



## biodiesel and renewable diesel

in the north american rail industry—value proposition



**The rail industry continues to progress towards lower carbon targets established to help reduce lifecycle carbon emissions using bio-based diesel fuel in locomotives. Some of the following Q&As go through specific aspects of use of biodiesel and renewable diesel in the Rail freight industry.**

**Q: What is driving lifecycle carbon emissions reduction initiatives for the North American rail industry?**

**A:** There are several factors that are driving the North American rail industry to plan, and help lower carbon targets at various levels.

One important factor is establishing voluntary lifecycle carbon emission reduction targets. Class 1 railroads such as Canadian National (CN), Union Pacific (UP) and others have established mid-term and long-term targets for their Scope 1, Scope 2, and Scope 3 emissions.

Stakeholder groups including investors, customers, employees, and communities where railroads operate are some of the driving forces.

National and state agencies are introducing new policies promoting carbon reduction. These policies typically take the form of incentives in the form of tax credits that enable higher biofuels adoption to help lower carbon emissions. One additional factor that is discussed less frequently but is important for competitiveness of the rail industry is that rail freight carbon reduction targets must be equal to, if not lower than, other modes of freight

transportation to ensure they are in the best position to serve the Scope 3 emissions needs for end customers.

**Q: How common is the use of biodiesel and renewable diesel in the rail sector today?**

**A:** Biodiesel blended with conventional diesel at varying levels has become more commonplace in the rail industry over the past decade, driven in part by its ability to be a drop-in solution.

Several key locomotive and engine manufacturers have already approved varying levels of biodiesel blends, and many OEMs approve the use of 100% renewable diesel (RD100) and blends of up to 20% biodiesel (B20) in their locomotives. With these approvals, we have continued to see increasing amounts of biodiesel utilized across rail networks to drive lifecycle carbon emission reduction while also benefiting from incentives and market blend economics.

Railroads, national labs and OEMs are making significant progress with biofuels and are gaining confidence in performance aspects such as supply chain reliability, cold weather operability and transparency in handling under current infrastructure and operating procedures.

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**Q: How much can renewable diesel and biodiesel reduce lifecycle carbon emissions compared to other fuels?**

**A:** Compared to conventional diesel, renewable diesel may reduce engine emissions by up to 100% for fossil carbon.<sup>1</sup> Biodiesel also reduces total hydrocarbon by up to 70% and renewable diesel does so by up to 40%.<sup>2</sup> The carbon intensity (CI) scores of both biodiesel and renewable diesel have also been consistently lower than LNG and hydrogen.<sup>3</sup> Compared to electric, biodiesel may be about 56% more effective at reducing carbon emissions when taking the power grid into consideration.<sup>4</sup>

**Q: What are storage and handling differences with biodiesel and renewable diesel compared to petroleum diesel?**

**A:** Biodiesel blends can be used in existing diesel tanks, generally without any modifications. Rail operations regularly consume significant quantities of fuel, so the fuel in storage tanks turns over very quickly. Because of this, there isn't much difference between storage and handling of biodiesel blends versus petroleum diesel.

The one exception could be extreme cold weather storage. The cloud point of biodiesel and renewable diesel is different from that of conventional diesel. For distilled biodiesel, storing at least a few degrees above the fuel's cloudpoint is important. For biodiesel blends up to B30, heated or insulated tanks aren't typically needed depending on some aspects of fuel handling prior to delivery to the storage tanks.

**Q: Does a transition to biodiesel require any modifications to operational infrastructure or engines?**

**A:** One of the biggest advantages of biofuels as a lower carbon fuel solution is that it can be implemented today with virtually any existing equipment and infrastructure, with little to no impact on operations. In fact, biodiesel can provide some engine performance benefits, including improved lubricity and combustion, which helps to reduce diesel particulate filter (DPF) clogging and regenerations when compared to petroleum diesel. Biodiesel fuel blends can help reduce particulate matter (PM) which can have a

positive impact on local air quality. Many rail yards and rail tracks are located near residential areas, so reduced PM emissions which in turn helps improve air quality are an additional benefit of adoption of biodiesel blends.

**Q: What advice would you give to someone in the rail industry that may be skeptical of integrating biodiesel?**

**A:** When evaluating various lower carbon fuel solutions, we recommend taking a more holistic approach to evaluate a number of specific criteria, including: technology readiness, operational impact, cost, and fuel availability. You may find that biodiesel and renewable diesel check all those boxes—including usability in virtually any existing equipment, maintaining operations, being easy to implement, and readily available.

Two of the most significant benefits of bio-based fuel solutions are:

1. The ability to use existing infrastructure, typically without changes.
2. Maintaining interoperability that is critical to the operations of the railroad industry.

As bio-based fuels see increased adoption, lower carbon fuel producers such as Chevron Renewable Energy Group are investing to enhance the availability of these renewable fuels in the market. One such example is the improvement and expansion of our Geismar biorefinery that will take production site capacity from 90 million gallons of renewable diesel production per year to 340 million gallons per year by 2030.

Another relevant aspect is the availability of feedstocks that go into making lower carbon fuels. Chevron Renewable Energy Group has a diversified strategy to source feedstocks reliably. Our feedstock flexibility helps ensure more predictable pricing, availability and lower carbon intensity.

Lower carbon solutions for the rail industry are already being demonstrated with key Class 1 railroads successfully deploying biodiesel and renewable diesel in their operations. Chevron Renewable Energy Group has partnered with Union Pacific (UP) and Canadian National Railways (CN) to implement lower carbon fuel solutions.