



Electric – Plug in Your Electric Bus?

Managing assets and energy with Smart Charging

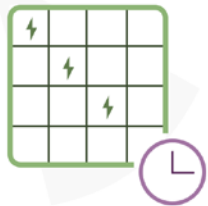
Understanding Power Rates

Rates will vary based on Peak Use and Peak Time of Day



Peak Use

Understanding how peaks affect rates



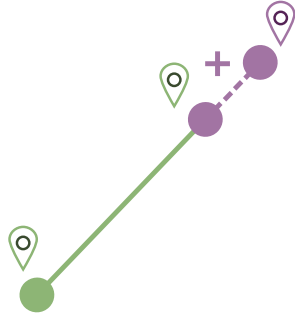
Peak Time of Day

Understanding how rates vary by time of day



Energy Management KPIs

Establishing goals and monitoring results



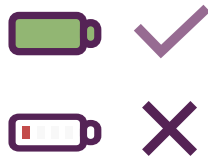
Extending range

Monitoring and managing range based on environmental factors and charging infrastructure



Managing costs

Anticipating and monitoring energy costs



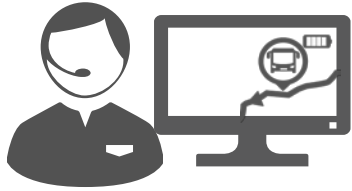
Monitoring Battery state-of-health

Battery performance degradation over time



Stakeholders

Different stakeholders with different needs



Operations

Achieving timetables and providing reliable service
Energy management



Maintenance

Reliable and fault free buses
Charging management

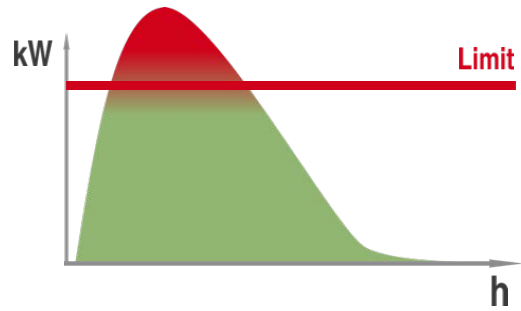




 **VIRICITI**
Approach

What is Smart Charging?

Peak shaving and load balancing



Peak Shaving

Programmatically set charger limits to minimize peak usage

300 kW limit

100 kW 100 kW 100 kW



Load Balancing

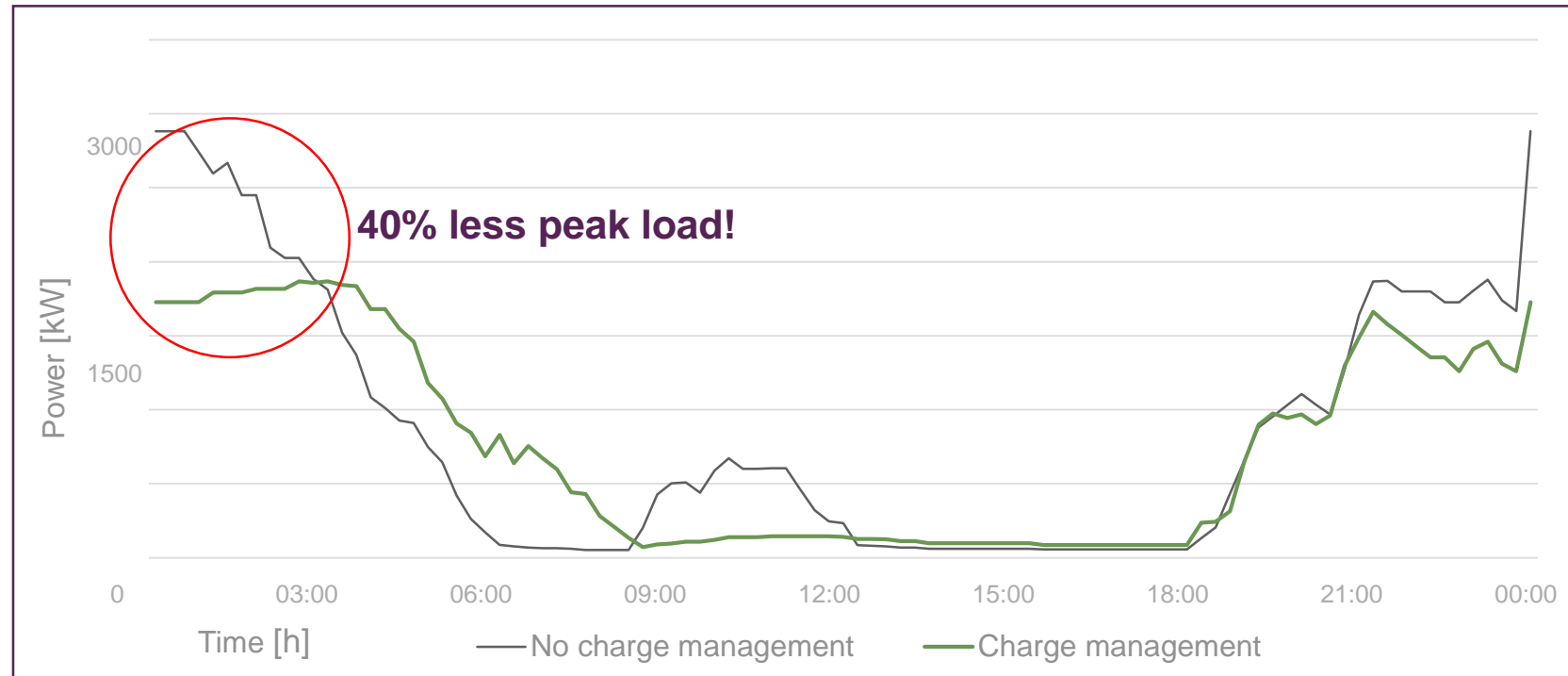
Setting limits across all chargers to avoid usage spikes



Smart charging use case

Scenario with smart charging:

- 60 buses
- Bus connected to charging station, Smart Charging System regulates charging
- Charging power variable: 0-150 kW



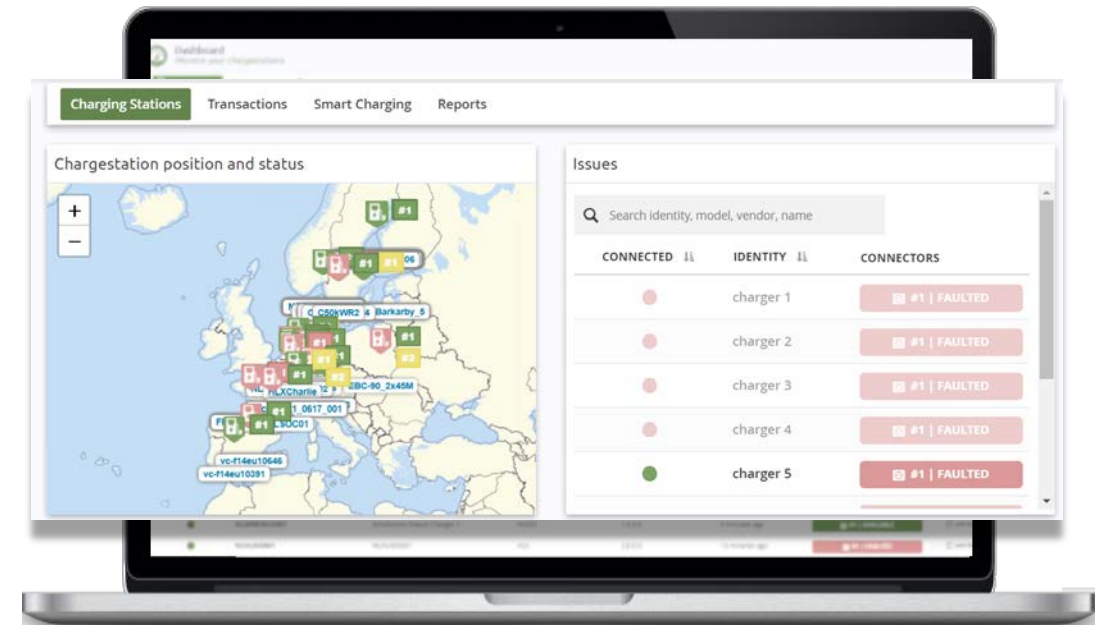
- ✓ Linking of vehicle data with planning data for calculating charging power
- ✓ Flexible regulation of charging power, with the possibility of integrating renewable energies



Charge Station Status

Monitoring of charging stations is key to ensure a high reliability of bus operations

- ✓ Buses need to **charge when connected**
- ✓ Detect problem in **real-time**
- ✓ **80% of issues** solved remotely
- ✓ **Best practice:** Charge stations should be able to communicate with back-offices via OCPP (1.6 or 2.0 preferred)



Reports, Alerts and Real-time Data

Arm yourself with solid, real-time data



Automated Report

Vehicle power usage reports
Charger performance reports
Energy consumption reports



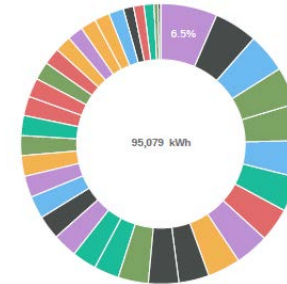
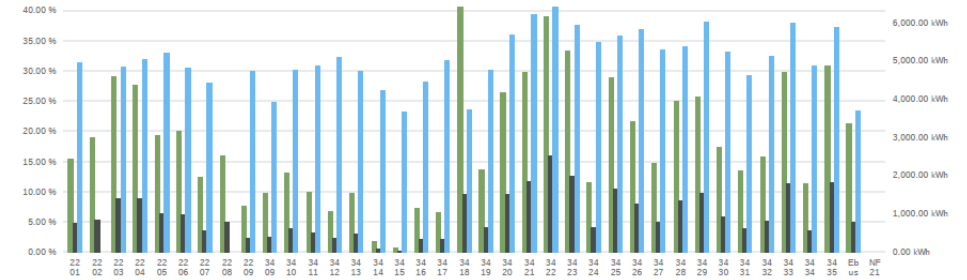
Alerts

Is the bus fully charged by 6am?
Has the bus fallen below a 10% SOC?
Is there a maintenance issue with the bus?



Real-time Data

Is the charger connected and delivering power?
How many miles are left in the battery?
Is there an issue with the vehicle or charger?



Charging station position and status

Issues

Search identity, model, vendor, name

CONNECTED	IDENTITY	CONNECTORS
<input type="checkbox"/>	veefil-65743	<input type="button" value="#1 FAULTED"/> <input type="button" value="#2 FAULTED"/>
<input type="checkbox"/>	veefil-65742	<input type="button" value="#1 FAULTED"/> <input type="button" value="#2 FAULTED"/>

All charging stations

Search identity, model, name, vendor, firmware charging available unavailable

CONNECTED	IDENTITY	NAME	VENDOR	CONNECTORS	ACTIONS
<input checked="" type="checkbox"/>	veefil-108506	DTA Tritium #8	Tritium	<input type="button" value="#1 AVAILABLE"/> <input type="button" value="#2 AVAILABLE"/>	<input type="button" value="Soft Reset"/> <input type="button" value="Hard Reset"/> <input type="button" value="Clear Cache"/>
<input checked="" type="checkbox"/>	veefil-65712	DTA Tritium #4	Tritium	<input type="button" value="#1 AVAILABLE"/> <input type="button" value="#2 AVAILABLE"/>	<input type="button" value="Soft Reset"/> <input type="button" value="Hard Reset"/> <input type="button" value="Clear Cache"/>
<input checked="" type="checkbox"/>	veefil-65714	DTA Tritium #5	Tritium	<input type="button" value="#1 AVAILABLE"/> <input type="button" value="#2 AVAILABLE"/>	<input type="button" value="Soft Reset"/> <input type="button" value="Hard Reset"/> <input type="button" value="Clear Cache"/>



About us

Mission: accelerate the adoption of commercial electric transportation globally

- ✓ 7+ years of experience
- ✓ 1400+ electric buses
- ✓ Market leader in EU and US
- ✓ 200+ partners (Operators & OEMs)

 Amsterdam  Greenville  Los Angeles



Thank you!



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