

**Houston Clean Cities Technologies  
Conference  
October 23 - 24, 2018**

# Thank you

- I want to thank Mike Fuller and the Houston-Galveston Area Council for inviting me here to be part of this great event ... **Houston Clean Cities Technologies Conference**
- I am excited about all the ideas presented here to make the great Houston metroplex a cleaner community for us to live and work in.

# Who am I?

## And why am I here 😊

- I am married with two grown children.
- I work as an airline pilot for one of the major airlines based out of the Houston area.
- After my passion for my family, and my job, I have a passion for what is best described by the following slide.

One electricity generating system,  
Six electricity consumption devices.



# Just clean energy being produced and consumed.

- That is why I feel I am here.
- To share with you all, this perspective.
- That on a personal level, we can all do our part to achieve a cleaner Houston.
- A cleaner place to live and work.

# No silver bullet ... We need to do it all!

- The other reason I am here is to share with you the idea that many great technologies are being talked about at this conference. They all have their place in the overall solution of achieving a Clean Houston.

# No silver bullet ... We need to do it all!

- Not just personal electric vehicles and equipment and solar systems.
- Yes, Alt Fuel Fleets, Heavy Duty and Idle Reduction Equipment.
- Yes, Natural Gas, LPG.
- Yes, Propane Autogas Landscaping Equipment.
- Yes, use of Solar/EV refrigeration technology.
- Yes, EV trucks.

# No silver bullet ... We need to do it all!

- Yes, Dual Fuel System for CNG.
- Yes, Propane Autogas for Vehicles.
- I believe the answer is YES, YES, YES!

# Why do I believe they are all important?

- Because they all have a place in fulfilling our needs.
- i.e. My electric cars can not carry 40,000 pounds around Houston or across the country.
- Our Tesla can carry us across the country.
- But we need vehicles that can carry 40,000 pounds around our community and across the country.
- We need those vehicles to be as clean and efficient as they possibly can be and in some of those cases, electric vehicles can't fill that niche yet.
- As technologies become available to achieve those missions more efficiently and with less cost to the environment, they should be incorporated.

# The test for each technology is:

- Does the total effect of the technology you are looking to use increase or reduce its effect on the environment for the job that it does.
- We need to incorporate energy efficiency and cost to our environment as part of the decision making as we choose the technological solution for our particular challenge.

# Drawdown.org

- One of the best works that I know of to date for looking at solutions to the reduction of green house gas emissions and the drawdown of green house gasses stored in the atmosphere and seas can be found at [Drawdown.org](http://Drawdown.org).
- They have 80 solutions listed and the process by which they can be implemented.

# Drawdown.org

- The idea is not to get hung up on the ranking of these solutions.
- All of them work together in achieving Drawdown.

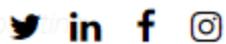
# Drawdown.org a work in progress

- Drawdown.org a work in progress
- There is a book you can buy to introduce you to the idea.
- However, this organizational effort is growing and continues to gather and process data and refine their analysis.
- Anyone can contribute to this effort by picking the area of solution and working in it.



NOTE: Energy Storage (utility-scale & distributed), Grid Flexibility, Microgrids, Net Zero Building, and other solutions modeled independently to avoid double counting impacts from other solutions.

# DRAWDOWN



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Rank	Solution	Sector	TOTAL ATMOSPHERIC CO <sub>2</sub> -EQ REDUCTION (GT)	NET COST (BILLIONS US \$)	SAVINGS (BILLIONS US \$)
1	<b>Refrigerant Management</b>	Materials	89.74	N/A	\$-902.77
2	<b>Wind Turbines (Onshore)</b>	Electricity Generation	84.60	\$1,225.37	\$7,425.00
3	<b>Reduced Food Waste</b>	Food	70.53	N/A	N/A
4	<b>Plant-Rich Diet</b>	Food	66.11	N/A	N/A
5	<b>Tropical Forests</b>	Land Use	61.23	N/A	N/A
6	<b>Educating Girls</b>	Women and Girls	59.60	N/A	N/A
7	<b>Family Planning</b>	Women and Girls	59.60	N/A	N/A
8	<b>Solar Farms</b>	Electricity Generation	36.90	\$-80.60	\$5,023.84
9	<b>Silvopasture</b>	Food	31.19	\$41.59	\$699.37
10	<b>Rooftop Solar</b>	Electricity Generation	24.60	\$453.14	\$3,457.63
11	<b>Regenerative Agriculture</b>	Food	23.15	\$57.22	\$1,928.10
12	<b>Temperate Forests</b>	Land Use	22.61	N/A	N/A
13	<b>Peatlands</b>	Land Use	21.57	N/A	N/A

# DRAWDOWN

55 Household Recycling

Materials

2.77

\$366.92

\$12.14

56

Materials

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[email sign up](#)

[donate](#)

70 Recycled Paper

Materials

0.90

\$573.48

N/A

26	<b>Electric Vehicles</b>	Transport	10.80	\$14,148.00	\$9,726.40
32	<b>Ships</b>	Transport	7.87	\$915.93	\$424.38
37	<b>Mass Transit</b>	Transport	6.57	N/A	\$2,379.73
40	<b>Trucks</b>	Transport	6.18	\$543.54	\$2,781.63
43	<b>Airplanes</b>	Transport	5.05	\$662.42	\$3,187.80
49	<b>Cars</b>	Transport	4.00	\$-598.69	\$1,761.72
63	<b>Telepresence</b>	Transport	1.99	\$127.72	\$1,310.59
66	<b>High-speed Rail</b>	Transport	1.52	\$1,038.42	\$368.10
69	<b>Electric Bikes</b>	Transport	0.96	\$106.75	\$226.07
74	<b>Trains</b>	Transport	0.52	\$808.64	\$313.86
75	<b>Ridesharing</b>	Transport	0.32	N/A	\$185.56

# TRANSPORT TRUCKS

# #40

## RANK AND RESULTS BY 2050

6.18 GIGATONS  
REDUCED CO2

\$543.54 BILLION  
NET IMPLEMENTATION COST

\$2.78 TRILLION  
NET OPERATIONAL SAVINGS

**IMPACT:** *If adoption of fuel-saving technologies grows from 2 percent to 85 percent of trucks by 2050, this solution can deliver 6.2 gigatons of carbon dioxide emissions reductions. An investment of \$544 billion to implement could save \$2.8 trillion on fuel costs over thirty years.*

The Concept S truck by MAN reduces fuel consumption by 25 percent compared to conventional 40-ton trucks. The integrated truck/trailer combination is aerodynamically designed to reduce drag. It also prevents cyclists from being dragged under the wheels. The front windshield greatly increases driver visibility and safety.

The impact of trucks on greenhouse gas emissions is oversized. Comprising just over 4 percent of vehicles in the United States and 9 percent of total mileage, they consume more than 25 percent of fuel—50 billion gallons of diesel each year. Worldwide, road freight is responsible for about 6 percent of all emissions, and growing.

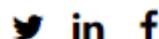
There are two tracks for increasing fuel efficiency: (1) building it into the design of new trucks and (2) driving it up in rigs already on the road.

New models are sporting:

- better engines and aerodynamics

control devices. Added up, they can make a significant dent in fuel use and costs.

# DRAWDOWN



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## TECHNICAL SUMMARY



### Trucks

Project Drawdown defines the *trucks* solution as: the increased use of fuel reduction technologies and approaches for trucking. This solution replaces conventional trucking technologies and approaches.

Heavy trucks use about 50 percent of all freight industry energy, and light trucks another 20 percent; trucks are, therefore, responsible for a majority of emissions in the freight industry. Growth in emissions continues despite the use of more efficient vehicles and despite reduced freight demand from the 2008 financial crisis. Carbon emissions from trucking and other commercial operations are predicted to grow even more rapidly than those from personal transportation.

A number of design and technology measures are readily available to increase a truck's fuel efficiency, including: low-rolling resistance tires, more efficient engines, devices to reduce idling and aerodynamic drag, and predictive cruise control. These can significantly improve fuel economy, and in many countries such measures have to some degree been implemented. This work examines the potential emissions and financial impact of a high adoption of a package of these technologies instead of continued use of conventional trucks.

### Methodology

*Total Addressable Market* [1]

The total addressable market for *trucks* is defined as the total trucking freight demand to



# TRUCK FUEL EFFICIENCY

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# This was just an introduction.

- This was just an introduction on [Drawdown.org](http://Drawdown.org)
- There is a great amount of information on this topic in there.
- The key to achieving clean cities is for all of us to do our part.
- To think with efficiency and stewardship of our environment in mind.

As an individual household we are doing our part. We are not done 😊



# Thank you again!

- Kevin Douglass
- Houston Electric Auto Association
- HEAA.org