



RENEWABLE PROPANE

Joy Alafia

joy@westernpga.org

CLIMATE CHANGE



NEW MARKET DRIVERS

- PUBLIC
- GOVERNMENT
- INDUSTRY/CORPORATIONS

PUBLIC

CONCERNS REGARDING CLIMATE CHANGE - U.S.



56%



68%



69%



75%



78%

Source: Pew Research 2018 Study

CORPORATIONS

**78% of S&P 500 Companies
Have Sustainability Statements**

GOVERNMENT

Paris Agreement

$< 2^{\circ}\text{C}$

$< 3.6^{\circ}\text{F}$

G20 – NATIONALLY DETERMINED CONTRIBUTIONS

Target description	
South Africa	22% reduction against baseline scenario by 2030
Mexico	130 MtCO ₂ e reduction on annual dynamic baseline by 2030
Korea	60% to 65% reduction against 2005 carbon intensity by 2030
Canada	40% reduction against 1990 absolute emissions by 2030
Japan	37% reduction against 2005 absolute emissions by 2025 and indicative 43% against 2005 by 2030
Australia	26% reduction against 2013 absolute emissions by 2030
US	30% reduction against 2005 absolute emissions by 2030
India	21% reduction against business as usual scenario by 2030
China	26% to 28% reduction against 2005 absolute emissions by 2030
EU	37% reduction against baseline scenario by 2030
Brazil	26% to 28% reduction against 2005 absolute emissions by 2025
Russia	Emissions in a range between 398 and 614 MtCO ₂ e by 2025-30
Indonesia	41% reduction against business as usual emissions by 2030
Turkey	33% to 35% reduction against 2005 carbon intensity by 2030
Saudi Arabia	25% to 30% reduction against 1990 absolute emissions by 2030

Source: PWC

<https://www.pwc.co.uk/sustainability-climate-change/assets/pdf/low-carbon-economy-index-2019.pdf>

GOVERNMENT ACTION – CARBON TAX/CARBON MARKETS

Targets:

Transportation

Building Energy

Applications



NATIONALLY

Renewable Fuels Standard (RINS)

Green Economy

National Low Carbon Fuels Standard?

National Cap-and-Trade?



RENEWABLE PROPANE

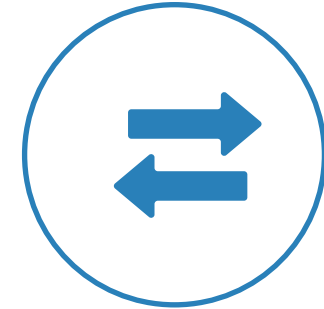
RENEWABLE PROPANE BENEFITS



Low NOx Engines



Ultra-low & Negative Carbon
Footprint



Fungibility



Economics



Environmental Steward

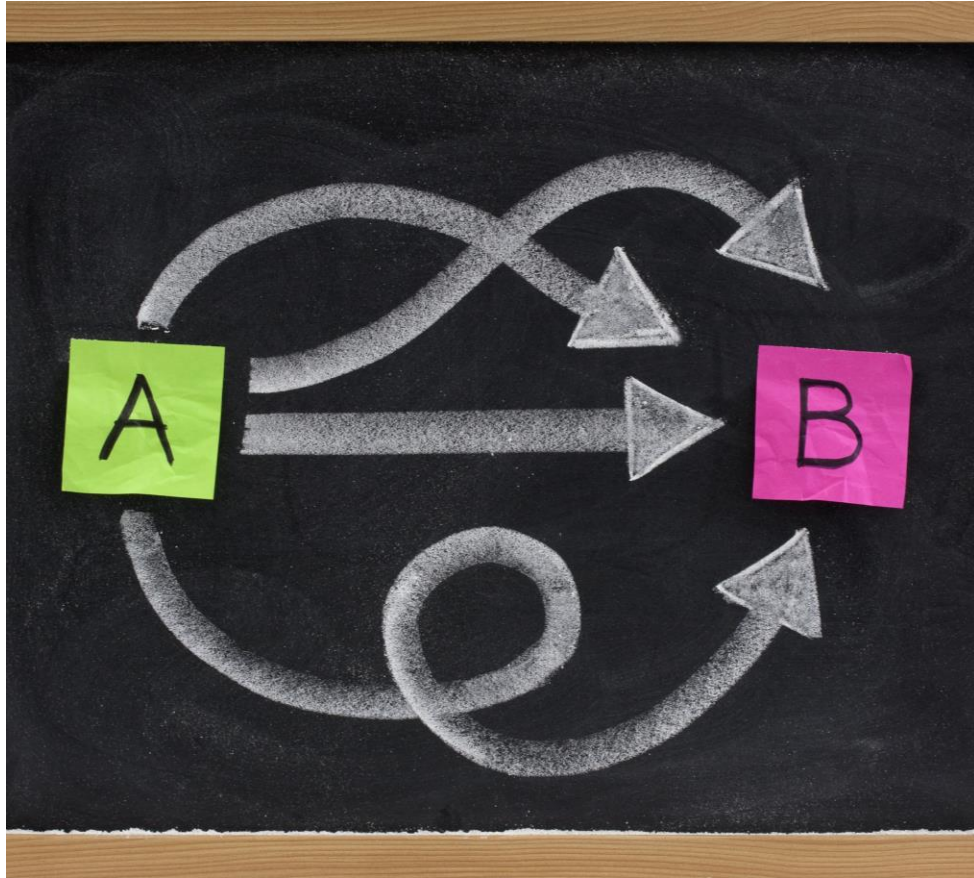
**Where does renewable
propane come from?**





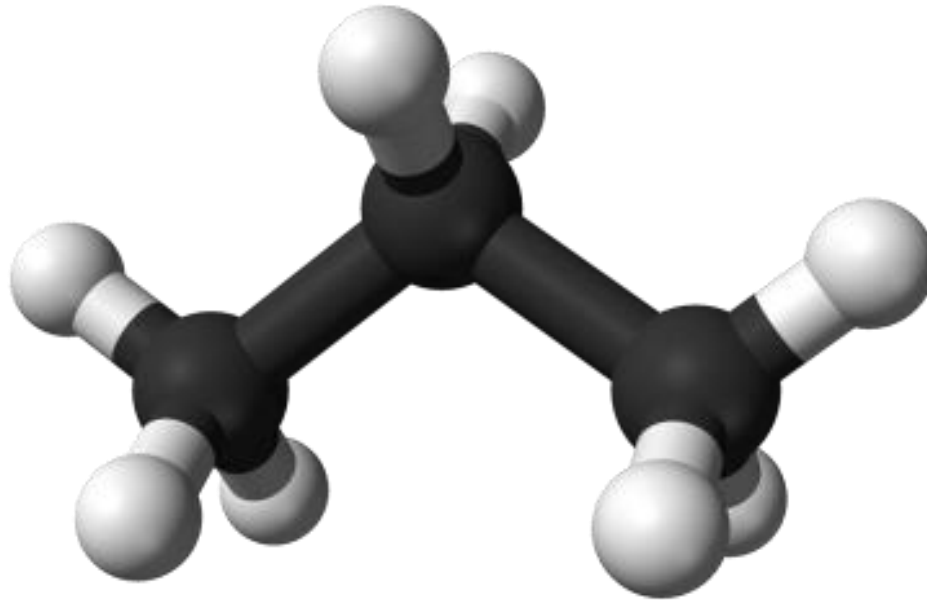
How is it produced?

PATHWAYS FOR RENEWABLE PROPANE

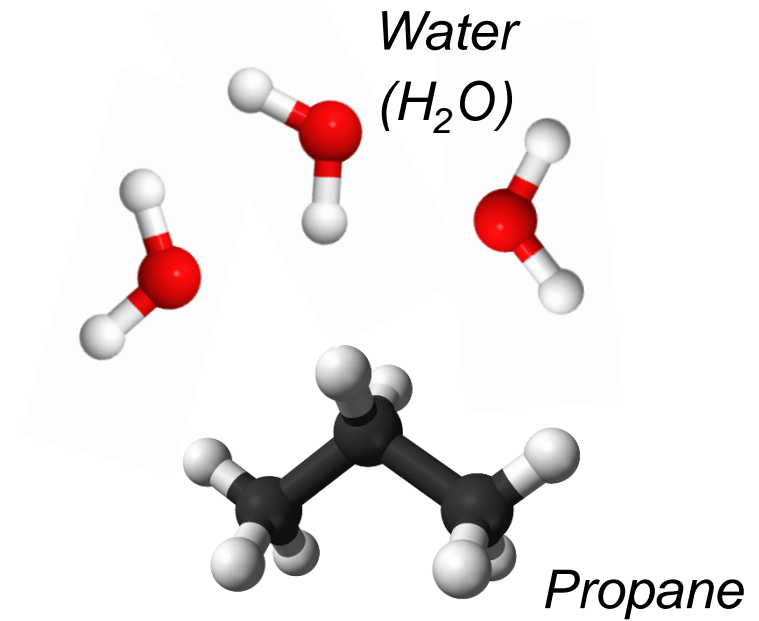
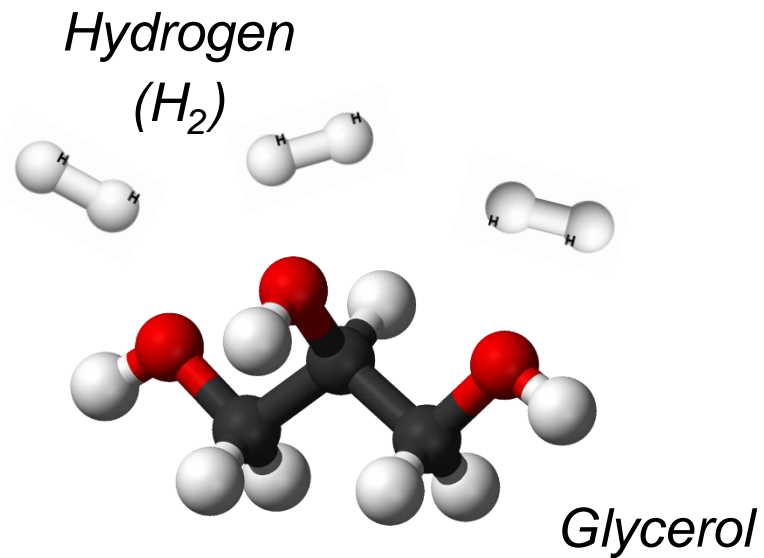


- **Gasification – syngas, from biomass**
- **Gasification – syngas, from waste**
- **Pyrolysis from biomass**
- **Glycerin-to-propane**
- **Power-to-X**
- **Biogas Oligomerization**
- **Alcohol to jet/LPG**
- * **Plus ammonia, DME, hydrogen, etc.**

PROPANE MOLECULE (C₃H₈)

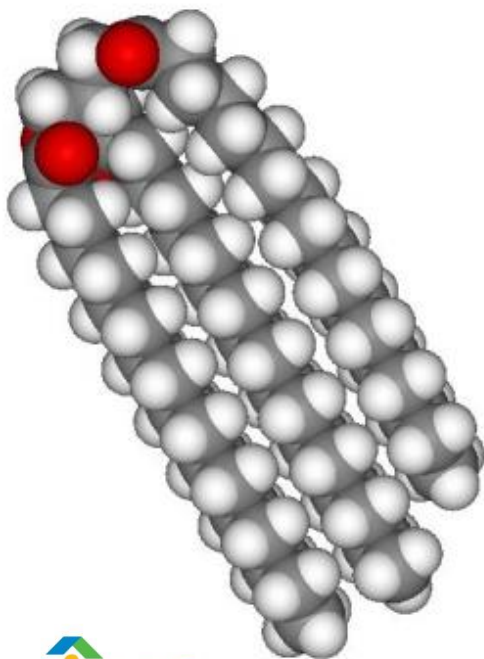


HYDROTREATING PROCESS (HVO)

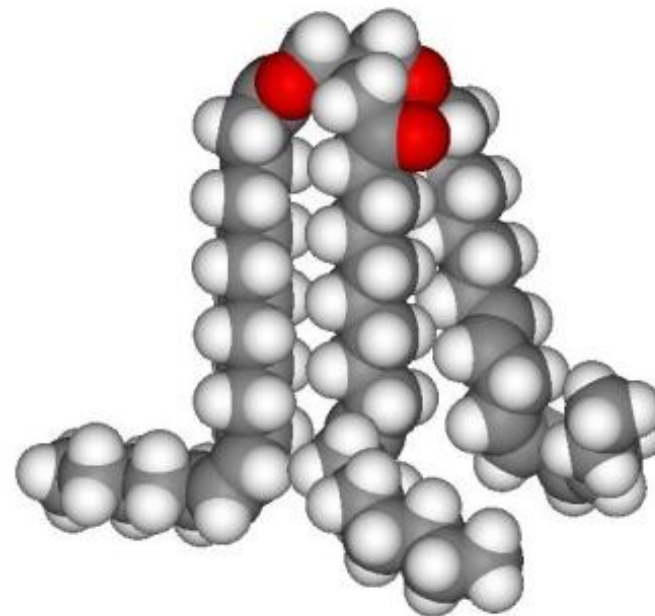


FEEDSTOCK (FATS & OILS)

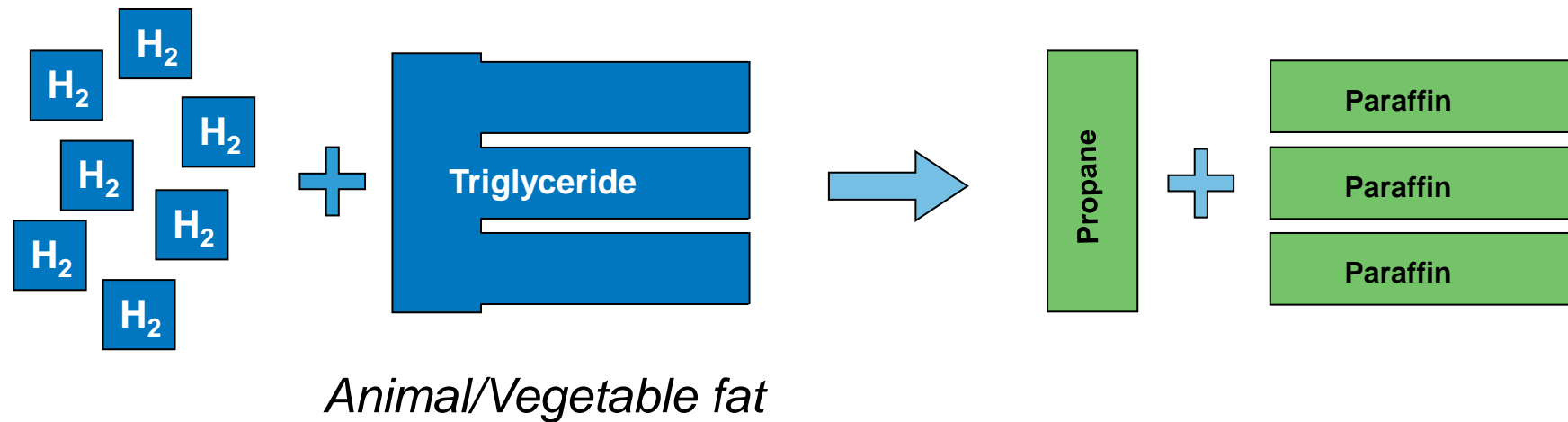
Animal Fat
(Saturated Fat)



Vegetable Oil
(Unsaturated Fat)



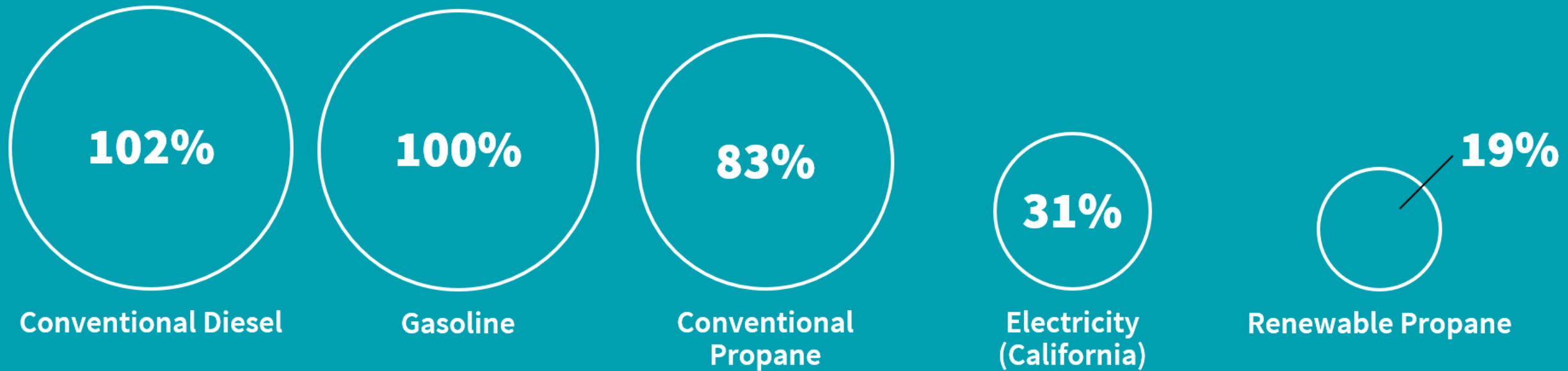
RENEWABLE DIESEL (& RENEWABLE LPG)



Hydrotreating reaction

LIFE CYCLE EMISSIONS

Carbon Intensity



CARBON MARKETS

CARBON MARKETS

PROGRAM	\$/gal	
	Fossil LPG	Renewable LPG
LCFS Vehicles when displacing gasoline	\$0.13	\$0.75
LCFS Vehicles when displacing diesel	(\$0.01)	\$0.64
LCFS Forklifts (gasoline)	\$0.13	\$0.75
AB32 (Cap & Trade)*	(\$0.87)	\$0.00
RINs	\$0	\$1.10

POTENTIAL LCFS CREDITS

Propane & rDME Blend = \$0.88 per gallon

Renewable Propane & rDME Blend = \$1.77 per gallon

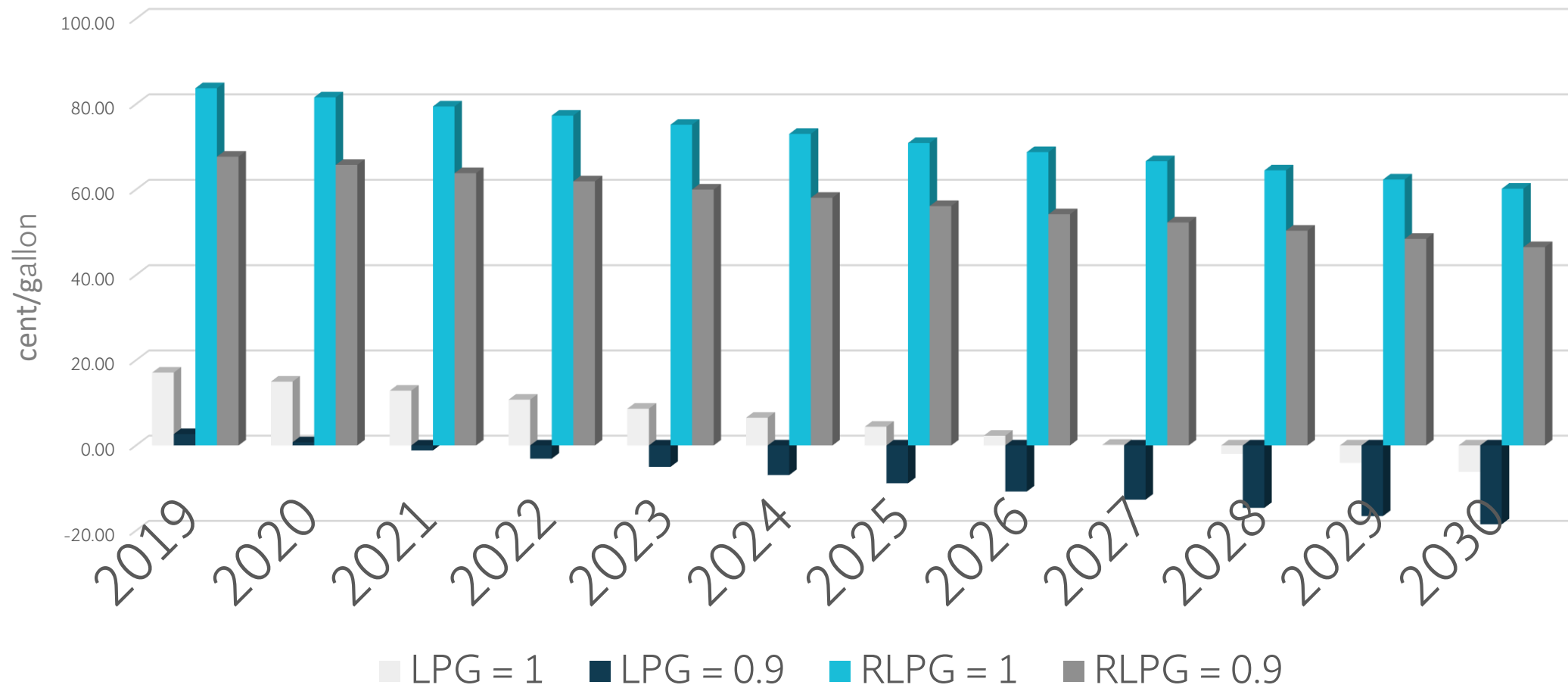
LCFS 2020 Credit Price \$190/ton

RLPG CI of 45 g CO₂e/MJ v. 83 g CO₂e/MJ for fossil propane

*RLPG should generate \$0.10 for AB32

RINS as of Feb, 2021

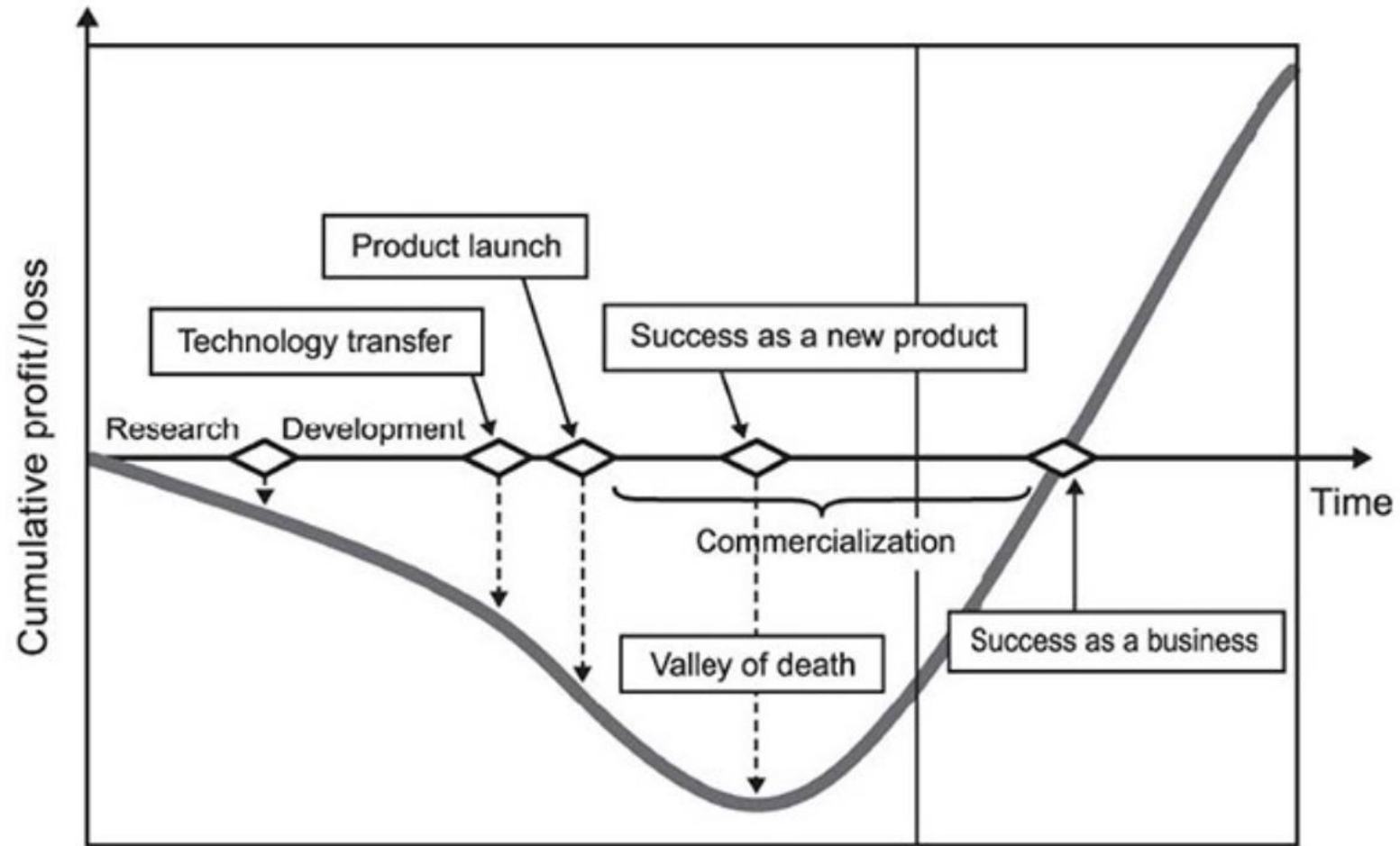
CALIFORNIA LCFS – CREDITS/DEFICITS



SUPPLY



VALLEY OF DEATH



Source: Malcolm Auld, Heartchain Article "How to Avoid the Death Valley Curve" Jul. 2, 2018

FROM ZERO TO COMMERCIALIZATION



NESTE OIL - ROTTERDAM



U.S. VOLUME **POTENTIAL** (MILLION GALLON/YR)

Producer	Location	RLPG capacity	Status 2021
BP	Blaine, WA	2.7	Operating
Diamond Green Diesel	Norco, LA	5.4	Operating
Diamond Green Diesel	Port Arthur, TX	48.2	Start-up 2024
Global Clean Energy Holdings	Bakersfield, CA	18.8	Onstream late 2021
HollyFrontier	Cheyenne, WY	10.7	Start-up early 2022
HollyFrontier	Artesia, NM	13.4	Start Q1 2022
Kern Oil & Refining	Bakersfield, CA	NA	Unknown
Marathon	Martinez, CA	36.8	Start 2022
Marathon	Dickinson, ND	0.8	Operating
Next Renewable Fuels	Portland, OR	80	Unknown
Phillips 66	Rodeo, CA	34	Start 2024
Renewable Energy Group	Geismar, LA	10.1	Operating
Sinclair	Sinclair, WY	14.8	Operating
World Energy	Paramount, CA	3.8	Operating
Capacity sum		280	

Source: Eric Johnson, Atlantic Consulting

RENEWABLE PROPANE CUSTOMERS

Coca-Cola

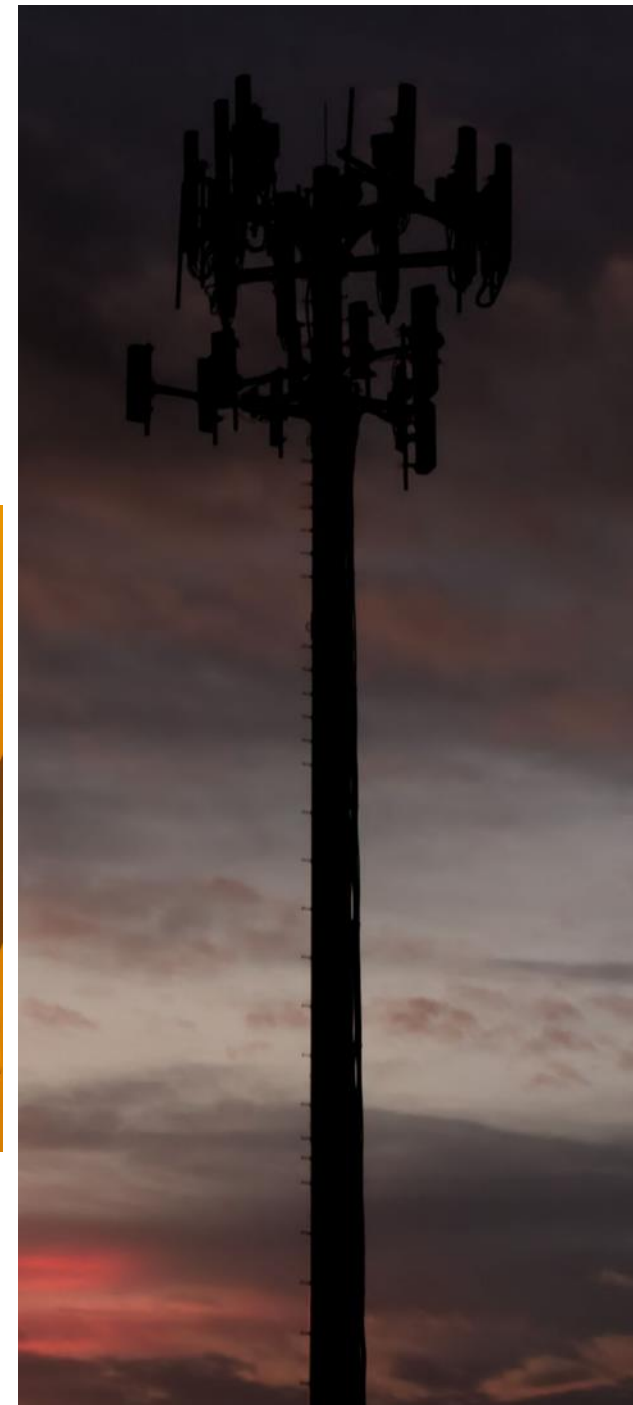
L'Oréal

U-Haul

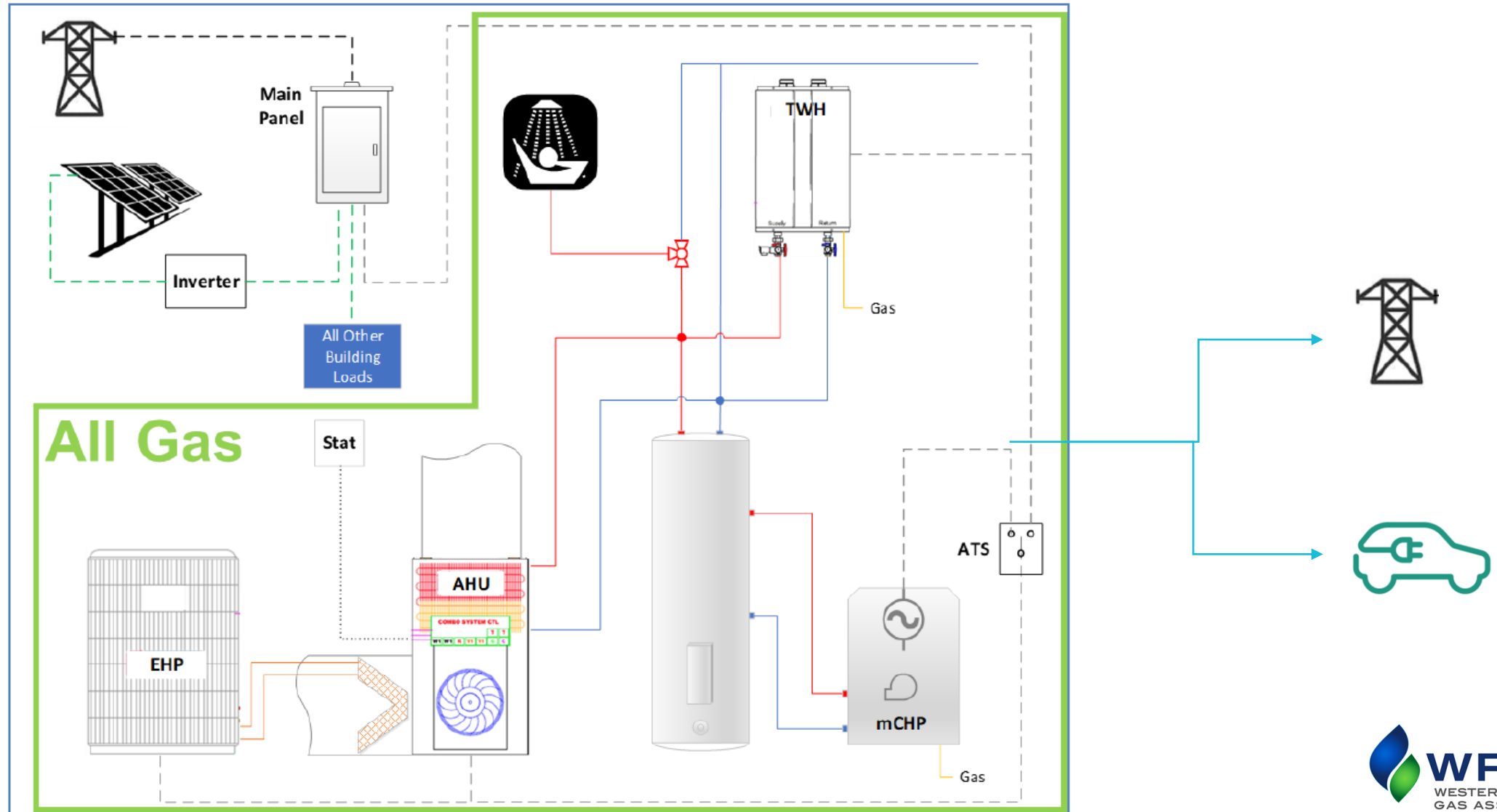
School Districts

Government Entities

FUTURE



FUTURE



WPGA'S SUSTAINABILITY COMMITMENT

100% RENEWABLE PROPANE FOR CALIFORNIA BY 2030



WPGA[®]

**WESTERN PROPANE
GAS ASSOCIATION**

Leading the way for renewable propane

Thank You

JOY ALAFIA

joy@westernpga.org