Smart Charging for eBus Fleets

ASTSBC: TRA25-03

March 2025

Bia Smart Charging

Why Bia is the leader in eBus smart charging...

Bia is optimising charging for the largest eBus depot in Europe

235 DC sockets

300 eBuses

15 MW power

Complex integrations

100% fleet uptime ✓

40% lower peak loads ✓

20% lower charging costs ✓

55% fewer power penalties ✓

Efficient, cost-effective and clean charging

Advanced charge optimization that considers power constraints, fleet schedules, dynamic electricity pricing and onsite solar generation

100% fleet uptime

Bia ensures the fleet is always ready to leave on schedule, providing full visibility of all real-time and historical charging sessions

Seamless Integrations

Bia integrates multiple charger brands, onsite solar, ERP system and 5 levels of the depot's electrical infrastructure

Grid Services & V2G

Bia's ability to accurately identify and forecast flexibility ensures this depot can confidently participate in capacity markets without compromising uptime

EMT MADRID

Trusted by...

Bus Operators

EMT MADRID · GRUPO RUIZ · transdev the mobility company · alsa · arriva a DB company · EMT VALENCIA · movantis · AISA · avanza by MOBILITY ADO · AFIFI GROUP TRANSPORTATION AND LOGISTICS

Strategic partners

TotalEnergies · Iberdrola · enel · BRIDGESTONE · EIFFAGE

Bia's Smart Charging integrates with all your fleet systems to control and optimise charging

Monitor and manage your chargers and fleet in real-time

Simulate and forecast fleet electrification costs and energy requirements

Optimise charging according to your business priorities

Enable revenue generation through **grid flexibility services**

Bia Smart Charging

Priority Balancing - the first layer of our smart charging solution

Bia Priority Balancing

EXAMPLE: Depot with 200 kW power capacity

STATIC BALANCING

67 kW

67 kW

67 kW

DYNAMIC BALANCING
(Industry Standard using SoC)

100 kW

20% battery

30 kW

80% battery

70 kW

50% battery

BIA PRIORITY BALANCING incorporating SOC and Departure Time*

53 kW

20% battery

6h to go

80 kW

80% battery

1h to go

67 kW

50% battery

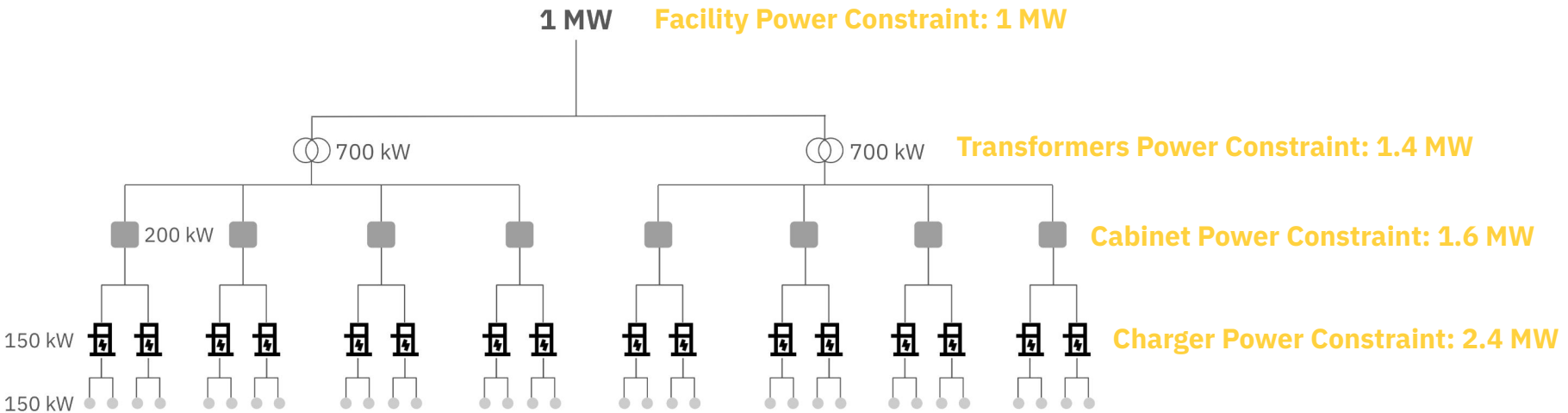
3h to go

*SoC predicted for AC chargers to 95% accuracy
*Departure time can be predicted

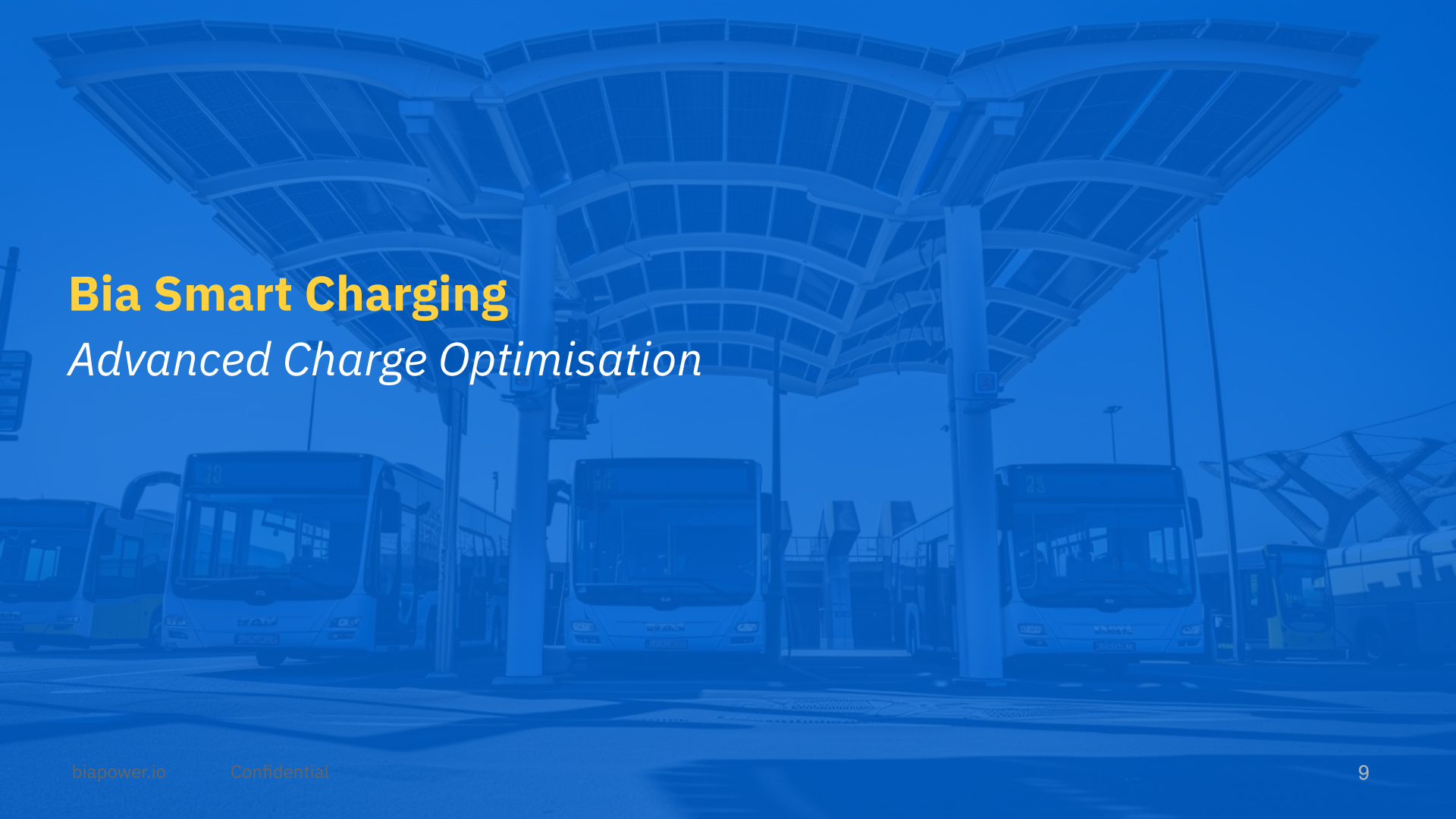
Bia Priority Balancing

Developed for **Bia's Priority Balancer** not only uses SoC and departure time, it also incorporates 5 levels of electrical infrastructure - **Charger, Cabinet, Transformer, Feeder, Facility**

MULTI-LEVEL BALANCER



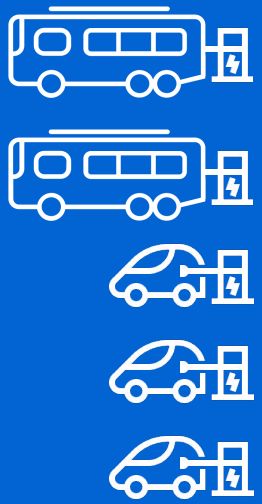
Results: can enable 20% faster charging if required



Bia Smart Charging

Advanced Charge Optimisation

Advanced Charge Optimisation



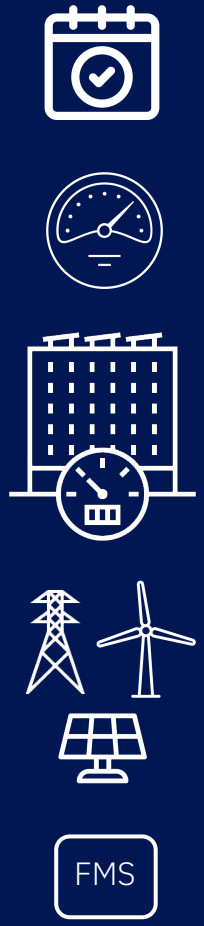
EV Charging Data (inc SoC)

Optimised Charging Commands

bia

Data Imports from other systems:

- Energy Prices and Power Costs ✔
- Electrical Infrastructure and Power Capacities ✔
- Fleet Management System (departure times, SOC target) ✔
- Telematics ✔
- Onsite Solar Generation ✔
- Building Energy Consumption ✔
- Battery Storage ✔



Custom Optimisation Strategy
(see next slide)

Bia dashboard

FMS

SAP

eMSP

A charge optimisation strategy can be customized according to a particular charging site's priorities - whether that be reducing peak loads, energy costs, CO2, battery degradation - or all of the above.

Peak loads

Bia operates the charging infrastructure with minimal impact on the electrical installation, allowing the **operation of more chargers by avoiding or delaying costly energy infrastructure upgrades**.

up to 80% less power required

Energy costs

The platform sends optimal schedules to all chargers to consume energy when the **electricity tariff is the cheapest and energy penalty optimisation.**

up to 50% charging costs reduction

CO_2 footprint

Bia incentivizes **charging with renewable energy** from either onsite generation (*self-consumption*) or the grid.

up to 70% carbon footprint reduction

Battery health

Bia's algorithms look after EVs, avoiding battery dwelling at high state of charge and **reducing its degradation**.

up to 40% less battery degradation

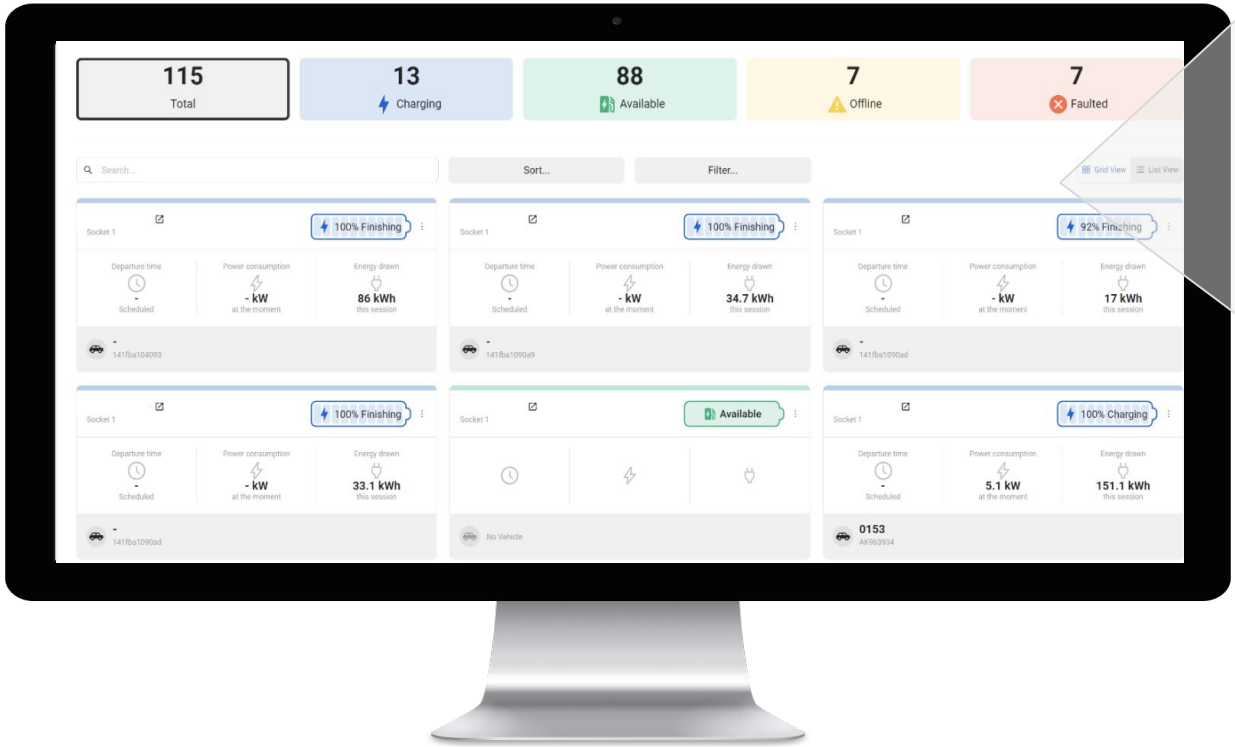
Bia optimisation **improves operations** and ensures **100% fleet uptime**

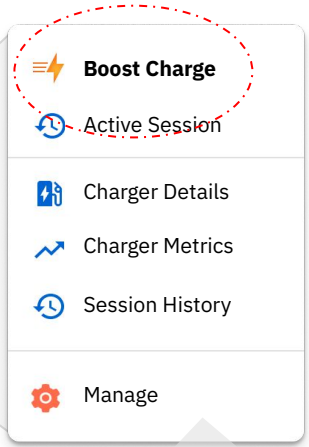
Bia Smart Charging

The Dashboard - real-time and historical monitoring, management and reporting

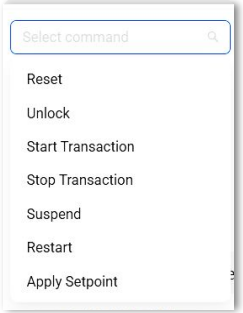
REAL-TIME OPERATIONS

Real-time and historical monitoring and management of all charging sessions



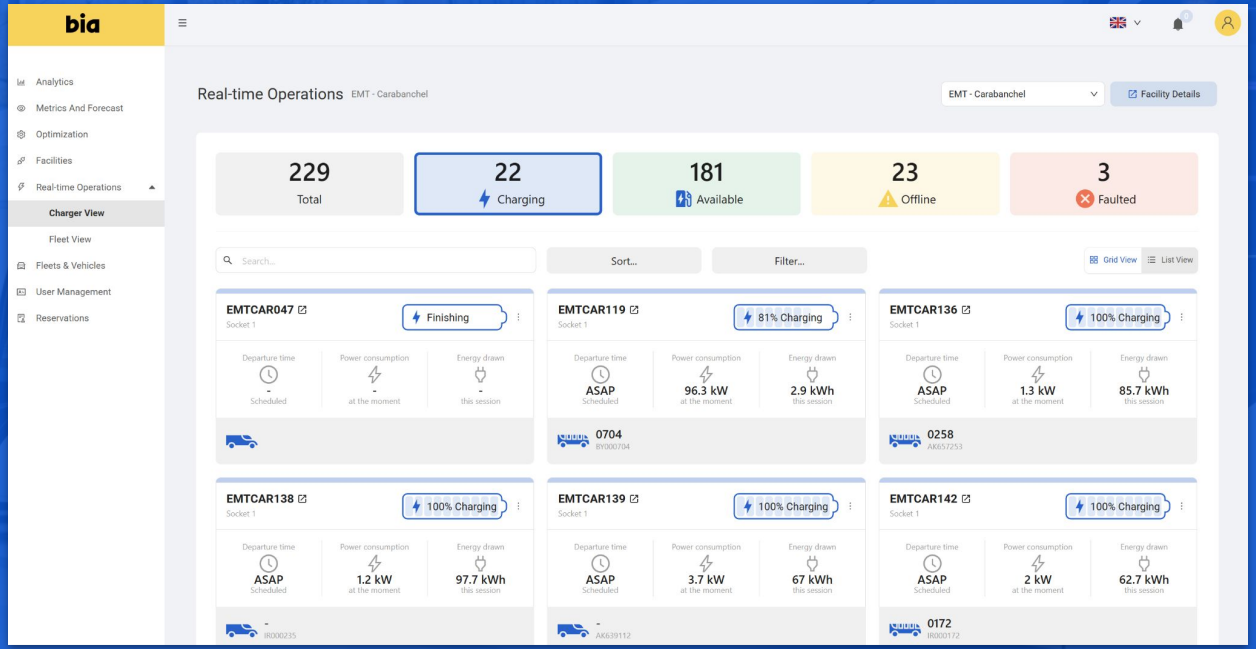


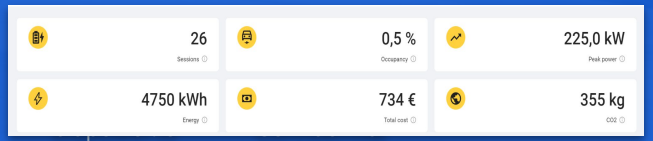
Boost - Dynamic Power Allocation: *Boost charge to allocate more power to vehicles requiring a quick departure for service.*

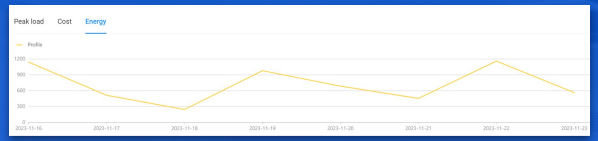


Remote Charge Management

REAL-TIME OPERATIONS



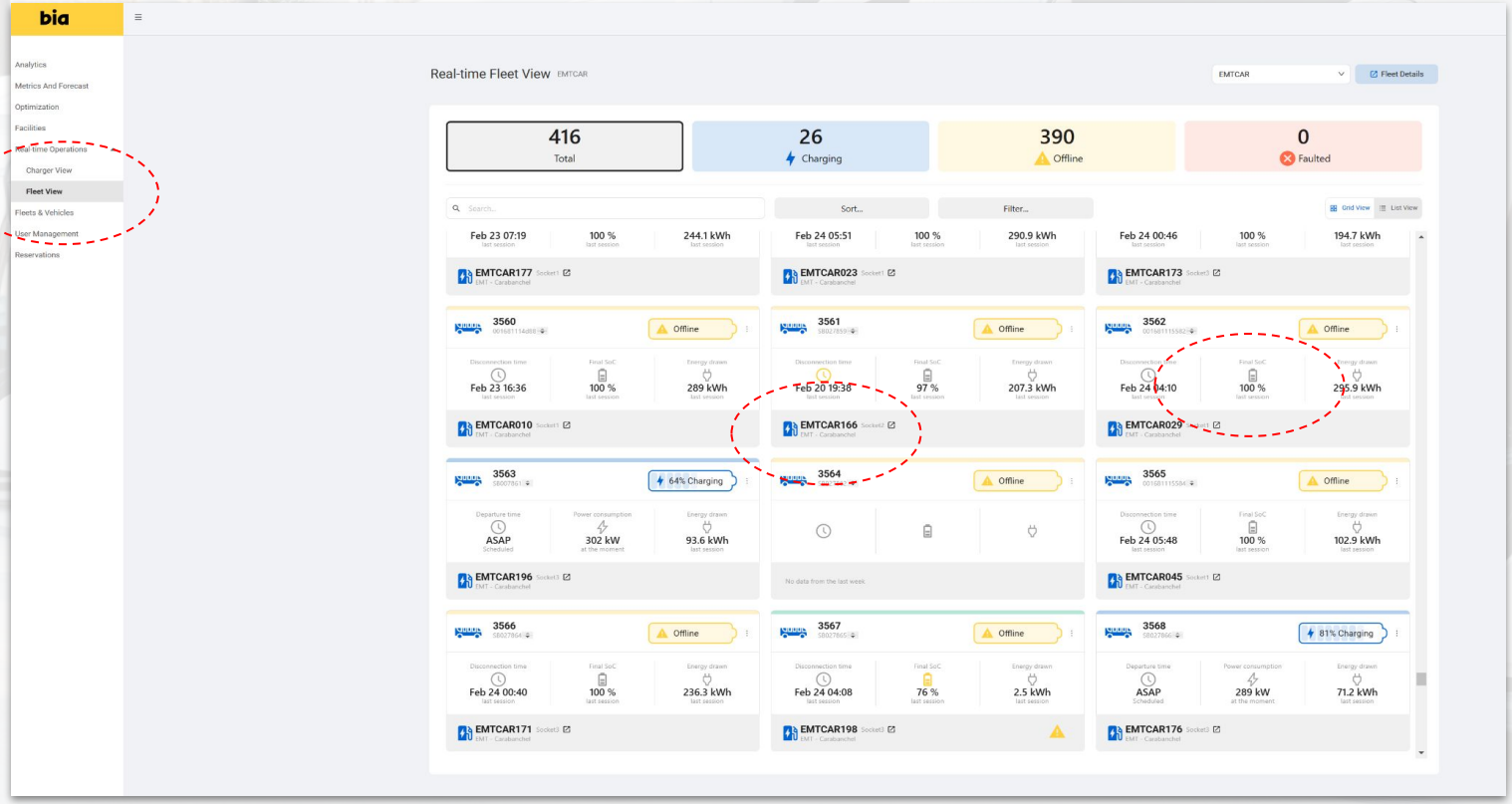




- **Filter** according to charger status
- **Metrics per charger**
  Number of charging sessions
  Charger Occupancy
  Charger energy consumption
- **Session history**
  per charger
- **Unlock command**
  Terminate transaction & unlock socket
- **Reset command**
  Stop transaction & reboot
- **Notifications**

REAL-TIME VEHICLE TELEMATICS INTEGRATIONS

Dashboard incorporating Fleet View of vehicles (Q2 2025 release)



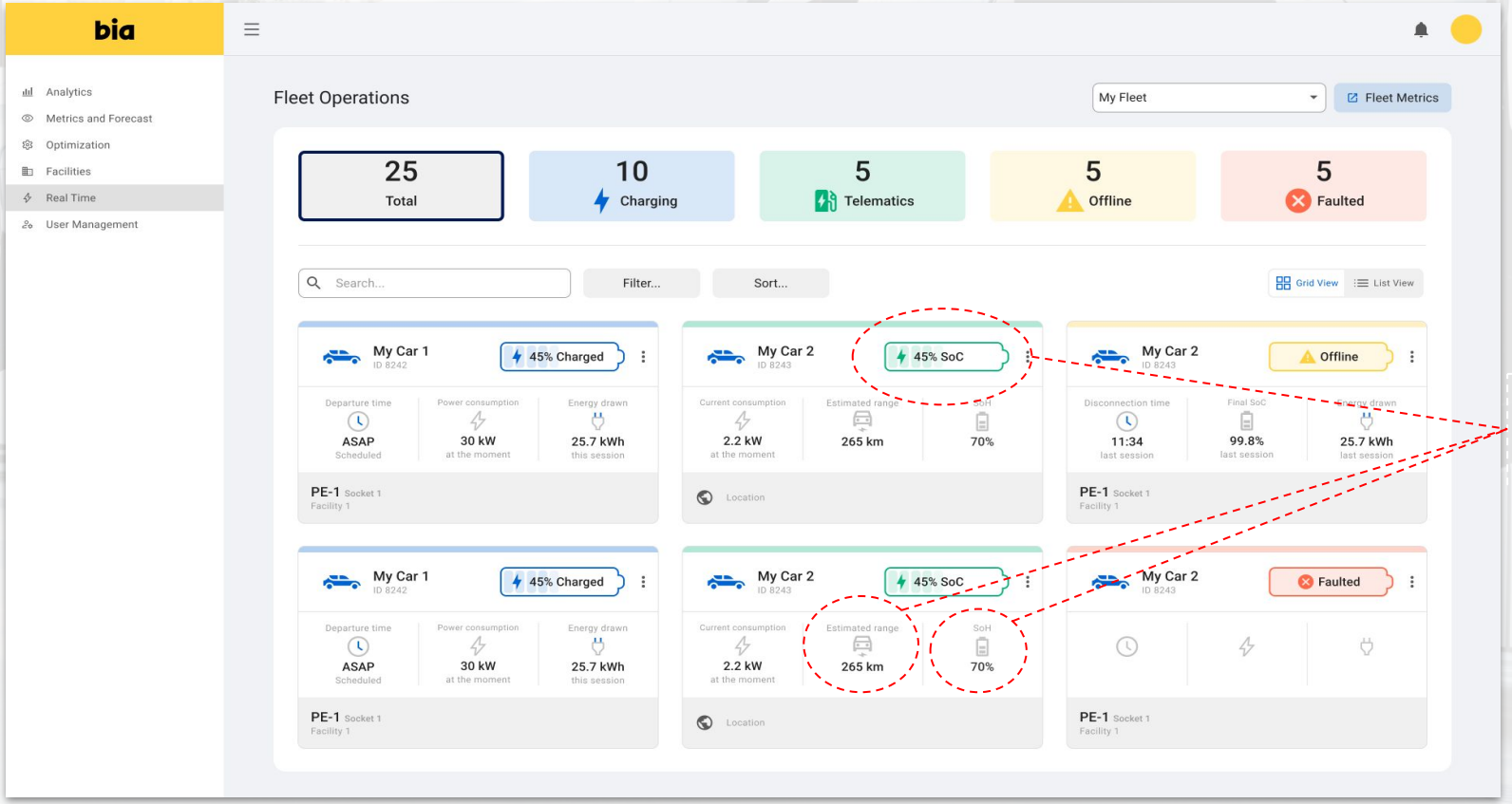
Flip between Charger and Fleet view

View data such as current charging status, time at which last session ended and final SoC for route attribution.

View detailed historical analytics on all charging sessions per vehicle

REAL-TIME VEHICLE TELEMATICS INTEGRATIONS

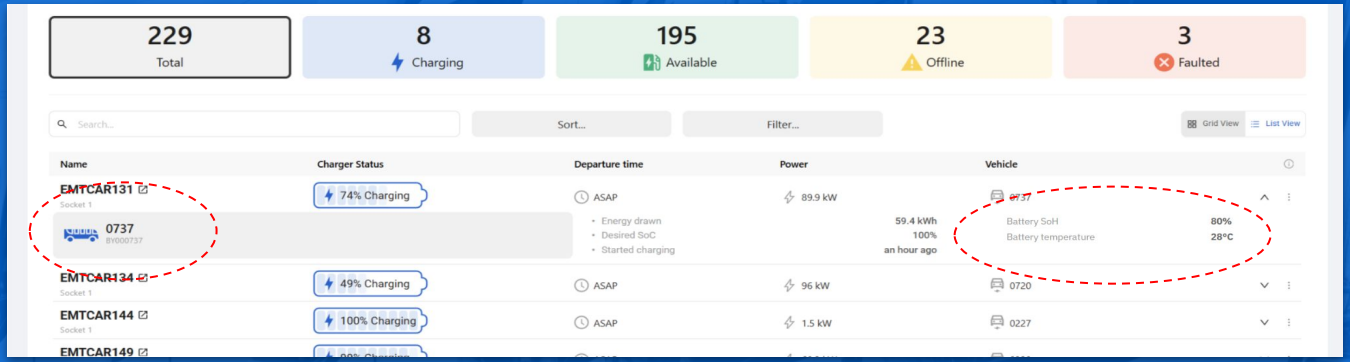
*Dashboard incorporating **en-route** vehicle telematics (Q2 2025 release)*



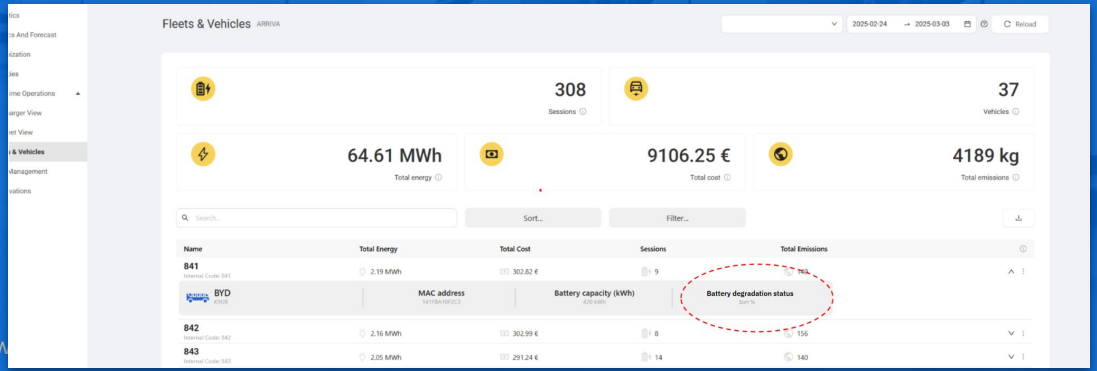
live
en-route

REAL-TIME BATTERY MONITORING AND INSIGHTS

Real-time battery monitoring and data reporting would require Out of Scope work and be dependent on a telematics integration and/or data being reported by the charger. The below images are mock-ups of how the data can be presented in our dashboard



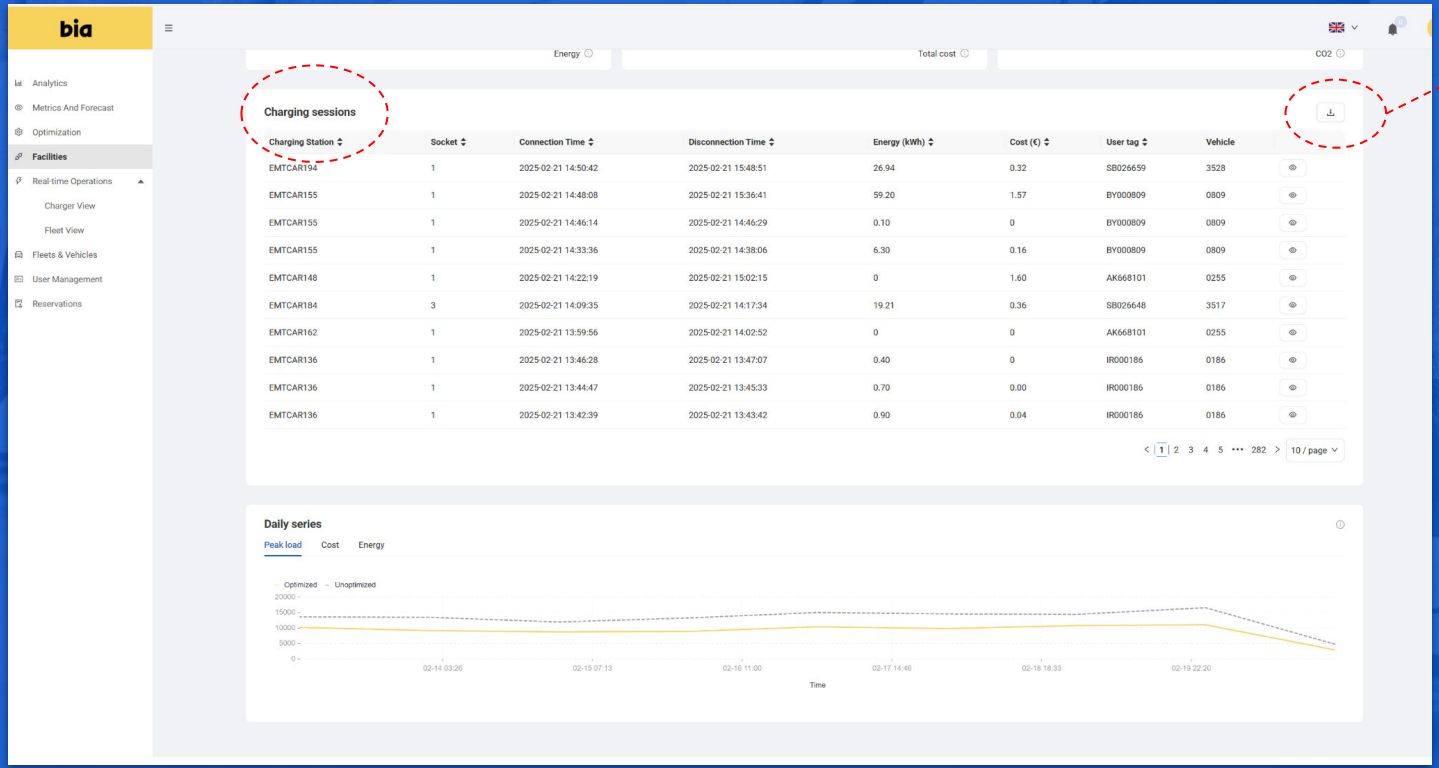
In the Real-Time Monitoring tab, the battery temperature and SoH can be reported



In the Fleets & Vehicles tab, battery data insights such as degradation status can be reported

REPORTING - CHARGE SESSION

Detailed historical reporting on every charge session

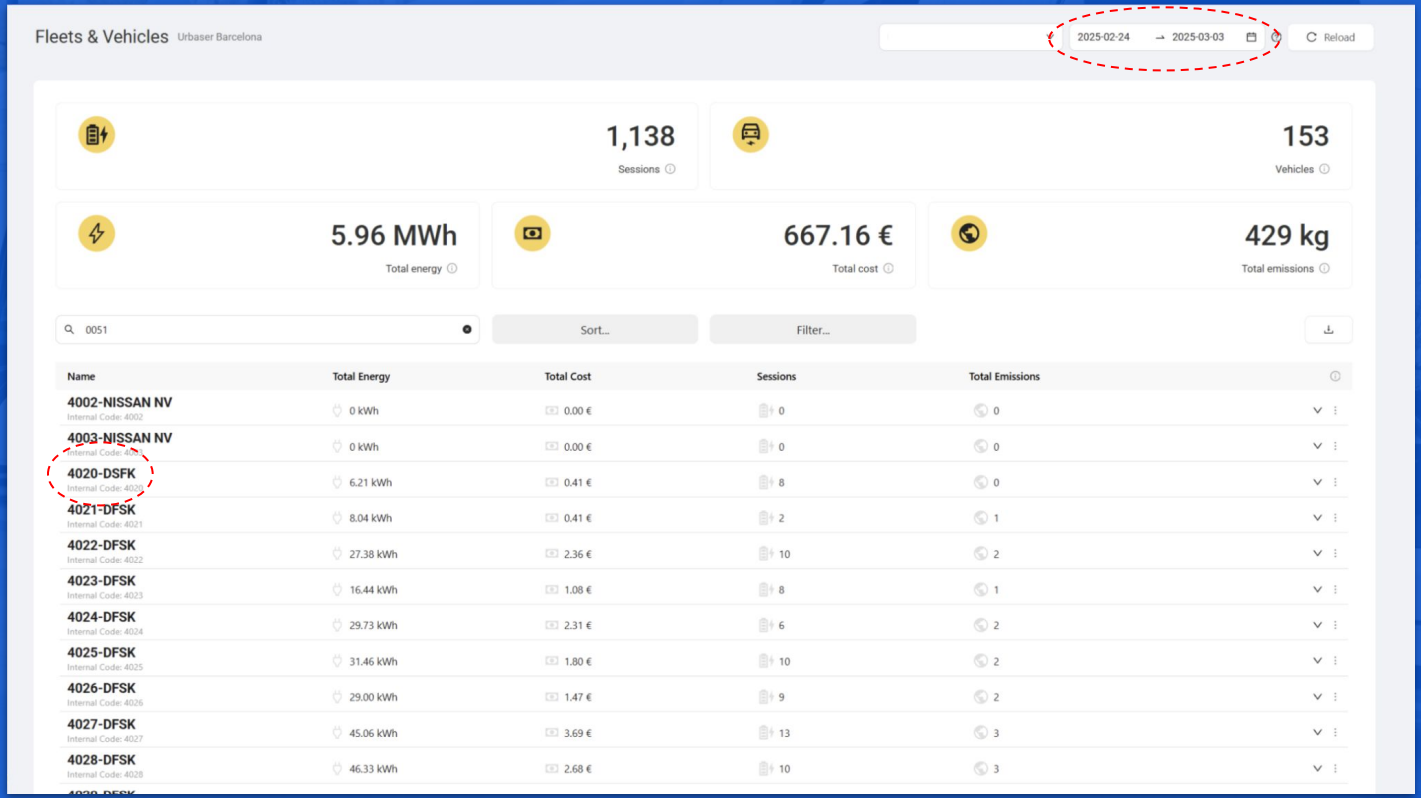


Detailed charging session data is available to download in .csv format or automatically feed into an ERP via API

- Per charger
- Per IDtag
- Connection/disconnection time
- Number of sessions
- Costs
- Energy drawn (kWh)
- Peak Power (kW)
- Co2 (kg)

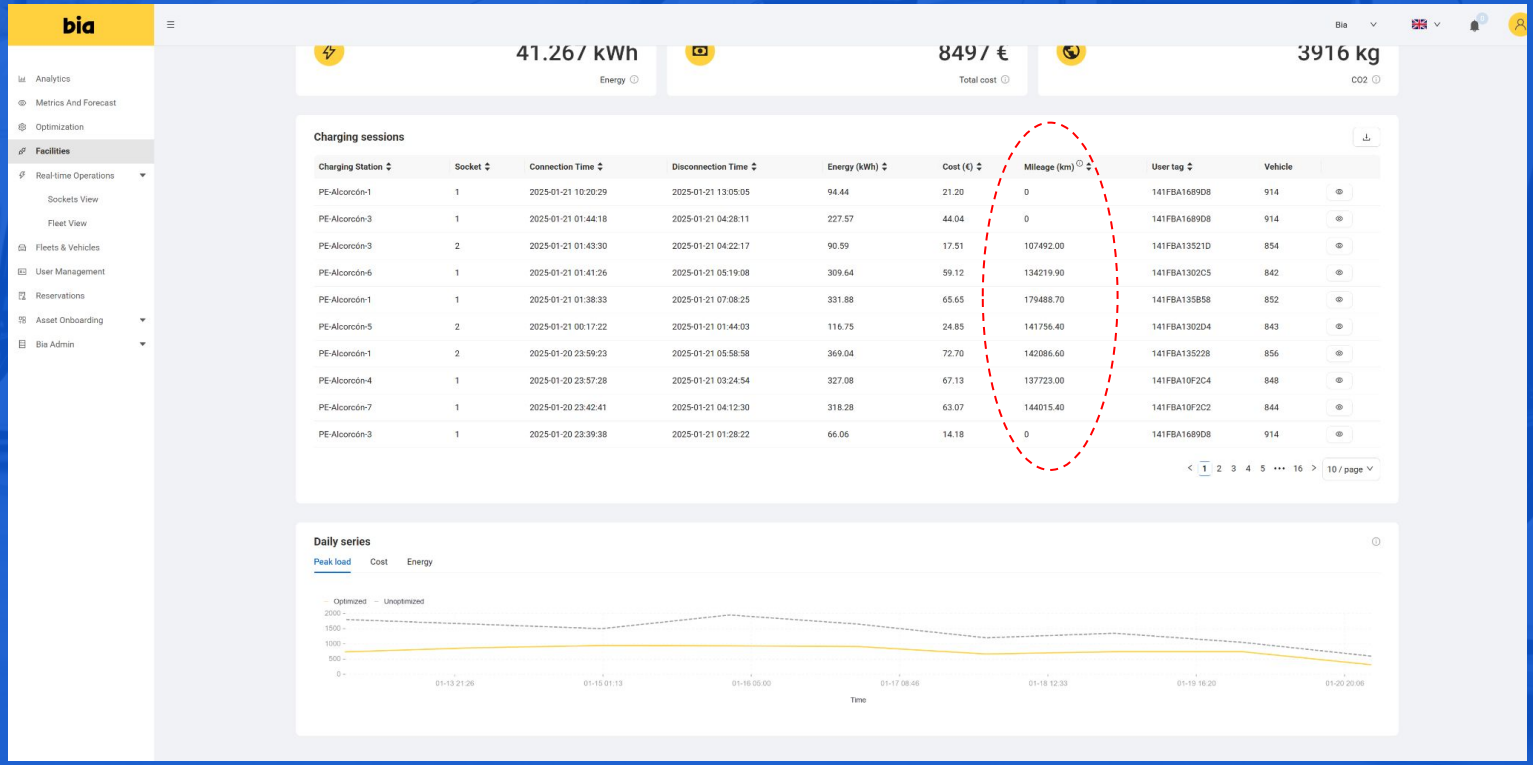
REPORTING - PER VEHICLE

See cost breakdowns, energy requirements and emissions per vehicle over a specific time frame



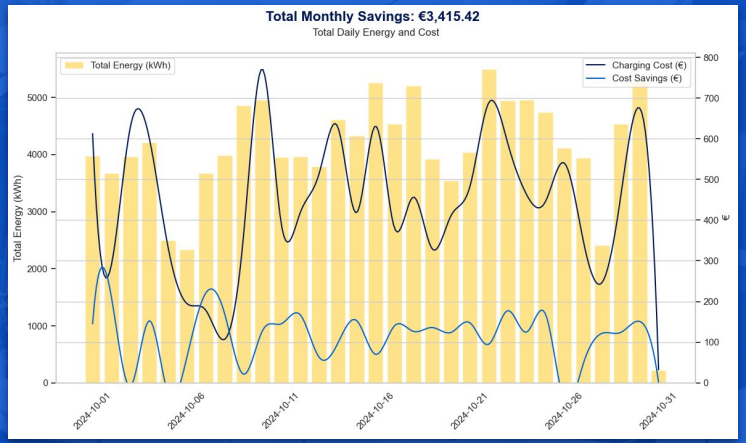
REPORTING - VEHICLE TELEMATICS INTEGRATIONS

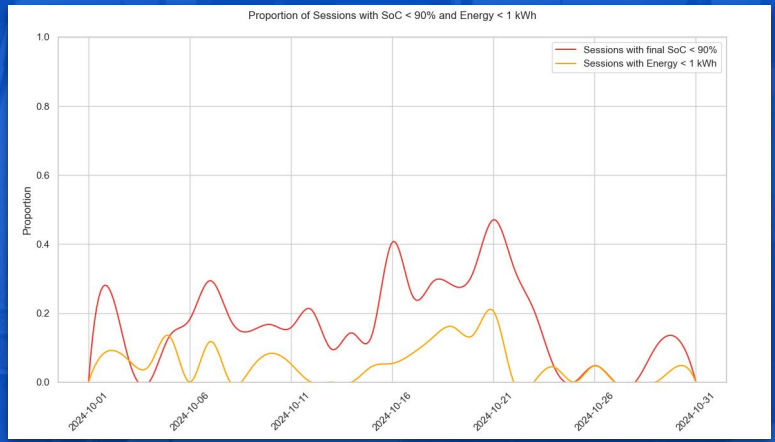
An example of integrating mileage via an telematics API integration to enable the bus operator to calculate energy efficiency performance

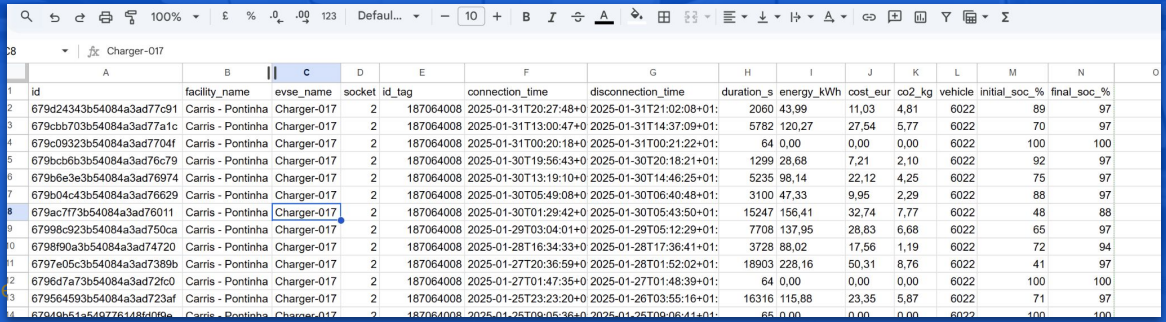


REPORTING - DOWNLOADABLE REPORTS

Bia can provide automated monthly reports (below), or ASTSBC can download data in csv format directly from the dashboard







100% £ % .0 .00 123 Defaul... 10

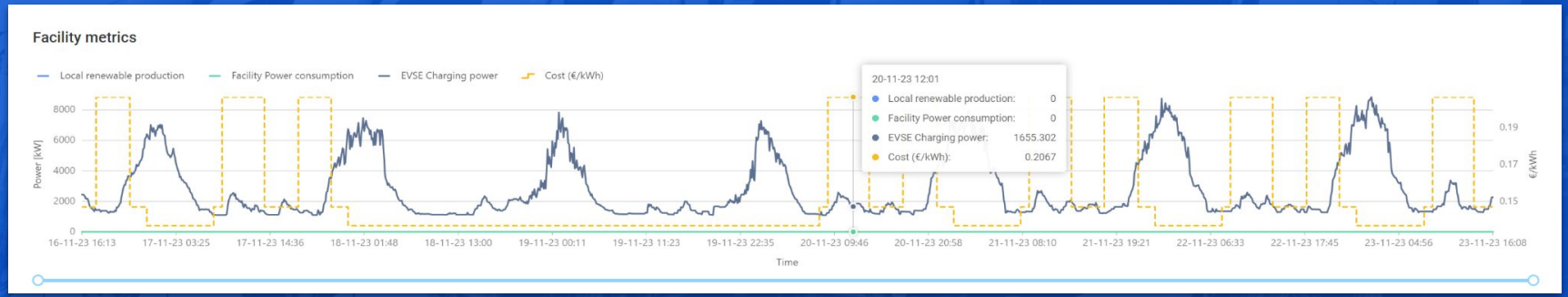
C8 Charger-017

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	id	facility_name	evse_name	socket	id_tag	connection_time	disconnection_time	duration_s	energy_kWh	cost_eur	co2_kg	vehicle	initial_soc_%	final_soc_%
2	679d24343b54084a3ad77c91	Carris - Pontinha	Charger-017	2	187064008	2025-01-31T20:27:48+0	2025-01-31T21:02:08+01:	2060	43,99	11,03	4,81	6022	89	97
3	679cbb703b54084a3ad77a1c	Carris - Pontinha	Charger-017	2	187064008	2025-01-31T13:00:47+0	2025-01-31T14:37:09+01:	5782	120,27	27,54	5,77	6022	70	97
4	679c09323b54084a3ad7704f	Carris - Pontinha	Charger-017	2	187064008	2025-01-31T00:20:18+0	2025-01-31T00:21:22+01:	64	0,00	0,00	0,00	6022	100	100
5	679bcb6b3b54084a3ad76c79	Carris - Pontinha	Charger-017	2	187064008	2025-01-30T19:56:43+0	2025-01-30T20:18:21+01:	1299	28,68	7,21	2,10	6022	92	97
6	679b6e3e3b54084a3ad76974	Carris - Pontinha	Charger-017	2	187064008	2025-01-30T13:19:10+0	2025-01-30T14:46:25+01:	5235	98,14	22,12	4,25	6022	75	97
7	679b04c43b54084a3ad76629	Carris - Pontinha	Charger-017	2	187064008	2025-01-30T05:49:08+0	2025-01-30T06:40:48+01:	3100	47,33	9,95	2,29	6022	88	97
8	679ac7f73b54084a3ad76011	Carris - Pontinha	Charger-017	2	187064008	2025-01-30T01:29:42+0	2025-01-30T05:43:50+01:	15247	156,41	32,74	7,77	6022	48	88
9	67998c923b54084a3ad750ca	Carris - Pontinha	Charger-017	2	187064008	2025-01-29T03:04:01+0	2025-01-29T05:12:29+01:	7708	137,95	28,83	6,68	6022	65	97
10	6798f90a3b54084a3ad74720	Carris - Pontinha	Charger-017	2	187064008	2025-01-28T16:34:33+0	2025-01-28T17:36:41+01:	3728	88,02	17,56	1,19	6022	72	94
11	6797e05c3b54084a3ad7389b	Carris - Pontinha	Charger-017	2	187064008	2025-01-27T20:36:59+0	2025-01-28T01:52:02+01:	18903	228,16	50,31	8,76	6022	41	97
12	6796d7a73b54084a3ad72fc0	Carris - Pontinha	Charger-017	2	187064008	2025-01-27T01:47:35+0	2025-01-27T01:48:39+01:	64	0,00	0,00	0,00	6022	100	100
13	679564593b54084a3ad723af	Carris - Pontinha	Charger-017	2	187064008	2025-01-25T23:23:20+0	2025-01-26T03:55:16+01:	16316	115,88	23,35	5,87	6022	71	97
14	67949b51a54977f148fd0f9e	Carris - Pontinha	Charger-017	2	187064008	2025-01-25T09:05:36+0	2025-01-25T09:06:41+01:	65	0,00	0,00	0,00	6022	100	100

REPORTING - METRICS & FORECAST

The dashboard provides load profile metrics over a defined period of time, as they relate to multiple datasets (for example energy prices, facility power consumption, onsite solar production etc)

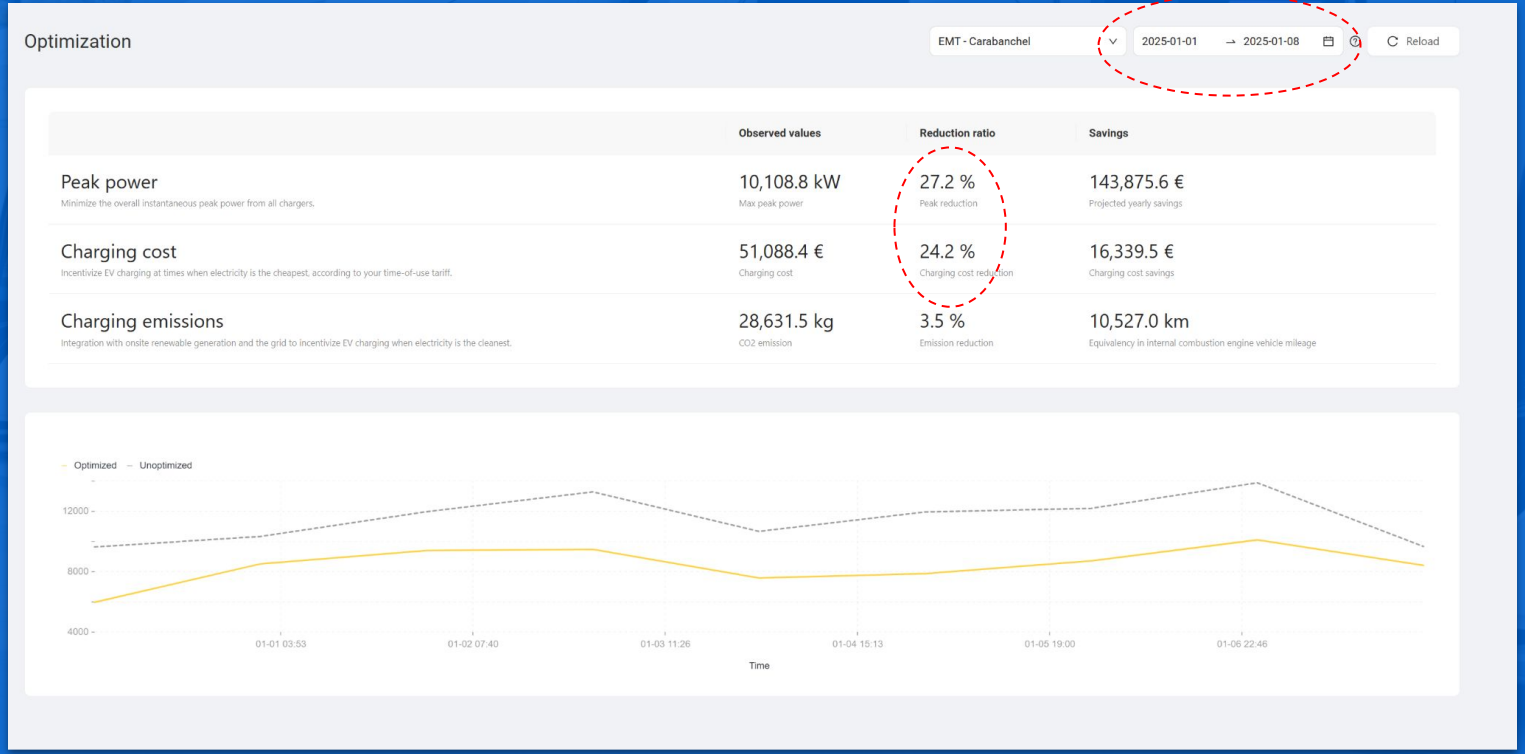
- **Costs optimization**



- **On-site solar production & building consumption**

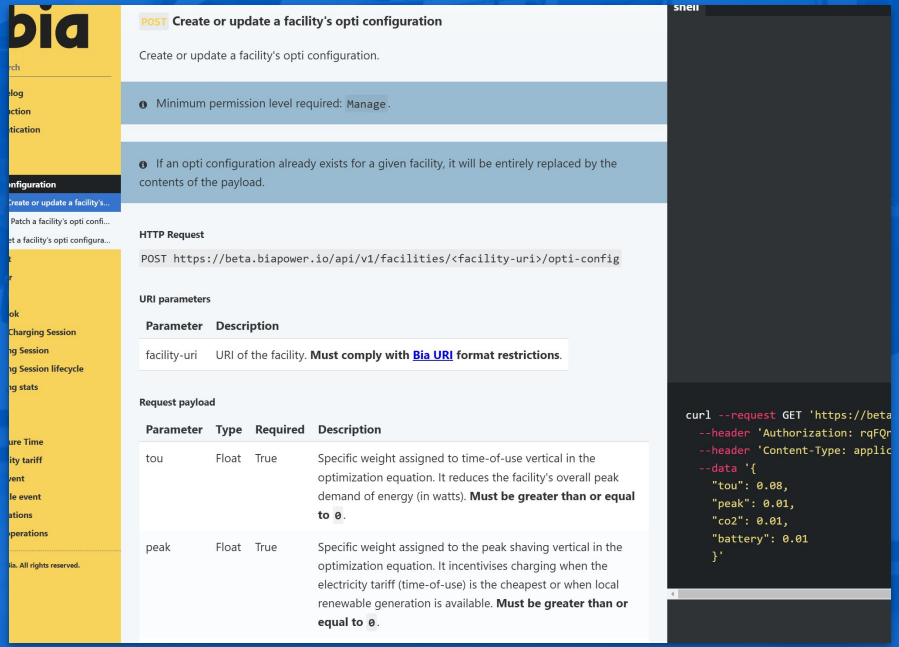
REPORTING - CHARGE OPTIMISATION RESULTS

The dashboard shows charge optimisation results over a defined period of time, including charging cost, peak loads, emissions and optimised load profile (vs baseline)



REPORTING - API

Multiple Bia customers use Bia's API to integrate charging data with third party systems such as an ERP (see EMT Madrid slide 39) or a fleet management system



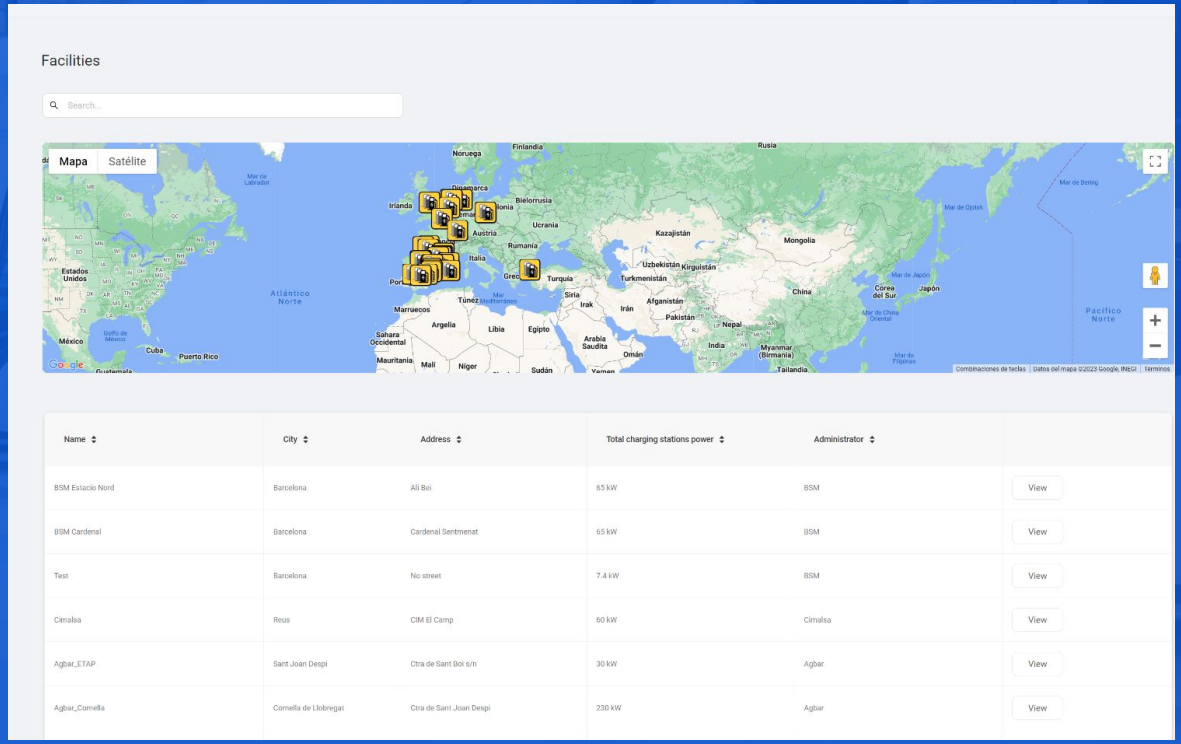
ASTSBC can access Bia's API using these credentials:

https://docs.biapower.io/

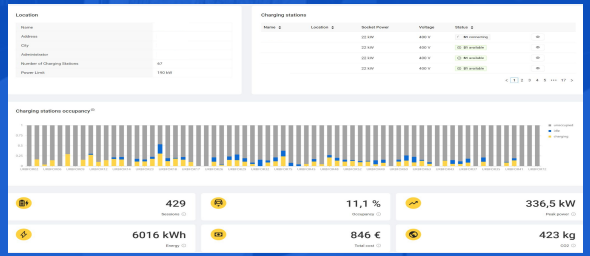
Username: beta-doc
Password: SyWpk87w4T

FACILITIES

Visualize all your facilities and chargers in one place

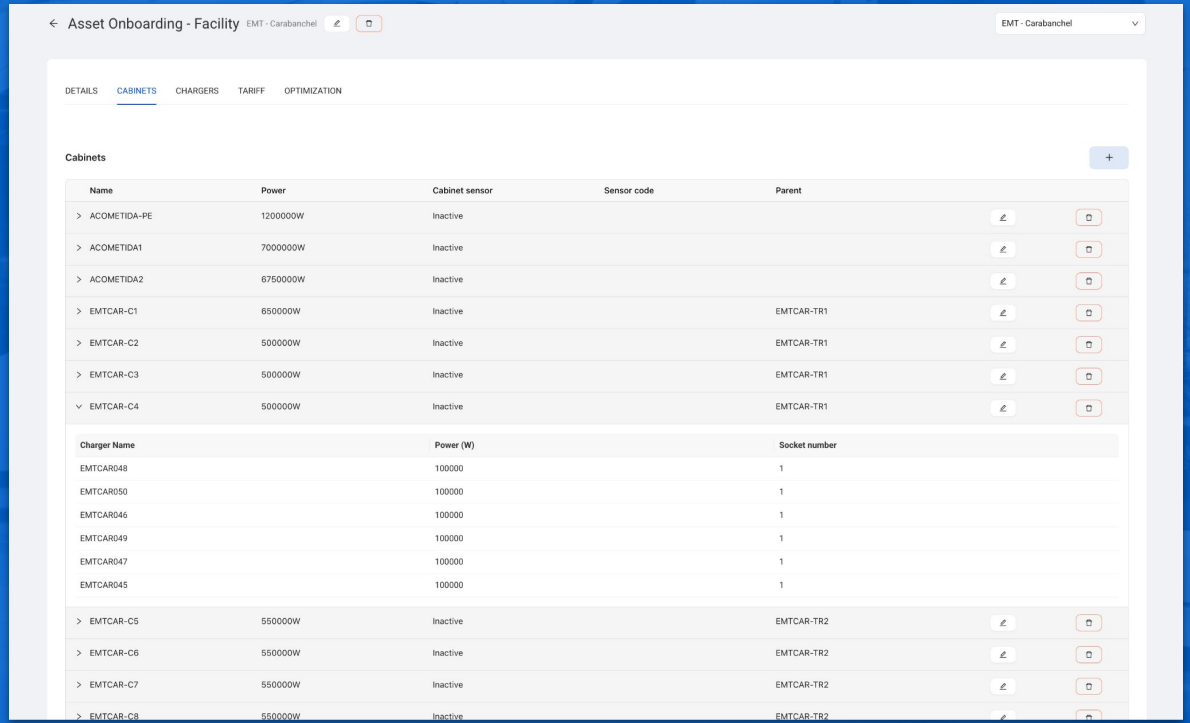


- General data & statistics per facility



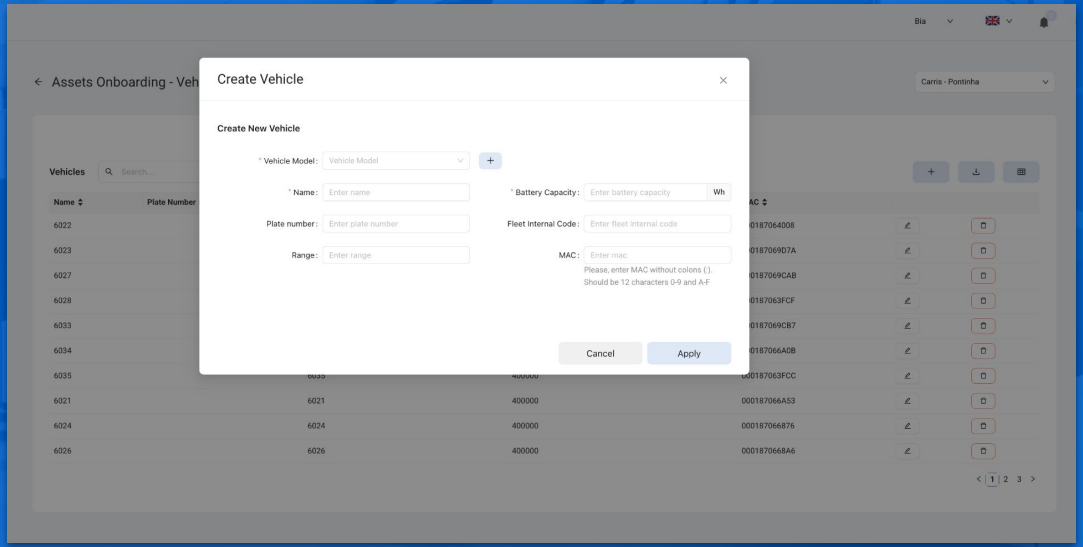
ONBOARDING - CHARGERS

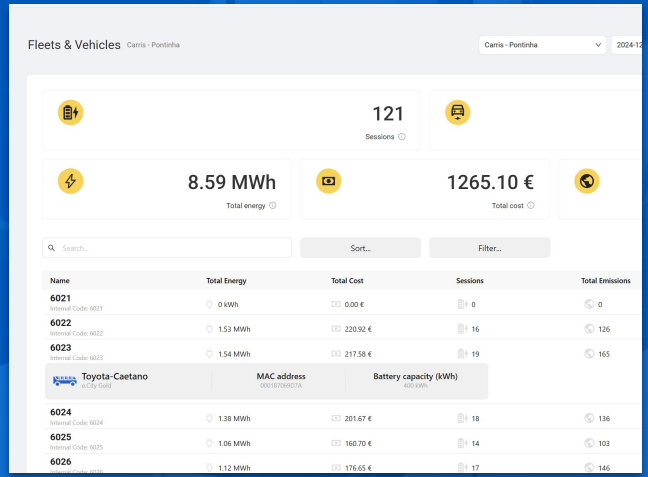
Using our Onboarding tool, charger groups can be created with a maximum power level defined for each group



ONBOARDING - VEHICLES

Vehicle onboarding can be completed via the Bia dashboard. In Bia, fleets are linked to charging facilities to ensure seamless interoperability of bus among depots and whitelist management

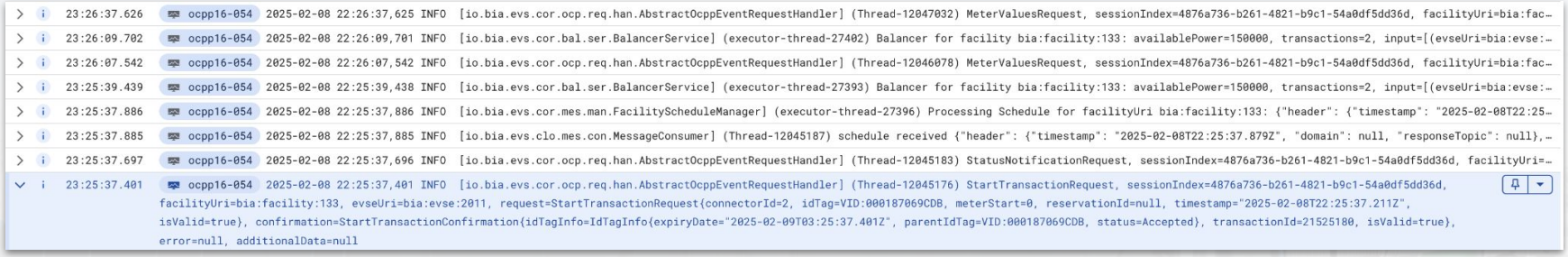




ERROR LOG PROVISION

OCPP logs are available from the Bia platform for each managed charger. Messages like StartTransaction, StopTransaction, MeterValues, Authorize, StatusNotification and other internal logs can be audited to assess the behavior of the chargers and minimize its downtime.

Here is an example of an OCPP error log for the customer depot that can be queried:

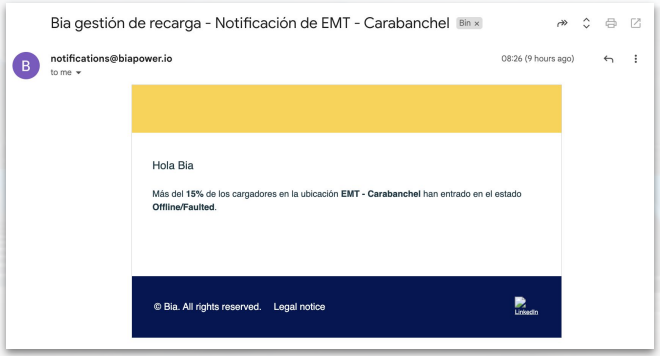


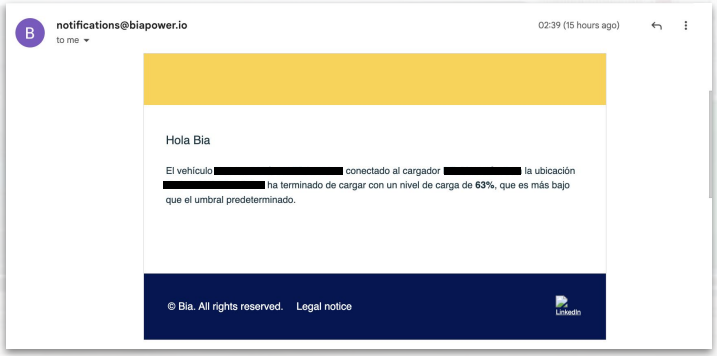
CUSTOMIZABLE NOTIFICATIONS AND ALARMS

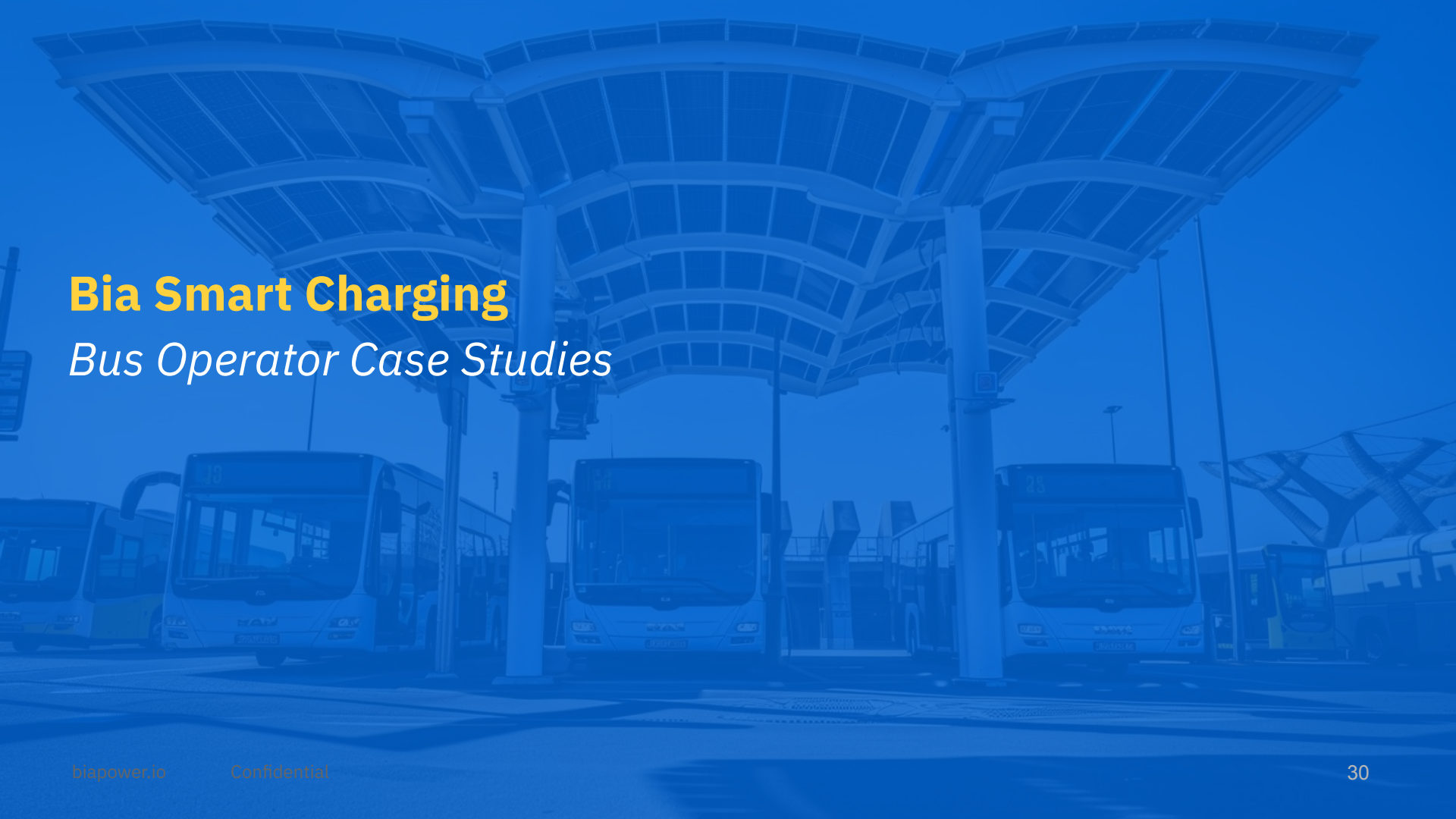
Bia can customize the type of notifications operators want to receive and their trigger thresholds. Below a couple of examples we currently support:

- Massive outage at more than X% of the chargers
- Charger going offline (or in fault mode)
- Charger is back online
- Charging session at charger Y interrupted at SOC lower than X%
- Active charging session at charger Y reached SOC X%
- Vehicle Y at charger X won't be ready at its expected departure time (hh:mm)
- It's currently hh:mm, and the following vehicles are still at SOC lower than X%: A, B, C…

Notifications and Alarms can be sent via email and SMS







Bia Smart Charging

Bus Operator Case Studies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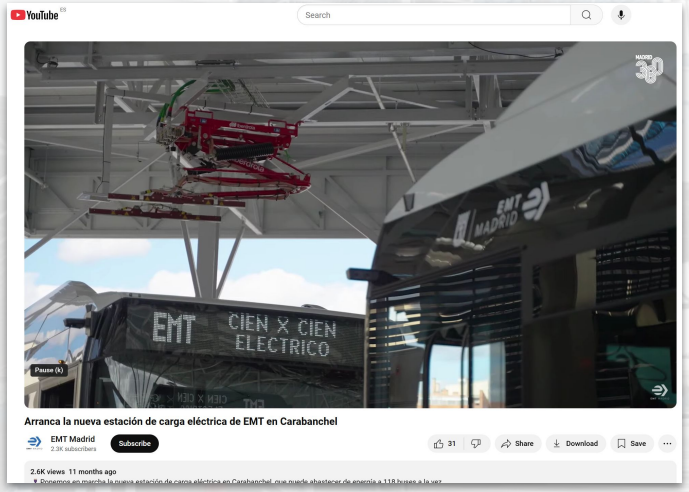
Click here to see a video of the EMT Madrid Carabanchel Depot



Sector: Public Transport Operator

Scope: Monitoring and control of 235 chargers from the Carabanchel depot (scaling up to 413).

Integrations:

- **Chargers**: four brands of OCPP-compliant chargers (both connector and pantograph).
- **ERP system**: charging data for each vehicle is automatically reported in their system.
- **Fleet management system**: vehicle departure times are retrieved by Bia to inform charge optimisation.
- **Onsite energy assets**: Bia also monitors energy loads via Modbus TCP to make sure charging load balancing is done safely, from an electrical infrastructure perspective, and efficiently from a fleet uptime perspective.
- **Preconditioning**: via the bus OEMs cloud platform to ensure all vehicles are fully charged and preconditioned before the driver arrives. VDV 261 will be used for the chargers that implement it.
    - Preconditioning ensures the vehicle's cabin reaches a comfortable temperature before departure using grid energy instead of the battery, preserving autonomy. Bia will provide the scheduled departure time and ambient temperature (if available via OCPP) so the vehicle can autonomously plan and activate preconditioning. It will also factor in the extra energy needed based on external conditions, ensuring charging optimization does not interfere with this function.

Monthly stats:

- **Sessions**: 6000
- **Energy**: 850 MWh
- **Energy cost (with Bia)**: 130 k€
- **Power penalties (with Bia)**: 100 k€
- **Average charger occupancy**: 15% of the time

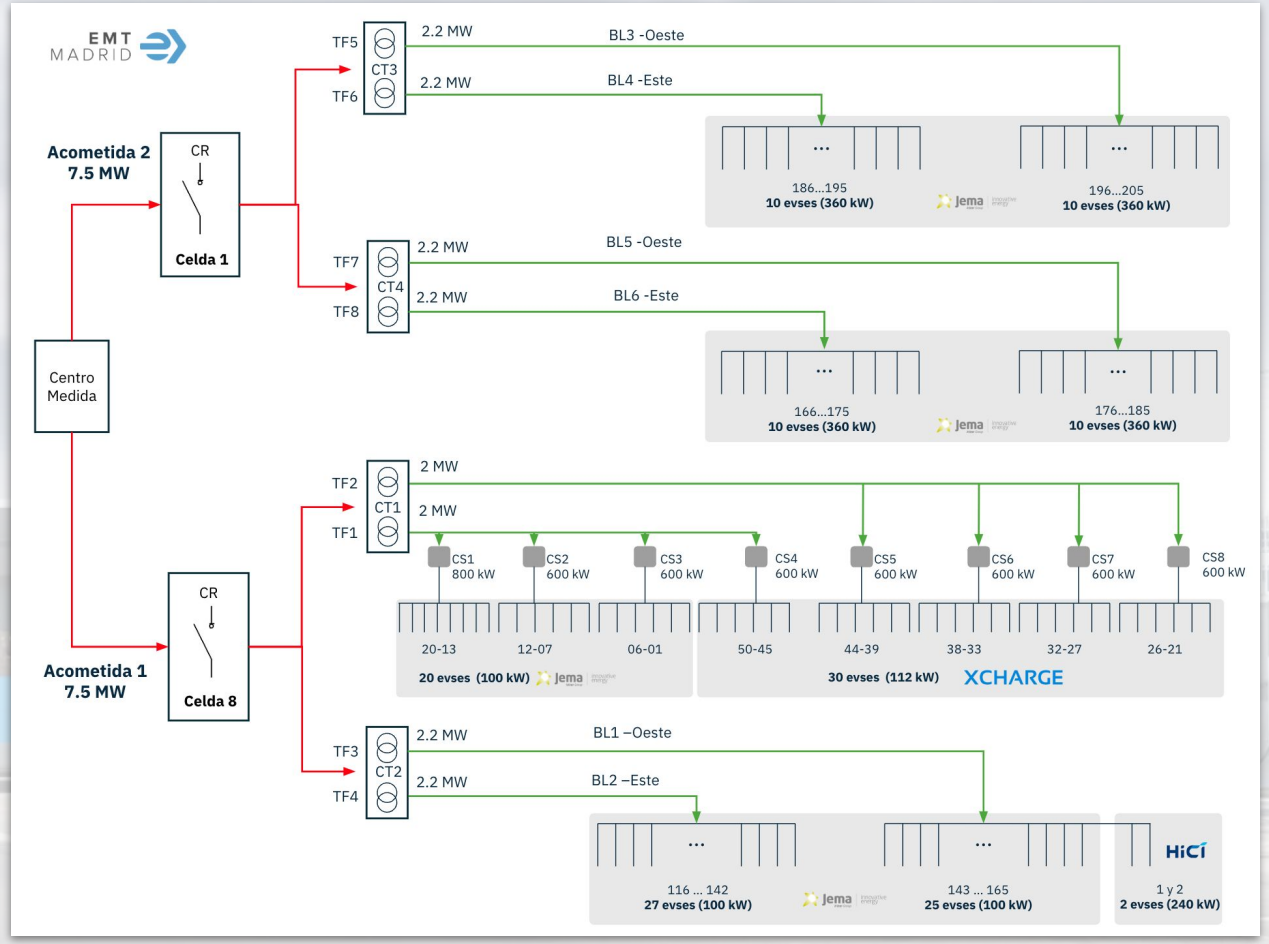
Energy cost (without Bia): 155 k€

Power penalties (without Bia): 220 k€

Fleet uptime 100% maintained, with 0 electrical outages, and minimum power penalties

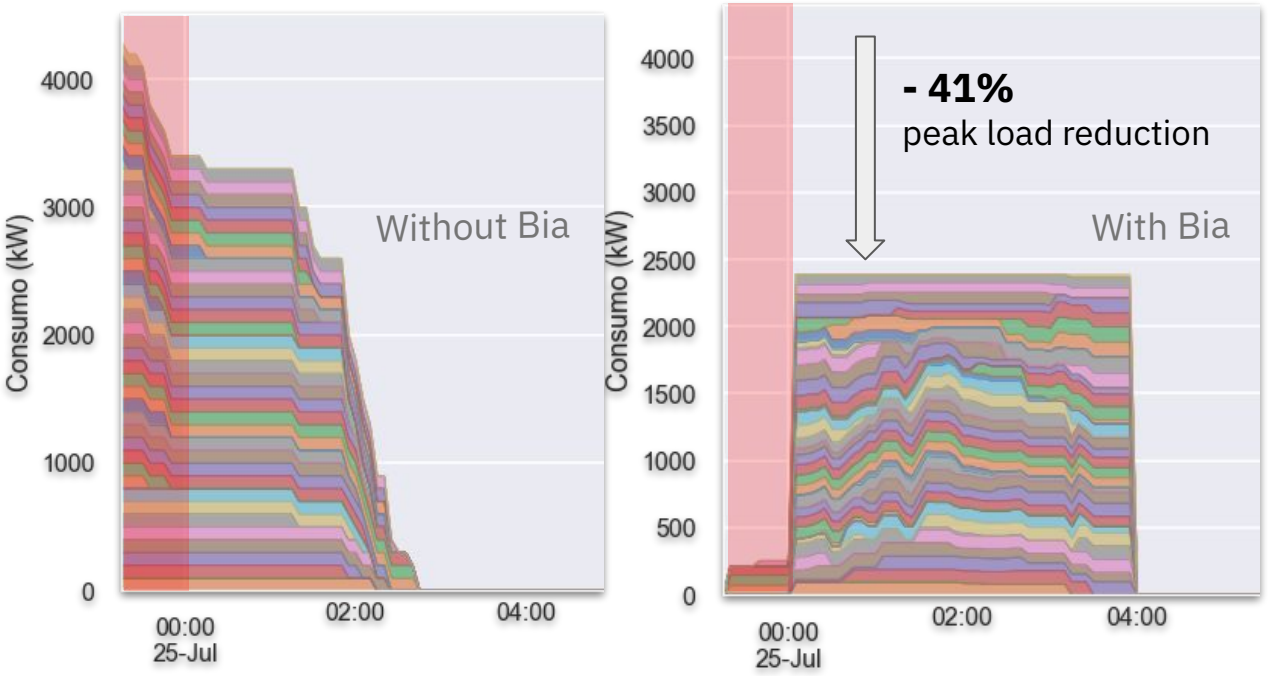
Bia's priority balancing applied at 5 different levels:

- Facility
- Feeder
- Transformer
- Cabinet
- Charger



Sector: Public Transport
Scope: Energy Cost Reduction & Scalability
Number of sockets: 50 sockets (100kW each)

By postponing charging to a cheaper tariff and levelling the load curve, peak loads and energy costs are significantly reduced



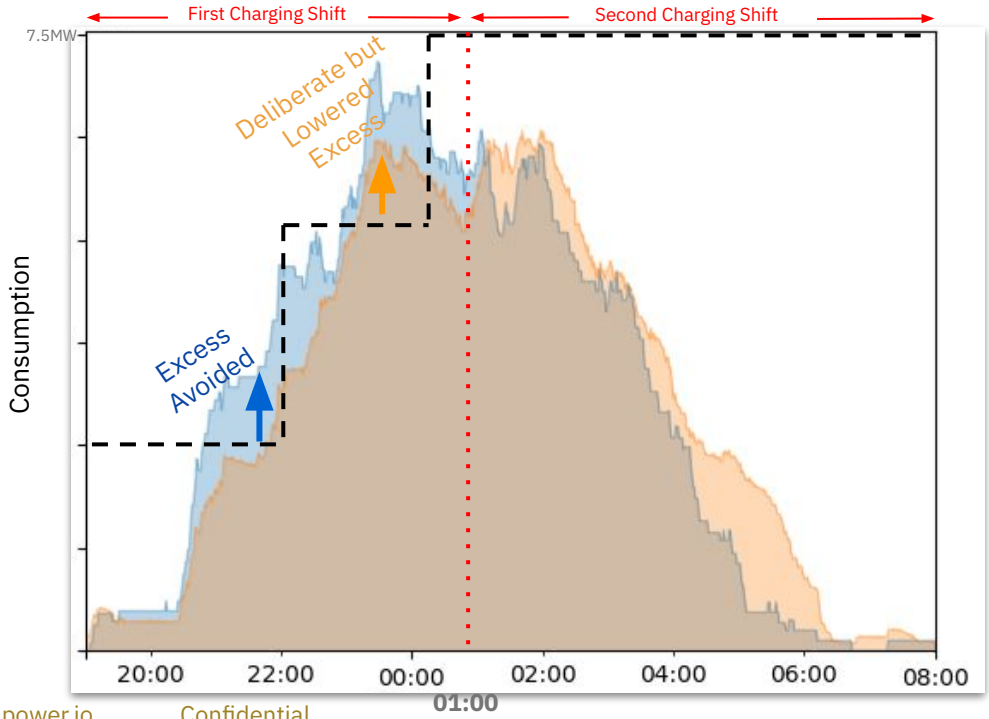
High energy price (€/kWh)

Reduction of peak power
- €90,000/year in peak loads

Off-peak charging
- €40,000/year in price arbitrage

Sector: Public Transport
Scope: Power penalty minimization (plus Multi-Shift charging)
Number of sockets: 235

Bia's optimization also considers power penalties - in some cases avoiding a power penalty while in others deciding to take a penalty to ensure vehicle uptime whilst factoring in multi-shift charging requirements



Contracted power

Base load curve

Optimized load curve (**real**)

Allow power excesses **when required** (so vehicles are ready on time), but in a **controlled way**.

Power penalties (without Bia): €220k/month
Power penalties (with Bia): €100k/month

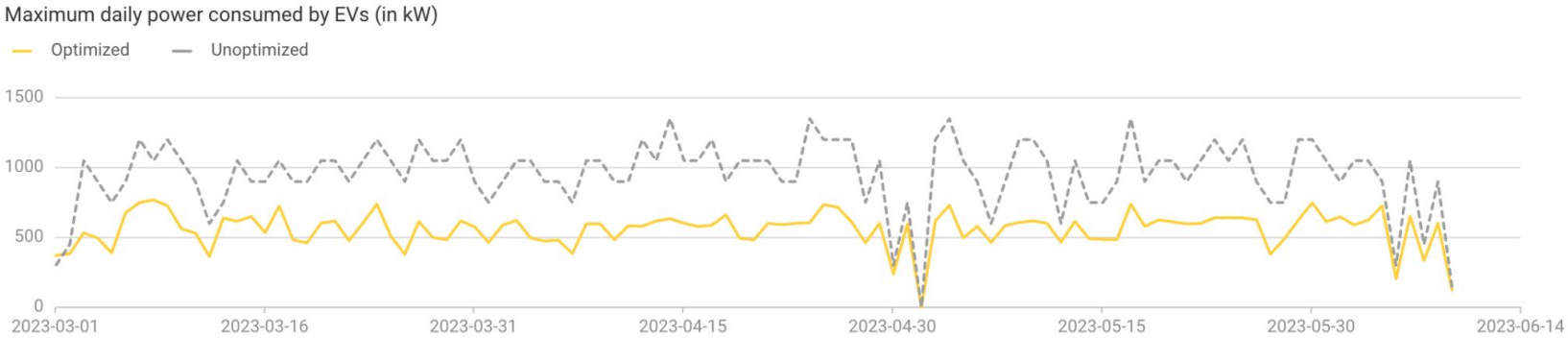
Energy cost (without Bia): €155k/month
Energy cost (with Bia): €130k/month


arriva
a DB company

HOW WE OPTIMIZE - Reducing Peak Load

Sectors: Arriva - Public Transport
Iberdrola - Utility
Scope: Peak Load Reduction
Number of sockets: 16

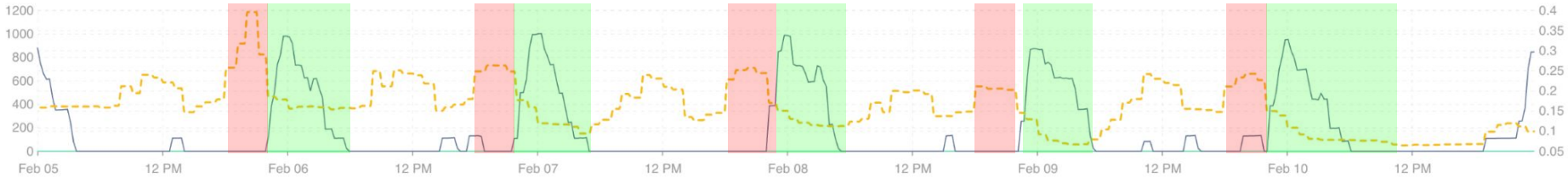
Over the course of 3 months, peak loads are significantly reduced resulting in lower costs but also enabling installation of new chargers without impacting electrical infrastructure



44% Peak Load Reduction
€1350/month Energy Bill Reduction

bia

Sectors: Arriva - Public Transport / Iberdrola - Utility
Optimization Strategy: Electricity Costs & Peak Load Reduction
Number of sockets: 16



EV load
Electricity Tariff
Peak Hours
Off-Peak Hours

25% variable electricity cost savings: **€3000/month**
24% slower charge (reduces battery degradation)

Heavy Duty Vehicle Operator

USE CASES - Heavy Duty eTruck

Assets and integrations:

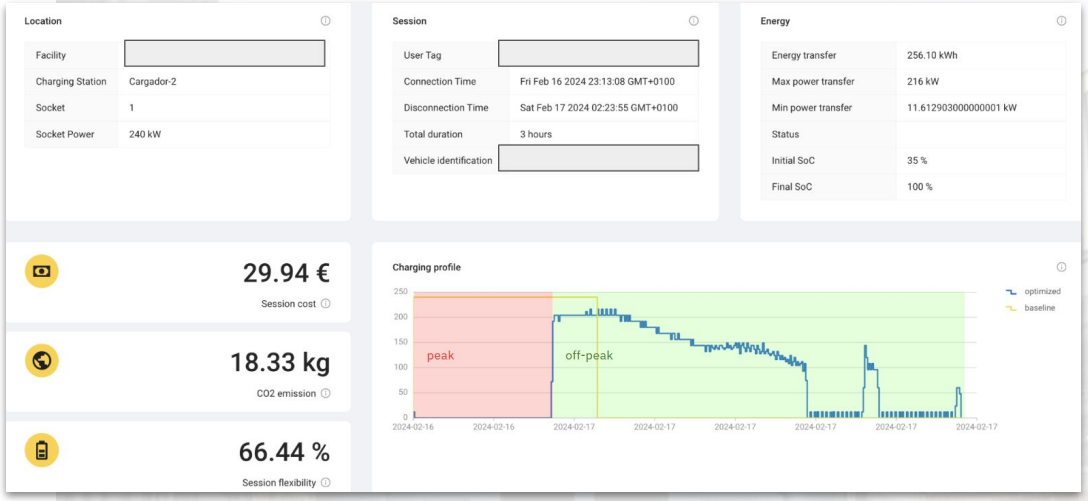
- Heavy-duty trucks (600 kWh capacity)
- 8 double 240kW chargers (16 sockets)
- Large logistics center with big cooling needs
- Solar PV installation (1 MWp)
- Fleet management system (for departure times)

Custom Smart Charging Strategy:

- ✔ 100% vehicle readiness
- ✔ Charge during cheapest energy price
- ✔ Reduce peak loads to avoid power penalties
- ✔ Integrate 1MW of solar energy production whenever possible

Daily Stats:

- ⇨ 20 charging sessions
- ⇨ 3MWh of energy
- ⇨ €300 of variable energy costs
- ⇨ 130kg of CO2 from grid electricity



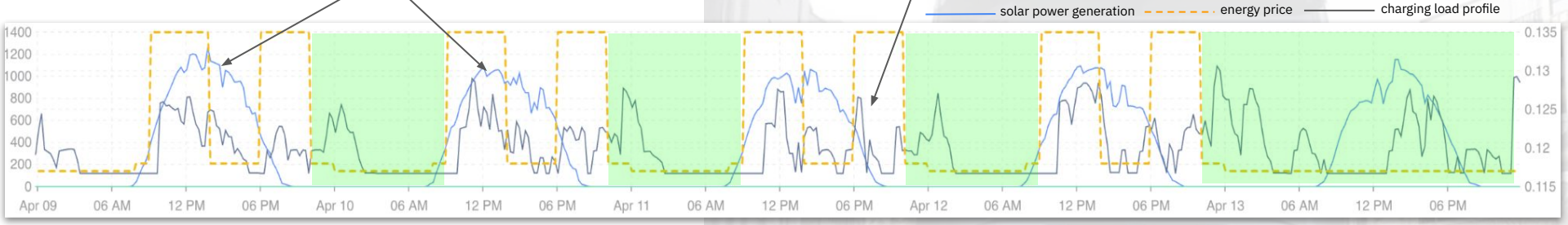
*In the above graphic, you can see how charging is **postponed** until off-peak energy hours, **balanced** with the depot electrical infrastructure (to avoid exceeding power limits) and finished in time for **departure**. The variable departure time and target SoC were integrated from the fleet management system **via API.***

*In the next slide you will see how the charge load profile changes to integrate onsite **solar energy production.***

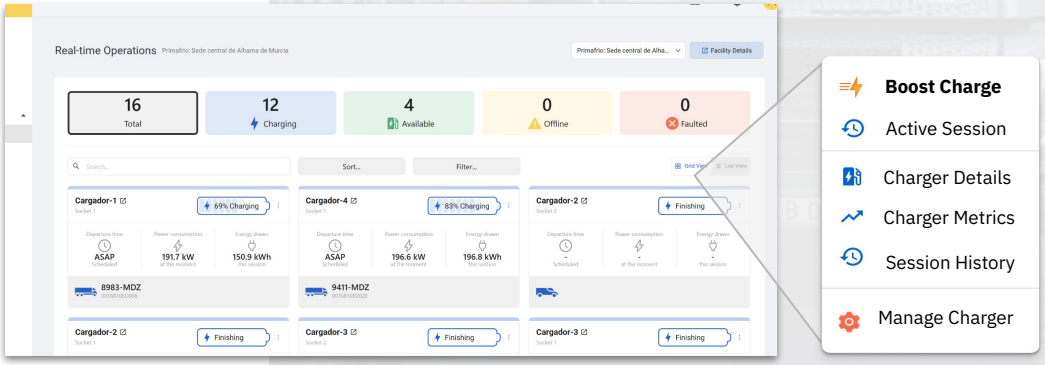
USE CASES - Heavy Duty eTruck

Bia's optimization engine **synchronizes EV charging with on-site solar power generation**, maximizing self-consumption of clean energy and minimizing grid dependence. This translates to significant cost savings and a reduced carbon footprint for the fleet, **ultimately lowering the TCO**.

To **ensure fleet readiness**, EV charging will be prioritized even during periods of low solar generation. In such cases, the system will seamlessly switch to grid power, minimizing disruption and ensuring your vehicles are charged and operational, even if grid electricity costs are higher.



Bia's real-time monitoring dashboard includes in-depth charger and vehicle monitoring, alarms and notifications and the ability to remotely boost charging sessions and manage the charger



Bia Smart Charging

Hardware Agnostic - EVSEs

Bia is hardware agnostic, with extensive experience working with the following charger brands, plus many more...

Additional Capabilities that may be of interest to ASTSBC (additional costs may apply)

Carbon Market

Bia can play a key role in the carbon markets with its smart charging system, which integrates real-time network emissions factors as well as on-site renewable energy production to precisely calculate the carbon footprint of the managed depots. Some of these depots are already optimizing their operations based on their carbon footprint thanks to Bia. By participating in the carbon markets, Bia could validate the source of emission reductions, track and certify CO2 savings, and enable the businesses operating these depots to obtain carbon credits. These credits could be used to offset their own emissions or traded on carbon markets, generating revenue while contributing to the fight against climate change. Bia could also play a role in monitoring on-site renewable energy production assets, ensuring these installations fully contribute to decarbonization efforts.

Flexibility Services

As a major energy consumer, a school bus operator like ASTSBC can participate in flexibility markets, which allow the valorization of charging flexibility with the electrical grid operator, whether through a supplier or an aggregator. This participation not only helps optimize electricity costs but also supports the overall balance of the grid.

Bia, as a provider of smart charging solutions capable of detecting, anticipating, and exploiting this flexibility, offers its clients the opportunity to participate in these mechanisms, such as the demand response market. In this context, Bia will encourage fleet charging when the grid has an energy surplus and may delay charging when the demand is too high. This flexibility helps reduce energy costs and, in some cases, eliminates them.

Moreover, flexibility mechanisms, such as demand response, help meet the growing capacity and energy needs of the grid while offering financial benefits to participants, such as compensation for demand reductions or adjustments requested by RTE or an aggregator.

Additional Capabilities that may be of interest to ASTSBC (additional costs may apply)

Battery State of Health Estimation

Based on telemetry variables, both historical and real-time data collected during charging, a machine learning engine will be trained to improve the state of health (SoH) and lifespan of the battery.

Some of the most relevant variables for this optimization include:

- The ΔkWh/ΔSoC ratio for each charging interval (or charging session).
- The ΔAh/ΔSoC ratio for each charging interval (or charging session).
- The battery voltage at different charge levels.
- The ΔVoltage/ΔkWh ratio for each charging interval (or charging session).
- The ΔVoltage/ΔAh ratio for each charging interval (or charging session).

Moreover, our dashboard will allow identifying vehicles that can complete their service with a charge level capped at 80%, thereby extending the lifespan of the batteries (charges between 20% and 80% are ideal to ensure the long-term functionality of the batteries).

Predictive Maintenance for Chargers

Based on all telemetry data from the chargers managed by Bia since its inception, a machine learning model is trained to identify anomalies and inconsistencies in the telemetry reported by the equipment. This allows us to anticipate potential failures.

This will help reduce downtime for the charging infrastructure and anticipate any issues or inconsistencies reported by the chargers (e.g., rejection of OCPP commands, telemetry unit discrepancies, etc.).

V2X

We have already developed our own bidirectional charging algorithms, currently used in the Spanish market via the OCPP protocol, and which will be compatible with OCPP 2.0.1 in the next two years. With this technology, vehicles will serve as energy storage units, allowing the use of energy stored in the bus batteries when energy costs are high, to power other parts of the facility (V2B - Vehicle-to-Building) or even the grid (V2G - Vehicle-to-Grid). The vehicles will then be recharged when energy costs are lower, optimizing energy expenses.

In addition to significantly reducing electricity costs, V2X offers the possibility of making them negative in certain scenarios. Furthermore, V2B (or V2G) can also be used as a safety mechanism to discharge the bus batteries in the depot according to the manufacturer's recommendations, ensuring optimal management and extending their lifespan.

Support and Maintenance

UNLIMITED SERVICE	**Definition**	
Troubleshooting *Bia Related Issues*	*Addressing and resolving problems specifically related to the Bia platform in accordance with the Bia SLA. This includes diagnosing issues, providing solutions, and ensuring the system functions smoothly.*	*Unlimited Hours* *(if Bia Related Issue)*
LIMITED SERVICES	**Definition**	
Non-Bia Technical: *Fossil Transactions*	Troubleshooting and addressing 'Fossil Transactions'. Examples: duplicate, simultanious, telemetry reported after charging session is closed, burst of multiple OCPP messages, unrequested priority charge, charge delay or other related data	Limited Hours (see pricing)
Non-Bia Technical: *Telemetry*	Troubleshooting and addressing non-Bia related 'Telemetry' issues. For example: *Charger-Bia communication failure (degraded mode should be configured) *Charger does not establish OCPP connection correctly and appears Offline in Bia *Charger doesn't send Available StatusNotification and is shown Offline in Bia *No telemetry data sent by charger (StartTransaction, StopTransaction, or MeterValues) *Anomaly in telemetry data (typically in the MeterValues message) *Degraded Mode configuration (AllowOfflineTransactions and DefaultTxProfile)	Limited Hours (see pricing)
Non-Bia Technical: *Hardware*	Troubleshooting problems related to the hardware equipment (display, emergency button, power modules, firmware...)	Limited Hours (see pricing)
Non-Bia Analysis	Troubleshooting and analysis that results in non-Bia issue	Limited Hours (see pricing)
System Integrations Maintenance	Includes maintenance and troubleshooting to 3rd party system integrations for example FMS, ERP, PV, energy sensors etc. Any new integration or additional features of existing integrations will be priced on a case-by-case basis	Limited Hours (see pricing)

LIMITED SERVICES	Definition	
Customer Calls	Customer Calls outside of SLA definitions and protocols	Limited Hours (see pricing)
Update Optimisation parameters	This involves 'post deployment' adjusting power limitations at facility, charger and sockets level. Modifying vehicles departure rules, energy tariff, custom balancer settings, or optimization criteria (cost, CO2, battery health...).	Limited Hours (see pricing)
Customer Training	Including initial training for new users and ongoing training for updates or new features.	Limited Hours (see pricing)
Customer Meetings	Scheduled and unscheduled Customer meetings (Partners and Facility Managers) to discuss progress, troubleshoot, gather feedback, and plan future actions.	Limited Hours (see pricing)
3rd Party Meetings	Scheduled and unscheduled meetings that include third parties (utilities, OEMs, vendors, consultants) for technical advisory, technical troubleshooting, testing and planning.	Limited Hours (see pricing)
Custom Analytics	Providing custom analysis and reports on charging metrics.	Extra Charge
Simulations	Running simulations for reconfiguring optimisation parameters, for new sites, new energy tariffs, scale up and scale down of operations.	Extra Charge
New System Integrations	New system integrations or updating functionality and data sets to existing integrations that Bia has integrated at onboarding, for example: Adding new chargers, offboarding chargers, FMS, ERP, energy sensors, onsite solar, onsite battery, additional meters etc	Extra Charge
Out of Scope work	Any research, development and product work that has not been agreed in the initial scope of work.	Extra Charge

Thank you

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