Commercial Pilot Case Study:

ElectricFish's battery microgrid integrated EV charger

350^2

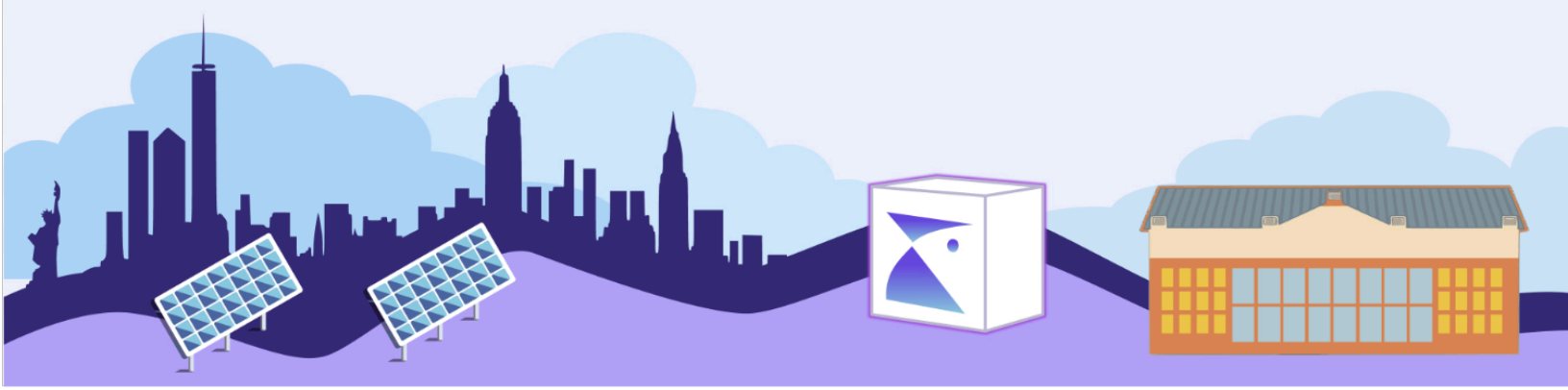
Floyd Benett Field, 56 Aviation Rd, Brooklyn, NY 11234

June 2023 - Feb 2024

ElectricFish

In partnership with:

conEdison · Jamaica Bay – Rockaway Parks Conservancy · National Park Service · Newlab · NYC EDC



1. Executive Summary

ElectricFish Energy, Inc., aims to revolutionize the electric vehicle (EV) charging landscape in New York City through a pioneering pilot project at Floyd Bennett Field, Building 135. This initiative marks ElectricFish's strategic entry into the NYC market.

Our patented technology facilitates rapid interconnection of high-powered EV charging stations (up to 350 kW) in grid-constrained locations, offering a leap forward in consumer and fleet-facing applications without the need for extensive groundwork. The pilot project not only served to validate ElectricFish's battery-integrated EV extreme-fast charging station, the 3502, and its proprietary optimization engine, the Stargazer, but also aimed to demonstrate cost-effectiveness, fast charging capabilities, and resilience during power outages. We set ambitious targets to ensure reliable operation under NYC's environmental conditions, and quantify the value of resilience benefits to our partners.

The pilot project began in June, 2023, to demonstrate the capacity to service both retail consumers and an enterprise customer in a hybrid use case within the ConEdison utility service territory. The project was completed in partnership with Con Edison, National Park Service, Leap, New York City Economic Development Corporation, Jamaica Bay-Rockaway Parks Conservancy, Newlab.

Our objectives were clear: to demonstrate the capability of our technology in rapidly interconnecting EV charging infrastructure, enhancing local grid resiliency, validating our solutions under NYC's unique conditions, and showcasing the economic and operational benefits of our system. Key metrics were established to measure success, including the number of successful charging sessions, system uptime, backup power readiness, performance in ConEdison demand response programs. These goals align with our broader mission to support the electrification of transportation, optimize energy usage, and contribute positively to the energy market dynamics.

Objective	Status	Results
Rapid and low cost installation	✅	xxx
Demonstrate islanding / backup capabilities	✅	Backup power readiness: 96.036% 68.8 KWH
Deliver electric vehicle fast charging sessions	✅	107 sessions
Deliver bidirectional kilowatts to the grid	✅	308.8 +/- 15 KWH
Participate in energy markets	✅	100% participation in summer season with 240 kwh curtailed

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2. Project Partners

The project was conducted in partnership with Con Edison, Jamaica Bay-Rockaway Parks Conservancy, National Park Service, Newlab, and New York Economic Development Corporation. During the project we also brought on Leap Energy.

Con Edison was the Authority Having Jurisdiction (AHJ) for the utility interconnection permitting process. Jamaica Bay-Rockaway Parks Conservancy administers the Gateway National Recreation Area (including Floyd Bennett Field) on behalf of the National Park Service. Newlab, alongside NYCEDC, convened the Resilient Energy Studio, which programmatically made this project possible. Finally, Leap was brought on as a partner mid-project to help ElectricFish monetize grid services at the site.

3. Pilot Objectives and Metrics

Accelerate EV Charging Interconnection: Demonstrate the rapid deployment of high-powered EV charging infrastructure (up to 350 kW) in grid-constrained locations.
Support Local Grid Resiliency: Utilize bi-directional energy capabilities and software optimization to enhance local grid resiliency.
Validate Technology in NYC Conditions: ElectricFish aims to validate its hardware and communication technology under the regulatory, technical, and environmental conditions specific to NYC, marking its first deployment in this competitive market.
Quantify Value of Resilience: Assist Con Edison in quantifying the resilience benefits of a distributed EV charging network during both standard operations and vulnerable grid conditions.
Energy Market Participation: Expand ElectricFish's operational scope by actively participating in the energy market, leveraging the pilot to demonstrate how its technology can contribute to and benefit from energy market dynamics.

3.1 Metrics

Cost-Effectiveness and Time Savings: Demonstrate the cost effectiveness of installation and operation of ElectricFish chargers in comparison to other DC fast charger solutions with or without BESS.
Fast Charging Capability: Evaluate ElectricFish's ability to provide extreme-fast charging services, measuring the efficiency and speed of the charging process for both public and municipal fleet vehicles.
Islanding and Backup Capabilities: Showcase the islanding and backup capabilities of ElectricFish's system to underline its resilience benefits. The focus will be on demonstrating the system's performance during simulated or actual power outages near Building 135.
Impact on Grid Stability and Efficiency: Evaluate the contribution of ElectricFish's technology to grid stability and efficiency, particularly during peak demand periods or grid stress events.
Stakeholder and Utility Feedback: Gather insights from utilities, partners, and stakeholders regarding the effectiveness, impact, and value of ElectricFish's project activities, including deployment, charging, and other grid interactions.
Energy Market Integration and Grid Services: Showcase ElectricFish's integration with the energy market through active participation in grid services like demand response, while quantifying the revenue generated from these activities.

4. Introduction to Technology

4.1 The 350squared

The ElectricFish 3502 system represents a transformative advancement in energy storage and EV charging technology, merging a robust 200 kWh energy storage capacity with a 350 kW extreme-fast charging capability. This innovative system enables charging of electric vehicles to up to 200 miles in just 10 minutes, catering to vehicles with a wide voltage range from 300 to 950 VDC. Designed as a plug-and-play solution, the 3502 is engineered for quick deployment in community settings, offering both extreme-fast charging for EVs and bi-directional power supply to the local grid, thus serving as a critical asset for grid stability and efficiency.

Physically, the ElectricFish 3502 is built to withstand NYC's diverse environmental conditions, with a durable galvanized steel enclosure and a liquid cooling system to maintain optimal performance. It operates efficiently across a wide ambient temperature range of -20°C to 70°C and is designed to meet high standards of protection (IP54 / IK10 and NEMA 3R) and seismic resilience. This level of

durability and reliability makes the 3502 system ideal for deployment in a variety of settings, ensuring continuous operation and safety.

The system's rapid deployment capability, from weeks instead of years, positions it as a game-changer in the market, offering customers a unique opportunity to capitalize on the accelerating transition to electric mobility and smarter energy solutions. More detailed specifications are included in the appendix.

4.2 Stargazer Optimization

Stargazer is a cutting-edge real-time optimization engine that significantly enhances the capabilities of ElectricFish's 3502 system. Utilizing a blend of live site data and historical analytics, Stargazer balances energy consumption, forecasts the demands of EV charging, and engages dynamically with energy markets. It continuously evolves to unlock new revenue sources for customers and streamline operational costs, while also bolstering the reliability and stability of the energy grid.

The suite of core functionalities Stargazer offers is pivotal for modern energy systems. It enables real-time energy market participation via a Time-of-Use (TOU) API, allowing users to access demand response initiatives, creating new income streams while decreasing operational expenses. Additionally, its sophisticated load balancing capability schedules energy charging and discharging by optimizing the 3502 system's efficiency and deferring the need for expensive infrastructure overhauls. Stargazer's ability to forecast EV charging patterns improves supply and demand management, resulting in significant cost savings, improved grid dependability, and reduced wait times at charging stations.

Moreover, Stargazer's design for fault-tolerant operation ensures resilience and uninterrupted performance, even during power outages and blackouts, thanks to its deployment on an advanced Nvidia edge computing platform. This guarantees the continuous operation of the ElectricFish 3502 system, preserving data integrity and system availability in all conditions.

Through third-party API integrations, Stargazer offers flexibility and customization, adapting seamlessly to meet the diverse requirements of each customer. Through its adaptive learning and predictive analytics, Stargazer ensures our system remains at the forefront of technological innovation, embodying a forward-thinking approach to the evolving demands of energy ecosystems and electric mobility.

4.3 Real-time Energy Efficiency Framework (REEF)

REEF serves as a comprehensive, customer-facing data visualization platform, making it a critical interface between ElectricFish's services and users. Along with geolocation capabilities and safety alarm notifications, REEF allows the customer to have real-time monitoring of charging operations and understand their energy consumption patterns and behaviors. REEF also displays real-time grid sources and the volume of renewables ingested by the unit. This transparency not only keeps customers informed about their energy usage but also highlights our commitment to sustainable energy practices. With a server uptime of 99.99%, customers can rely on REEF for virtually uninterrupted access to their energy data. Even during necessary system maintenance and updates, REEF ensures minimal disruptions, reinforcing its role as a reliable, customer-centric platform.

4.4 ElectricFish Charging Management System (ECMS)

ElectricFish's internal management system executes the operational strategies, safety protocols and emergency-response strategies formulated by Stargazer, controlling the battery system, EV chargers, and local generators, and implementing safety measures and fault mitigation strategies as needed. ECMS ensures seamless data flow and commands between internal modules, as well as maintaining robust communication channels with external entities like grid operators, emergency services, and weather forecasting services. The software also ensures all modules maintain synchronized operations and data consistency, with seamless and secure exchange of data.

4.5 ReefETL

The ReefETL Module is responsible for managing the extraction, transformation, and loading (ETL) process of data within the DER Management System. ReefETL is responsible for handling the ingestion of raw data from various sources, including ECMS, Stargazer controllers, energy markets, site loads, and sensors. For internal data sources like ECMS and Stargazer controllers, ReefAPI is used as a gateway for inserting data into the pipeline, granting reachability and data integrity. ReefETL then transforms raw data into a standardized format suitable for event streaming and analysis. Finally, ReefETL loads processed data into the data warehouse for structured storage and reporting, specifically generating frameworks for analytical queries for ancillary teams and maintaining links to BI tools such as Tableau and PowerBI

5. Deployment and Installation

Objectives	Key performance metrics	
Rapid installation and commissioning	Order- to-deployment timeline	**32 weeks Sep 22- 25th May 23**
	Post-delivery activation timeline	**9 days 27th May - 7th June**
Site preparation	Quick turnraround	**13 days**
	Trenching, conduit isntall	**$22,500**
	Concrete pouring, pad	**$11,250**

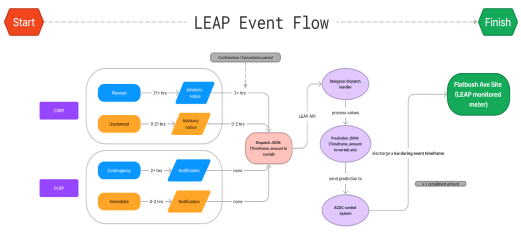
	installation	
Electrical Installation	Upgrade time	**3 days**
	Electrical cable installation, service disconnect	**$30,000**
Demonstrate building load management and support	Electricity delivered in low-/no- solar generation hours	
Deliver electric vehicle fast charging sessions	Number of payment transaction EV charging sessions delivered	
	kWh of paid EV charging sessions delivered	

	Details	Invoiced expenses
Shipping	Detroit to NY trucking	$2,750
	Trucking fuel surcharge	$643
	Rigging for loading	$1,600
	Rigging for unloading	$445.00
Insurance	Insurance premium payment	$
Maintenance	Man-hours for servicing	90
	Labor cost for maintenance	$4,050.00
	Labor cost for upgrades	$1,200.00
Administrative	Travel	$2420
	Lodging	$3,454.91
Total		

5.1 DER Operational Analysis

Total successful sessions: 107
Total attempts (successful and unsuccessful): 146 - based on the number of telegram notifications since sep 20
Avg. Energy dispensed per charging session: 5.36kwh

5.2 Demand Response Participation



ElectricFish's dedication to advancing sustainable energy solutions is exemplified through its strategic participation in Con Edison's Commercial System Relief Program (CSRP) and Distribution Load Relief Program (DLRP). These demand response initiatives are critical components of New York's strategy to enhance grid reliability, reduce peak demand pressures, and mitigate the risk of outages and service disruptions. By engaging in these programs, ElectricFish demonstrates their commitment to alleviating grid strain and supporting the broader objectives of sustainable energy management and grid resilience.

The CSRP is specifically designed to address network-level peak demand challenges by incentivizing customers to lower their energy use during designated periods of high demand. This program plays a pivotal role in maintaining grid stability and ensuring the efficient distribution of energy resources across the network. Similarly, the DLRP aims to provide crucial load relief during emergency conditions, such as those leading to a Condition Yellow, which are defined by situations that could severely compromise the grid's operational integrity. Participation in these programs underscores ElectricFish's role as a key player in the collaborative effort to enhance grid performance, particularly during critical times when the risk of overloading the system is highest.

Stargazer utilizes a third-party grid services aggregator, Leapfrog Power, for direct integration into Con Edison's demand response programs, receiving and processing energy curtailment requests through a REST API. A dedicated webhook captures these requests and storing these dispatches in AWS S3 for Stargazer to analyze at five-minute intervals. This ensures that Stargazer is always primed to respond promptly to both DLRP and CSRP events, which demand swift action due to their critical nature and the time-sensitive incentives offered by LEAP for effective participation.

The core of this process is the Dispatch Handler which extracts vital information from the dispatch JSONs, such as event timeframes, program types, and energy curtailment targets. It prioritizes actions based on urgency and other critical factors like the system's State of Charge (SOC) and current charging load. This strategy optimizes ElectricFish's response to grid needs, maximizing performance-based compensation from LEAP for effective energy management and grid support.

Through diligent participation and strategic energy management, ElectricFish demonstrated exceptional adherence to both programs' requirements, achieving energy curtailment across various periods in Summer 2023.

ElectricFish successfully reduced energy consumption on multiple occasions, aligning with both program's objectives to manage peak demand. The company maintained a perfect performance factor throughout its participation, indicating exemplary compliance with curtailment requests and operational excellence. Financial rewards were notable, reflecting the value of ElectricFish's contributions to grid stability and the effectiveness of its demand response strategies.

Across both programs, ElectricFish's contributions not only helped in managing the grid's load during peak times but also highlighted the potential for smart energy solutions to play a critical role in modern energy ecosystems.
The success in these programs, marked by high performance factors and the realization of financial incentives, illustrates the synergy between technological innovation and grid management needs. As a testament to innovation, ElectricFish was recognized by LEAP as being the first charger to deliver bidirectional kilowatts to the grid.

6. Conclusion

The success of ElectricFish Energy, Inc.'s pioneering pilot project at Floyd Bennett Field, Building 135, heralds a transformative moment for New York City's electric vehicle (EV) charging infrastructure. This initiative represents a strategic entry into the NYC market, aiming to revolutionize the landscape through rapid interconnection of high-powered EV charging stations, offering a leap forward in consumer and fleet-facing applications.

Throughout the pilot project, ElectricFish validated its cutting-edge technology, showcasing the cost-effectiveness, fast charging capabilities, and resilience of its system, all tailored to meet NYC's unique conditions. Partnering with key stakeholders like Con Edison and the National Park Service, ElectricFish demonstrated exceptional performance metrics, exceeding targets for successful charging sessions, uptime, and grid responsiveness.

This pilot project's success not only underscores ElectricFish's commitment to advancing sustainable transportation but also signals a paradigm shift in urban mobility and energy resilience. As ElectricFish prepares for wider deployment, the city of New York stands poised to embrace a future where electric mobility is accessible, efficient, and environmentally sustainable.

7. References

1. https://www.newlab.com/blogs/electricfish-unlocks-electric-vehicle-fast-charging-at-floyd-bennett-field
2. edc.nyc/sites/default/files/2024-02/NYCEDC-Green-Economy-Action-Plan-02-28-24.pdf