PowerSecure

4068 Stirrup Creek Drive
Durham, NC 27703

powersecure.com
microgrid360.com

# Uncovering the Science Behind Renewable Fuel: On the Road to Net Zero

Both energy end-users and producers are accelerating toward increasingly near-term decarbonization goals. In the face of this ongoing industry-wide shift, renewable replacements to conventional petroleum-based fossil fuels are becoming more popular and widely accessible.

However, as fuel technology advances and alternatives to fossil fuels are implemented, there is a growing concern about how to meet decarbonization goals without losing resiliency and stranding existing assets along the way. Renewable fuels, including renewable diesel and renewable natural gas, introduce a host of benefits to reduce carbon footprints across the supply chain, maintain operational resiliency, and avoid costly modifications or upgrades to existing assets.

This article uncovers the science behind the latest advancements in renewable fuels and the benefits you can expect when using them in an energy generation system.

## How Renewable Fuels are Produced: Quick Facts

### Renewable Diesel

Whereas fossil diesel is produced through the extraction and refinement of crude oil from the ground, renewable diesel is produced from 100% renewable biowaste, using already existing carbon molecules in the atmosphere, which can be processed into renewable fuels over and over again. It's a virtuous, circular cycle. Renewable diesel is chemically similar to fossil diesel and does not emit any new carbon to the atmosphere. Renewable diesel producers are exploring a new generation of feedstocks, such as algae, agricultural waste and municipal solid waste, which will further displace new carbon emissions from fossil fuel sources.

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### Is Renewable Diesel the Same as Biodiesel?

Although biodiesel is often confused with renewable diesel, the two are different categories of fuel. The process used to make biodiesel, transesterification, where biowaste is purified but oxygen is not removed, which impacts the fuel's performance in low temperatures and during storage, and creates higher emissions.

When producing renewable diesel, the process of hydrotreating avoids the performance and storage issues of biodiesel by removing oxygen entirely, making it a viable substitute for fossil diesel with no blending required.

### Renewable Natural Gas

Renewable natural gas (RNG) is a pipeline-quality gas produced from biomass. It is produced by capturing methane from the decomposition of organic biowaste — such as food waste, animal manure, wastewater treatment plants, and landfills. The captured methane is then filtered for impurities and undergoes a biochemical process, such as anaerobic digestion or thermochemical gasification, resulting in fuel that is comparable to fossil natural gas.

## Benefits of Renewable Fuels

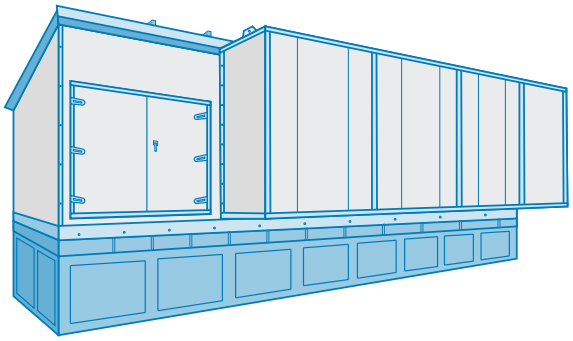
### Drop-in Ready

Renewable diesel and RNG are drop-in fuels, meaning they are both fully interchangeable with their fossil counterparts. Renewable diesel meets the same ASTM D975 specification (a series of 13 tests diesel fuel must meet at the time of delivery) as fossil diesel, making it a drop-in fuel source for diesel-fired engine-generators like the Volvo Tier 4 Final and Stage V. RNG is interchangeable with traditional pipeline-quality natural gas and is fully compatible with the U.S. pipeline infrastructure. Renewable diesel and RNG can be fully utilized in existing diesel-fired and natural gas-fired assets with no modifications or additional investment required.

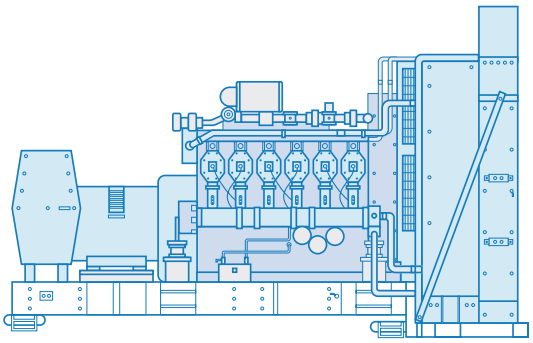
### Convenience and Performance Enhancements: Year Round

Renewable diesel has a high centane number, over 70 (compared to 48-52 for fossil diesel), meaning it ignites faster and results in a more complete combustion. This results in a cleaner burn with less particulate matter build-up inside the engine generator which leads to a less frequent need for unscheduled maintenance and, in turn, substantial cost-savings over the lifetime of the engine-generator. The cold properties of renewable diesel can be adjusted via isomerization, thereby satisfying even severe winter and artic climate grades as low as -40˚C. There is also close to zero risk of water absorption or microbial growth during its handling and storage, due to its non-polar molecular structure, which allows the fuel to be stored for long periods of time without degradation.

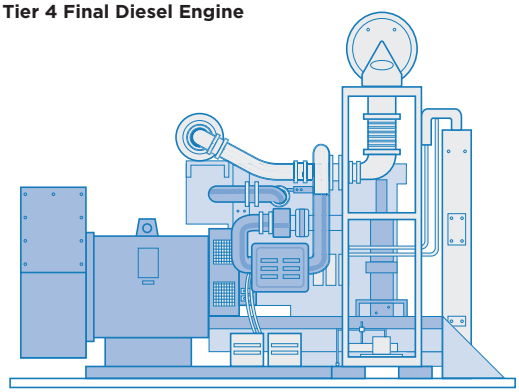
**PowerBlock Generation System**



**Natural Gas Engine**



**Tier 4 Final Diesel Engine**



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### Reaching Decarbonization Goals

As renewable diesel and RNG are produced from existing biowaste, both renewable diesel and RNG produced from captured carbon that would otherwise be emitted into the atmosphere that is repurposed it into pipeline quality fuel. This results in no new carbon being released into the atmosphere. that could otherwise be released into the atmosphere, instead being captured and repurposed as fuel.

Compared to fossil diesel, renewable diesel:

- Produces up to 80% less greenhouse gas emissions over the lifecycle of the fuel
- Emits no new carbon emissions from the engine and significantly less pollution
- And is produced from 100% renewable materials

On average, RNG produces:

- 51% fewer greenhouse gas emissions over the life cycle of the fuel
- 21 times less potent emissions than uncaptured methane released directly into the atmosphere

## Conclusion

PowerSecure, a leading microgrid solutions provider, is committed to providing clean, safe, reliable and affordable power. On the path to net zero, PowerSecure is enabling energy users and producers to take a portfolio approach to reduce their carbon footprints. As technology evolves, an enterprise-wide effort is necessary for companies to meet decarbonization goals without stranding existing grid and distributed assets.

Renewable fuels are drop-in ready solutions to drastically cut greenhouse emissions across the lifecycle, helping companies accelerate toward sustainability goals without sacrificing existing assets or operational resiliency.

Although the RNG supply chain is not yet fully developed, renewable diesel is currently available in California, Oregon, and other future-ready states with low-carbon fuel standards as a fossil fuel replacement. PowerSecure is now offering its California customers the option to switch to renewable diesel. PowerSecure provides clean and reliable power for everyday operation and during unanticipated grid outages. As organizations continue to evolve their energy strategies to prepare for the future, partnering with a solutions provider that readily adapts with fuel technology changes entering the marketplace is critical. Flexible, forward-facing technology solutions will be key to building the future of energy generation and achieving net zero goals for a brighter future.

To learn more about renewable fuels and how PowerSecure is helping customers prepare to be future ready, visit powersecure.com/renewable-fuel-ready.