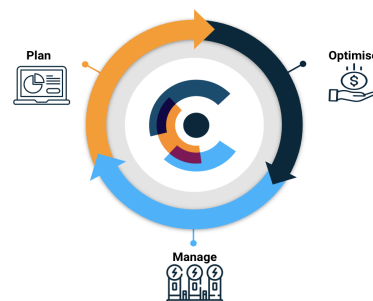![BetterFleet]

The Association of School Transportation Services of British Columbia (ASTSBC)

Request for Standing Offer #TRA23-02:
Supply and Delivery of Charging Equipment & Software for Electric School Buses

June 30, 2023

BetterFleet, part of the Evenergi group, is working with fleets globally to optimize the transition to zero emission. Our sole purpose is to decarbonize complex fleets. As many of our customers start to reach a level of understanding, it becomes clear that a charge management platform is much more than just energy management. Indeed, it becomes an integral part of how the transit agency manages dispatch, battery warranties/lifecycles and energy consumption.

Since 2018, BetterFleet has been pursuing this expansive definition of a charge management system. In addition to a more holistic vision of charge management as an operating system, BetterFleet's approach to zero emission fleet transitions is that it is an iterative process of planning, optimization and management. For example, when a new schedule is developed by school bus planners, charge management, battery management and dispatch will also change, and these changes need to be emulated before deployment. Another example is when new BEBs are being procured and data from the live environment is needed to emulate how they may perform prior to deployment. A final conceptual requirement that we often hear is that customers want fewer systems, and to be able to access functionality via a single interface and dashboard. As you will see in the pages to follow, BetterFleet has solved many of those challenges.

BetterFleet Manage, our charge management platform, is currently being deployed at King County Metro, just on the other side of the British Columbia border in Seattle, Washington.

What makes our company different from other charge management software providers is our consulting and advisory team that provide a 'human touch' beyond being purely a software company. We operate independently and agnostically, meaning we always provide the best unbiased advice to achieve electrification success for our clients.

BetterFleet is active in the school bus industry across North America. We are currently working with Dean Transportation, Michigan's largest private school bus operator with nearly 2,000 school buses, to identify electrification pathways, grant opportunities and charge management solutions. In addition, we are about to start assignments with San Diego Unified School District and Kern County School District on their electrification transitions.

BetterFleet is a proud member of the National School Transportation Association (NSTA), which represents private school bus contractors in Canada and the United States. We are often asked to present at NSTA conferences and provide thought leadership to the student transportation industry on electrification, and we recently peer-reviewed a research project that Rutgers University completed on behalf of NSTA on electrification.

We are a Canadian company with staff located throughout Canada including Vancouver, Toronto and Montreal.

Contents

Additional supporting information: High-level roadmap

The future of Charge Management Systems (CMS) and how you measure success

There are five key business drivers that can be measured against key performance indicators when underlying all the potential features of a CMS:

1. Operational excellence and service continuity

2. Warranty management of vehicles and chargers

3. Total cost of ownership optimization

4. Monitoring and reporting for continual improvement

5. Minimization of additional complexity and overhead in existing operations

The key features required to deliver on these CMS requirements include:
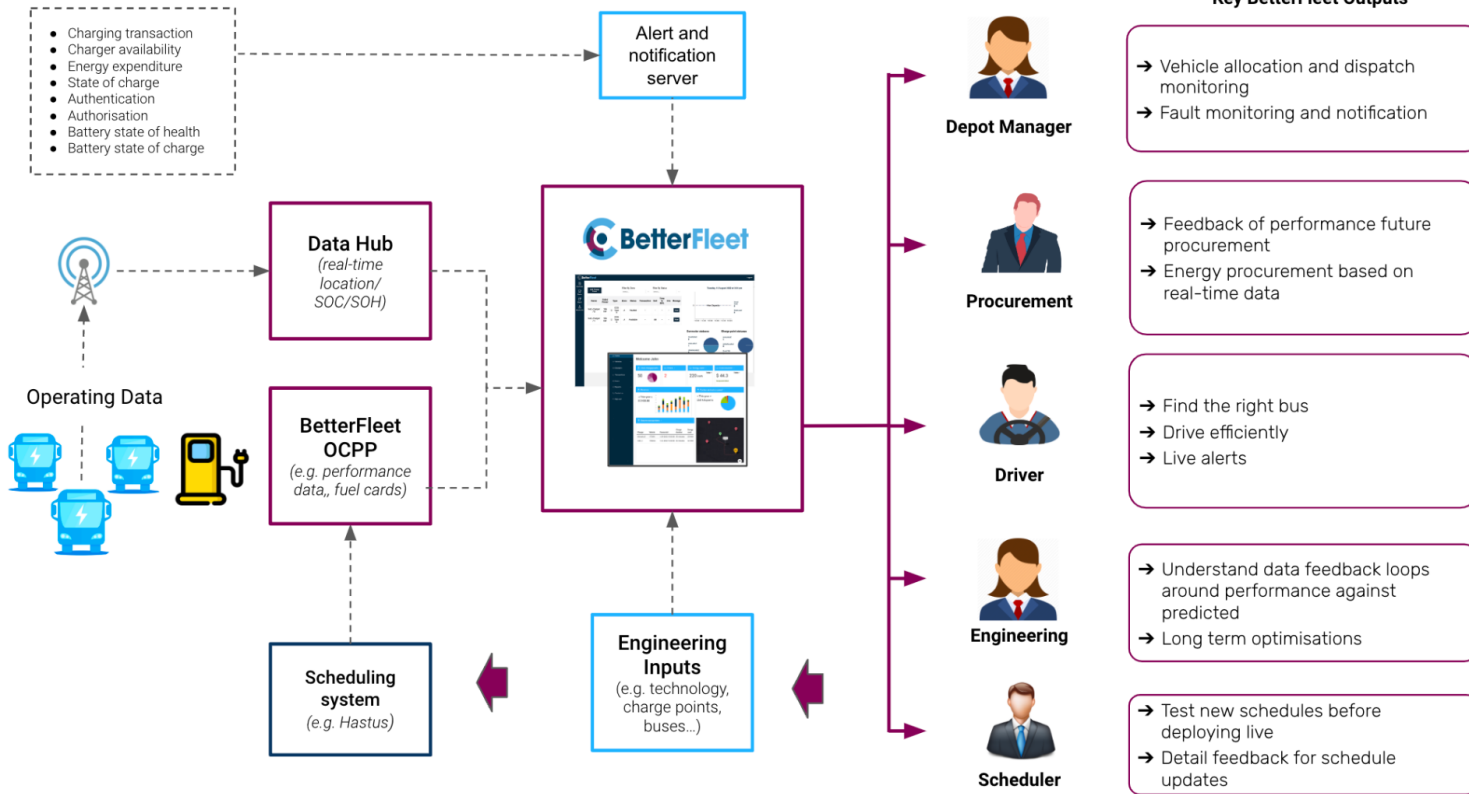
- Vendor agnostic OCCP 1.6 and 2.0 compliant

- Remote management of the EVSE

- System status visualization

- Alert escalation and management

- Operational reporting

- Driver charger interaction management

- Data and functional integration with 3rd party systems

- Security, performance and accessibility

- Machine learning for continual improvement

The overall conceptual design of the system is outlined on the following pages and shows how the various key users will interact with the CMS system.
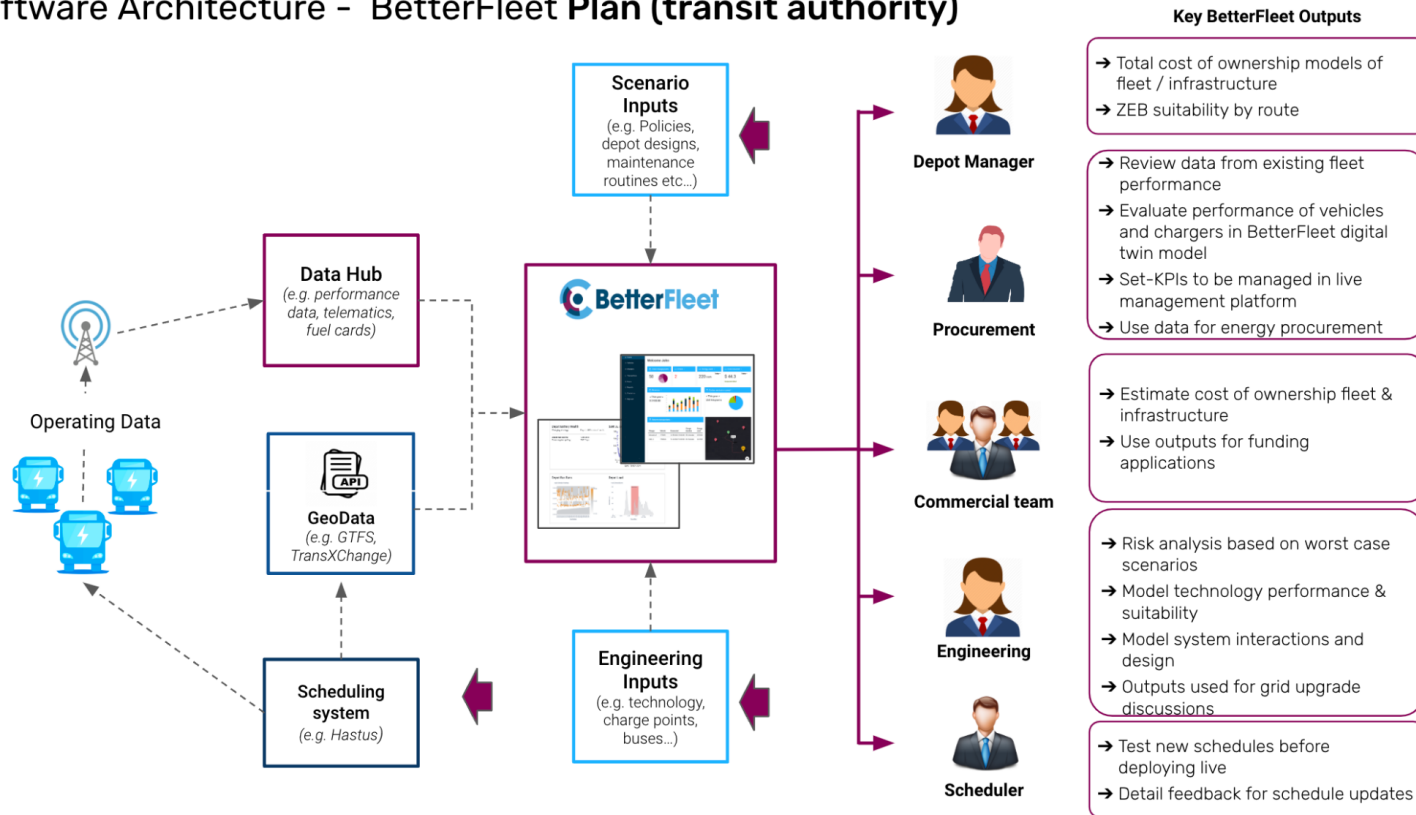
High level systems architecture

The following diagram outlines the high level architecture and use cases for a sophisticated bus depot Charge Management System (CMS).

Software Architecture - BetterFleet **Manage**

Key BetterFleet Outputs

Charging transaction
Charger availability
Energy expenditure
State of charge
Authentication
Authorisation
Battery state of health
Battery state of charge

Alert and notification server

Depot Manager
➔ Vehicle allocation and dispatch monitoring
➔ Fault monitoring and notification

Data Hub
(real-time location/ SOC/SOH)

Procurement
➔ Feedback of performance future procurement
➔ Energy procurement based on real-time data

Operating Data

BetterFleet OCPP
(e.g. performance data,, fuel cards)

Driver
➔ Find the right bus
➔ Drive efficiently
➔ Live alerts

Engineering
➔ Understand data feedback loops around performance against predicted
➔ Long term optimisations

Scheduling system
(e.g. Hastus)

Engineering Inputs
(e.g. technology, charge points, buses...)

Scheduler
➔ Test new schedules before deploying live
➔ Detail feedback for schedule updates

The following diagram is an overview of how ZEB planning software integrates with the live management system to create a holistic picture.

Software Architecture - BetterFleet **Plan (transit authority)**

Key BetterFleet Outputs

- → Total cost of ownership models of fleet / infrastructure
- → ZEB suitability by route

- → Review data from existing fleet performance
- → Evaluate performance of vehicles and chargers in BetterFleet digital twin model
- → Set-KPIs to be managed in live management platform
- → Use data for energy procurement

- → Estimate cost of ownership fleet & infrastructure
- → Use outputs for funding applications

- → Risk analysis based on worst case scenarios
- → Model technology performance & suitability
- → Model system interactions and design
- → Outputs used for grid upgrade discussions

- → Test new schedules before deploying live
- → Detail feedback for schedule updates

Depot Manager

Procurement

Commercial team

Engineering

Scheduler

Scenario Inputs
(e.g. Policies, depot designs, maintenance routines etc...)

Data Hub
(e.g. performance data, telematics, fuel cards)

GeoData
(e.g. GTFS, TransXChange)

Operating Data

Scheduling system
(e.g. Hastus)

Engineering Inputs
(e.g. technology, charge points, buses...)

Key performance indicators

While a CMS must deliver a lot of functionality, it is important to agree on the underlying business performance indicators that it must operate against. These are outlined below.

Operational excellence and service continuity

The core of any CMS should be a focus on ensuring that the operational services are delivered at the highest possible levels and that there are no service continuity issues.

The CMS can contribute to this in a number of ways:

- Matches bus schedules to charging strategies to ensure zero emission buses have the required battery state of charge to complete its next service

- Integrates parking plans with charging strategies to ensure vehicles can be parked, cleaned, serviced and charged, to be ready to depart at the right time

- Works seamlessly with allocation/departure teams to ensures vehicles are available and serviceable at the point drivers need them

- Ensures that there is seamless escalation of charging issues (such as out-of-service) to enable rapid response and resolution

- Ensures operational resiliency of zero emission vehicles by reporting incidents as they happen to allow intervention to proactively manipulate schedules and vehicle utilization to overcome any planned or unplanned situations

- Red/Amber/Green signaling to alert users for buses with low state of charge and state of charge required for next routes

- Allows a two-way communication with drivers before, during and after the service to ensure vehicles have the required state of charge, and for drivers to report any incidents or events

- Preheating - need integration with charger manufacturers and OEMs using VDV 261

- Ensures the highest level of system security to avoid risks of cyber attacks

Remote setup and control of each charger

Warranty management of vehicles and chargers

- Implement charging strategies that minimize impact on batteries and ensure compliance with warranty requirements
- Ensure that battery balancing is performed and does not impact on service continuity

Total cost of ownership optimization

- Optimizes charging profiles to minimize grid infrastructure requirements
- Optimize charging profiles to ensure that energy cost are minimized
- Ensure that any changes to bus schedules do not lead to significant escalation of costs
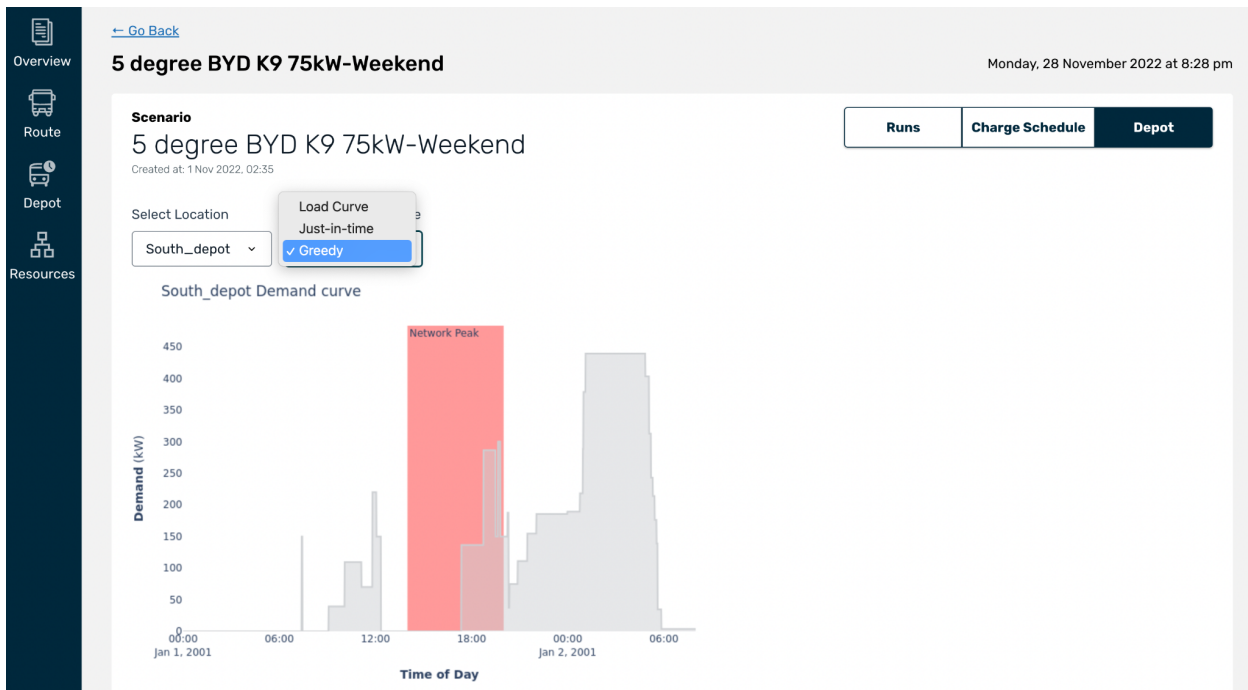
Continual improvement and reporting

Meaningful reports that enable management decision making around:

- Chargers and usage Issues transactions
- Energy efficiency across the system, such as charger efficiency. Understanding metered energy at point of connection vs. energy at chargepoint vs. change in battery SOC
- Detailed trend reports and trends about transactions
- Corrupted transactions and maintenance
- On run out - how many buses went out and with what charge, highlighting those that went out under 100%
- Report at end of day - buses missing their in-day top up charge
- Being able to access raw data in app and via API and download reports into excel format
- Implement data collection and storage to enable machine learning as significant volumes of data is collected to start to implement predictive optimizations in planning and management

Overview of vehicle fleet KPIs
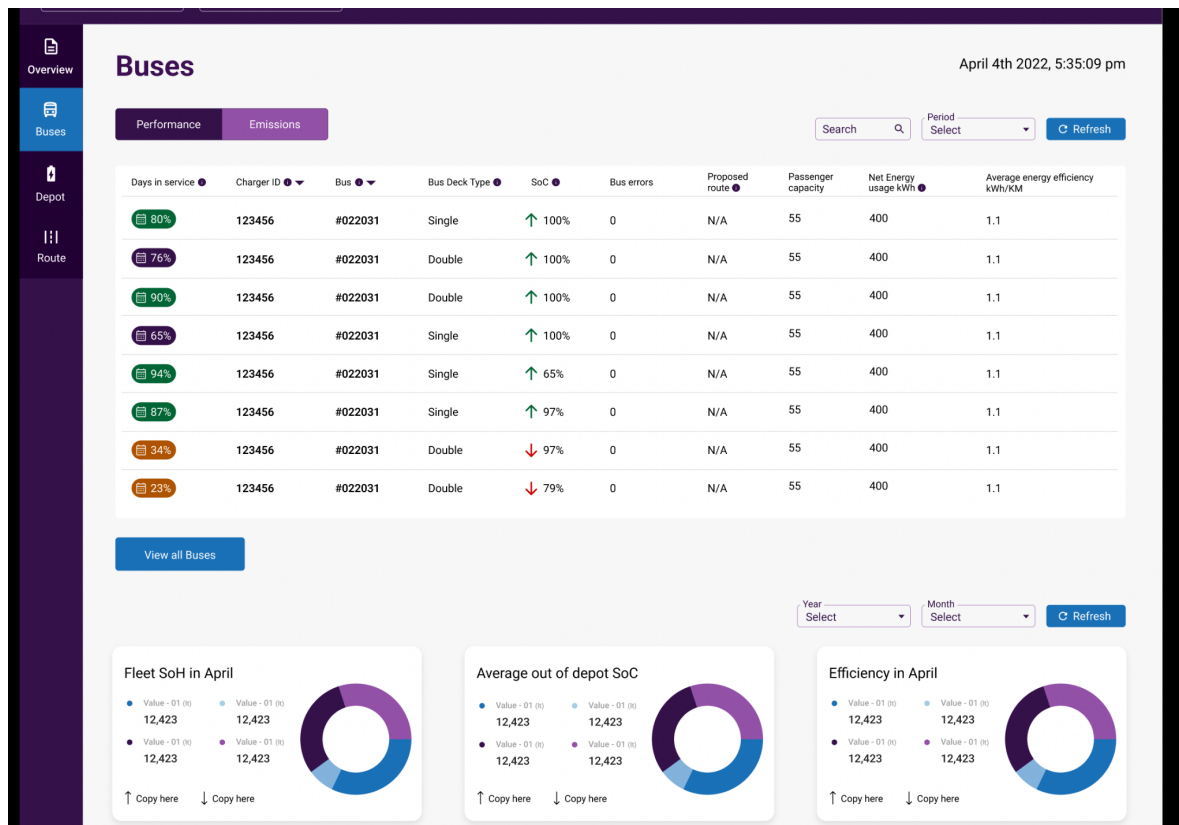
Minimization of additional complexity and overhead in existing operations

BetterFleet can integrate with existing systems so that the bus operator can minimize the disruption on their existing processes. This will ultimately lead to significant cost savings.

Integration with telematics

Integration with dispatch

Your Charge Management Solution

Our solution will integrate with all charging manufacturers, provide required control of those systems, create visualizations of these operational aspects of the chargers and vehicles, provide notifications and escalation if the systems are not performing as expected, and provide operational reporting to enable long term understanding and continual improvement.

Platform system requirements

To deliver of the full vision articulated here the following is required:

1. OCPP complaint charging infrastructure
2. AVL system with open APIs (Evenergi supports GeoTab, but can integrate with any accessible telematics system)
3. Buses which allow for tracking of battery state of health and state of charge
4. Dispatch system or can use simple dispatch system from BetterFleet

Note that many of the powerful features are available without these four elements.

Platform specification

Feature	Description	How it delivers the core requirements
Remote management of the EVSE	The EVSE systems must be managed remotely so that chargers can be reset, and charge management strategies are deployed.	Operational excellence and service continuity
Vendor agnostic OCCP 1.6 and 2.0 compliant	Electric Vehicle Supply Equipment (EVSE) and vendor agnostic system that can easily on-board the EVSE platforms into the bus operator's environment and any others that are required in future.	Operational excellence and service continuity
Smart charging	Including dynamic load management to remain within infrastructure limits, energy cost optimization and hourly charging limits.	Total cost of ownership (TCO) optimization
Parking and dispatch Dispatch optimization	Integration with scheduling systems, enabling forward-looking charge management. For example, when a bus returns to the depot the CMS knows which route it is scheduled to drive next and how much energy is required. It then determines when and how much to charge the bus to ensure it meets its operational requirements.	Operational excellence and service continuity

	It is critical in the bus operator's operational environment that drivers are able to quickly locate the right bus to take on the next route, particularly if the en-route charging events have been missed for any reason. Equally important will be guiding the driver to the correct parking location.	
System status visualization	An operational dashboard should visualize the status of the system at any point in time to enable a quick reference point for operational staff. This includes the current vehicle state of charge and % to complete, whether the vehicle is on charge, the specific charger it is using, and the time it will take to complete (estimate).	Operational excellence and service continuity
Alert escalation and management	The system must create meaningful alerts that enable an efficient resolution of any charger faults. Notifications can be directed to a nominated contact via email or SMS - whether that is agreed to be internal staff, external contractors or both. This will typically be for managing a charger that has become unexpectedly unavailable, or if charge events are not occurring as expected.	Operational excellence and service continuity
Operational reporting	The system will need to provide meaningful and easy to interpret reports on critical operational areas such as: ● successful and unsuccessful charging sessions ● time in use per day ● time available per day ● total energy consumption ● time not operational ● charger performance (kW delivered) ● start and end state of charge.	Continual improvement
Security, performance and accessibility	The system complies with the highest levels of security to ensure there can be no penetration of the network.	Security
Data and functional integration	The system requires the highest level of interoperability and systems integration using open Application Programming Interfaces where-ever possible.	Minimization of complexity and overhead in existing operations
Machine learning for continual improvement	We have designed an architecture that will store and manage all of your data in a form that can be used for machine learning as sufficient data is available.	Continual improvement

Methodology for customer success

Delivering on the vision of an integrated CMS requires a laser focus on customer success. Requirements must be crystal clear and agreed, all stakeholders must be engaged and driven to integration schedules, and support services must be delivered to ensure risk management and optimizations are delivered.

Planning and implementation

Process overview

The following is an overview of our typically end-to-end implementation process.

L = Lead and S = Support

Category	Item	Evenergi	ASTSBC Purchaser
Project kick off	Kick off the project meeting - Scope - Schedule - Team and resources - Risks and mitigations - Roles and responsibilities - Identify key stakeholders for engagement internally - Project methodologies	L	L
Business process mapping	Work with identified stakeholders to confirm the new process. Identify best cost pathways and processes for Tier 1 and Tier 2 support and end to end process from initial site analysis, implementation through to the end point of EVSE support and fault notification and escalation	L	L
Detailed functional design	Workshop to define the detailed functional design, interfaces, onboarding information, customisation, billing plans, network design, and so on	L	S
System setup	Set up the system in the Cloud	S	S
	Configure the domains and SSL certificates	L	S
Interfaces setup	Notification interfaces configuration: email, SMS	L	S
Integration	APIs integration (if required)	L	S
Implement and test support processes	Propagate support processes with relevant parties and test with sub-set - fleet, driver, on-site manager, EVSE supplier	L	L
Training	Conduct a training session	L	S
User-Acceptance test post cutover	Proactive monitoring of the platform and service	L	L

Operations

High level overview

The following diagram outlines the high level architecture of day to day support. It emphasizes the ability for users to access self-service where possible and then escalation via a help desk function as a last resort.
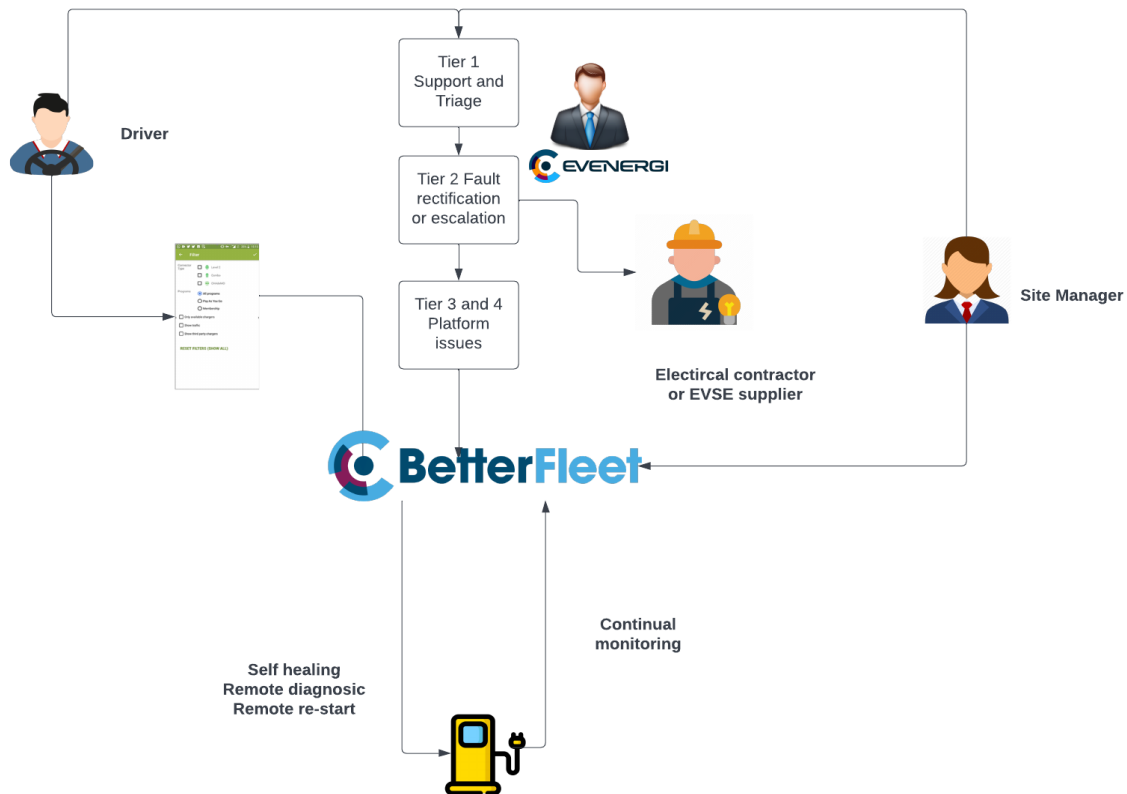
Level 3 and Level 4 support

Evenergi's services include providing comprehensive Level 3 and level 4 support if there are any issues with respect to the platform itself.

Ongoing support in energy and infrastructure optimization

Evenergi has deep expertise in energy management optimization. Our business includes four PHDs in energy market optimization along with several energy market experts with history in energy retail and distribution businesses. Evenergi has unique skills and platforms for managing and optimizing transition planning. These skills will take data analytics on the existing fleet, the vehicles and infrastructure that has been transitioned, and help to optimize around costs and operational requirements.