintenance
 - Who ya gonna call?
- Cost
 - Initial Investment
 - O&M



Codes and Standards

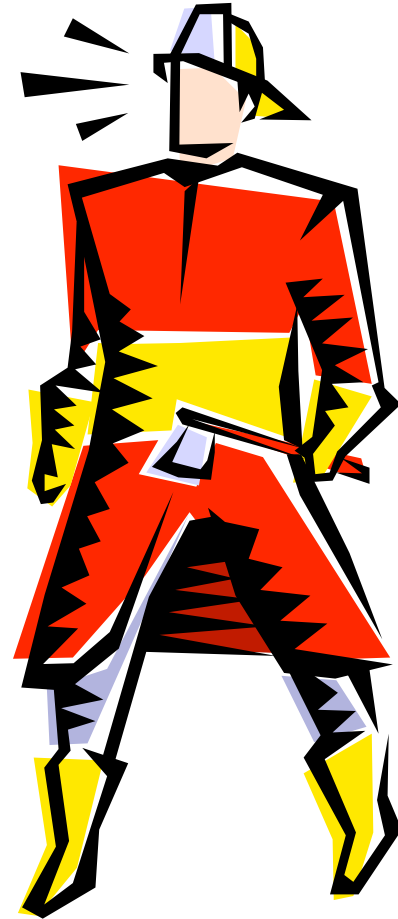
- NFPA 52, 57 and/or 59A Chapter 10
 - ◆ National Electric Code
 - ◆ Uniform Building Code
 - ◆ ASME Section VIII Division 1
 - ◆ ANSI B31.3

- CA/DOSH Title 8

- CA Weights & Measures
 - ◆ NIST Handbook 44

Involve Local Regulatory Agencies

- Critical to be EARLY in the process
- Provide a Natural Gas Education
- Fire Department Review May Require Detailed Hazard Studies
- Planning / Zoning Requirements May Affect Equipment and Installation



LOCATION	ACCESS VIA	LNG STATION
ARIZONA		
Mesa	I-10, I-17	Empire Power Systems
Phoenix	I-10, I-17	Empire Power Systems
CALIFORNIA		
Anaheim	I-5, CA91	Taorima Industries
Bakersfield	CA99, CA58, I-5	Kern Co. School District; Kern County Regional Transit
Barstow	I-15	City of Barstow
Coalinga	I-5, CA18	Harris Farms
El Cajon	I-5, I-805, CA-52	Waste Management Corporation
Fresno	CA99, CA180	USA Waste, Inc.
Long Beach	I-405, I-710	City of Long Beach
Ontario	I-10, I-15	United Parce Service
Palmdale	CA14	Waste Management, Inc.
Rialto	I-10, I-215	Stater Bros Markets
Riverside	I-215, CA91	Riverside County Waste Management Dept.; Burrtec Waste Industries
Sacramento	I-5, I-80	Raley's Markets
Sacramento	I-5, I-80	County of Sacramento; City of Sacramento
San Diego	I-5, I-805	City of San Diego Environmental Services
San Francisco	I-380, CA101	NorCal Waste
Santa Fe Springs	I-5, I-605	The Vons Companies, Inc.
Simi Valley	CA118	G.I. Rubbish
Thousand Palms	I-10	Sunline Transit; Waste Management, Inc.
Tulare	CA99, CA137	City of Tulare
Walnut	CA60, CA57	Sysco Food Service of Los Angeles



Refueling Stations Summary

- CNG
 - Only economic to light duty fleets located on a pipeline
- LNG
 - ◆ Heavy Duty Fleets and Transits
- LNG/LCNG
 - ◆ Combination of Light/Medium and Heavy Duty Fleets
 - ◆ Public access can help offset your investment
- FIRST ANALYSIS
 - Look for existing public access stations to utilize funds already expended
 - Partner with other local fleets in your area to spread your capital investments



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