Texas NGV Alliance Member Meeting
October 10, 2019
Arlington, Texas

11:00 am  Registration and Networking

11:15 am  Welcome and TXNGVA Updates:
Susan Shifflett: TXNGVA
Lunch

12:00 pm  Dallas-Fort Worth Clean Cities Annual Report and NGV UPTIME:
Lori Clark: North Central Texas Council of Governments

12:15 pm  State of the Union- Liquified Natural Gas:
Applied LNG

1:00 pm  Travel to Applied LNG: Midlothian, Texas

1:30 pm  Private Tour of Applied LNG: Pre-Registration is Required
Ed McKenna, CEO, Applied LNG

2:30 pm  Adjourn

Thank You for Our Meeting Co-Hosts:

Mark Your Calendar Now for the Final 2019 Member Meeting:

- December 12: Member Meeting- CenterPoint Energy- Downtown: Houston, TX
  - Keynote Speaker: Dan Gage: NGVAmerica
  - Meeting Co-Host: OnBoard Dynamics
Interested in Sponsoring DFWCC? Visit [www.dfwcleancities.org/sponsorus](http://www.dfwcleancities.org/sponsorus)!
What is NCTCOG?

Regional Planning Agency

North Central Texas Council of Governments

Metropolitan Planning Organization (MPO)

DFW Clean Cities Coalition
Nitrogen Oxides ($NO_x$) Emission Sources

Total $NO_x = 296.77$ tons per day (tpd)

- **On-Road Mobile**: 130.77 tpd
- **Off-Road Mobile**: 25.24 tpd
- **Non-Road Mobile**: 45.54 tpd
- **Point (Excluding Oil & Gas)**: 38.30 tpd
- **Point (Oil & Gas)**: 16.50 tpd
- **Area**: 26.55 tpd
- **Oil & Gas (Production & Drill Rigs)**: 13.87 tpd

- **Light-Duty Vehicles (Passenger Cars and Trucks)**: 50.8 tpd
- **Medium-Duty Trucks**: 14.86 tpd
- **Heavy-Duty Trucks**: 65.11 tpd
Clean Cities was created by the Department of Energy to address the requirements of the Energy Policy Act of 1992:

To advance the nation’s economic, environmental, and energy security by working locally to advance affordable, domestic transportation fuels and technologies

Partners with public and private fleets

Alternative fuel neutral; DFWCC focuses on fuels and technologies that decrease ozone formation
8-Hour Ozone NAAQS Historical Trends

As of October 7, 2019

1997 Standard < 85 ppb (Revoked)

2008 Standard ≤ 75 ppb (Serious by 2021)

2015 Standard ≤ 70 ppb (Marginal by 2021)

Consecutive Three-Year Periods

Design Value (ppb)

Source: NCTCOGG TR Dept

1Attainment Goal - According to the US EPA National Ambient Air Quality Standards, attainment is reached when, at each monitor, the Design Value (three-year average of the annual fourth-highest daily maximum eight-hour average ozone concentration) is equal to or less than 70 parts per billion (ppb).
### DFWCC Annual Report Results: 2018

<table>
<thead>
<tr>
<th>Energy Impact</th>
<th>Ozone Impact</th>
<th>40 Reporting Fleets</th>
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<tbody>
<tr>
<td><img src="energy_icon.png" alt="Energy Impact Icon" /></td>
<td><img src="ozone_icon.png" alt="Ozone Impact Icon" /></td>
<td></td>
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<tr>
<td><strong>23,243,022</strong> Gallons of Gasoline Equivalents Reduced</td>
<td><strong>753,602</strong> Pounds of Ozone Forming Nitrogen Oxides (NOx) Reduced</td>
<td></td>
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<tr>
<td><strong>6,288</strong> Alternative Fuel Vehicles (AFV)</td>
<td><strong>592</strong> Electric/Hybrid Vehicles</td>
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<tr>
<td><strong>149</strong> AFV Non-Road Equipment</td>
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See the DFWCC annual report for more details: [https://www.dfwcleancities.org/annualreport](https://www.dfwcleancities.org/annualreport)
Annual Report Takeaways
Use is Mostly Transit Agencies and Airports
- Otherwise Decline in Public Sector
Private Sector Use Steady But Few Report
Slight Downward Trend Overall From 2017

Public Sector Data Includes:
Arlington, Dallas, Denton, Irving, DART,
Dallas County, DFW International Airport,
Trinity Metro

Private Sector Data Includes:
Frito-Lay, UPS, Waste Management

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<thead>
<tr>
<th>Fuel</th>
<th>Vehicles</th>
<th>Stations</th>
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<tbody>
<tr>
<td>CNG</td>
<td>2,572</td>
<td>25</td>
</tr>
<tr>
<td>LNG</td>
<td>100</td>
<td>6</td>
</tr>
</tbody>
</table>

2018 Gallons of Gasoline Equivalent Reduced by Fuel Type for Alternative Fuel Projects
21,894,733 gallons
- CNG (81%)
- Liquefied Natural Gas (12%)
- Hybrid (conventional) (0.4%)
- Electric (0.3%)
- E85 (1.9%)
- Propane (2.6%)
- Biodiesel (2.0%)
- Plug-in Hybrid (0.1%)
Natural Gas Challenges
Increase Public Sector Use
Increase Reporting
  - Especially Private Sector

What to Expect Next Year
Clean Cities 25th Anniversary
2020 Fleet Challenge – Setting Goals for a Cleaner Fleet
FHWA-Designated Natural Gas Corridors

Signs can be requested from TxDOT. See the TxDOT policy on signage linked at https://www.dfwcleancities.org/altfuelcorridors
Natural Gas Vehicle U.P.-T.I.M.E. Analysis

Updated Performance Tracking Integrating Maintenance Expenses

Project funded by the Department of Energy

• Led by Clean Fuels Ohio
• Other major participants include DFWCC, Central Oklahoma Clean Cities, Tulsa Area Clean Cities, Wisconsin Clean Cities, Chicago Area Clean Cities, Energetics, National Renewable Energy Laboratory, National Truck Equipment Association, Green Truck Association and multiple freight and goods movement fleets operating both NGV and diesel vehicles.
• Clean Cities Coalitions will identify and engage CNG fleet stakeholders and coordinate project implementation in their respective regions.
Objectives

Quantify differences in maintenance costs between diesel and natural gas vehicles (NGVs)

Determine maintenance cost changes/improvements of newer generation NGVs compared to older generation NGVs

Capture impacts of different technology solutions and best practices that impact/reduce maintenance costs

Lack of recent data ➔ maintenance cost uncertainty ➔ barrier to NGV adoption

NGV technology advancements

New diesel exhaust after-treatment systems
Please Let Us Know if You Are Willing to Participate!

Fleet Type: Freight and Goods Movement

Vehicle Types: Medium- and Heavy-Duty Natural Gas and Diesel

Repair Data to Provide: Cost, Frequency, and Type

Participating Fleets Will Receive:
- Study Analysis – Aggregate Data
- Individualized Analysis of Their Operation
For More Information

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North Central Texas Council of Governments
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Established in 1995 and part of PMC Global Inc., Applied LNG produces, markets and sells LNG to transportation, industrial, and municipal markets in the Western U.S., Northern Mexico, Texas and the surrounding states. Applied offers turnkey fuel solutions to its customers, including delivery of clean LNG, RLNG and LCNG fuel.
LNG peak-shaving plants typically have significantly less LNG storage capacity than import and export terminals but are strategically located in the pipeline system. Peak shaving is one the most common domestic uses for LNG today. In fact, peak shaving facilities have been a critical element of many gas utilities to ensure that there are sufficient gas supplies to serve their customers during the heating season. Some gas utilities don’t use peak shaving, because they can rely on large underground storage facilities to store low cost gas for use during peak times. However, where underground storage is not an option, many gas and electric utilities buy gas during times when prices are lower and store the gas in above ground peak shaving facilities until it is used later either during winter or summer.
Domestic LNG Applications / Utilities

One half of peak shaving facilities are in the Northeast while a quarter are in the Midwest. Of the over **1.3 billion gallons per year** of peak shaving capacity in the United States, almost 1 billion or 77 percent is in these two regions.

Note: Satellite LNG facilities have no liquefaction facilities. All supplies are transported to the site via tanker truck. Source: Energy Information Administration, Office of Oil & Gas, Natural Gas Division Gas, Gas Transportation Information System, December 2008.
UGI’s LNG Peak Shaving Plant with Liquefaction and 3-million-gallon storage tank near Reading, PA
Domestic LNG Applications / Utilities

Satellite Peak Shaving Plant (no liquefaction capacity) for Greenville Public Utilities
Domestic LNG Applications / On-Road

LNG is currently being utilized by private fleets and government agencies as a transportation fuel and is largely utilized where pipelines are not available or cannot provide enough capacity.

Here are some examples of municipalities and the annual LNG volume consumption.

- City of Los Angeles - ~ 6,000,000 Gallons of LNG
- Phoenix Metro Area - ~ 11,000,000 Gallons of LNG
- City of El Paso – ~ 1,500,000 Gallons of LNG
- City of Santa Monica – ~ 4,500,000 Gallons of LNG
Domestic LNG Applications / On-Road

- City of Los Angeles - ~ 6,000,000 Gallons of LNG
Domestic LNG Applications / On-Road

- Phoenix Metro Area - ~ 11,000,000 Gallons of LNG
Domestic LNG Applications / On-Road

- City of El Paso – ~ 1,500,000 Gallons of LNG
Among multiple applications, LNG is also used in the HHP sector. From powering electric power plants to mobile asphalt plants, sand drying, heating, agriculture, drilling and pressure pumping are some examples of current end-users in the market today. Most of these end-users are private organizations with limited access to a pipeline.
Domestic LNG Applications / HHP

Natural Gas off the grid – HHP Applications Powering...

Mineral Processing Company in VT

Natural Gas Generators in MX
LNG offers huge advantages, especially for ships in light of ever-tightening emission regulations. Conventional oil-based fuels will remain the main fuel option for most vessels in the near future, and, at the same time, the commercial opportunities of LNG are interesting for many projects.

Existing LNG fueled vessels in the US demand a capacity in excess of 120,000,000 Gallons of LNG yearly.
Domestic LNG Applications / Marine

Tote Maritime – Two Vessel Running on LNG
*Perla del Caribe* and *Isla Bella*
Domestic LNG Applications / Marine

Crowley Maritime – Two Vessel Running on LNG
*El Coqui and Taíno*
Domestic LNG Applications / Marine

Clean Marine Energy – Clean Jacksonville Bunker Barge
GTT *Demonstrator* Mark III Flex Cargo Containment System
Shrinking Markets

➢ Pipeline Migration
✓ Currently LCNG stations, Virtual Pipelines, Large LNG Consumers

➢ Electric Powering
✓ Municipalities, Delivery Vans, Personal Vehicles
New Markets

Space Exploration

The "LNG propulsion system", which uses a combination of liquid oxygen and liquid natural gas, has the following advantages.

➢ It is less evaporable in space; therefore, it is suitable for a vehicle that travels to space for a prolonged period, such as an inter-orbit transporter and planetary probe.
➢ Propellants are less expensive thus the launch cost can be reduced.
➢ The possibility of an explosion is lower; hence it is safer.
➢ Thanks to the high density, the propellant tank can be smaller; therefore it is suitable for a large-size launch vehicle such as a reusable transporter.
An important detail in this conversation about moving LNG by rail is that the LNG would travel in much more robust, safer tank cars, the DOT-113 line, than even the new cars used to move ethanol and oil.
Q & A

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