Propane Education & Research Council

RENEWABLE PROPANE

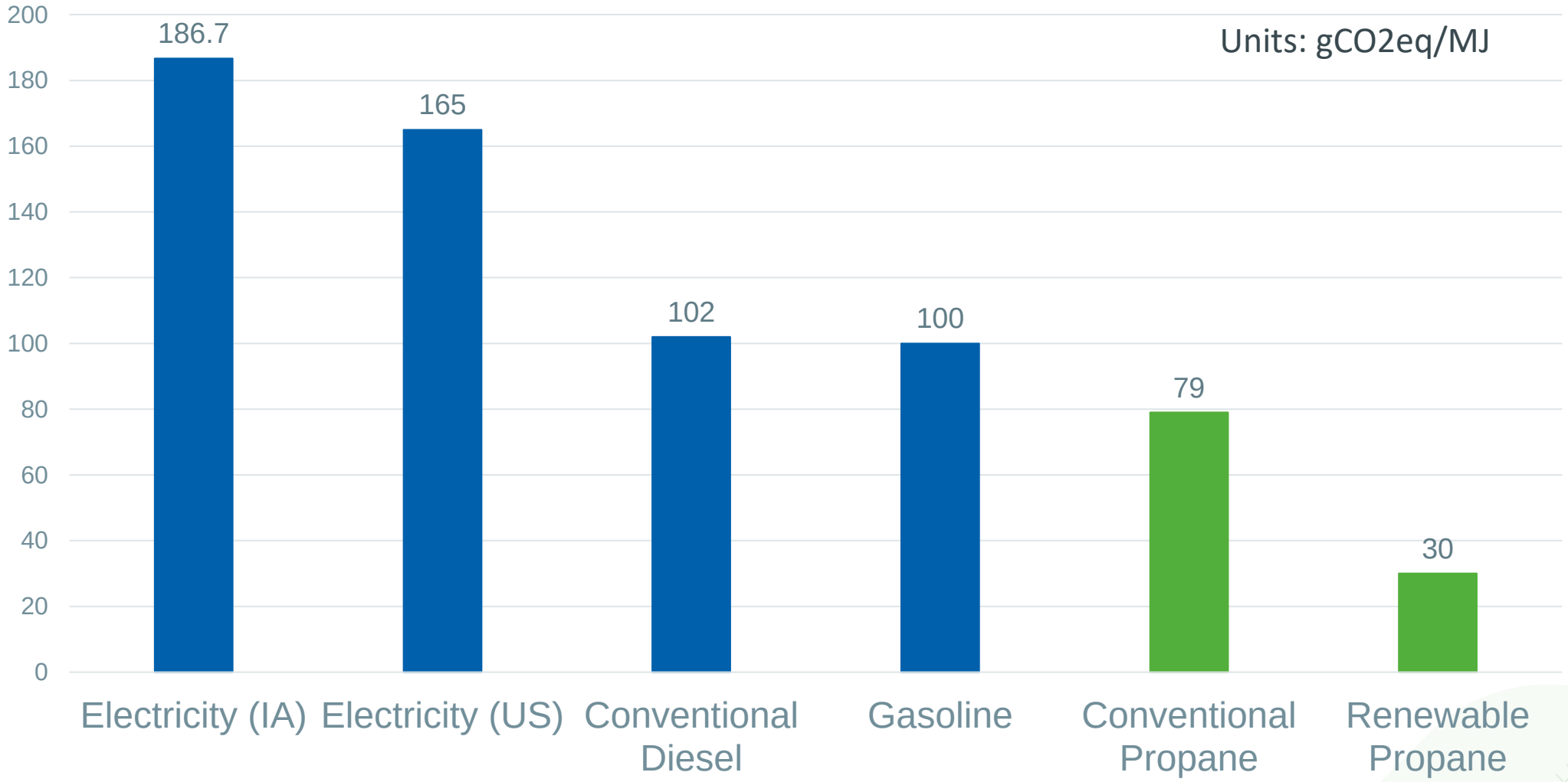
Tucker Perkins

President and CEO
Propane Education & Research Council

ENERGY FOR EVERYONE
propane

WHY RENEWABLE?

Carbon Intensity

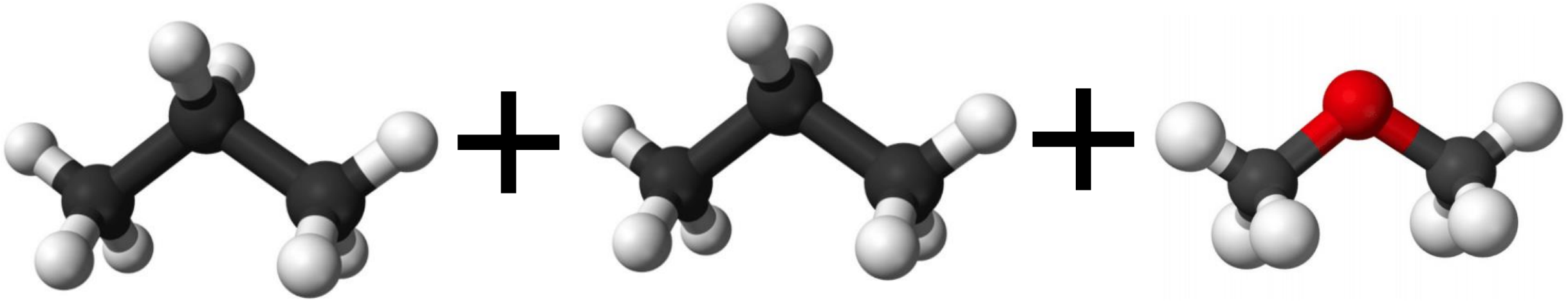


Carbon-Neutral Cocktail – The Future?

80 gCO2eq/MJ

20.5 gCO2eq/MJ

-278 gCO2eq/MJ



Conventional
~30% by mass

Renewable
(NA Sourced used cooking oil)
~50% by mass

Renewable
(Dairy gas based)
~20% by mass

~0 gCO2eq/MJ

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.

- Low carbon intensity
- Inexpensive feedstock
- Abundant feedstock
- Low energy conversion
- Final product competitively priced

Renewable Propane Production

Source: Menecon Consulting/Atlantic Consulting

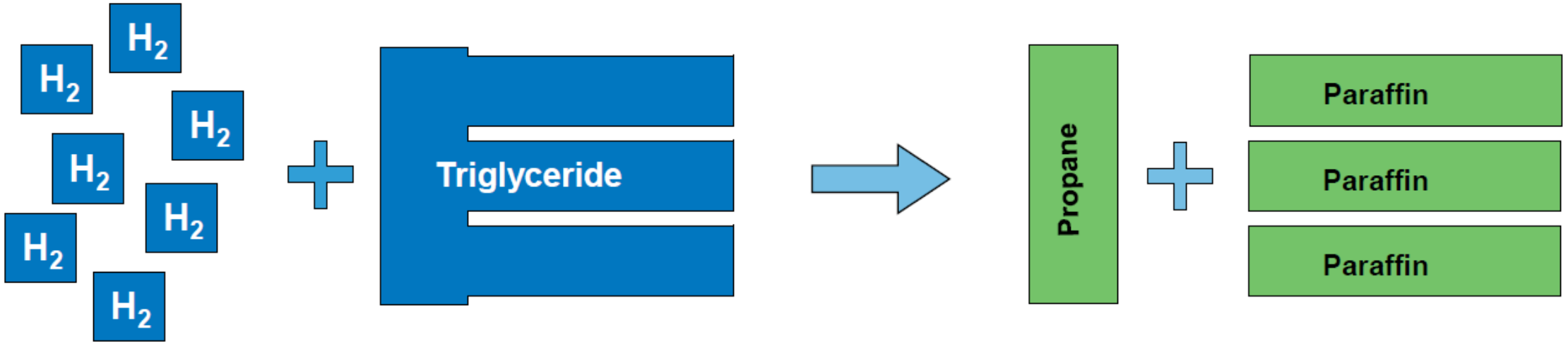
Producer	Location	RP Capacity (Millions)	Status 2020
BP	Blaine, WA	2.7	Operating
Diamond Green Diesel	Norco, LA	5.4	Operating
Diamond Green Diesel	Port Arthur, TX	48.2	Start-up 2024
Global Clean Energy Holdings	Bakersfield, CA	18.8	Online late 2021
HollyFrontier	Cheyenne, WY	10.7	Start-up early 2022
HollyFrontier	Artesia, NM	13.4	Start Q1 2022
Kern Oil & Refining	Bakersfield, CA	NA	Unknown
Tesoro Marathon	Dickinson, ND	0.8	Operating
Marathon	Martinez, CA	36.8	
Next Renewable Fuels	Portland, OR	80	Unknown
Philips 66	Rodeo, CA	34	
Seaboard Energy		8.4	Q4 2021
Sinclair	Sinclair, WY	14.8	Operating
World Energy	Paramount, CA	3.8	Operating
	Potential Capacity Sum	*288.4*	

Commercial Production Of Renewable Propane

- Current production is directly linked to the amount of RHD produced.
- Carbon Intensity (CI) depends on feedstock
  - Renewable propane CIs are the same as those for RHD under the California LCFS
  - Conventional propane has a CI of 83g CO_2/MJ in California

	Used Cooking Oil	Raw UCO	Corn Oil	Animal Fats	Soybean Oil
CA LCFS Carbon Intensity for REG renewable propane, by feedstock [g CO_2/MJ]	24.35	18.99	34.32	35.71	56.57

Renewable Diesel (And Renewable LPG)

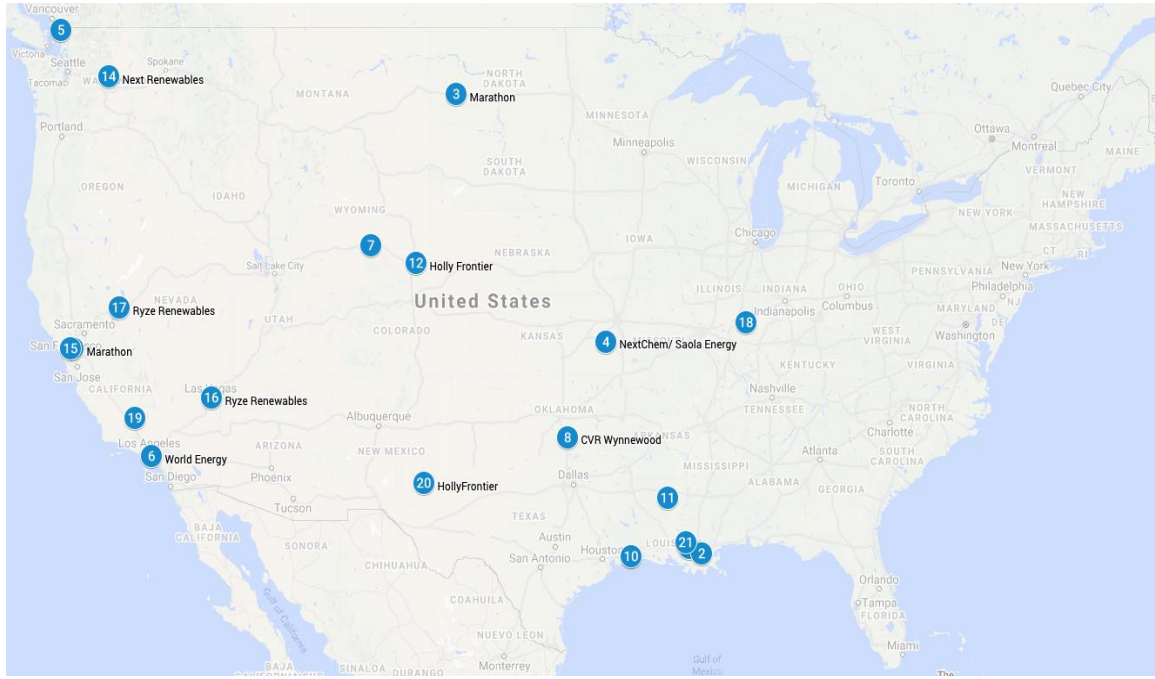


Animal/Vegetable fat

Hydrotreating reaction

Commercial HEFA Production of RD and SAF – USA

- Over 790M Gal/y (2.4M t/y) RD/SAF production in service
  → ~68M gallons potential
- Claimed growth of RD/SAF to over 6.3B Gal/y (19M t/y)
  → ~540M gallons potential
- Highest capacity in Louisiana area > 2.5B Gal/y (7.8M t/y), California > 1.8B Gal/y (5.7M t/y)
- **None on the east coast**



Biofuels Digest, Feb. 2021. https://www.biofuelsdigest.com/bdigest/2021/02/08/50-renewable-diesel-projects-and-the-technologies-behind-them/10/ , Biodiesel Magazine, Jan. 2021

	Company	Location	Existing Gal/y	Additional Gal/y	Status	Technology
1	Renewable Energy Group	Geismar, LA	90M	250M	Expanding 2023	
2	Diamond Green – Valero	Norco, LA	290M	400M	Expanding 2021	Ecofining
3	Marathon	Dickinson, ND	180M			HydroFlex
4	NextChem/ Saola Energy	Garnett, KA	5M			
5	BP Cherry Point	Birch Bay, WA	42M			
6	World Energy	Paramount, CA	35M	230M	Expanding 2023	
7	Sinclair/HollyFrontier	Sinclair, WY	150M	240M		
8	CVR Wynnewood	Wynnewood, OK		100M	Under construction	HydroFlex
9	Diamond Green – Valero	Port Arthur, TX		470M	Under construction 2024	
10	Emerald Biofuels	Port Arthur, TX		110M	Under construction	
11	Green Fuels	Port of Columbia, LA		32M	Planning 2025	
12	Holly	Cheyenne, Wy		90M	Planning 2022	
13	Marathon	Martinez, CA		730M	Converting 2023	HydroFlex
14	Next Renewables	Columbia River, OR		750M	Planned 2024	
15	Phillips 66	Rodeo, CA		650M	Planning 2024	
16	Ryze Renewables	Las Vegas, NV		100M	Planning	
17	Ryze Renewables	Reno, NV		50M	Planning	
18	St Josheph Renewable Fuels	Newton, IL		90M	Planning	
19	Bakersfield Renewable Fuels	Bakersfield, CA		230M	Converting 2022	HydroFlex
20	HollyFrontier	Artesia, NM		110M	Converting 2022	
21	Grön Fuels	Baton Rouge, LA		900M	Planning 2030	
		Total	**792M**	**5,532M**		

What are the Roles of PERC and NPGA?

NPGA (Make It Fair)

- Regulation, tax policy, government investment, codes, standards

PERC (Make It Real)

- Awareness, market growth, research, studies (WLPGA)
- Producers and their groups (GPA, ABB, RFA)
- Customers
- OEM

What is a Marketer to do?

- Know enough to be able to speak about it
- Discuss with your suppliers
- Discuss with your customers?
- Discuss in your state associations
- Be aware of changes in the landscape

Tucker Perkins

President & CEO

Propane Education & Research Council

202.452.8975

Tucker.Perkins@propane.com