U.S. Department of Energy Selects Parallel Systems to Receive a $4.5 Million in Funding for Advanced Testing of Autonomous Battery-Electric Rail Vehicles

The testing will validate Parallel's rail vehicles as an alternative to trucking, reducing greenhouse gas emissions and highway congestion

February 14, 2022 (Los Angeles, CA): Parallel Systems, a company founded by former SpaceX engineers to create autonomous battery-electric rail vehicles, today announced it has been selected to receive $4,438,897 from the Department of Energy (DOE) as part of its Advanced Research Projects Agency-Energy (ARPA-E) initiative. The ARPA-E program, developed to advance high-potential, high-impact energy technologies, will fund a 29-month advanced testing program with Parallel's autonomous, battery-powered rail vehicles and a range of partners starting in the second quarter of 2022.

As part of the funding, the merits and implementation strategy of Parallel's autonomous freight system will be analyzed with DOE's National Renewable Energy Laboratory (NREL) and the Rail Transportation and Engineering Center (RailTEC) at the University of Illinois, leveraging the ALTRIOS open-source railway modeling software. The vehicles will be tested with Transportation Technology Center, Inc. (TTCI), a subsidiary of the American Association of Railroads.

"Our mission is to decarbonize freight by building a cleaner, automated rail future," said Matt Soule, Co-Founder and CEO at Parallel. "The funds awarded from the Department of Energy will help us achieve our mission by supporting Parallel through our advanced testing phase. This critical step will enable us to move trucking freight to clean rail and accelerate the decarbonization of the entire freight industry."

The overarching aim of the advanced testing program is to demonstrate three key innovations unique to Parallel's system: overall vehicle stability, contact-based platooning and energy efficiency.

Parallel's autonomous rail vehicles will be evaluated for track-worthiness in Pueblo, Colo. at TTCI's state-of-the-art testing facility. TTCI will collect data around how Parallel vehicles perform on the tracks in various conditions, including dynamic stability in twist and roll, pitch and bounce, and yaw and sway. The tests will benchmark the new vehicle dynamic performance

against the requirements of traditional freight rail vehicles. NREL and RailTEC will collaborate to model the vehicles and system performance.

The advanced testing program will also analyze Parallel's contact-based platooning method and platoon dynamics. Specifically, the ARPA-E funding will advance Parallel's innovative contact-based platooning by providing further research on bumper designs, control logic, and resultant reduction in energy.

NREL and RailTEC will evaluate the energy efficiency and environmental benefits of Parallel's vehicles. Parallel's technology will be one of the firsts to be evaluated by NREL's Advanced Locomotive Technology and Rail Infrastructure Optimization System (ALTRIOS) software. ALTRIOS is an ARPA-E funded tool designed to simulate and optimize energy conversion and storage dynamics, train dynamics, meet-pass planning (detailed train timetabling), and freight-demand-driven train scheduling. ALTRIOS will help determine the optimal amount of energy Parallel needs to run and maintain its system, enabling the company to meet charging demands. The software will also evaluate the merits of distributing the energy storage and investigate the improved network capacity and resilience achieved with self-propelled cars.

Parallel's business model is to give railroads the tools to convert some of the $700 billion U.S. trucking industry to rail and operate alongside existing rail operations. Trucking freight accounts for 444 million metric tons of carbon dioxide, or approximately 7%, of the United States greenhouse gasses (GHGs); consumes 45 billion gallons of diesel annually; and grows in volume (ton-miles) by 4% each year. ARPA-E funding can unlock Parallel Systems' efforts to achieve a meaningful impact on GHG emissions and diesel imports.

Rail is widely recognized as an energy-efficient means of surface freight movement. However, today's trains are miles long and require large terminal operations that impact the economic feasibility of short-haul freight service, which represent one-third of the nation's freight movements in ton-miles. Today, less than 2% of short-haul intermodal freight under 500 miles is delivered by rail. Parallel Systems is developing a highly scalable system of autonomous electric rail vehicles to enable existing railroads to economically serve short-haul and long-haul markets. This technology reduces terminal complexity and points of congestion, resulting in cost-competitive hauls of any length.

Parallel came out of stealth mode in January of 2022, with the company unveiling its prototype and plans for a system to help overhaul the way the country approaches freight. The company's patent-pending vehicle architecture combines advanced software and hardware with the historic rail industry to increase utilization of the expansive United States railroad system. The zero-emissions railcars are individually powered and can work together to form platoons that reduce energy consumption or split off to multiple destinations while en route.

Since 2009, ARPA-E has awarded close to $3 billion in research and development funding for more than 1270 potentially transformational energy technology projects. The DOE states

awardees of the ARPA-E program are unique because they are rethinking current systems to develop entirely new ways to generate, store, and use energy. As a program selectee, Parallel is now among the institutions and companies, including Stanford University, that are actively working to ensure the country can achieve federal-government laid plans of eliminating carbon emissions by 2050.

About Parallel Systems

Founded in 2020, Parallel Systems is the world's first autonomous battery-electric rail system. The company is a U.S. based manufacturer and transportation technology innovator whose mission is to deliver a safer, more efficient and sustainable alternative to short-haul trucking. The company provides significant benefits, including: 1) enables railroads to grow by increasing their role in shorter-route transportation; 2) makes America's busiest roadways safer for motorists by decongesting; 3) reduces the costs of shipping; 4) creates high-skilled, high-wage jobs; 5) reduces pollution. To date the company has raised nearly $100 million in venture capital funding as well as an ARPA-e grant.

About TTCI

TTCI is a wholly-owned subsidiary of the Association of American Railroads established to support the development and deployment of innovative technologies to increase the safety, reliability, and efficiency of the railroad industry. Learn more at www.TTCI.tech and on our LinkedIn page.

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