Clean Cities Georgia Transportation Summit

Organizing partners:

Clean Cities Georgia – Partnership for Clean Transportation
Southface
Georgia Tech
Georgia Power
Georgia Chamber

Gold sponsors:

Georgia In Charge
Georgia Automobile Dealers Association

Silver sponsors:

Atlanta Gas Light

Bronze sponsors:

Vesta Freight
Gas Authority
Take Comfort In Blossman Gas & Appliance
Blue Bird
ABEV Power Solutions
Kia
DSI EV Solutions

CLEAN CITIES GEORGIA TRANSPORTATION SUMMIT

WELCOME AND OPENING REMARKS

Frank Morris
Executive Director
Clean Cities Georgia

Ian Skelton
Natural Gas Vehicles
Director at Atlanta Gas Light

Dr. Tim Lieuwen
Executive Director of the Strategic
Energy Institute at Georgia Tech

Clean Cities Georgia Transportation Summit

WHO WE ARE

- Part of the national Clean Cities Coalition funded by the Department of Energy's (DOE) Vehicle Technologies Office (VTO) since 1993
- Serve as a central coordinator for clean transportation activities in Georgia related to clean fuels, vehicles, and infrastructure
- Focused on reducing petroleum usage for individuals and fleets with domestic fuel sources

National Network

Over 80 Clean Cities coalitions with thousands of stakeholders, representing more than 80% of the U.S. population

30 years
CLEAN CITIES
GEORGIA
PARTNERSHIP FOR CLEAN TRANSPORTATION

Clean Cities
U.S. Department of Energy

Clean Cities Georgia Team

Frank Morris
Executive Director

Samantha Pettigrew
Project Manager

Pamela Fann
Community
Engagement Liaison

Sumner Pomeroy
Program Manager

Cameron Ages
Programs Associate

Matthew Popkin
Marketing Associate

Event Sponsors

The Early Years


NATURAL GAS
POWERED
partment of Energy


CNG
Compressed Natural Gas
No Smoking
Stop Engine
1
Natural Gas


POWERED BY
CLEAN BURNING PROPA
Georgia Gas
US DOT 469071
PROPANE


ELECTRIC-POWERED
EFFICIENCY 1

CLEAN CITIES GEORGIA TRANSPORTATION SUMMIT

CHAIRMAN REMARKS

Ian Skelton

Natural Gas Vehicles Director at Atlanta Gas Light

Board Chair at Clean Cities Georgia

Welcome to Georgia Tech!

Tim Lieuwen

September 2023

Georgia Tech

Executive Director of the Strategic Energy Institute (SEI)

Tim Lieuwen
Professor, Aerospace Engineering
Strategic Energy Institute

Georgia Tech

Snapshot of GT efforts in R&D, Education and Outreach relevant to “Clean Cities”

- Renewable Fuels
- Energy Storage
- Carbon Capture
- Electric Vehicles
- Decarbonization in Georgia and the Southeast
- Pilots on GT Campus for Microgrid, Living Building, Energy Storage, EV Charging
- New curricular offerings and STEM activities
- Partnerships with Large Auto OEMs, Energy Companies, Electric Utilities, National Labs
- Support for Public-Facing Roundtables & Strategic Dialogues

SPOTLIGHT ON SETRI:

SE Transportation Regional Initiative

Georgia Tech

SETRI: Southeast Regional EV Initiative

75+ Partner Organizations

- Utilities
- Charging Companies
- Auto OEMs & Transportation
- NGOs
- Universities & Labs

Education & Awareness

Policy & Government Engagement

Technology, Infrastructure & Economic Development

Georgia Tech

Stakeholder MOU

Duke UNIVERSITY

MEMORANDUM OF UNDERSTANDING FOR SIGNATORIES TO THE ACCORD

Signatories to the Transportation Electrification Accord are invited to use the principles in their efforts to advance transportation electrification. Nothing in the Accord binds any signatory to any specific position. Nothing in the Accord authorizes any signatory to speak on behalf of other signatories, though signatories are welcome to use the existence of co-signatories as evidence of the appropriateness of these principles.

FPL

TESLA

SEEA
SOUTHEAST ENERGY EFFICIENCY ALLIANCE

greenlots
A Member of the Shell Group

BLUE BIRD

Southern Company

RIVIAN

ups

CLEAN CITIES GEORGIA
PARTNERSHIP FOR CLEAN TRANSPORTATION

...

https://southeastev.org/

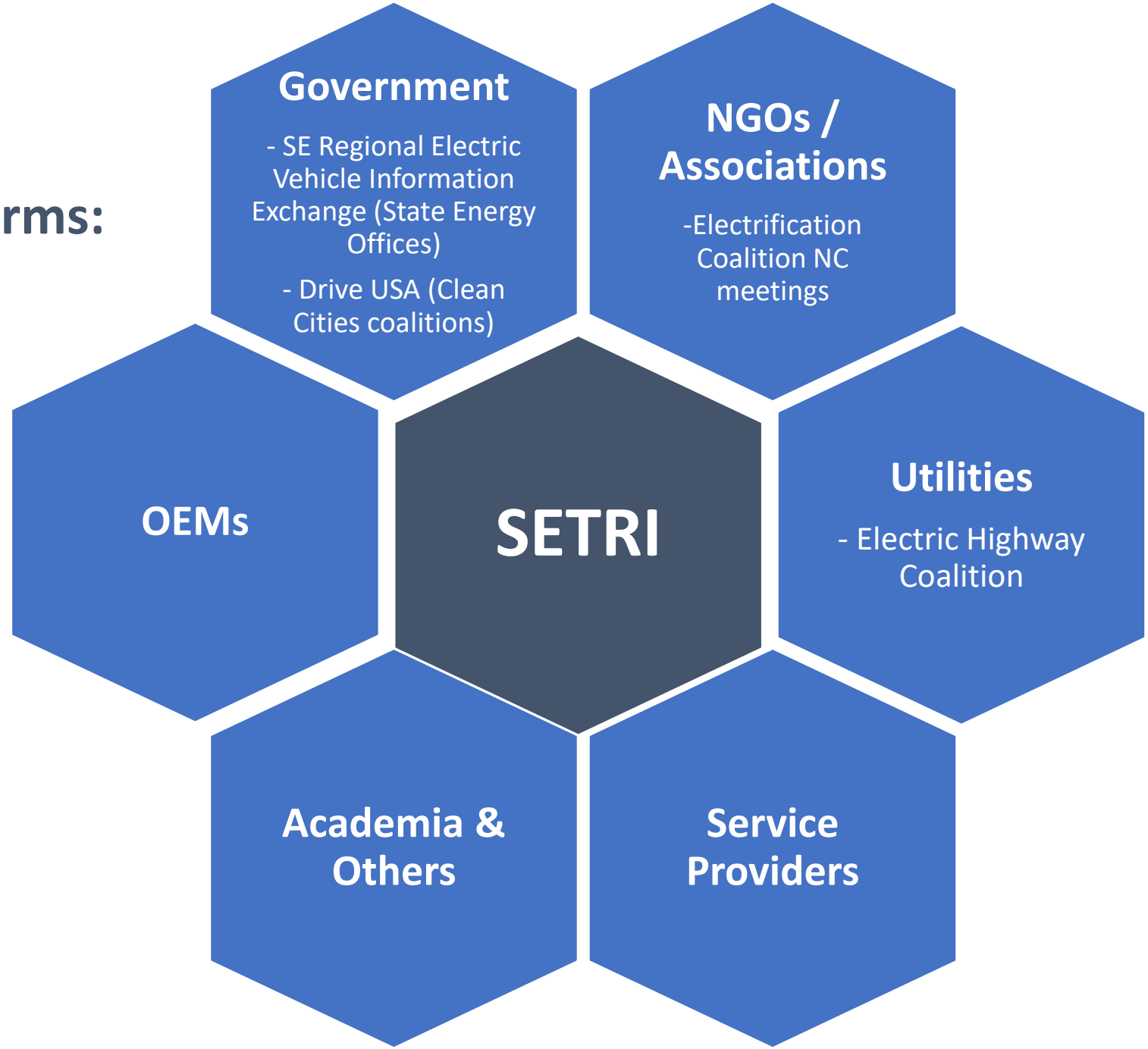
SETRI Overview

SETRI connects, convenes, informs:

Via:

- Monthly emails
- Quarterly meetings
- Website resources
- Educational resources

https://southeastev.org/



GEORGIA

PARTNERSHIP FOR CLEAN TRANSPORTATION

WHY WE DO IT

Transportation is Responsible for 29% of Total U.S. Emissions

- 4 Million Class 8 Diesel Trucks in operation
- 309,615 Medium-Heavy trucks were sold in 2022
- 929,200 licensed buses (school, charter, shuttle, transit)
- 480,000 school buses moving 26M students every day
- 40,714 school buses were sold in 2019
- School buses travel 6B miles annually, with 857M gallons of mostly diesel fuel

WHY WE ARE HERE

Transportation is Responsible for 29% of Total U.S. Emissions…

Air Quality Improvements Due to the Unexpected Halt of Air and Ground Travel:

- Global road travel and commercial flight activity decreased by 50 and 60% respectively.
- Boston Logan Airport Ultrafine Particle Numbers Concentrations (PNC) dropped 48% in first few months of pandemic.
- Levels of air contaminants: nitrogen dioxide (NO_2), sulphur dioxide (SO_2), carbon monoxide (CO), and particulate matter (PM) decreased globally compared to levels in the past few decades.

WHY WE ARE HERE

Transportation is Responsible for 29% of Total U.S. Emissions…

- In many megacities of the world, the concentration of PM and NO_2 declined by > 60% during the lockdown period.
- $PM_{2.5}$ and NO_2 concentrations declined by 36 and 51% respectively immediately after the shutdown New York City.
- NASA image captured from AURA satellite observed that emissions of NO_2 declined by up to 30% due to lockdown (Northeastern region).

CLEAN CITIES GEORGIA TRANSPORTATION SUMMIT

EXECUTIVE PANEL

Frank Morris
Executive Director
Clean Cities Georgia

Dr. Nuray Elci
GM Renewables
at Chevron

Robert Gordon
Fleet Manager
for DeKalb County

Ryan Bankerd
Director of Automotive
Sustainability for UPS

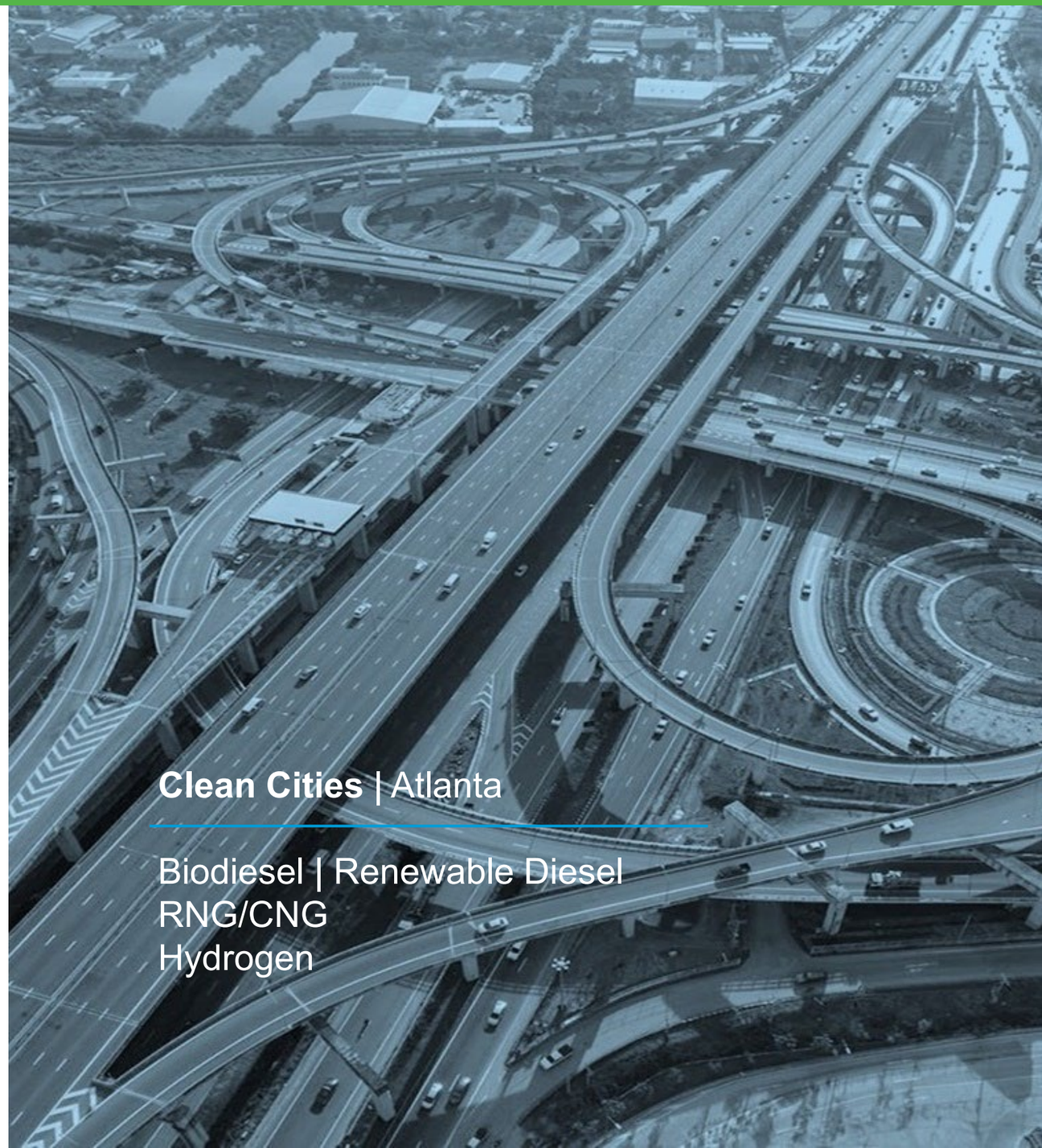
Chevron Renewable Fuels

Exploring possibilities together in lower carbon fuels.

Nuray Elci

September 2023

the human Chevron energy company®



Reducing fleets carbon footprint, Chevron can help

Feedstocks include:		Delivery	Advantages	
Bio-feedstock Vegetable oils Waste animal fat Used cooking oil	**Renewable Diesel**	Trucked to fueling location	Meets ASTM D975 standard Reduced carbon emissions on a life cycle basis Made primarily from renewable sources Uses same infrastructure as petroleum No blend-percentage limitations	
RNG / CNG Dairy gas Landfill gas Waste-water treatment plant gas	**Compressed Natural Gas**	Obtained via connection to public pipeline	Lower life cycle carbon intensity Lower engine emissions of NOx RNG injection displaces fossil-based natural gas in the pipeline network Capturing RNG to power a vehicle represents ~400% decrease in lifecycle carbon intensity vs. conventional diesel[1]	
Fossil NG Renewable NG Municipal Waste Paper Waste Water	**Hydrogen Fuel Cell**	Trucked to fueling location or onsite production	Enables vehicles to operate nearly twice as efficiently as an ICE Only emissions are water vapor and warm air Depending on energy source used, can have anywhere from 54% to 180% reduction in emissions compared to conventional diesel[1]	

Sources
[1] Under California's Low Carbon Fuel Standard (LCFS)

Chevron REG: Our story told in numbers

470 MMGY
Nameplate
Production Capacity

10
Biodiesel
Production
Facilities

1
Renewable
Diesel
Facility

732 MM
Gallons Sold
In 2022

10
Terminals
in California [1]

50
Terminals
Across U.S.[1]

54,000+
Arranged Truckloads [1]

2,300+
Water Movements [1]

15,000+
Railcars Loaded [1]

16
Countries
Product
Was Sold
To In 2022

42
States
Product
Was Sold
To In 2022

Sources:
1. As of December 2021

Chevron REG production and distribution

- Regional Offices
- Biorefineries
- Terminal Locations

45+ Terminals

11 Biorefineries

Delivered Product to:

44 States

6 Canadian Provinces

19 Countries

Why would a fleet transition to RNG and CNG?

Cost Benefits

- Fuel vs Diesel savings
- Maintenance savings (no DPF)
- Less price volatility vs. diesel
- Grant funding available for select models

Policy Compliance

An increasing number of policies/specs are incentivizing conversion to lower carbon fuels

- e.g. CA LCFS, EPA RFS, CARB NOx spec, Alternative Fuel Tax Credit, SCAQMD WAIRE rule)

Sustainability

RNG-CNG has strong environmental attributes to enable fleets to meet sustainability targets

- ~90% fewer NOx emissions than EPA standard (CA & OR)
- ~25% less CO2 emission and ~90% PM 2.5 reduction vs diesel
- Mitigated odor & noise pollution

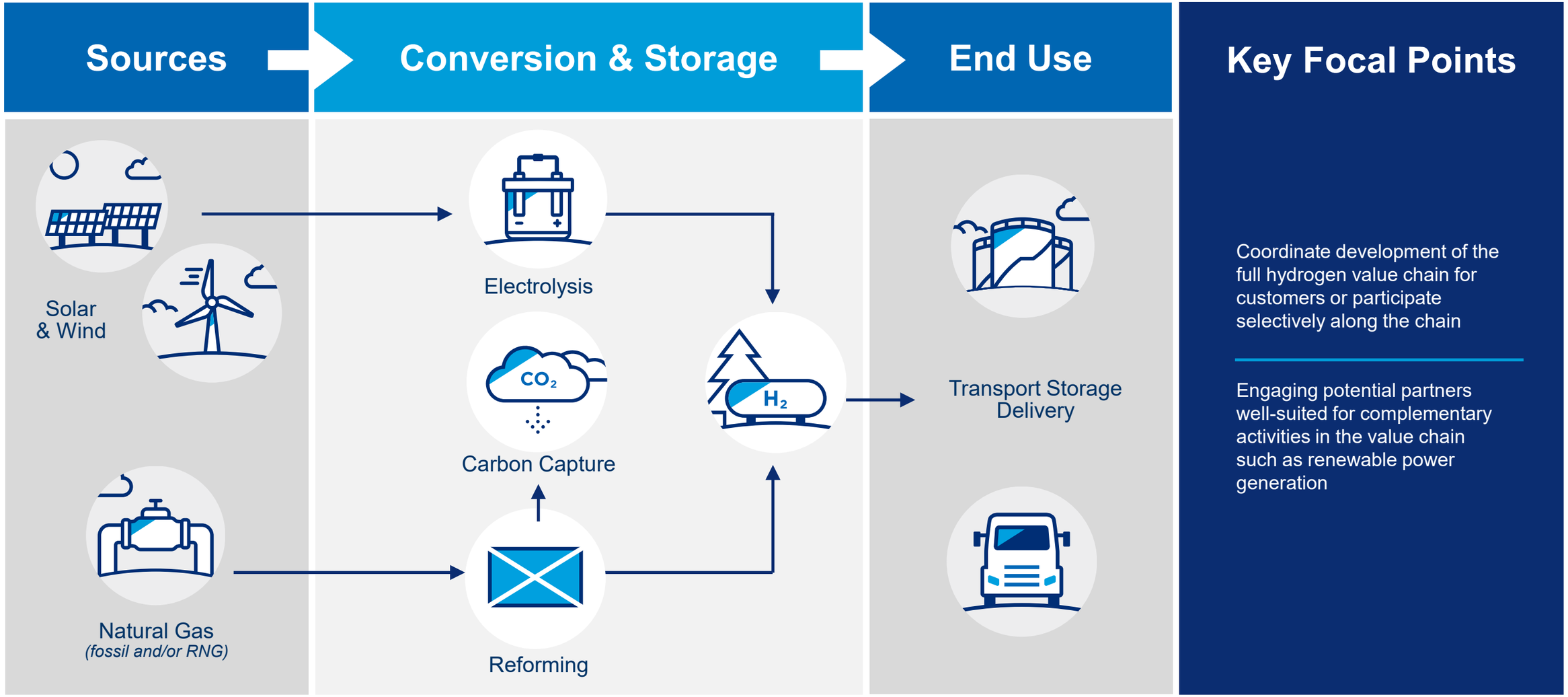
Reliability

- Direct and on-demand pipeline access
- Existing fueling infrastructure
- Quick-fill stations that can reduce conventional fuel delivery disruptions

Chevron's RNG & CNG Network

CNG Stations

Chevron hydrogen value chain focus



Key Focal Points

Coordinate development of the full hydrogen value chain for customers or participate selectively along the chain

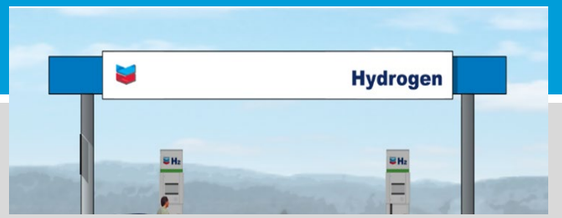
Engaging potential partners well-suited for complementary activities in the value chain such as renewable power generation

A phased approach to hydrogen truck & bus fueling

From mobile trailers, behind the fence, to large scale public facilities

Mobile fueling will enable demonstration truck fueling behind the fence and potential contingency hydrogen supply when necessary.

On site hydrogen production units provides fleet fueling for 10-20 trucks/buses. Modular units (200kg-400kg/day) can be added as trucks are added.



Large scale hydrogen public fueling facility can be built while truck purchasing program accelerates beyond 20+ trucks.

A flexible fleet fueling system:

- Trade offs exist between mobile fueling and large-scale public fueling facilities (fill rates, H2 pricing, etc.)
- Mobile fueling offers contingency fueling and back up supply for fleet requirements although at a higher price point.
- Transparency of Truck Purchasing Programs provide alternative pathways to properly sized fleet fueling programs.

Thank you

the human energy company®

DeKalb County

AFV Initiatives

NAFA 100 BEST FLEETS

NAFA GREEN FLEET AWARDS

Fleet Management

- 152 Positions 138 Filled
- $33 million Annual Operating Budget
- $40 million Annual Vehicle Replacement
- Fleet averages 30,000,000 miles Annually
- Fleet Management maintains 3622 Vehicles
- 437 Alternative Fuel Vehicles 12%


DeKalb County
Public Works
Fleet Management
5350

CNG/ Propane/ Electric

- 262 CNG Heavy Duty/ 49 on order
- 73 CNG Light Duty
- 78 Propane Light Duty
- 37 Electric/ 35 on order 48 scheduled to order this year

CNG Powered Vehicle types in our Fleet

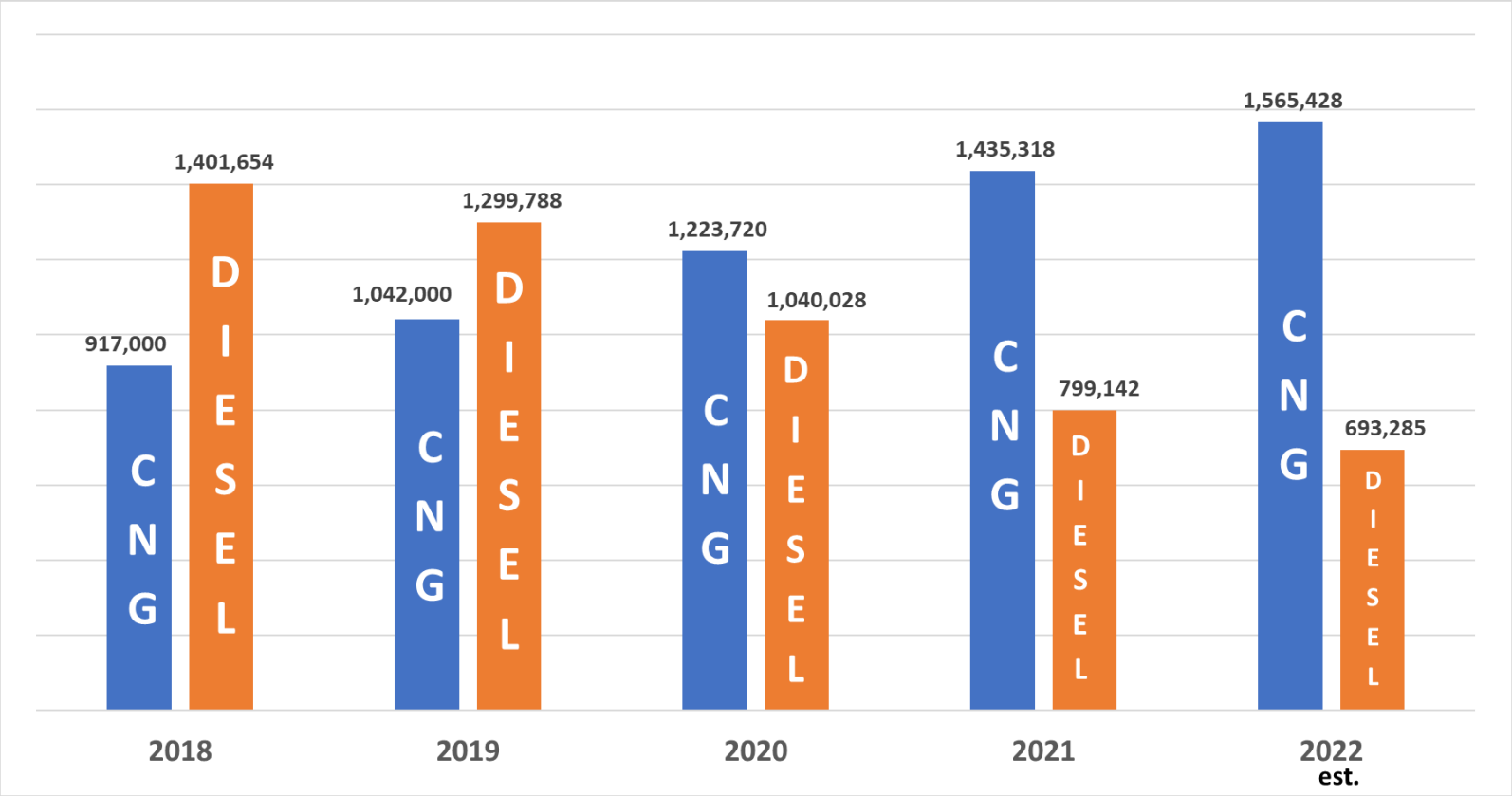
Heavy Duty / Medium Duty

- Rear Loaders
- Front Loaders
- Side Loaders
- Automated Side Loaders
- Roll Off Trucks
- Grappler Trucks
- Crew Trucks
- Crane Trucks
- Level Lift Trucks
- Bucket Truck
- Road Tractors
- Road Fork Trucks

Light Duty

- Pickup Trucks
- Sedans
- Vans
- Missed Collections Trucks

Fuel Usage (in gallons)



Robert Gordon

Director

DeKalb County Fleet Management

5350 Memorial Drive

Stone Mountain, GA 30083

Office 404-297-3280

Cell 770-652-6972

rlgordon1@dekalbcountyga.gov

CLEAN CITIES GEORGIA TRANSPORTATION SUMMIT

RENEWABLE NATURAL GAS PANEL

Rodney Dill
VP of Market Development & Communications for Municipal Gas Authority of Georgia

Earnell Kelly
Manager of Renewable Gas Business Development for Southern Company Gas

Justin Stankiewicz
Director of RNG Development for Chesapeake Utilities Corporation

Randy Beck
Director of Renewable Energy for Waste Management

Sustainability Overview

Presented by:
Earnell Kelly
Manager, Renewable Gas Business Development

Southern Company Gas | SUSTAINABILITY AND ENERGY POLICY

The Role of Renewable Gas

Renewable Natural Gas turns the problem of waste into renewable energy

What is Renewable Natural Gas (RNG)?

- RNG is a sustainable and alternative fuel produced from naturally occurring waste methane that is captured primarily from landfill, agricultural, wastewater plants, and food waste sites.

- Capturing this biogas at the source before it's emitted into the atmosphere reduces the amount of greenhouse gas emissions that contribute to the warming of our planet. **This is based on a total life cycle approach, not at the point of use.**

GHG emissions at point of use — **GHG emissions captured & processed** = **Net GHG emissions**

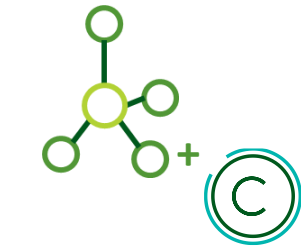
Available feedstock sources for Renewable Natural Gas

Wastewater Treatment Plants | Municiple Solid Waste | Agricultural & Food waste

Swine | Dairies | Landfills

Southern Company Gas | Sustainability and Energy Policy

How RNG Works

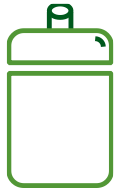


Avoided Methane + Environmental Attribute Credit

An environmental attribute for RNG is associated with the capture (abatement) of greenhouse gasses (aka a credit for the avoided methane emissions). It is a measured attribute that does not carry energy value

1 Credit = 1 Dekatherm of RNG

Organic Feedstock



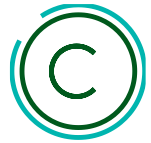
Anaerobic Digestion

Captured Methane

Biogas Treatment

Physical Natural Gas

Unbundled Product compressed for transportation use OR injected into NG distribution system



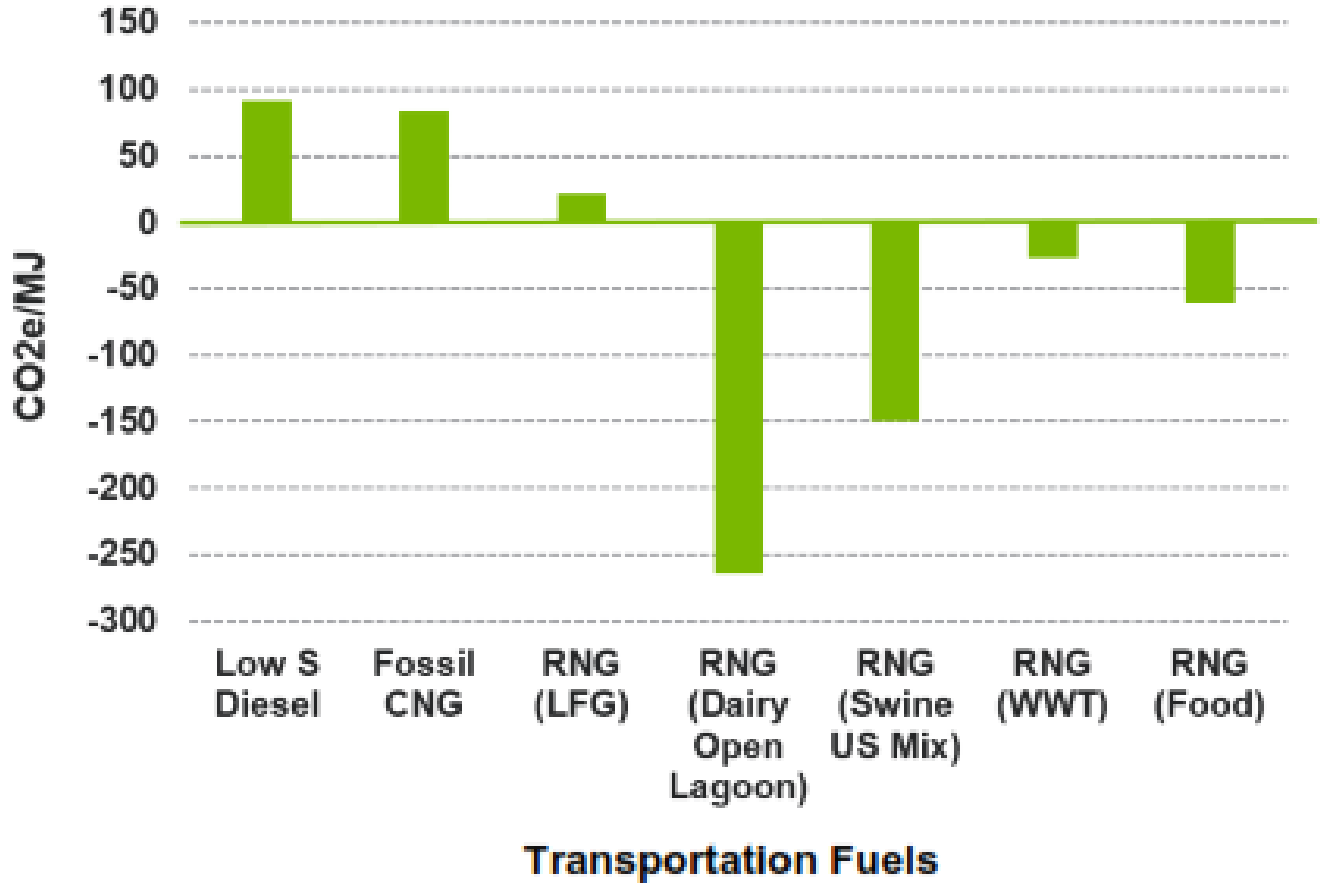
Environmental Attribute Credit

Unbundled Product sold in compliance or voluntary markets OR retired for Scope 1 Emissions reduction

Southern Company Gas | Sustainability and Energy Policy

Carbon Intensity of RNG Fuels

Figure 2.8. Relative CI of Transportation Fuels – DOE Argonne National Lab[18]



Relative Price in Voluntary Market

Source: AgStar Project Development Handbook, 3rd Edition

Southern Company Gas | Sustainability and Energy Policy

RNG Benefits

Renewable Natural Gas

is a critical component to our commitment to deliver clean, safe, reliable and affordable energy to our customers. RNG not only provides a sustainable, drop-in alternative source of geologic natural gas, but also provides additional benefits for our customers, the gas distribution system and local economies

Infrastructure. By integrating RNG, customers can reduce their emissions without upgrading equipment or infrastructure, assuming additional maintenance, or disrupting existing operations

Job creation. RNG projects create high-paying, clean-energy jobs, from plant managers and technicians to biologists and more

Environment. Integrating RNG facilities beneficially uses waste methane and can improve local air quality. Acquisition of the Environmental Attributes generated can be used towards a customer's Scope 1 emissions reduction for direct thermal use OR towards their Scope 3 emissions reduction for transportation fleet use with NGVs

Thank you!

Southern Company Gas | SUSTAINABILITY AND ENERGY POLICY

Clean Transportation Summit

CHESAPEAKE UTILITIES CORPORATION

Justin Stankiewicz
Director,
RNG Development

By the Numbers

160+
years of providing energy service

$1.8B
in capital investment over last 10 years

16
years of earnings growth

~310K
customers

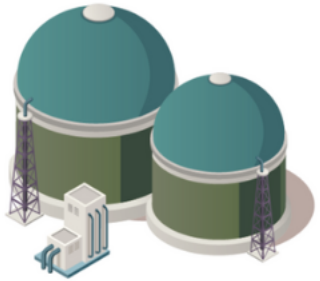
1,000+
employees

$2.2B
total assets

RNG Value Chain

1

Feedstock Source



2

Anaerobic Digestion and Gas Upgrading

3

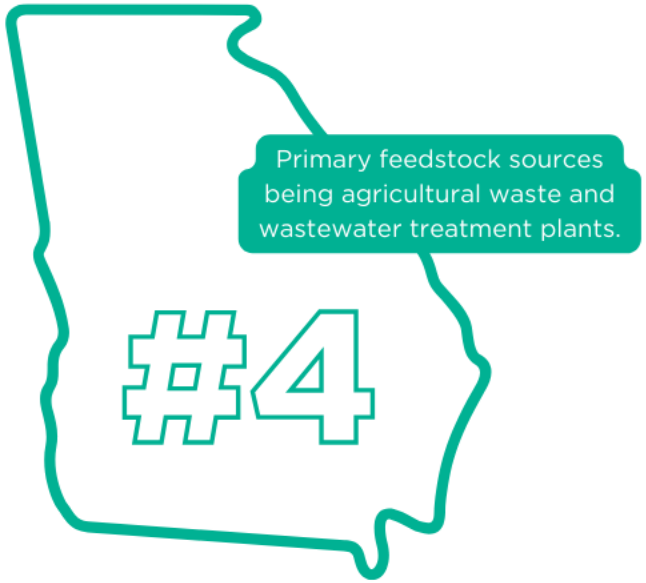
Virtual Pipeline Transport or Existing Distribution System

4

CNG Station End User

Biogas Potential

Georgia ranks 4th out of 50 states for its biogas production potential.



According to the American Biogas Council, up to 57.44 billion cubic feet of renewable methane from biogas could be produced annually in the State for energy, fuel, heat, and more.

That's equivalent to...

746 million GGE fuel

Removing 5.67 million cars from the road

8044 million kWh electricity

Savannah CNG Station

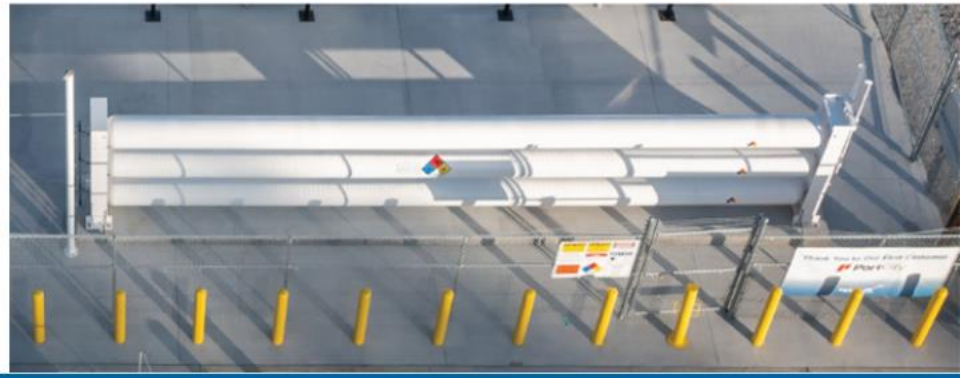
In partnership with Atlanta Gas Light, Marlin Compression offers a high-capacity CNG and RNG public access compression station for natural gas vehicles, specializing in fleets, delivery companies, solid waste providers, mass transit vehicles and other logistic industries. **The facility is one of the largest public access CNG stations on the East Coast.**

Station Features

- Two vehicle lanes, one tube trailer lane
- Two standard hoses
- Two high flow hoses
- Fleet pricing available
- Renewable Natural Gas (RNG) available

Storage Features

- Three horizontal ASME cylinders
- 43,000 standard cubic foot (SCF) fuel storage



Why Switch to CNG?

Low-Cost Fuel

Domestically sourced, historically stable low-cost fuel

Reliability

CNG engines offer comparable power, torque and reliability to diesel

Reduce CO2

Reduces your carbon footprint and meets increasingly stringent emissions regulations

Time Saver

No time waiting on regeneration, no diesel exhaust fluid (DEF) or diesel particulate filter (DPF)

Cost Efficient

Natural gas vehicles are priced 2-3xs less than all-electric vehicles, and offer greater emission reudctions

Health Conscious

Offers healthy improvements for your drivers with less noise and fumes compared to diesel trucks

CHESAPEAKE UTILITIES CORPORATION

Thank you.

jstankiewicz@chpk.com

CHESAPEAKE UTILITIES CORPORATION

WM Renewable Energy

September 2023

Our Collection Commitment

At WM, we believe **Energy** is **Renewable.**

Our expansive fleet is setting industry-leading standards for recycling and waste collection with lower emissions.

WM operates the **largest heavy duty compressed natural gas (CNG) vehicle fleet** of its kind in North America with emission levels that are significantly lower than current EPA regulations.

12,000* Alternative fuel heavy duty Class 8 vehicles

75% of WM's routed collection fleet runs on lower-emission compressed natural gas rather than diesel

47% of fuel allocated to our natural gas fleet comes from renewable sources

85% of new vehicles purchases by WM utilize compressed natural gas

Our Compressed Natural Gas Difference

90% reduction in NOx emissions

56% reduction in CO_2e emissions

~50% of our fleet operates with emissions lower than the 2027 EPA standards of .035 NOx grams per horsepower-hour

60 **metric tons** of greenhouse gas emissions (GHG) reduced for every diesel-powered truck replaced with CNG

40% reduction in GHG emissions attributed to our fleet since 2010

90M+ gallons of diesel fuel displaced each year by transitioning to CNG

*Total number of heavy-duty alternative fuel vehicles year to date.

Learn more at wm.com

Our Impact and Future

WM has been a pioneer in the environmental services industry, using alternative fuels in our fleet for decades and leading the transition to lower-emission vehicles.

We continue to explore and implement additional technologies including electric vehicles to best service our customers and reduce our impact.

Expanding with Electric

30+ Electric vehicles used in operations including Class 6 and light-duty vehicles

5+ Heavy Duty Class 8 Electric Vehicle (EV) pilots nationwide

Alternative Energy Commitment

$ 1B+ in planned investments through 2026 to grow our renewable energy business

42% reduction target for absolute Scope 1 and Scope 2 GHG emissions by 2031 compared to 2021 base year

65% target for beneficial use of captured landfill gas by 2026

100% allocation of renewable natural gas to our CNG-powered fleet by 2026

20+ years committed to alternative fuels including renewable natural gas, compressed natural gas, electric and other technologies

200+ Operational and planned CNG fueling stations for our collection fleet

28 Public CNG fueling stations in U.S. and Canada

Learn more at wm.com

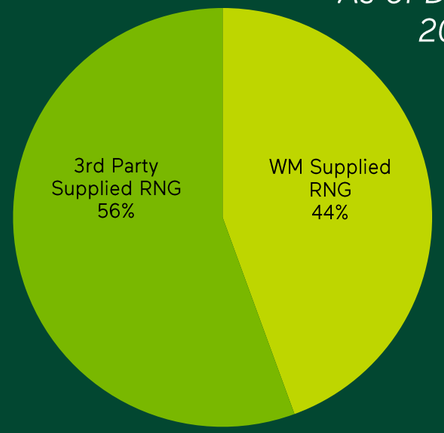
Importance of CNG in WM Fleet

Why CNG?

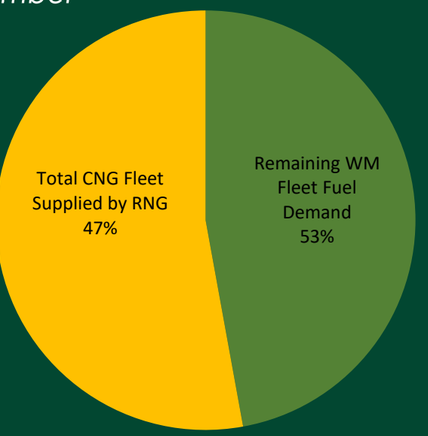
- Lower fuel costs
  - Commodity prices
  - Incentives (LCFS and RFS/RINs)
  - Tax credits distributed at BU level
- Reduce labor costs
  - CNG trucks can be fueled overnight > drivers spend less time waiting in line to fuel
- Reduced maintenance
  - Fewer filters to maintain and clean than diesel trucks
- Improved operational efficiencies
- Quieter than diesel
- Federal grants
  - Offset truck costs and infrastructure costs
- Environmental benefits
  - CNG meets emissions requirements through 2023
  - CNG trucks emit nearly zero particulate emissions

Total RNG Supplied

As of December 2022



WM Fleet Supply & Demand



Why not electrify collection fleet?

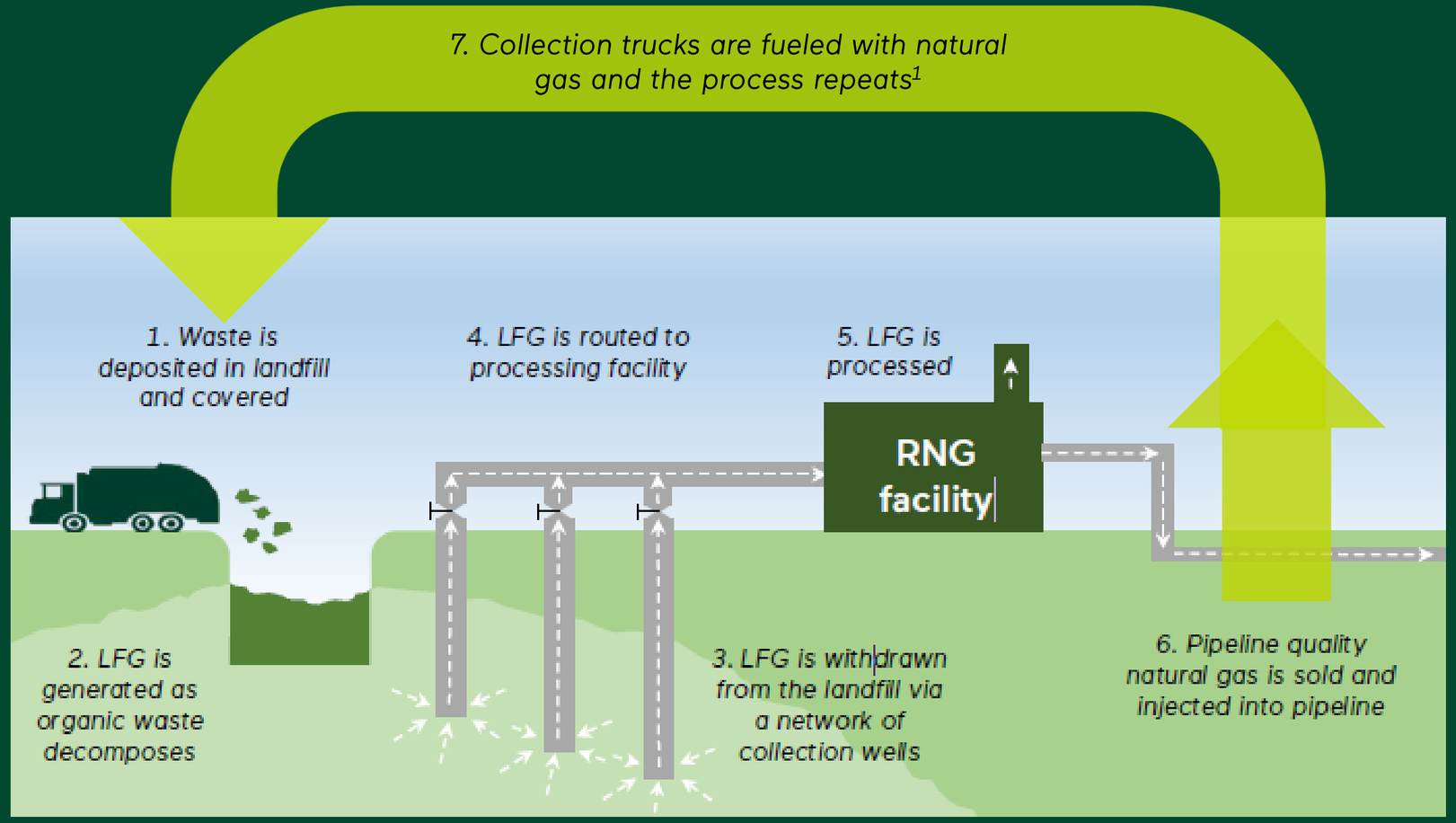
- Technology was the most similar to diesel trucks
- Weight limitations for heavy duty trucks – batteries add too much
- Technology not yet there for heavy duty trucks
- Charging time vs running time of trucks – trucks cannot run daily with only one charging session

WM currently owns and operates a few electric delivery vehicles and has plans to add more, including automated side loaders and tractors.

Renewable Natural Gas (RNG) to Compressed Natural Gas (CNG)

Closing the Loop

- RNG is pipeline-quality natural gas
- Offers a cost-effective, drop-in, low-carbon replacement for conventional fossil natural gas
- Can be transported via existing natural gas infrastructure



1. Environmental attributes (EAs), RINs, etc. are generated through allocation of gas to trucks

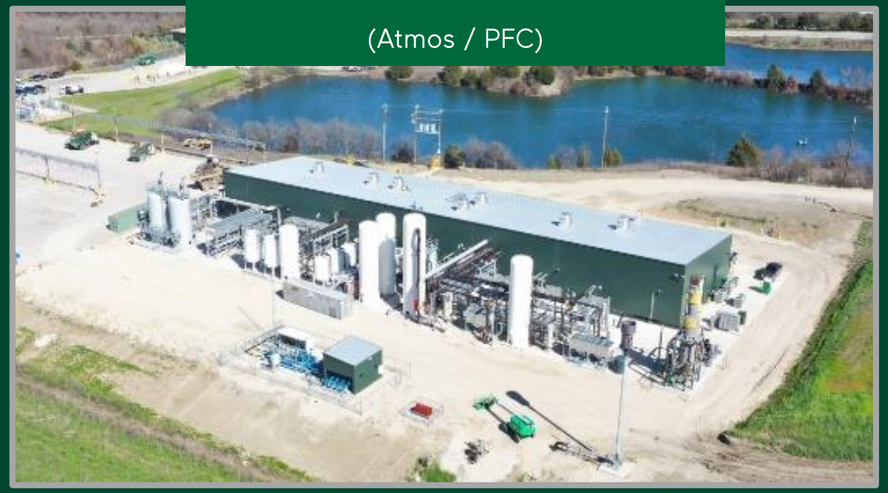
WMRE RNG Operations

WM Milam RNG

(Ameren LDC)

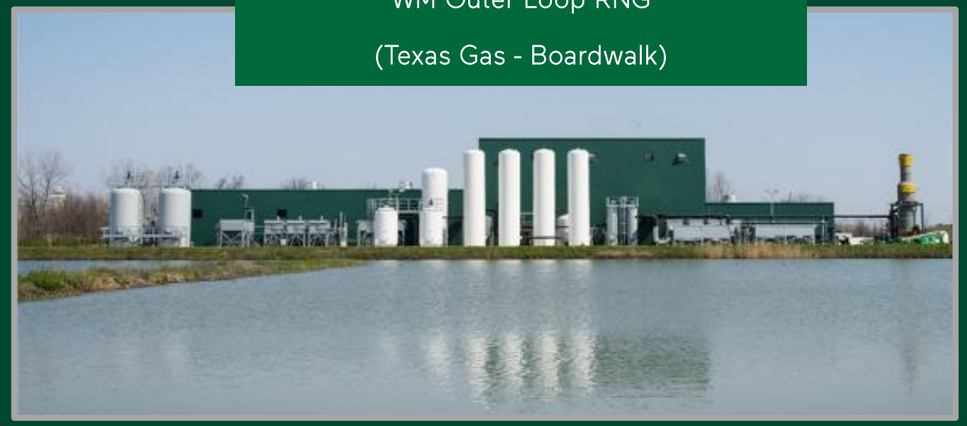
WM Skyline RNG

(Atmos / PFC)



WM Outer Loop RNG

(Texas Gas - Boardwalk)



WM East Oak RNG

(Southern Star)

Future Development

Georgia RNG Opportunities

Pine Bluff Landfill – Ball Ground, GA

- Active Development - pipeline constraint

Superior Landfill – Savannah, GA

- Current Power Plant – potential long term conversion

Wolf Creek Landfill – Dry Branch, GA

- Current Power Plant – potential shorter term conversion

R&B Landfill – Homer, GA

- Potential Development – pipeline constraint

Turkey Run Landfill – Hogansville, GA

- Active Development (3rd Party)

Evergreen Landfill - Valdosta, GA

- Potential Development

Georgia Fleet Stats

- 18 Hauling Companies
- 7 CNG Fueling Stations
  - No public stations
- 336 CNG Trucks
- 265 Diesel Trucks

Clean Cities Georgia Transportation Summit

Organizing partners:

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Southface
Georgia Tech
Georgia Power
Georgia Chamber

Gold sponsors:

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Vesta Freight
Gas Authority
Take Comfort In Blossman Gas & Appliance
Blue Bird
ABEV Power Solutions
Kia
DSI EV Solutions

CLEAN CITIES GEORGIA TRANSPORTATION SUMMIT

CURRENT AND FUTURE ELECTRIC VEHICLE APPLICATIONS

James Marlow
President of
Southface Institute

Lincoln Wood
Electrification Policy
Manager for
Southern Company

Mackenzie Baines
Product Director for
Cox Automotive

Scott Misico
Fleet Supervisor for
Cobb County

Gavin Ireland
CEO of Green Energy
Services

OUR DIVISIONS AND BUSINESSES

CONNECTIVITY

COX

MOBILITY

COX AUTOMOTIVE

NEW VERTICALS

COX ENTERPRISES

Proven Stability, Commitment to Innovation & Sustainability

Legacy of Innovation

As a fourth-generation family-owned business, we measure success in decades, not quarters.

Future-Forward Vision

We are committed to pushing the boundaries and seeing beyond the visible horizon with a focus on innovation and continuous improvement.

OUR COX CONSERVES GOALS:

- **Zero waste to landfill by 2024**
- **Water neutral by 2034**
- **Carbon neutral by 2034**

120
YEARS
OF INNOVATION

Mackenzie Baines

Product Director

Cox Automotive Mobility

As the vehicle is becoming an advanced connected, electric experience so are the health services to **care for**, **maintain** and **value** the vehicle

A one-stop solution for battery life cycle management

Battery Expertise
- Engineering Services & Consulting
- Battery Health Scoring
- Root Cause Analysis

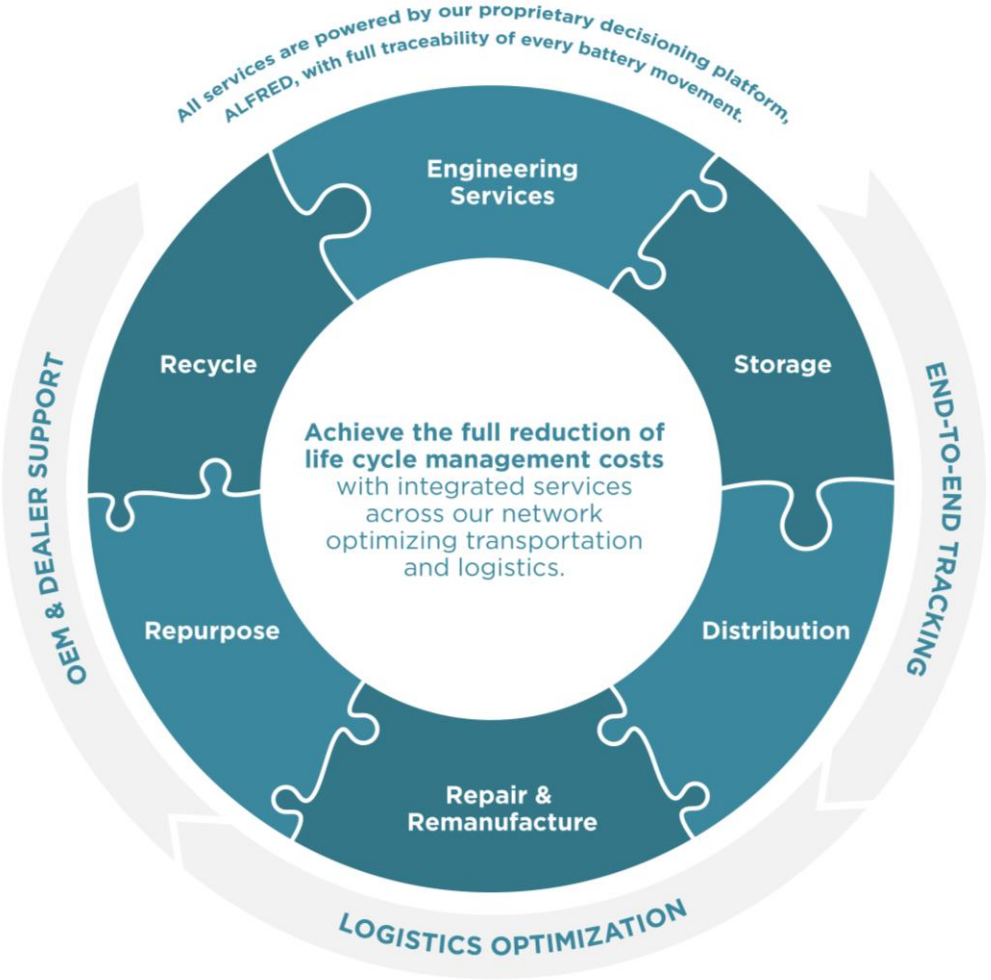
Storage & After Sales Support
- Battery Storage and Distribution
- Dealer Support (Online & Call Center)
- Warranty Claims Processing

Logistics Optimization
- Reverse & Forward Logistics
- Dunnage Management & Packaging
- End-to-end Tracking

Extend First Life
- Repair
- Remanufacturing
- Refurbishment

Repurpose
- Battery Grading
- Second Life Solutions

Recycle
- Pretreatment Recycling



Cobb County...Expect the Best!

Cobb County Fleet Management

- **Appx. 2,700 vehicles**
- **Over 10 million miles traveled**
- **Over 750,000 residents**
- **64 EV's, 55 charging stations 78 charging ports**
- **33 propane bi-fuel trucks, with onsite propane pump**
- **2 ANG vehicles with onsite pump and meter**

The Tax Assessors Fleet is 75% EV

Rangers use E-Bikes to patrol Parks and Trails

Sheriff's office uses Mach-E for Administrative Duties

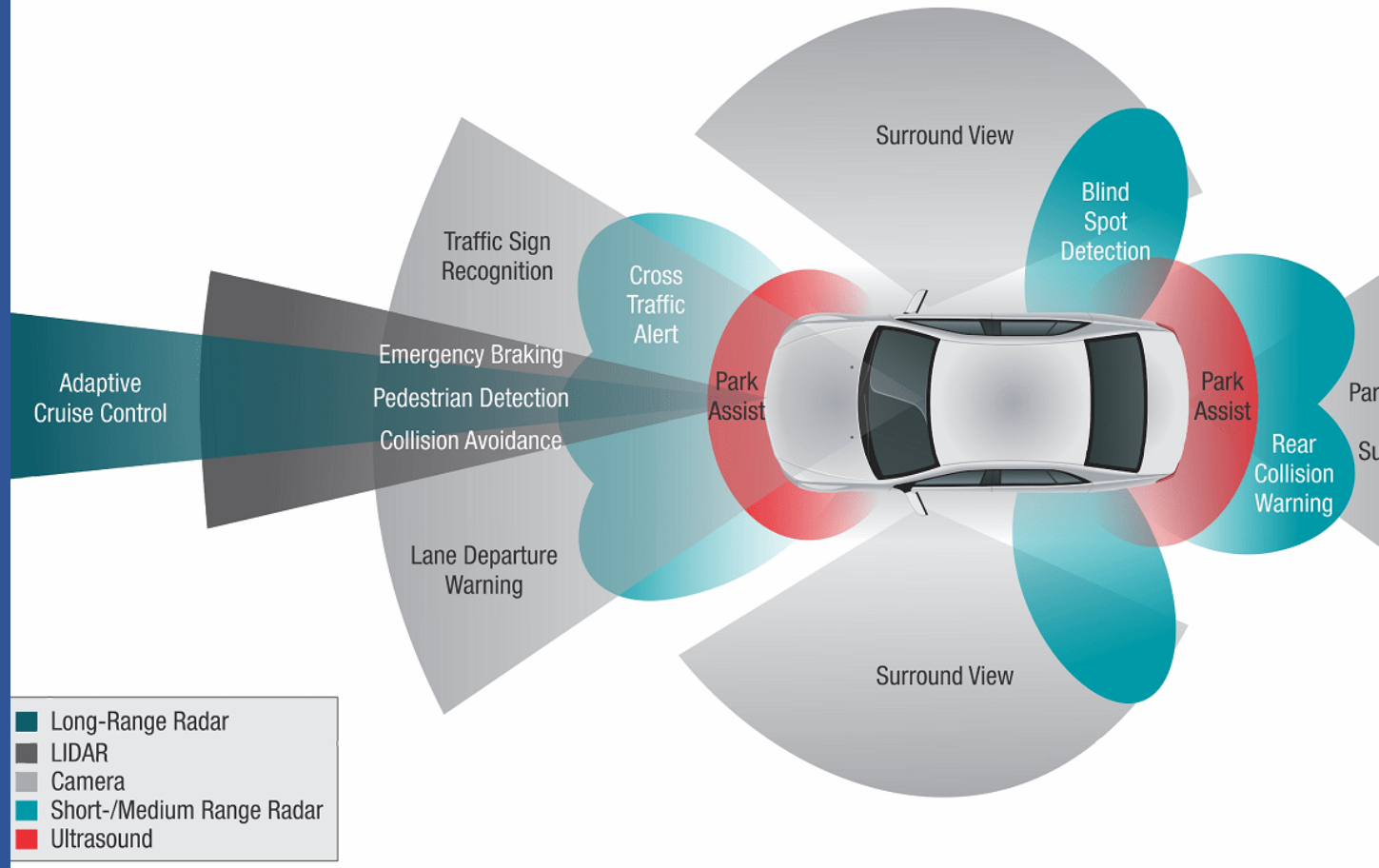
Prisoner Transport Van 3-year Total cost of ownership Diesel vs Electric

***Our transport vans travel on average 24,0000 miles a year**

Total cost savings in the first 3 years is 40,514.00

Future Plans

- More EV and Hybrid vehicles
- Improving Charging infrastructure
- Alternative Fuel Research & Implementation
- Technician Training
- Sustainability Planning



Cobb County...Expect the Best!

Scott Misico
Cobb County Fleet Management
Car Shop Supervisor
Scott.misico@cobbcounty.org

GEORGIA GREEN ENERGY SERVICES

https://www.gagreenenergysvc.com/

Electrical Panels

- **Capacity Planning:** Electrical panels for EV chargers need to be properly sized to accommodate the charging requirements of the installed charging stations. This includes considering the panel's amperage rating to ensure it can handle the additional load without overloading the system.

EV CHARGING STATIONS

Level 2 (L2)

- **Efficiency:** L2 chargers are more efficient than standard Level 1 chargers, providing faster charging times for electric vehicles.

- **Voltage and Amperage:** L2 chargers typically operate at 240 volts and can deliver higher amperage compared to Level 1 chargers, enabling quicker charging.

GEORGIA GREEN ENERGY SERVICES

EV CHARGING STATIONS

Level 2 (L2)

- **Charging Speed:** They can charge an electric vehicle roughly 3 to 5 times faster than a standard Level 1 charger, making them suitable for daily use and reducing charging times.

- **Residential and Commercial Use:** L2 chargers are suitable for both residential and commercial applications, offering versatility in charging solutions.

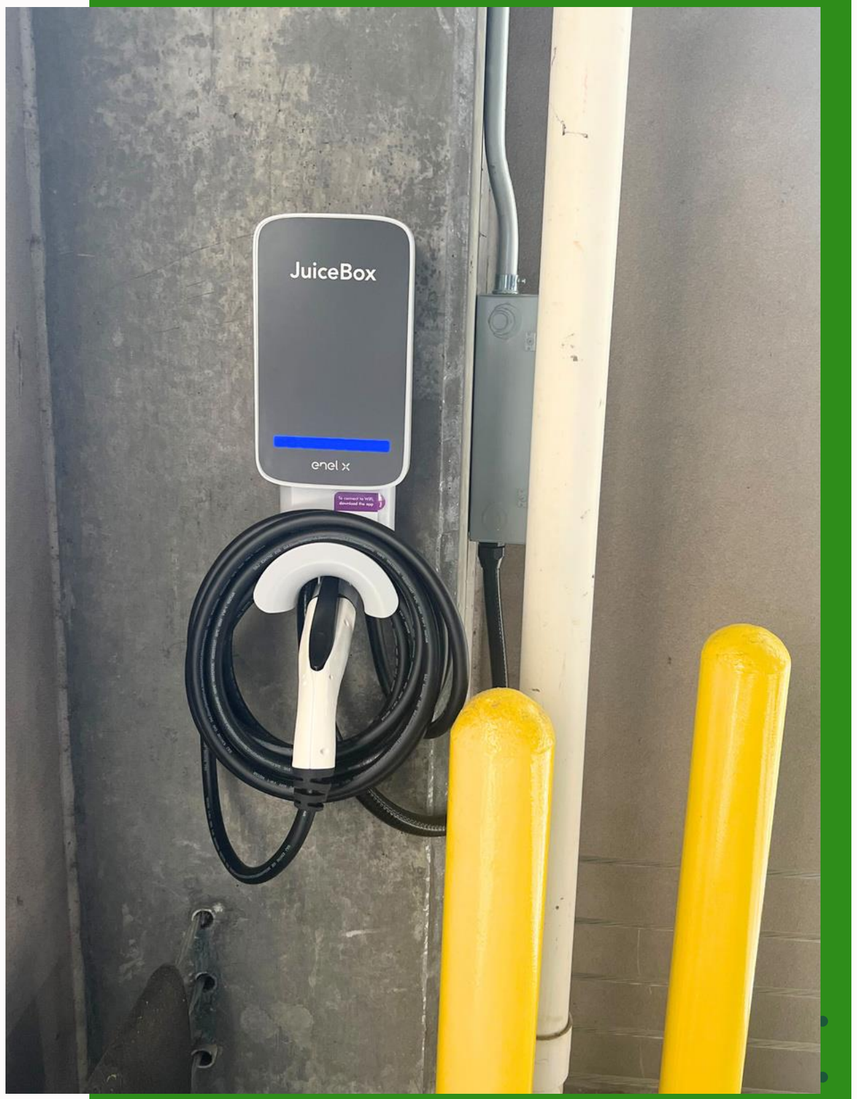
GEORGIA GREEN ENERGY SERVICES

EV CHARGING STATIONS

Level 2 (L2)

- **Installation:** They require professional installation and access to a 240-volt power source, which may involve some electrical work and potential costs.

- **Connector Types:** L2 chargers come with various connector types (e.g., J1772, Type 2, etc.), so compatibility with your electric vehicle is essential.



GEORGIA GREEN ENERGY SERVICES

Georgia Green Energy Services LLC

Electrical and Low Voltage Construction and Design

8(a) Certified - MBE - DBE - AABE – SBE

4040 Shirley Dr. SW. Atlanta Georgia 30336

p: 404-334-3323

m: 404-309-9278

Clean Cities Georgia Transportation Summit

Organizing partners:

Clean Cities Georgia – Partnership for Clean Transportation
Southface
Georgia Tech
Georgia Power
Georgia Chamber

Gold sponsors:

Georgia In Charge
Georgia Automobile Dealers Association

Silver sponsors:

Atlanta Gas Light

Bronze sponsors:

Vesta Freight
Gas Authority
Take Comfort In Blossman Gas & Appliance
Blue Bird
ABEV Power Solutions
Kia
DSI EV Solutions

CLEAN CITIES GEORGIA TRANSPORTATION SUMMIT

WORKING WITH DOE FOR FEDERAL FUNDING

Jeff Marootian

Principal Deputy Assistant Secretary for Energy Efficiency and Renewable Energy (EERE)

CLEAN CITIES GEORGIA TRANSPORTATION SUMMIT

RENEWABLE PROPANE PANEL

Alisha Lopez
Coalition Director of Southeast Florida Clean Cities

Mark Denton
VP of Business Development at Blossman Gas

Brian McMeans
Shop Foreman of Transportation for Henry County Schools

Rodrick Washington
VP for Fleet Services at Groome Transportation

Southeast Florida Clean Cities Coalition

September 27, 2023

Alisha Lopez, Director

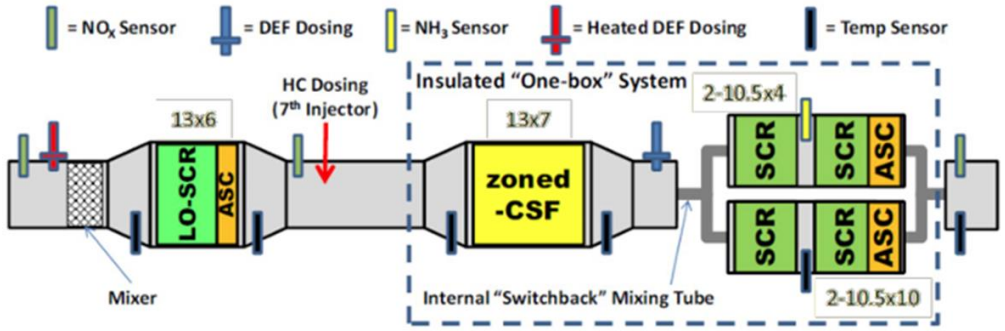
Email: Alopez@sfrpc.com

Phone: (954) 924-3653

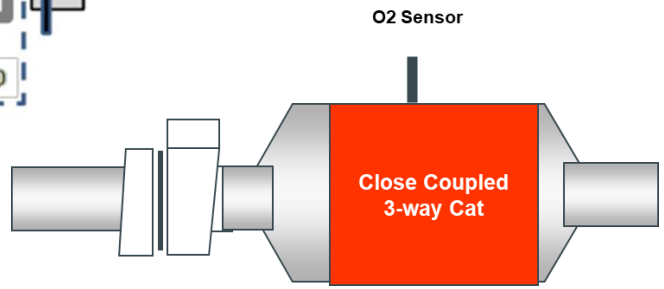
Social Media: @seflccc

The Diesel Emissions Challenge

Diesel - Current emissions = Single module.



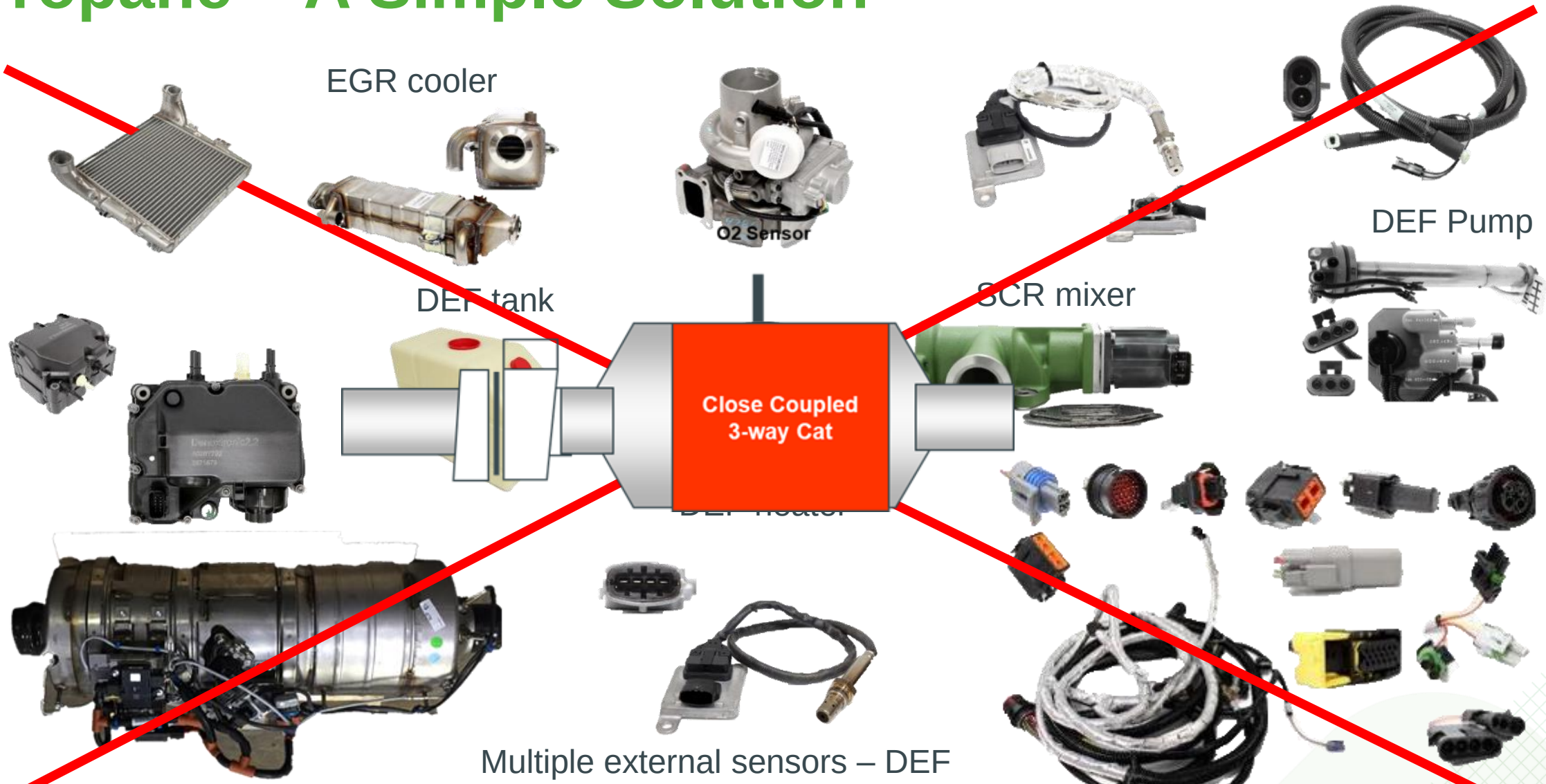
Diesel - 2028 Emissions Technology. Complex, costly, difficult to package, significant interaction with engine and operator.



Propane – Current and future emissions via a simple catalytic converter.

- 2027 EPA and CARB emissions limits increase significantly diesel exhaust after treatment technology. The target is 0.035 grams NOx.
  - Complex and costly, difficult to service, iterates engine performance, requires urea fluid.
- Propane engines already meet future emissions limits via a simple catalytic converter. No development required. Highly developed coast to coast fuel supply infrastructure.

Propane – A Simple Solution



DOC, DPF, SCR catalyst.
Complex - regen required.

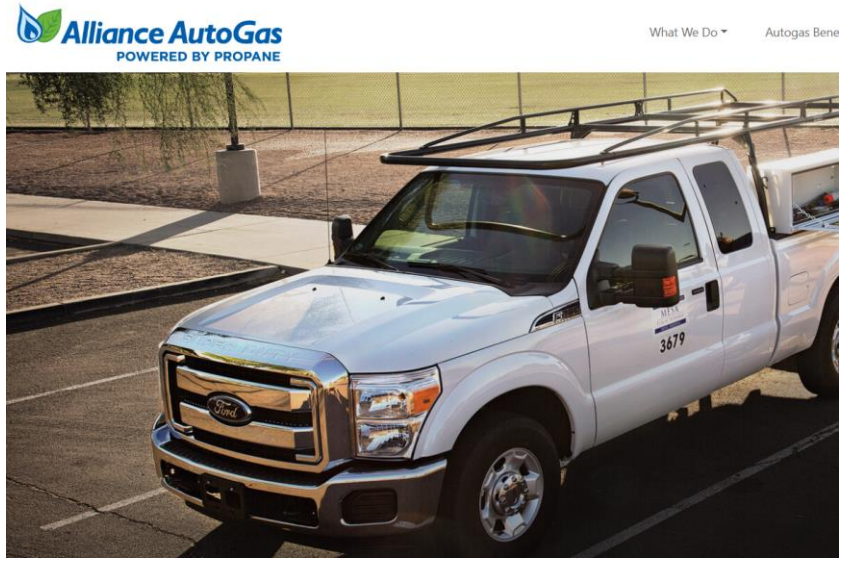
Multiple external sensors – DEF quality – DPF soot loading

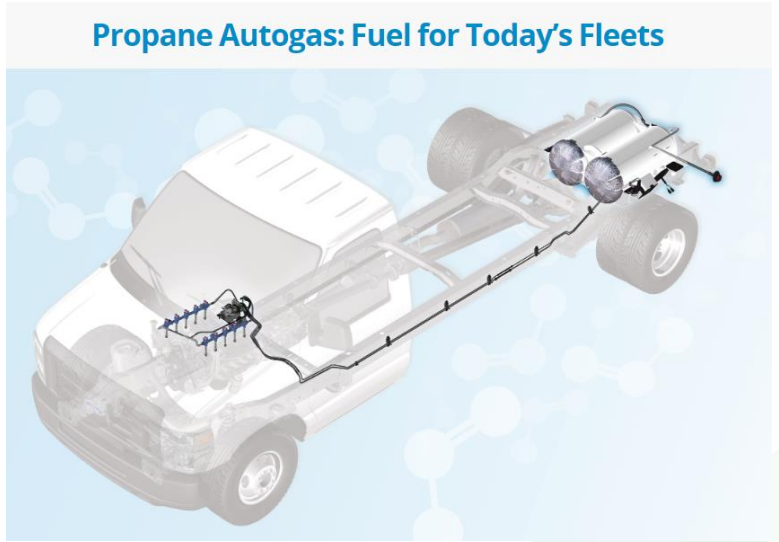
Complex vehicle side wiring

On-Road Propane Options – In Production Today

1. Converted engines - Blossman/Alliance Autogas
   - Convert existing vehicles to run on propane
2. Roush – Specific engines for school bus/transit applications

Solutions that are available today





Alliance AutoGas
POWERED BY PROPANE

Ford

F150
- 3.3 PFDI
- 5.0 PFDI
- 2.7/3.5 PFDI (SUMMER 20)

F250-F350
- 6.2 PFI

F450-F750
- 7.3 PFI (2021 MY)

E450
- 6.2 PFI
- 7.3 PFI (2021 MY)

TRANSIT
- 3.5 PFDI
- 3.5 ECOBOOST (FALL 20)

EXPLORER
- 3.3 PFDI

GM

SILVERADO 1500
5.3 DI

SILVERADO 2500/3500
6.6 DI

EXPRESS/SAVANA
6.0 PFI

FCA
FIAT CHRYSLER AUTOMOBILES

DURANGO
5.7 PFI

CHARGER
3.6 PFI

RAM
5.7 PFI
3.6 PFI (SUMMER 20)

OEM Propane Options

- Light & medium duty Ford trucks & vans, school bus.
- Factory Ford warranty maintained.
- No loss of HP / torque / towing capacity.
- Serviceable with existing diagnostic equipment.
- EPA & CARB Certified.

ROUSH® CLEANTECH

Ford F-53 / F-59

Ford E-350/450

Ford F-450/550

Ford F-650/750

Blue Bird Vision

Micro Bird G5

In Development – Ready for 2027

Base Engine

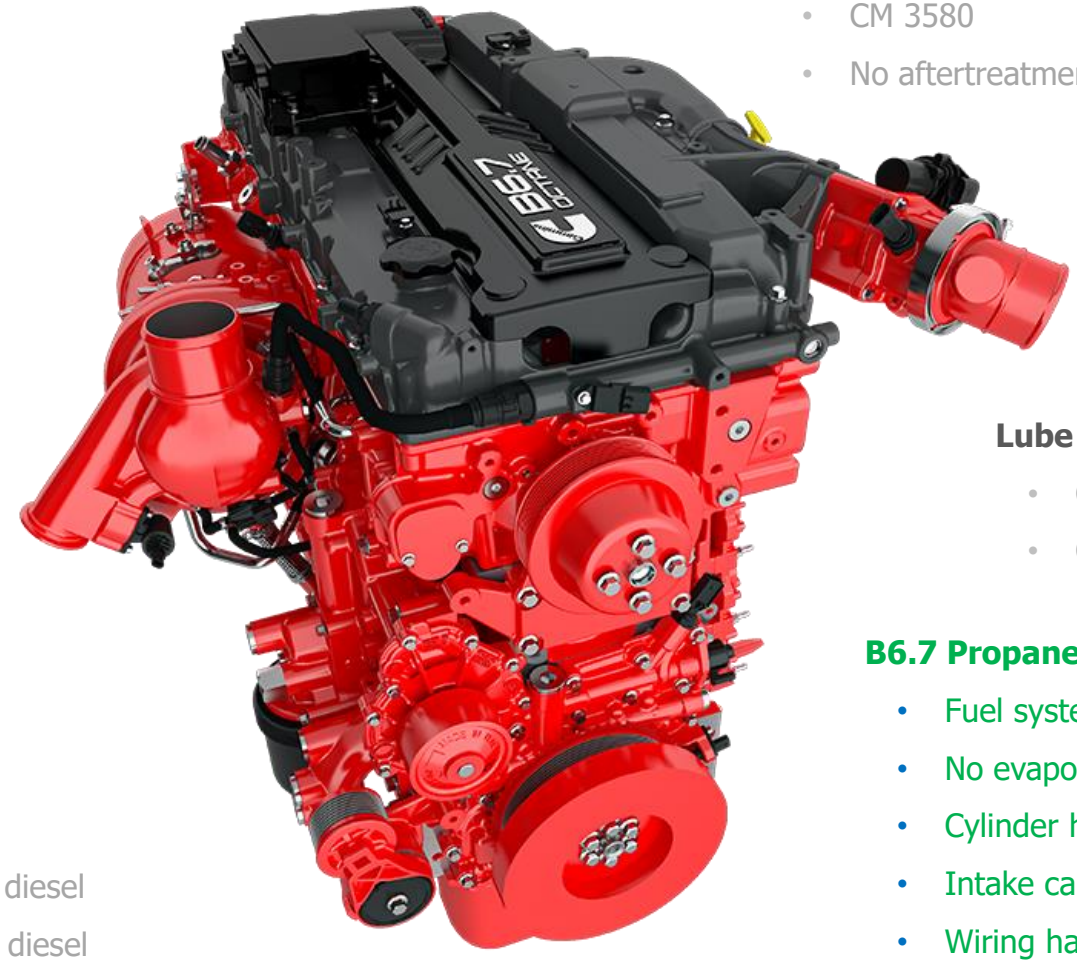
- 6.7L displacement
- 107 mm bore x 124 mm stroke
- 4 head bolt iron block
- 4 valve aluminum cylinder head

Air Handling System

- Dual independent cam phasing
- Wastegate turbocharger with command WG actuator
- Compressor by-pass valve
- Non-egr system
- Positive crank case ventilation
- Compression release exhaust brake

Vehicle Integration

- System weight improved over B6.7 diesel
- Customer interfaces similar to B6.7 diesel



Cummins Aftertreatment System

- On-engine three-way catalyst

Electronics/Controls

- CM 3580
- No aftertreatment control module

Fuel and Ignition System

- Direct injection
- M14 spark plug
- Coil-on-plug connection

Lube System

- GF-6A Oil Required (10w30 and 5w30)
- Controllable Piston Cooling Nozzles

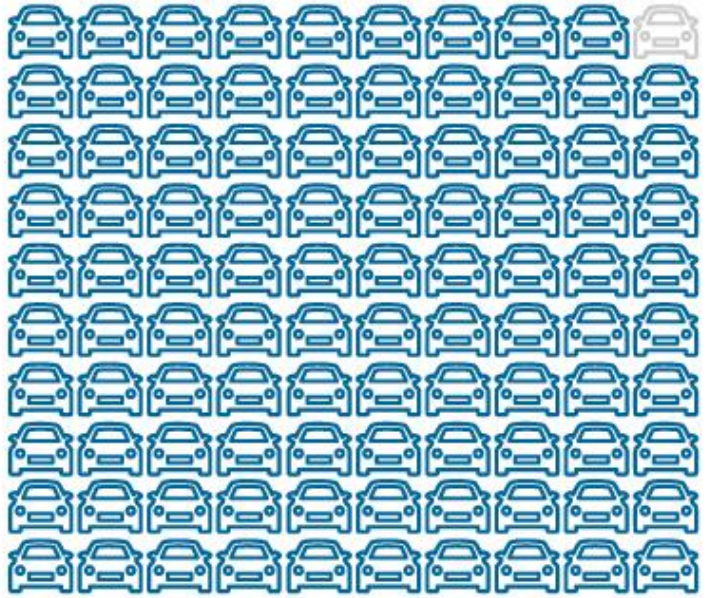
B6.7 Propane Differences

- Fuel system (port fuel vapor injected, low pressure rail)
- No evaporative fuel control
- Cylinder head (to accommodate fuel system)
- Intake camshaft (different profile)
- Wiring harness (to accommodate fuel system)
- Calibration and software
- TWC (underfloor) .02 g/hr. only

Domestic

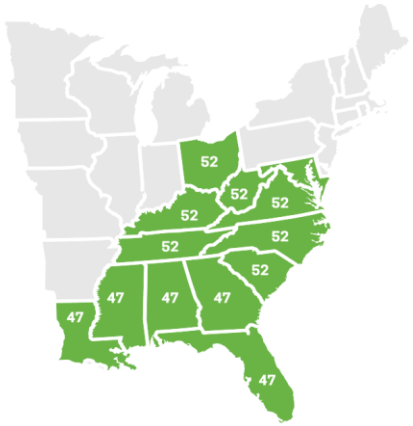
99%

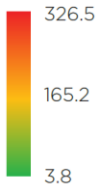
of propane autogas used in the U.S. is produced in **North America**



ELECTRIC VS. PROPANE

Graphs Below Represent the Carbon Intensity of Electricity Compared to Conventional and Renewable Propane



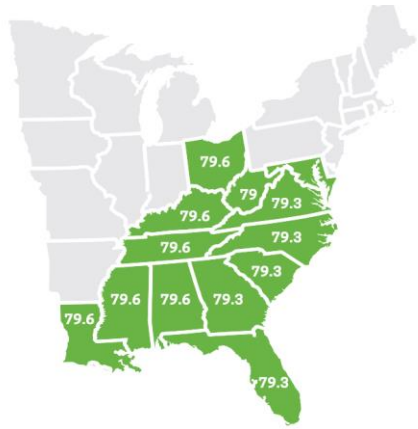


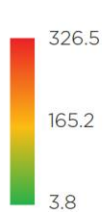
RENEWABLE PROPANE (rP)

50/50 blend of propane and renewable propane (rp)

Currently, renewable propane provides a lower carbon footprint solution in all 50 U.S. states except Vermont when compared EVs that are charged using the electrical grid. The entire U.S. propane industry is targeting at least a 50 percent replacement of conventional propane with renewable propane by 2050.

47 gCO2eq/MJ
AVERAGE FOOTPRINT

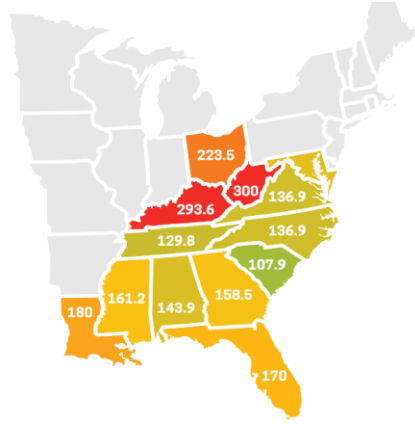


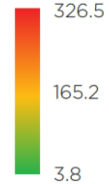


CONVENTIONAL PROPANE

Because of propane's low-carbon, high-energy output, it's a perfect fuel for residential and commercial applications such as vehicle fleets, agriculture and industrial work, and landscape management, just to name a few.

79.6 gCO2eq/MJ
AVERAGE FOOTPRINT





ELECTRICAL GRID

Along with emissions, the U.S. electrical grid can also lead to higher NOx and particulate matter emissions than the regulated internal combustion engine vehicles tail-pipe productive. Hence, full electrification is not correlative to decarbonization.

167 gCO2eq/MJ
AVERAGE GRID ELECTRICITY

Easy to Operate Infrastructure

SIMPLE DISPENSING

ARRIVE AT PUMP

SWIPE CARD

THE STAÜBLI QUICK CONNECT NOZZLE IS JUST AS SIMPLE TO HANDLE AS A TRADITIONAL "GAS PUMP" NOZZLE. SIMPLY, POSITION THE NOZZLE AT THE CONNECTOR AND OPERATE THE TRIGGER.

ENTER CREDENTIALS

BEGIN REFUELING

Smaller Installations

- Scalable skid mounted fueling equipment can expand as your fleet grows
- *Dual 1000 gallon tank skid only requires about 3 parking spaces*
- *Skid mounted equipment typically provided by propane supplier at little to no cost to the customer*

Larger Installations

<u>Autogas Fueling Infrastructure can grow as you grow!</u>

Starting with a single 1000 gallon skid-mounted fueling system and expanding to a 30,000 gallon tank system with little costs to the fleet owner.

Most propane suppliers will provide the fueling system at little to no cost with a fuel agreement in place.

Thank You!

Contact:

Mark Denton

V.P., Business Development

Cell: 251-610-2307

Email: mldenton@blossmangas.com

Alliance AutoGas

POWERED BY PROPANE

Blossman

Propane Gas & Appliance

Henry County Schools

Clean Propane Initiative

Henry County Schools

Clean Propane Initiative

- *Safe Energy*
- *Reliable Energy*
- *Cheap Energy*

GA Clean Fuels Transportation Summit

Rodrick Washington

V.P., Fleet Services

Groome Transportation

GROOME transportation

Groome Transportation- Airport Shuttle

Groome Transportation – Overview

- Groome Transportation:

  We are a third generation family owned company with 4 divisions:

  1) Airport Transportation- numerous airport locations providing door to door service to and from the airport

  2) Campus Shuttles- transporting students daily on many major campuses

  3) Military bases- transporting military personnel to major airports daily

  4) Medical facilities- transporting patients at major hospitals daily

Groome Transportation – Why Autogas?

1. Clean - propane autogas is environmentally friendly and helped us achieve some of our sustainability goals

2. Cost - propane cost considerably less than gasoline on fuel costs and maintenance

3. Tax credits received for running a clean alternative fuel to gasoline or diesel

Groome Transportation – By the Numbers

How many vehicles do you have in Georgia?

Over 300 that serve the Atlanta airport

How many locations to you have in Georgia?

11 locations that serve the Atlanta airport

How many vehicles do you have in your fleet?

504 Vehicles

How many total locations do you have?

43 locations across 15 states

How many miles do you travel per year (total company)?

Over 34 million miles annually between airport shuttles, campus shuttles, military bases, and medical facilities

How long has Groome been running autogas on their fleet vehicles?

13 years

GROOME transportation

Savings Using Autogas vs Gasoline

Propane Autogas
(previous 12 months)

Total $ Spent
$2,362,233.15
(w/o tax credit)

$1,868,433.00
(with tax credit)

Gasoline
(previous 12 months)

Total $ Spent
$3,777,571.98

Savings
(previous 12 months)

$(1,415,338.83)
(w/o tax credit)

$(1,909,138.98)
(with tax credit)

(11 Atlanta locations only)

Assumptions: propane autogas achieves 85% of the fuel economy of gasoline on average

*Tax credit for propane autogas is $.37 cents per gallon - good through December 2024

GROOME
transportation

Thank You!

Contact:
Rodrick Washington
V.P., Fleet Services
Cell: 936-402-3501
Email:
rwashington@groometrans.com

Clean Cities Georgia Transportation Summit

Organizing partners:

Clean Cities Georgia – Partnership for Clean Transportation
Southface
Georgia Tech
Georgia Power
Georgia Chamber

Gold sponsors:

Georgia In Charge
Georgia Automobile Dealers Association

Silver sponsors:

Atlanta Gas Light

Bronze sponsors:

Vesta Freight
Gas Authority
Take Comfort In Blossman Gas & Appliance
Blue Bird
ABEV Power Solutions
Kia
DSI EV Solutions

CLEAN CITIES GEORGIA TRANSPORTATION SUMMIT

BIOFUELS AND SUSTAINABLE AVIATION FUELS

Chris Clark
President/CEO for Georgia Chamber of Commerce

Dr. Tim Lieuwen
Executive Director of the Strategic Energy Institute at Georgia Tech

Alex Menotti
VP of Government Affairs, Policy and Sustainability at Lanza

Chris Coan
Executive Director of the Strategic Energy Institute at Georgia Tech

Executive Director of the Strategic Energy Institute (SEI)

Tim Lieuwen

Professor, Aerospace Engineering

Strategic Energy Institute

Georgia Tech

LanzaJet

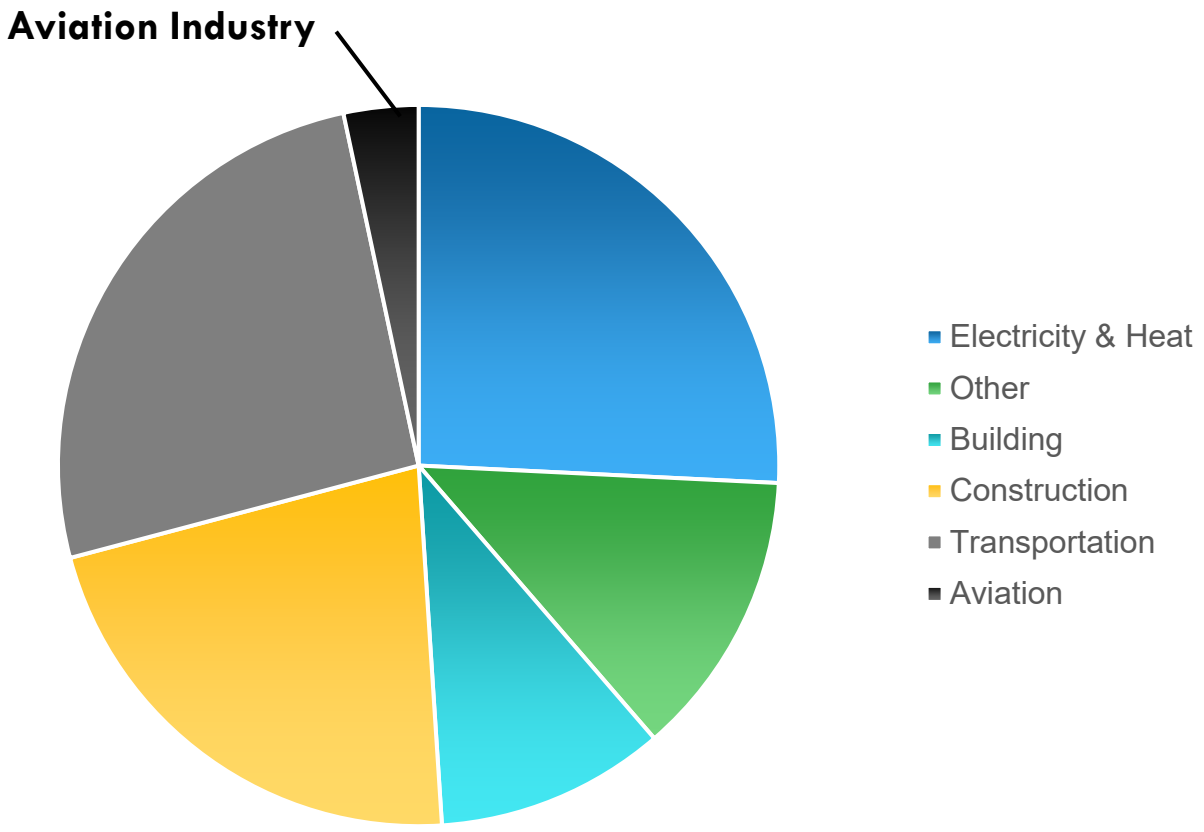
Clean Cities Georgia Transportation Summit

Alex Menotti
VP, Government Affairs, Policy, and Sustainability

27 September 2023

Today, aviation contributes to 2-3% of global CO_2 emissions, and the industry is on pace to grow significantly in the coming decades

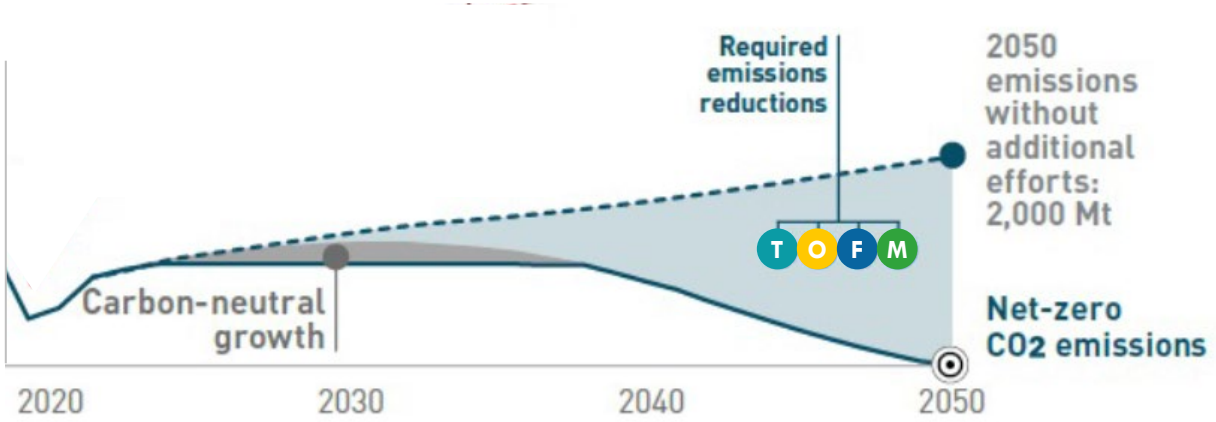
Aviation is also one of the hardest sectors to decarbonize

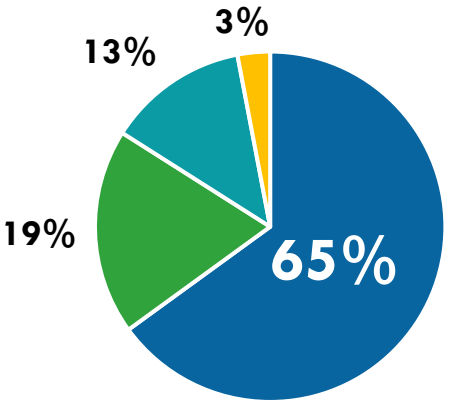


Source: World Resources Institute

SAF offers the most significant opportunity to decarbonize aviation at 65% share of overall reduction in GHG emissions

Aviation is a growing source of CO2 emissions and Alcohol to Jet technology is one of the most promising solutions to get to net-zero





Source: IATA, Fly Net Zero, October 2021

We are supported by a group of world-class investors and funders

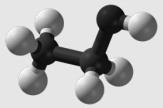
LanzaTech

- ✓ Funding commitments
- ✓ Commercial-scale projects commitments
- ✓ Offtake commitments
- ✓ Knowledge, support, and secondees commitments
- ✓ Feedstock supply flexibility commitments
- ✓ Innovative commitments

LanzaJet

Our technology converts ethanol to drop-in SAF and RD

The LanzaJet® ATJ Process

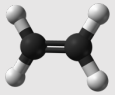


Ethanol

1

Dehydration

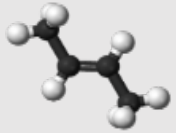
$- H_2O$



Ethylene

2

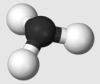
Oligomerization



$C_4 – C_{24}$ Olefins

3

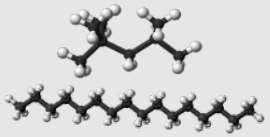
Hydrogenation



Hydrogen

4

Fractionation



Paraffins and Iso-Paraffins

Sustainable Aviation Fuel (SAF)

Renewable Diesel (RD)

90% SAF + 10% RD

Or up to

75% RD + 25% SAF

Stakeholders in our Technology Development

首钢朗泽 Shougang LanzaTech

U.S. DEPARTMENT OF ENERGY Energy Efficiency & Renewable Energy

Pacific Northwest NATIONAL LABORATORY

RSB

FEDERAL AVIATION ADMINISTRATION

BOEING

GE

virgin atlantic

HSBC

DARPA DEFENSE ADVANCED RESEARCH PROJECTS AGENCY

LanzaJet

Leveraging existing ethanol supply while continuing to develop additional waste-based sources = foundation for scalable SAF industry

Leveraging & Transitioning Existing Ethanol Supply

1G

- Existing low-CI ethanol production
- Cellulosic ethanol
- Waste-based ethanol

Building New Waste-Based Ethanol Supply

2G

- Industrial / landfill off-gasses
- Agricultural waste and residues
- Municipal Solid Waste (MSW)
- Corn fiber cellulose / sugarcane bagasse






Later this year, we'll complete the world's first ATJ commercial-scale biorefinery

LanzaJet Freedom Pines Fuels

December 2022

July 2023

Meeting the moment…

- Policy support
- Technology partnerships
- Private investment, capital deployment
- Continued commitments and meaningful market signals from aviation industry

Robust, and sustainable market for agriculture, creating jobs across rural America, strengthening energy security, and decarbonizing an entire industry…

Someday is Now.

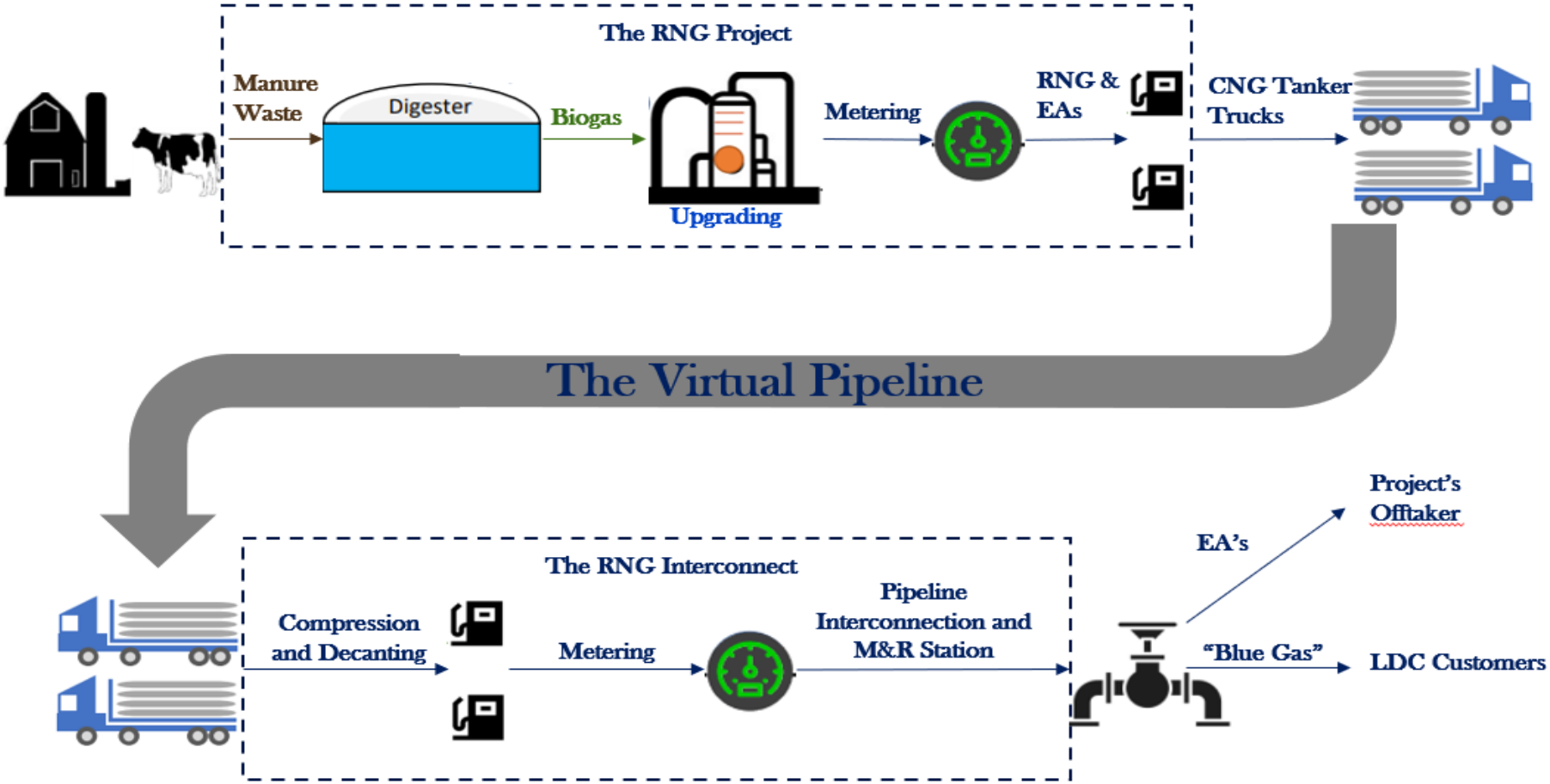
The Gas Authority

- Clean Cities Transportation Summit

- Renewable Natural Gas

» **Chris Coan**
» **The Gas Authority**
» **ccoan@gasauthority.com**

RNG Process – from Manure to Natural Gas



RNG Process – from Manure to Natural Gas

- The Players:
  - City of Eatonton – Natural Gas Utility
  - Two Diary Farms in Putnam County
  - Sustain RNG – a Duke Energy Company
  - Sapphire Gas Solutions – CNG Transportation
  - City of Dublin – Natural Gas Utility
  - West Rock Paper
  - The Gas Authority

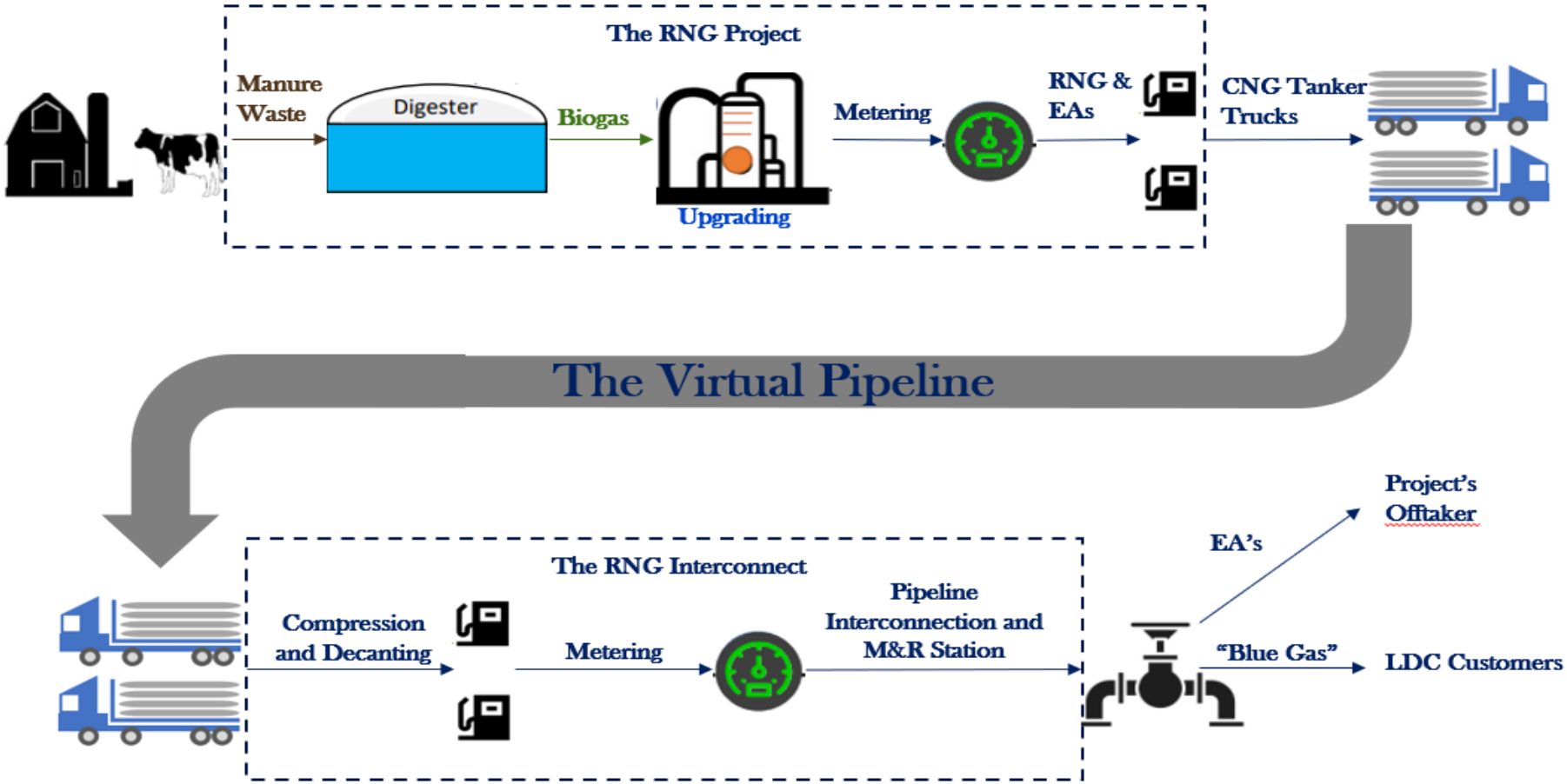
The Dairy Farm in Eatonton, GA

Waste Management Process

Natural Gas Compression

RNG Process – from Manure to Natural Gas

What is a "Virtual Pipeline"?



Injection Site in Dublin, GA

Output of process

- Current Fuel Source and Output:
  - 4000 milk cows
  - 250 Dekatherms per day output
  - Digester has a capacity of 500 Dekatherms per day
  - Compressor and Injection site have a 2500 Dekatherm per day capacity
- Timing:
  - Commissioning now – compressed gas being injected into the Dublin System
  - Full load expected by November 2023
- Future Goals:
  - Optimize current process with added farm participation
  - Prove concept and look for additional farm sites for future Digestors

A great success story….

- The Farmers:
  - Improved waste management and new revenue stream
- The City Gas systems:
  - Increased revenue selling gas to the Developer
  - Decreased cost for “Brown” renewable gas
- The Developer
  - Value of the “Green” credits for diesel replacement in California plus federal RIN credits
- Westrock Paper
  - Additional volumes of gas produced are first through the Meter
- The Gas Authority
  - Connecting the dots for its members and increasing the natural gas volumes in rural Georgia

CLEAN CITIES GEORGIA TRANSPORTATION SUMMIT

CURRENT AND FUTURE HYDROGEN APPLICATIONS PANEL

Tim Echols
Georgia Public Service Commissioner

Erin Lane
Vice President of Public Affairs for Plug Power

Soniya Bhagat
Engineering Associate at Center for Transportation and the Environment (CTE)

Jeremiah Oetman
Senior District Sales Manager for PAC Car/ MHC

Dr. Scott McWhorter
Chairman of the Board for Southeast Hydrogen Energy Alliance

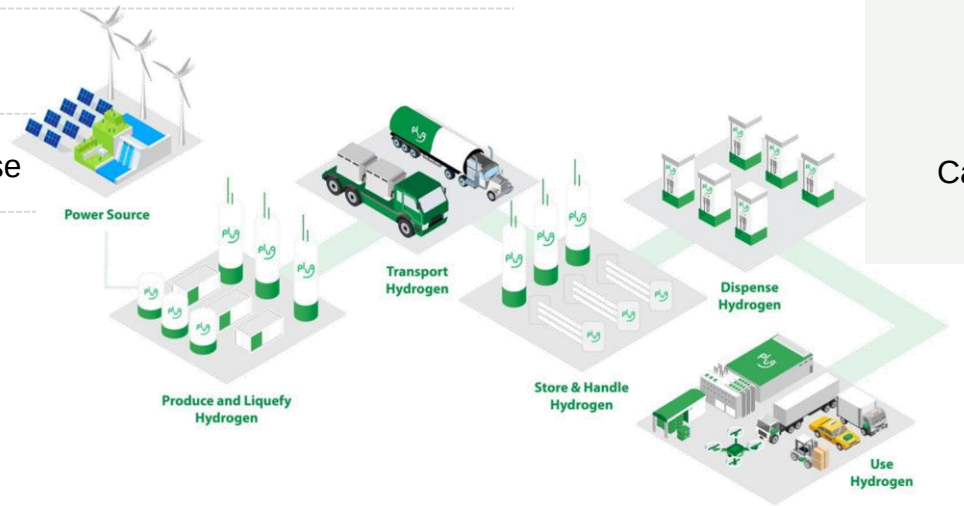
Clean Cities Transportation Summit

September 2023

Plug is a Pioneer in the Hydrogen Ecosystem

Plug is vertically integrated on the entire H2 value chain

- 1st to create a market for Fuel Cell technology
- Provider of turnkey solutions: FC, H2 supply, storage, dispenser
- One of the largest fuel cell manufacturer globally
- World's largest purchaser of liquid hydrogen
- 40+ years of electrolyzer and H2 liquefaction experience
- Building a global green hydrogen generation network
- 50+ trademarks
- ~70% blue chip customer base



Key performance indicators

~4,000
Employees

$1.4bn
2023 expected revenues

60,000+
Fuel cells in operations

1bn+
Operating hours on Plug's fuel cell technology (2bn+ kilometers)

500 tons per day
Green hydrogen generation capacity in 2025

4.5GW
Installed electrolyzer capacity in 2025 (external & BOO)

USD 2bn
Cash on balance sheet to invest in production capacity

$5bn+ Market Cap.
Listed on Nasdaq

Plug's Ecosystem of Products

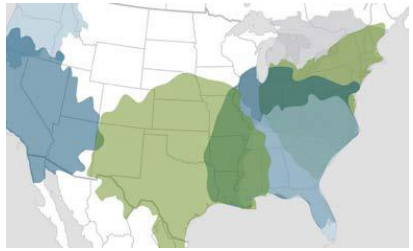
Production

Electrolyzers & Liquefaction

- < 1 MW up to 200 MW architectures
- Hardware or BOO solutions available
- Installation included upon request, in house EPC
- In-house liquefaction OEM and EPC

Green Hydrogen Production Network

- Construction underway across the U.S. with offtake volumes available 2023
- 500 TPD green hydrogen by 2025



Transport and Storage

Green Hydrogen Delivery & Storage

- Green hydrogen supply from own resilient network - zero and low CI options
- No complicated long-term contracts
- Liquid or high-pressure gas deliveries
- Large volume H2 storage (liquid and gas) options

Hydrogen Fueling Stations

- 350 & 700 bar fueling stations, up to 3 tons per day of H2 dispensing
- Full turnkey services (EPC, service, and IoT)
- Mobile refueler product

End Uses

FCEVs in Mobility

- Class 1-3 material handling
- Terminal tractor, cargo tractors, container mover, tow tractors
- City buses
- Class 4-8 vehicles
- Aviation for regional air-craft
- Mining equipment

Stationary Fuel Cells

- < 1 MW up to 200 MW architectures
- Millisecond response grid stabilization (peak, backup, and baseload power)
- Installation included upon request
- Hardware and PPA solutions available
- Clean, quiet, and secure!

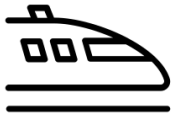
Service and Maintenance

- Uptime and reliability guarantees available
- Over 500 highly skilled technicians
- Remote monitoring and 24x7 technical assistance

Private Ecosystem

- Ask how we can build you your own ecosystem (pipelines or delivery)
- We offer custom built networks of hydrogen generation, delivery, storage, dispensing, and FC apps
- This can be across the entire US or regional in scale

Plug's Fuel Cell Applications

Material Handling	Vans	Stationary	Other Applications
			  

• 15+ years of experience
• 60,000+ fuels cells with over 2bn kilometers of operations cumulated
• 1 kg of H2/day average consumption
• Value proposition / key advantages:
  ○ Shorter refueling times
  ○ Higher facility productivity
  ○ Greater operating ranges
  ○ Lower maintenance costs
  ○ Lower total cost of ownership
  ○ Lower environmental impact
	• Joint-venture with Renault
	• Address 30% of the light commercial vehicle sector by 2030
	• Fuel cells capacity of 30KW
	• 6 kg of H2/ day average consumption
		• Stationary fuel cell for grid support or back up solution
		• Grid stability, back up solution for data centers, hospitals, telecom infrastructure, etc.
		• Capacity up to several MWs (containerized solution)
		• Several ton(s) of H2/day consumption
			Plug is also working on other fuel cell applications:
			• Heavy duty trucks
			• Aircrafts
			• Airport's ground support equipment
			• Mining vehicles
			• Train
			• Etc.

Hyvia, our JV with Renault to Fuel the Future H2 Light-Commercial-Vehicles Champion in Europe

- Plug has created a JV with Groupe Renault to offer fuel cell utility vehicles to customers in the logistics sector and develop emission-free mobility in Europe
- Renault's 100y+ of experience in LCVs and European market leadership with Plug's best-in-class H2 technology and expertise is set to create a European champion targeting **30% of the H2 LCV market in Europe by 2030**
- **Hyvia appears as a key hydrogen demand vector for Plug and requires the deployment of a robust territorial hydrogen network on a national and continental scale**

HYVIA

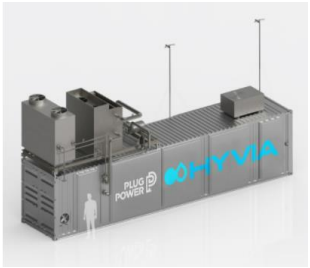
MASTER VAN H2-TECH

MASTER CHÂSSIS CABINE H2-TECH

MASTER CITY BUS H2-TECH

FUEL CELLS

GREEN H2 CHARGING STATIONS



GREEN H2 PRODUCTION AND STORAGE

Green Hydrogen at Work™

CTE Technology Development Projects

1994

1996

2018

2019

1995

2008

2018

2021

Legend Hybrid Battery Electric Hydrogen

Celebrating 30 Years

Hydrogen Fuel Cell Projects

CTE has led 40+ hydrogen based projects over the past 30 years

- AC Transit FCEB Support (13 FCEBs)
- AC Transit and OCTA FCEB ($45 million – 20 buses)
- Shell Oil Light-Duty H_2 Fueling Station
- Champaign-Urbana - FCEB deployment, Electrolysis H_2 Station
- SamTrans FCEB Deployment (10 FCEBs)
- **COMET Columbia, SC - FCEB, H_2 Station**
- Winnipeg Hydrogen Fueling Station – FCEB deployment, Electrolysis H_2 Station
- Foothill Transit – FCEB, Liquid H_2 Station
- North County Transit District - H_2 Station
- Fuel Cell Electric Class 8 Drayage Truck (Kenworth)
- Fuel Cell UPS Class 6 Delivery Van (2 deployments)
- Fuel Cell Electric Top Loader – POLA (Hyster-Yale)
- NorCal Zero Class 8 Trucks and Infrastructure (Hyundai)

Celebrating 30 Years

The Central Midlands Regional Transit Authority

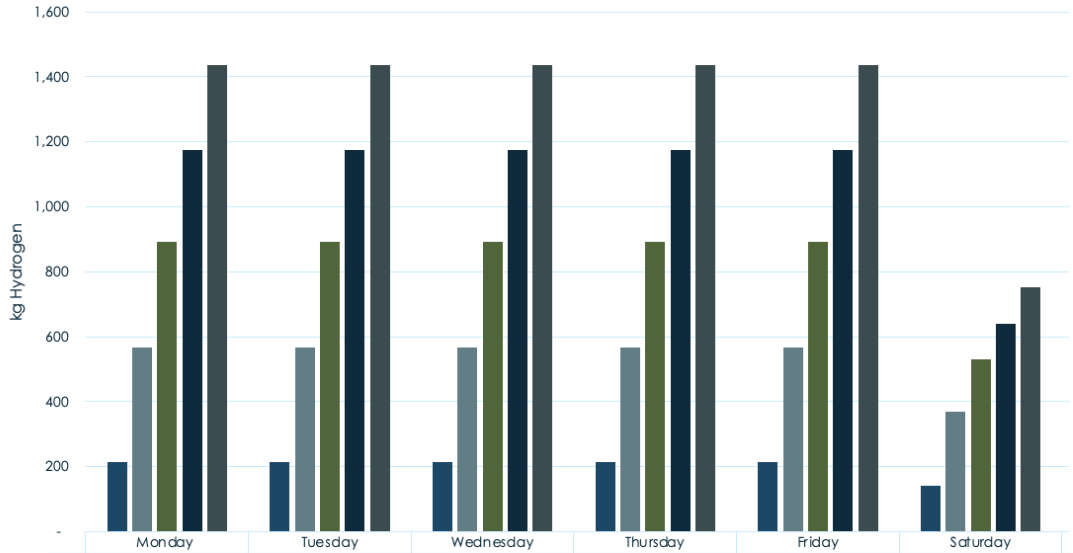
Columbia, SC, 2021-2024, $5 million

- **Deploy** 2 New Flyer fuel cell electric buses and 2) battery electric buses
- **Manage build** of hydrogen fueling station in partnership with Fluitron and Linde

Celebrating 30 Years

Hydrogen Fueling Infrastructure Assessment

Daily Hydrogen Demand



	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
2025	214	214	214	214	214	142
2032	568	568	568	568	568	368
2034	894	894	894	894	894	530
2037	1,176	1,176	1,176	1,176	1,176	641
2040	1,436	1,436	1,436	1,436	1,436	753

Each year represented on the chart is each year Operator would add additional FCEBs

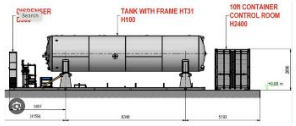
Hydrogen Fueling Scenarios

Scenario 1

Mobile Refueler for 5 years and then Permanent Station for 15 years

Scenario 2

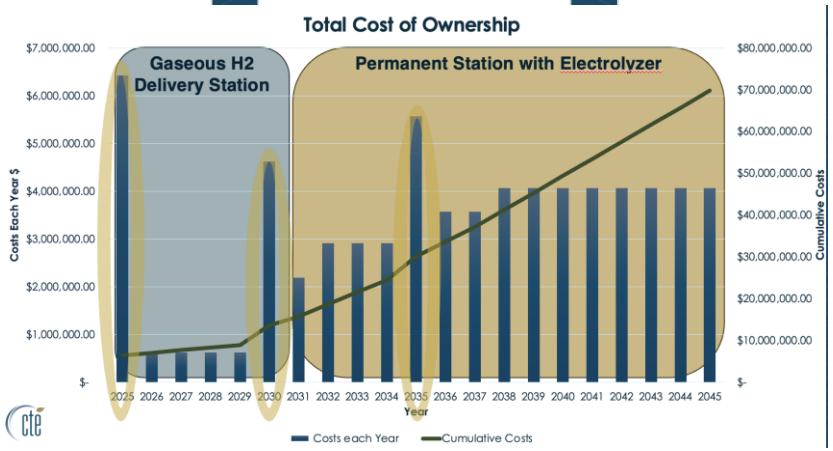
Permanent Station with Delivery for 20 years



Scenario 3

Permanent Station with Electrolyzer for 20 years

Total Cost of Ownership



Celebrating 30 Years

T680 FCEV

Fuel Cell Electric Vehicle

KENWORTH

The World's Best®

T680 FCEV

KENWORTH 100

- Class 8 Tractor
- 82,000lb GCWR
- Toyota Fuel Cell
- 450mi Range
- 15-20 min Fill Time
- 60kg H_2 Storage
- 310kW Motor
- Drayage
- Regional Haul
- Linehaul

T680 FCEV

KENWORTH 100

- Shore to Store Program
- 4 Year CARB-Funded Demonstration
- 10 T680FCEV Prototypes
- Proved Viability of Hydrogen as a Fuel
- Reduced CO_2 by 74.66 tons/Truck Annually

T680 FCEV

KENWORTH 100

- H_2 Infrastructure Commissioned by Shell
- Operating Partners
  - Toyota Logistics
  - UPS
  - Total Transportation Services Inc.
  - Southern Counties Express
- Drayage Operations
  - POLA, POLB, Port of Hueneme, Inland Empire

Southeast Hydrogen Energy Alliance

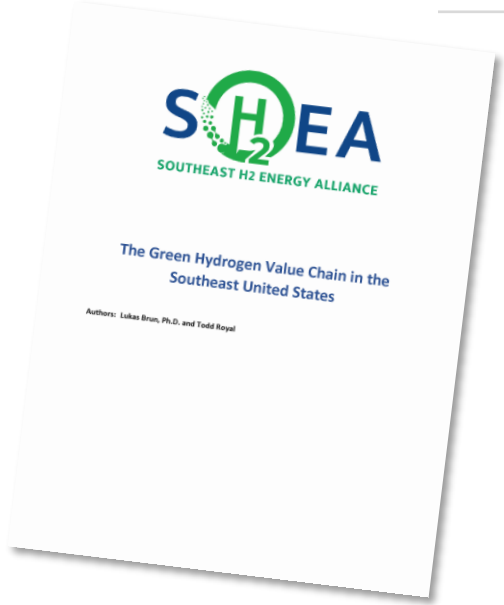
2006 Organized as the South Carolina Hydrogen and Fuel Cell Alliance

2020 Reconstituted as Southeast Hydrogen Energy Alliance

2021 Commissioned SE Green H2 Supply Chain Study

2022 Southeast Clean H2 Hub Collaboration
- Convening
  - 200+ organizations
  - 400+ professionals

2023 Launching new Working Groups and Roadmapping efforts



Board of Directors

Chairman: **Scott McWhorter** Treasurer: **Ted Motyka**

Executive Director: **Des Carlisle**

Sarah Adair	Geovanni Castano	Kevin Huang
Darrell Scott	Thomas Koeppe	Mark Johnson
	John Ledbetter	

Southeast H2 Energy Alliance

SHEA Focus Areas

Outreach & Partnerships

Stakeholders and Partners Management:

- Identify potential members and manage engagement based on SHEA mission and vision
- Develop marketing and development materials to grow SHEA's and members/partners footprint
- Quarterly Virtual Funding Opportunity Updates

State legislature Engagement:

- Energy and environmental policy development
- Energy-related budget proposals
- Identification and engagement of "champions" to support hydrogen-conducive efforts in the SHEA region

Knowledge Development

Workforce Development:

- Promotion of hydrogen-related trade and professional education at local and state level
- Scholarship and internship programs

Technoeconomic Knowledge:

- Monitor and project regional supply chain
- Infrastructure requirements and opportunities
- Supply/Demand Analysis opportunities
- Policy & Regulation Development
- Safety Training (H2 101's)
- Regional Roadmapping
- EJ and DEIA Impact mapping

WFD&ED Council:

- Industry-Academic Council on H2 Workforce and Education

Networking

H2 Events:

- Roundtables and discussion panels
- H2 Summit
- Technology, startup, company spotlights and networking
- Monthly Webinars
- State-focused events

Social Media:

- SHEA web page for news, technology, and member highlights;
- LinkedIn, Twitter for daily/weekly blasts and highlights

Meetings:

Annual Regionally Rotating Member Meeting

H2 Advocacy

Educating Communities, Government, and Stakeholders:

- Advocate for technology, projects, training, pollution, workforce development, economic development with local/state/federal stakeholder
- Webinars to raise awareness of potential of hydrogen development needs and opportunities

FUELX
Solid-State H_2 Power

The Hydrogen Storage and Power Solution

Provides 3X the energy density of lithium at 30% of the weight

Soldier Power

UAVs and UUVs

Transport *(scooters, delivery AVs, air taxis)*

Soldier Power needs lighter weight, longer runtime

UAVs/UUVs needs longer endurance (runtime), elimination of battery management & charging time

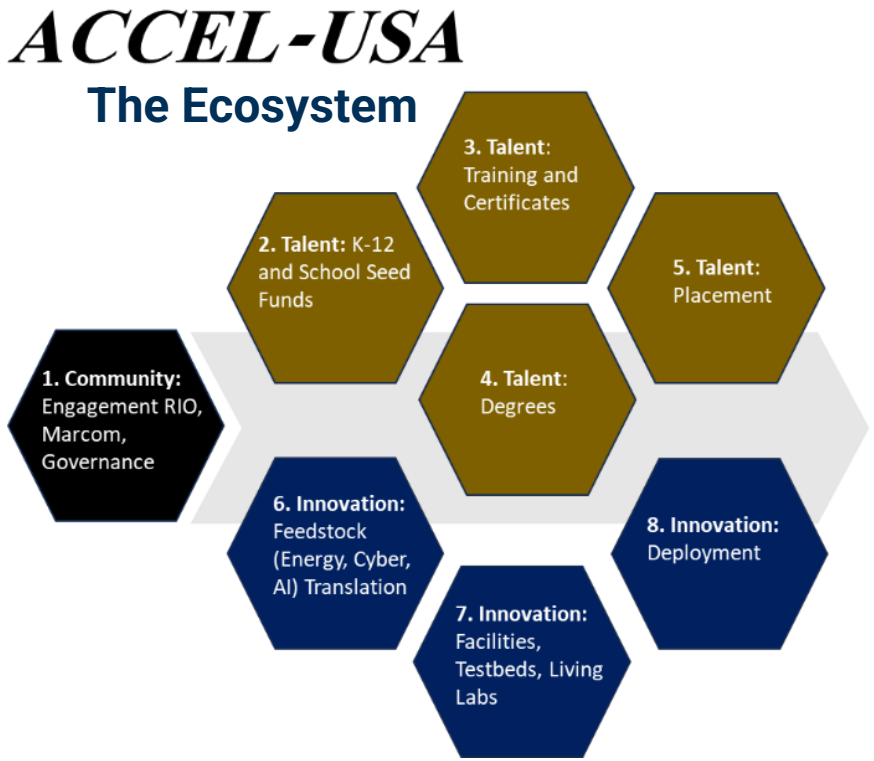
TRANSPORT needs lower emissions, range extension, and elimination of battery management & charging time

Website: fuelx.tech

ACCEL-USA (Accelerating and Catalyzing Clean Energy Leadership for the USA)

Vision: Within 10 years, make GA a globally dominate clean energy technology hub with an equitable, vibrant workforce and continuum of technology innovation, entrepreneurship and commercialization

- **Over 100 GA companies have engaged**
- **Technology Pillars in PV, Batteries, Hydrogen and EVs**
- **Technology Cross-cuts: AI and Cybersecurity leveraging the capabilities of GA-AIM (Artificial Intelligence for Manufacturing)**
- **Increase commercialization and entrepreneurship in clean energy technologies**
- **Create 'first of its kind' world-class technology testbeds to scale, demonstrate and validate the clean energy technologies of the future and provide a real-world training ground for the workforce of the future**
- **Create new, high-wage, high-quality jobs and develop a well-trained clean energy workforce**
- **Include underserved and underrepresented populations in the economic benefits realized by the Hub – from innovation through implementation**
- **Develop a more resilient domestic supply chain that is prepared to compete globally within the clean energy sector**



Georgia Tech

CLEAN CITIES GEORGIA TRANSPORTATION SUMMIT

GEORGIA TECH UPDATE

Rich Simmons

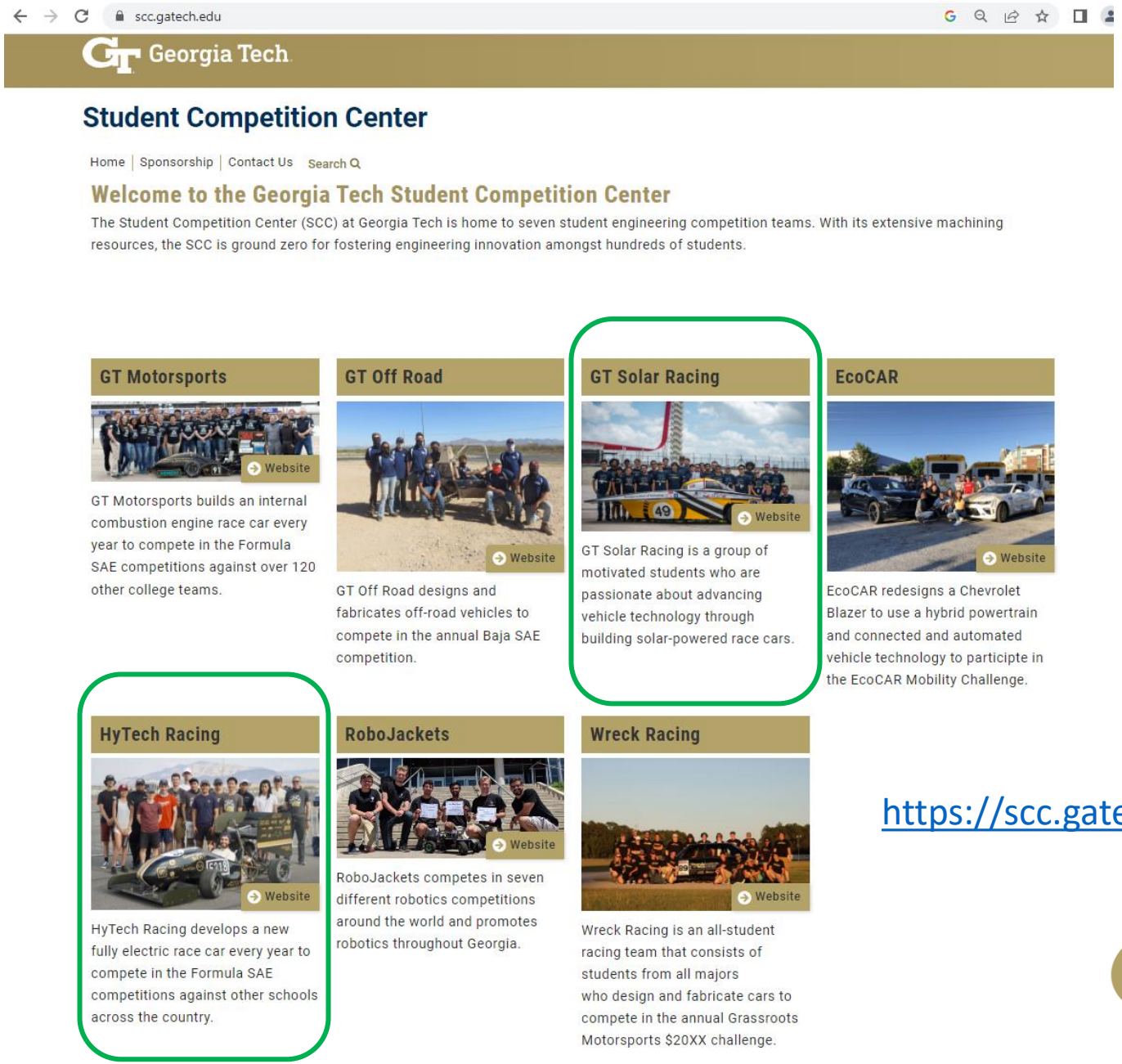
Director of Research and Studies at Georgia Tech

Georgia Tech Snapshot: Student Competition Teams

Richard A. Simmons, PhD, PE
Grant Espy, Luke Chen, Mukund Loiwal

September 2023

Georgia Tech

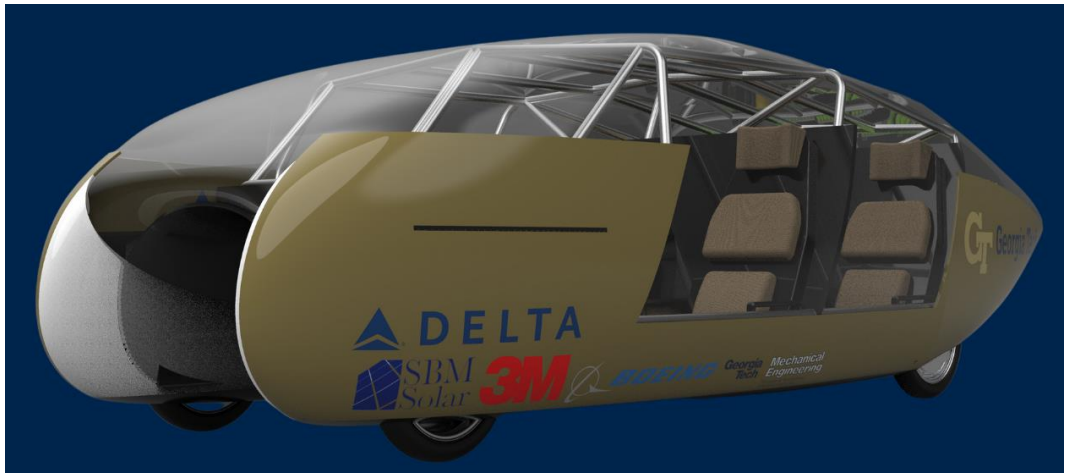


https://scc.gatech.edu/

Georgia Tech

GT Solar Racing Overview

In GT Solar Racing we compete in the American Solar Car Challenge where we drive across the country in a race with a single battery charge



GT SOLAR RACING
GEORGIA INSTITUTE OF TECHNOLOGY

GT Solar Racing: Key Challenge

Currently working on material testing for our composite chassis in order to prove its validity in possible different crash scenarios

GT Hytech Racing Team

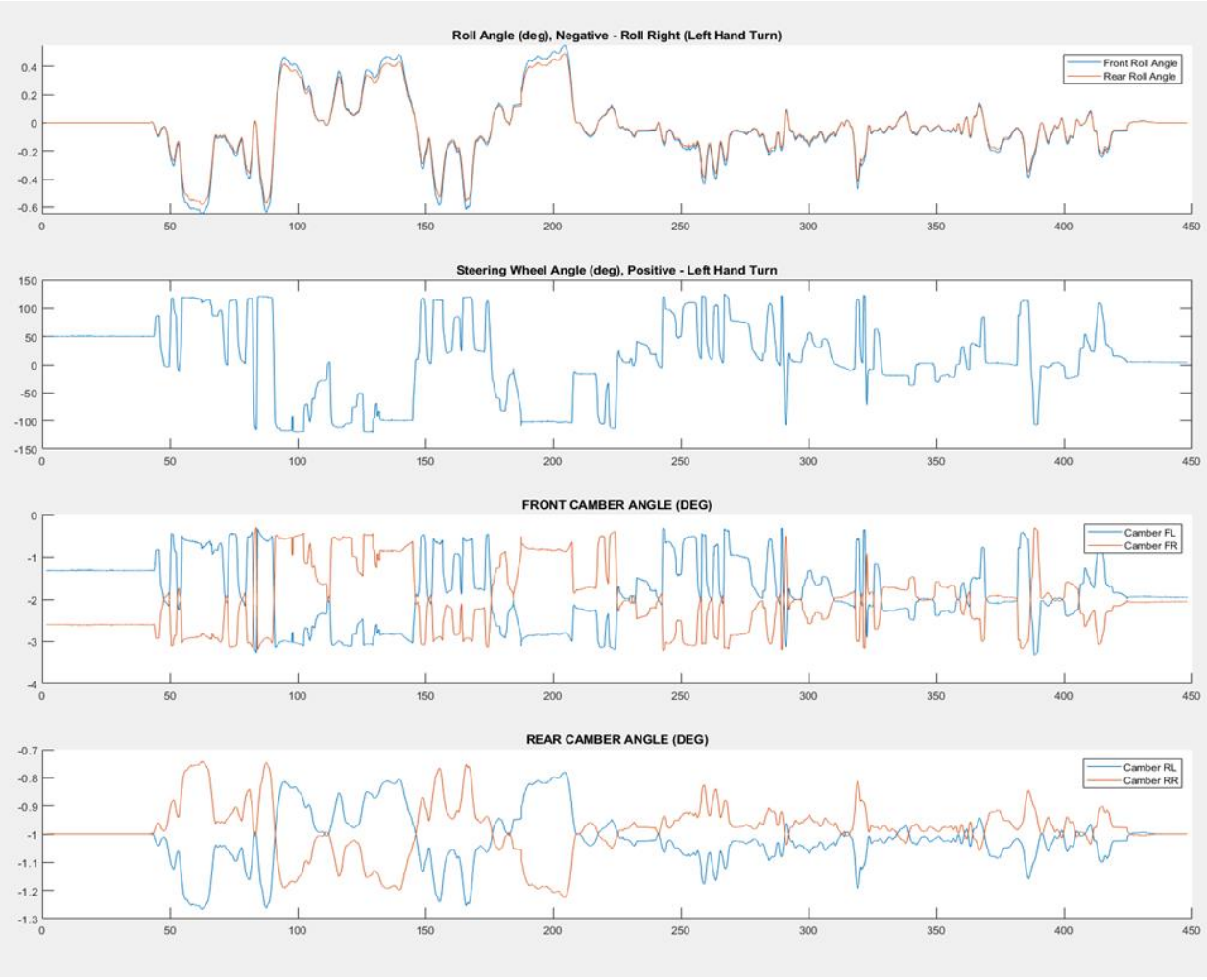
- Student-led, **fully electric, formula-style racecar** engineering team.
- We design and develop a new race car **each year**
- Compete against other schools like MIT, CMU, Cornell etc.
- **Mission: Build the next generation of engineers through the pursuit of performance as a tool, not an end goal.**

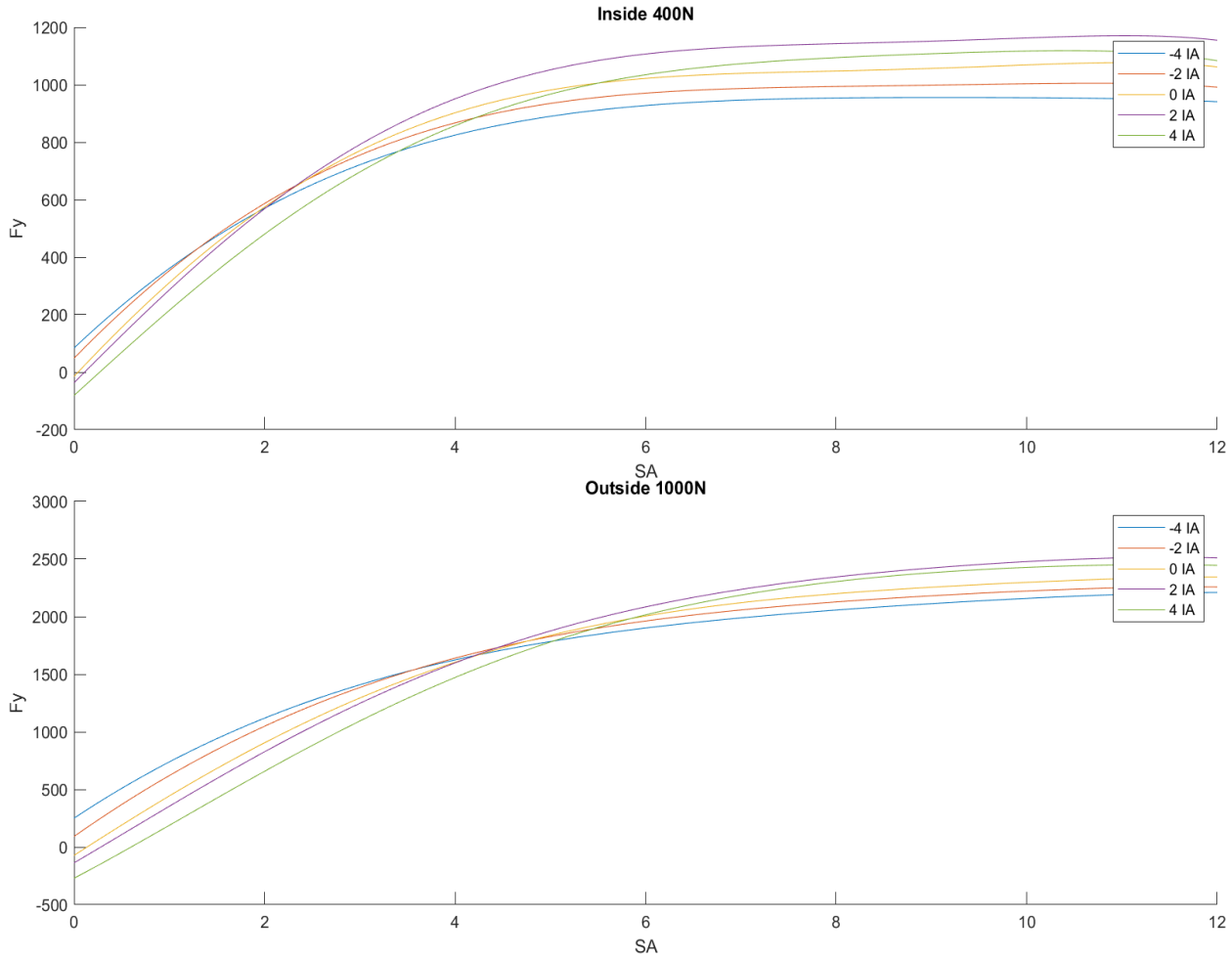
HT06 in Formula SAE Electric 2022, *Michigan International Speedway*

HT07 in Formula SAE Electric 2023, Michigan International Speedway

HT05 in Formula SAE Electric 2021, *Las Vegas Motor Speedway*

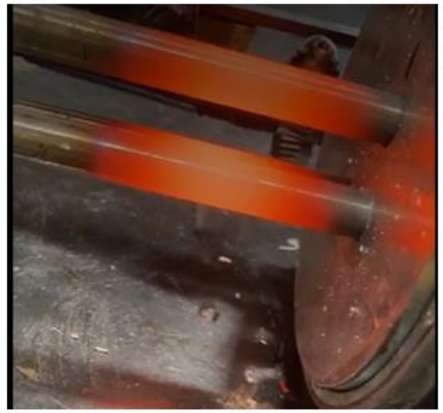
Hytech Team Challenge 1 – Tire Optimization

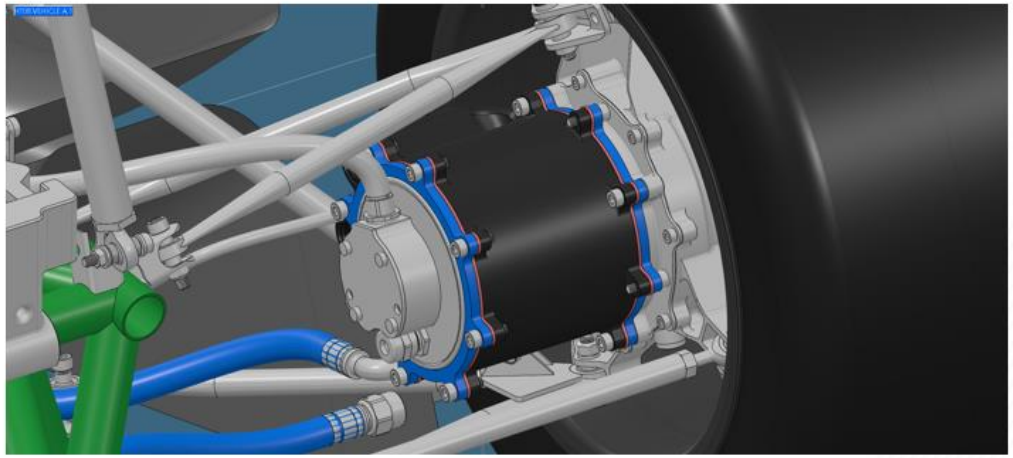




Hytech Team Challenge 2 – Cooling Jacket

- Cooling Jacket Seals
  - Types of seals
    - Neoprene
    - Buna
    - Viton
  - Real vs Spec Sheet
    - Compression
    - Lack of concentricity of motor
  - Repeatable installation
    - Winking
  - Thermal Expansion





CLEAN CITIES GEORGIA TRANSPORTATION SUMMIT

WORKING WITH EPA FOR FEDERAL FUNDING

Carol Kemker

Deputy Regional Administrator for EPA

CLEAN CITIES GEORGIA TRANSPORTATION SUMMIT

GRANTS OVERVIEW

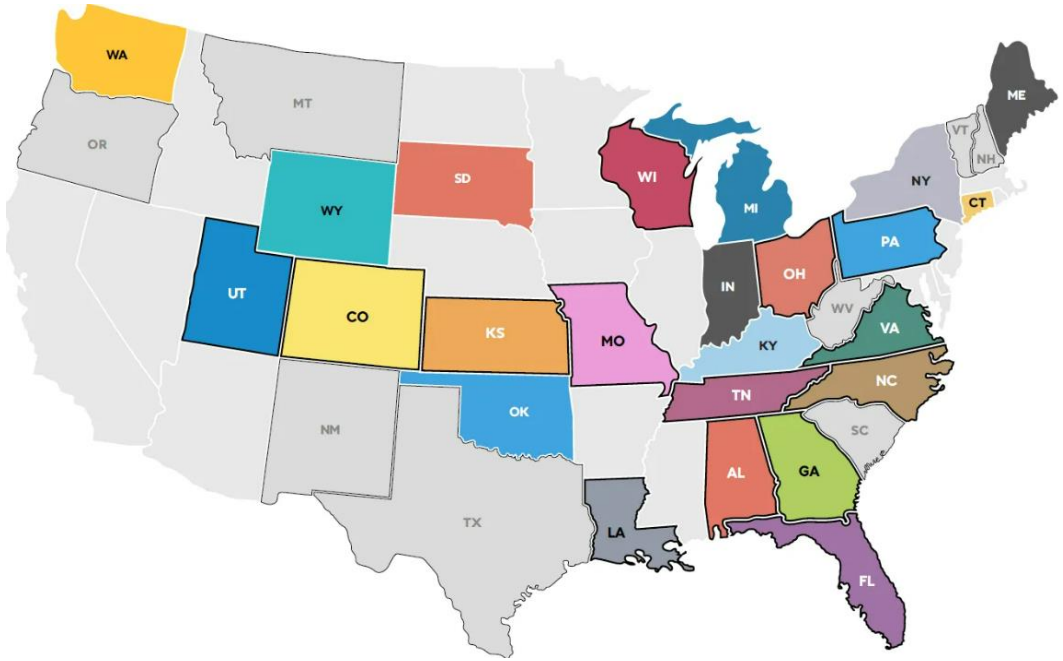
Sumner Pomeroy

Program Manager for Clean Cities Georgia & Southface Institute

Clean Cities Georgia Grant Initiatives

Drive Electric Georgia

- Part of multi-state initiative called DRIVE EVs USA with 14 original states and growing
- Increase EV adoption and infrastructure through education and stakeholder engagement through six priority areas:
  - Consumer education
  - Utility engagement
  - State & local infrastructure planning
  - State and local government officials' education
  - Dealer engagement
  - Fleet engagement



EMPOWER Workplace Charging

30 years CLEAN CITIES GEORGIA
PARTNERSHIP FOR CLEAN TRANSPORTATION

- DOE funded workplace charging grant focused on equity with over 30 states involved
- Funded to increase education and outreach to local businesses to install charging stations
- Not funded for the installations but will be working to connect businesses with resources to help pay for install costs

EMPOWER
WORKPLACE CHARGING

Clean Cities Energy & Environmental Justice Initiative

- Funding for training and a full-time Community Engagement Liaison: Pamela Fann
- Create Community Transportation Action Plans, focus areas include Buford Highway, City of Covington, and City of Jackson

New Projects

New – Awarded as Subrecipients

CALSTART

Zero Emission Vehicle East Coast Corridor Project

SACE & EV NOIRE

Advancing Equitable Access to EVs, Infrastructure, and Jobs in Underserved Communities

Funding Education and Awareness

Webinars and Presentations

- EPA's Clean School Bus Grant Webinars: Bus Technology, Infrastructure, and Utilities
- Share latest opportunities through newsletter
- Offer presentations with latest funding updates
- Open for collaboration and grant management

Future Work

Proposed – U.S. DOE VTO and EERE

1. CC-GA – Southeast Clean Cities Network Expansion
2. MILEPOST – Everest
3. TRIANGLE CLEAN CITIES – Test Real-World Charging
4. LOUISIANA CLEAN FUELS – Recharge
5. PLUG IN AMERICA – EV Events

Open Now – Closes Dec 1st

Diesel Emission Reduction Act (DERA) – looking for partners and collaboration

CLEAN CITIES GEORGIA TRANSPORTATION SUMMIT

CLEAN CITIES GEORGIA: 30 YEAR REVIEW

Don Francis
Clean Cities Georgia Director
(2009-2019)

Dale Aspy, Alan Powell, and Jim Powell
U.S. EPA

Frank Morris
Executive Director for Clean Cities Georgia

Clean Cities Georgia Transportation Summit

Organizing partners:

Clean Cities Georgia – Partnership for Clean Transportation
Southface
Georgia Tech
Georgia Power
Georgia Chamber

Gold sponsors:

Georgia In Charge
Georgia Automobile Dealers Association

Silver sponsors:

Atlanta Gas Light

Bronze sponsors:

Vesta Freight
Gas Authority
Take Comfort In Blossman Gas & Appliance
Blue Bird
ABEV Power Solutions
Kia
DSI EV Solutions