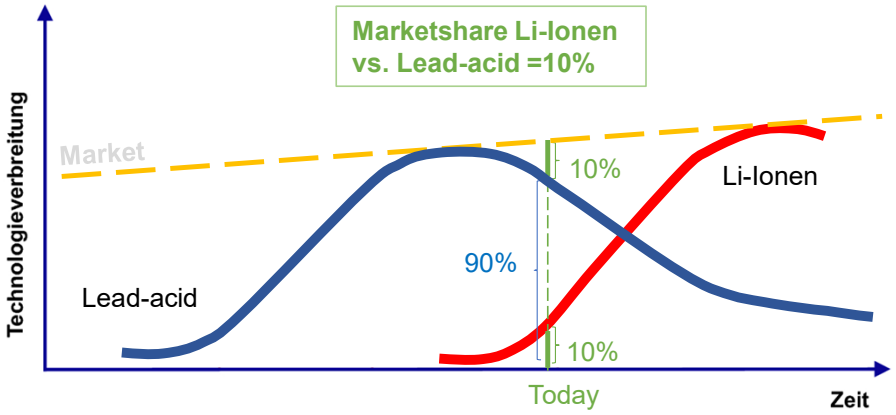
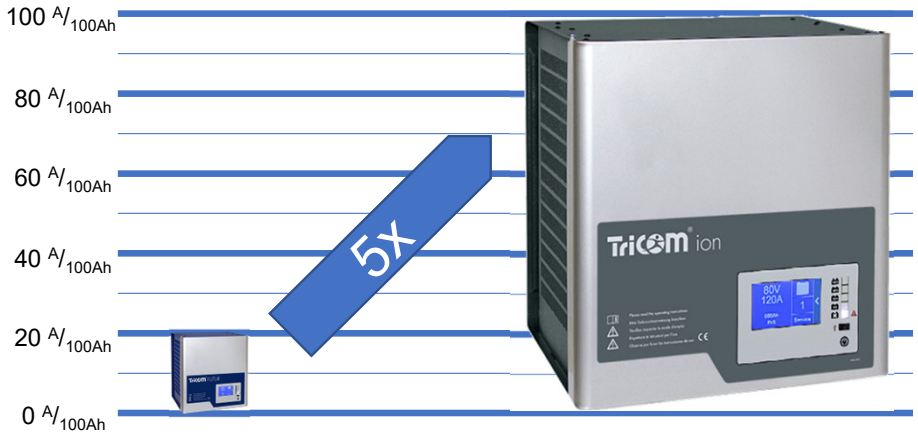
MD LOADmanagement

Why MD LOADmanagement?

- Currently we are experiencing a technological change in the market of motive power batteries. Lithium-Ion batteries push more and more in the market and force the lead acid battery.
- The main reason for these fact is the high-current charging possibility with lithium-ion batteries.
  - You reach longer operating hours and a higher productivity due to fast- and opportunity charging.
- These great advantages are following by some little challenges.
  - Energy costs
  - Installation costs
- MD LOADmanagement provides you a great solution.



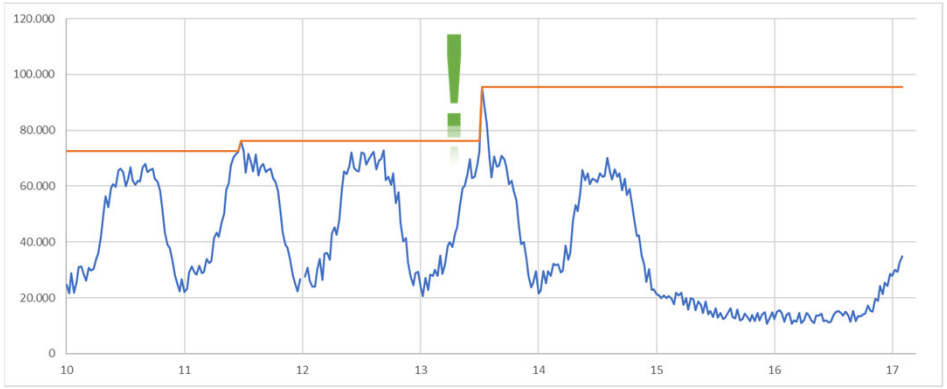


Labour and power prices also in other countries? Or just the power price?
Power price calculation scheme the same as in germany?

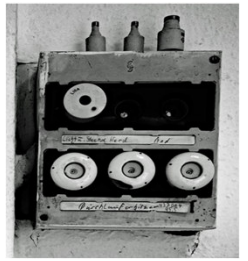
more power = more challenges

Energy costs

- Companys normally pay a labour price **and** a power price
- Annual demand >100.000kWh
- Power price
  - 15min average
  - 35.040 values/year
  - Just the highest count!



Investment costs

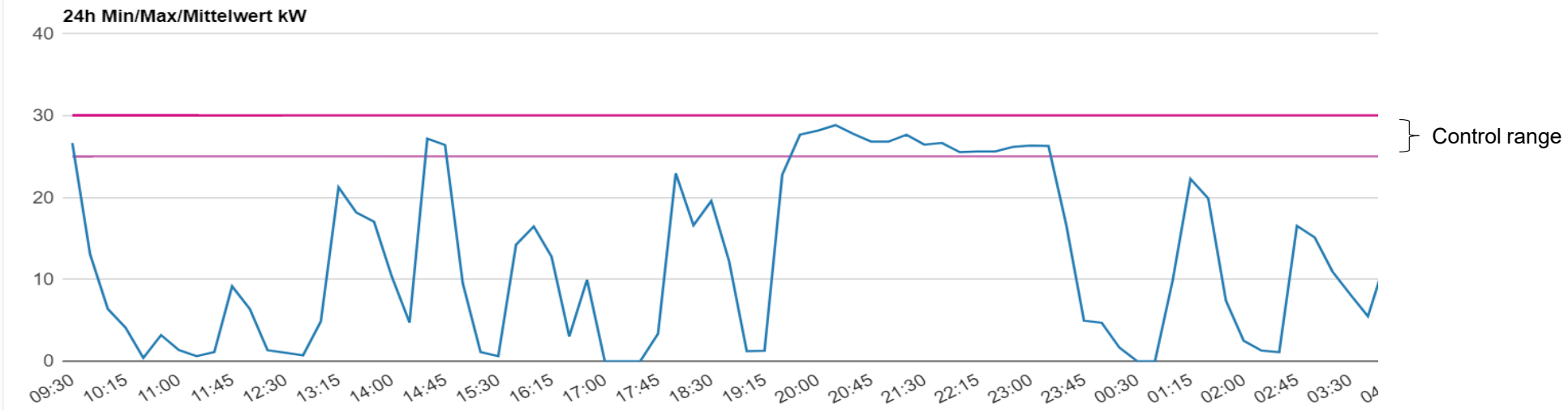


- Higher charging power needs higher input power
- It could be that your electrical grid can´t provide you the necessary power.
  - It may be necessary to make extensive changes.
- Possible changes are:
  - Power sockets with higher current values
  - Cable with bigger cross sections
  - Renewal of:
    - Sub-distribution
    - House connection
    - Power supply transformers

What does MD LOADmanagement do?

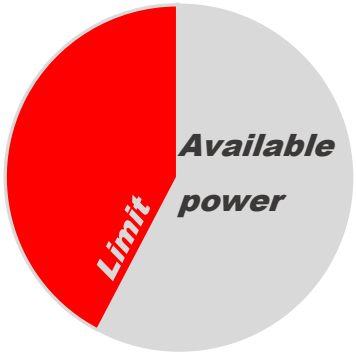
- MD LOAD limited the power (kVA) just if the total output increases to the (defined) control range
- The reducing is provided by a dynamic-priority management system.

- Principle of priorities:
  - Batteries with lowest state of charge (SOC) will be charge with most power.
  - Batteries with highest state of charge (SOC) will be charge with lowest power.



Beispiel

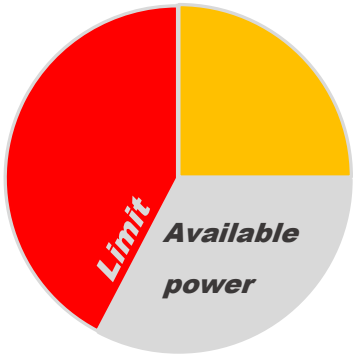
- TriCOM ION 4 x 48V / 200A
  - Single power 13 kVA
- Total output 52 kVA
- defined objective: Limit of 30 kVA

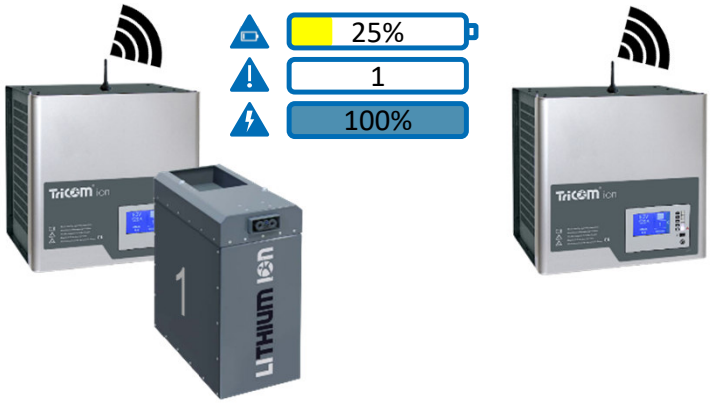


Beispiel

Battery 1 connected with charger

- Battery 1 with lowest SoC (25%)
- Battery 1 gets the highest priority
- Charger 1 gets the full power by the MD LOADmanagement control unit
- MD LOADmanagement is not activ
  - Total output below the defined limit

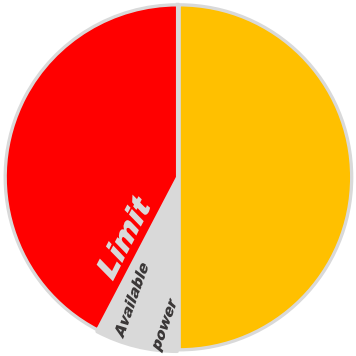


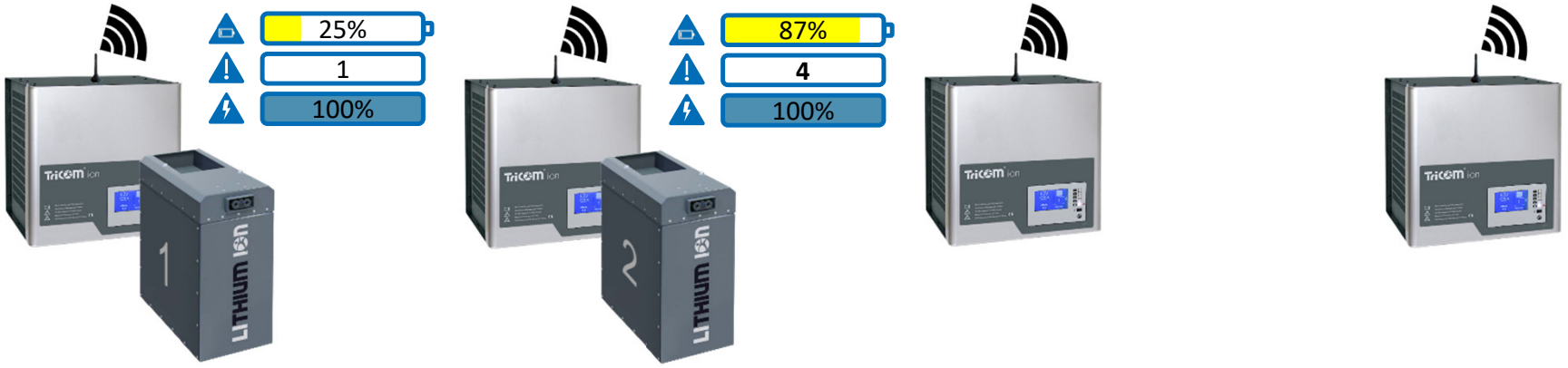


Beispiel

Battery 2 connected with charger

- Battery 2 with high SoC (87%)
- Battery 2 gets lowest priority
- Charger 2 gets the full power by the MD LOADmanagement control unit
- MD LOADmanagement is not activ
  - Total output below the defined limit

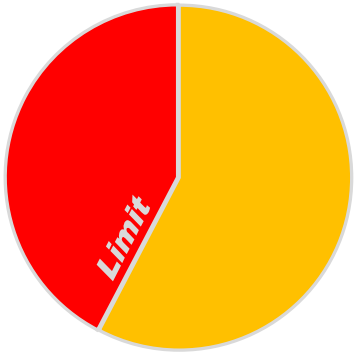


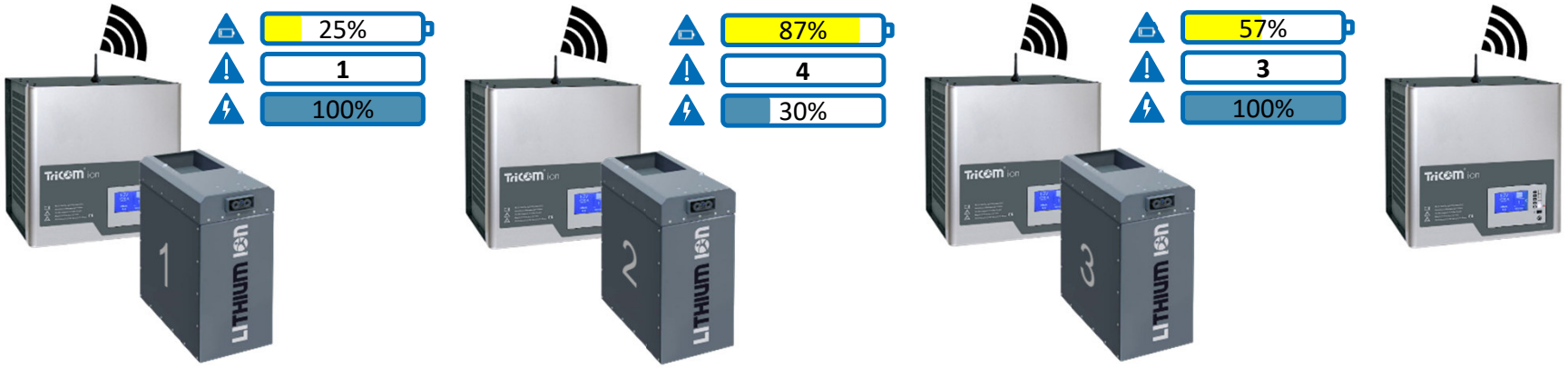


Beispiel

Battery 3 connected with charger

- Battery 3 with middle SoC (57%)
- Battery 3 gets middle priority
- Charger 1 and 3 gets full power
  Charger 2 gets 30% of charging power (30% of 200A)
- MD LOADmanagement is activ

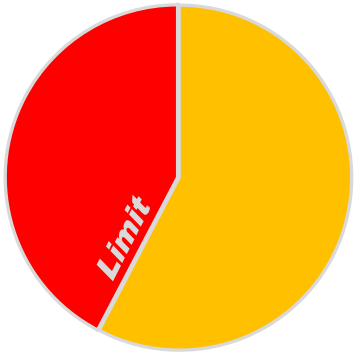


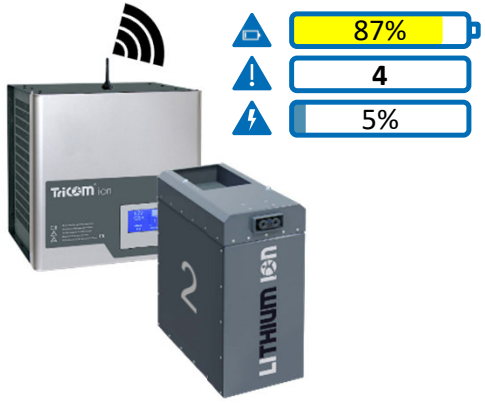


Beispiel

Battery 4 connected with charger

- Battery 4 with middle SoC
- Battery 4 gets middle priority
- Charger 1 gets full power
  Charger 3 and 4 share the available power
  Charger 2 gets the die lowest available charging power
- MD LOADmanagement activ

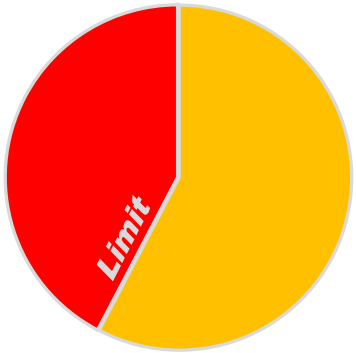


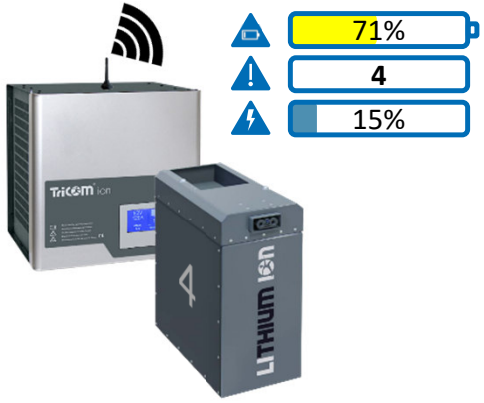


Beispiel

SoC of Battery 4 increases → Priority will be redristributed

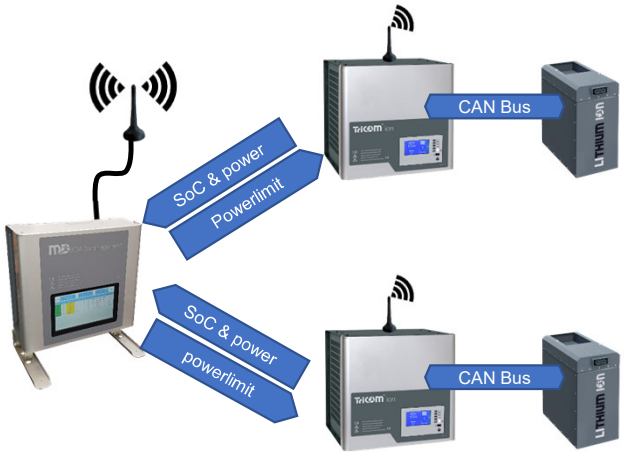
- Battery 4 with high SoC (71%)
- Battery 4 gets lower priority (3 to 4)
- Charger 1 and 3 gets full power
  Charger 2 and 4 share the available power
- MD LOADmanagement activ





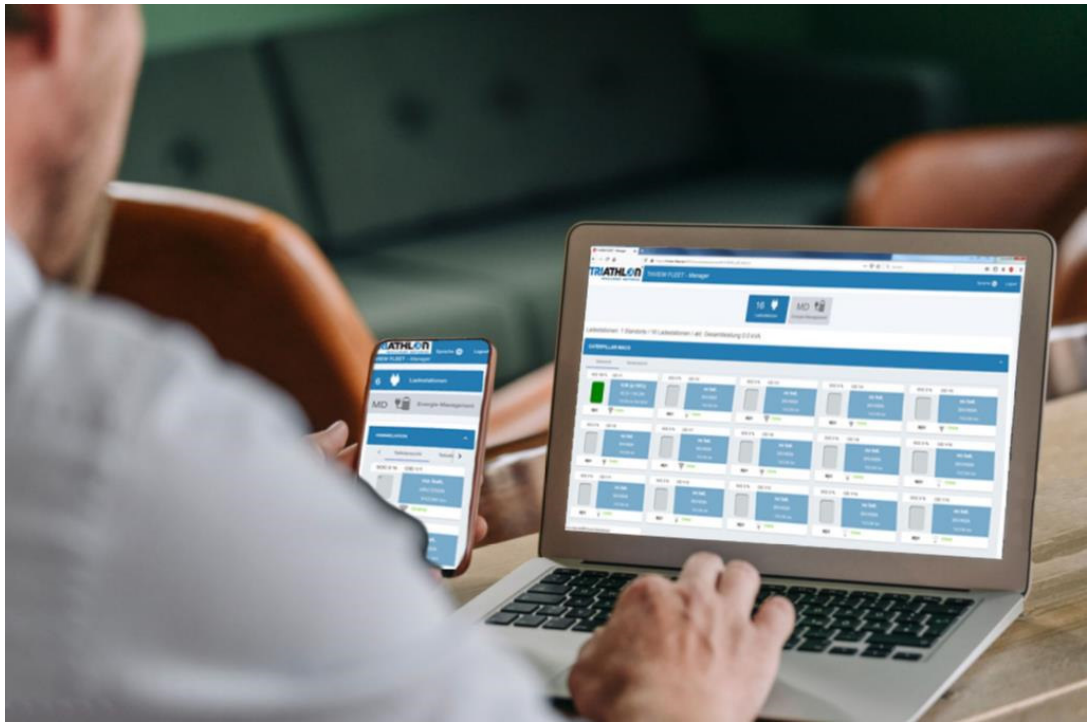
Wireless communication & central control unit

- TriCOM ION charger for MD LOADmanagement are equipped with an wireless module.
- With these wireless module all data will be share with the MD LOAD control unit and the charger will be controlled.
- The wireless range (868 MHz) is aprox. 100m.
  - WIFI- und LAN-connection are optionally available.
- The wireless antenna is in top of the casing cover.
  - Pre-fitting of the antenna bushing for chargers from production date 02/20.
- The wireless module is installed in the right bottom of the charger with a retaining rail.
  - Available as retrofit set.
- All data and information are collected, evaluated and displayed in the MD LOAD controll unit.
- Changes and settings can be made via a 10-inch-Touch-Display.
- All settings are password protected.



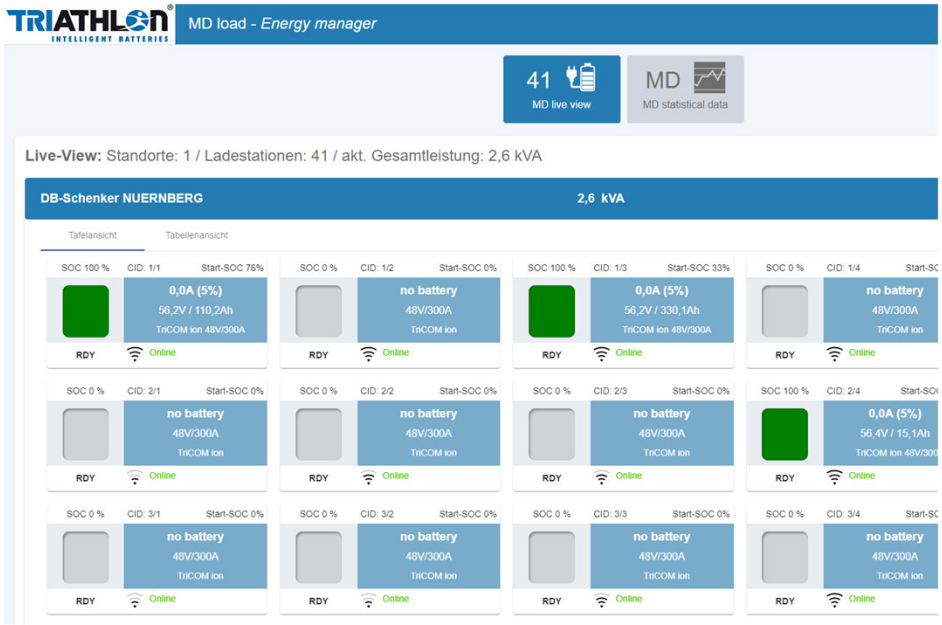
Stay Connected

- Besides the possibility to save energy costs and avoid investment costs MD LOADmanagement offers extensive remote access
- TriVIEW provides cloud-based data storage and delivers live battery and charger data
- Furthermore statistical data & management tools are provided

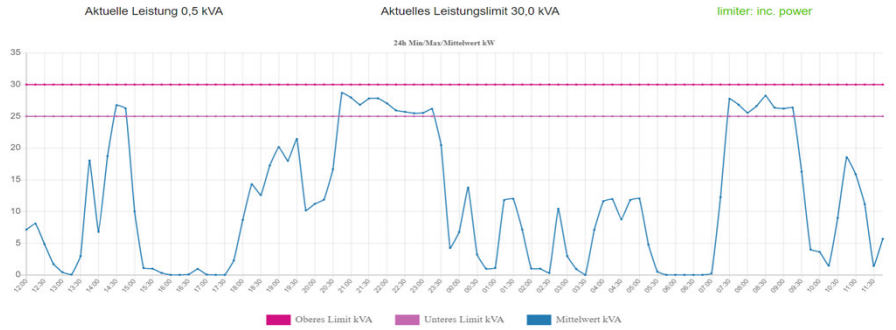


Übersichtliche Livedatenanzeige & Managementtools

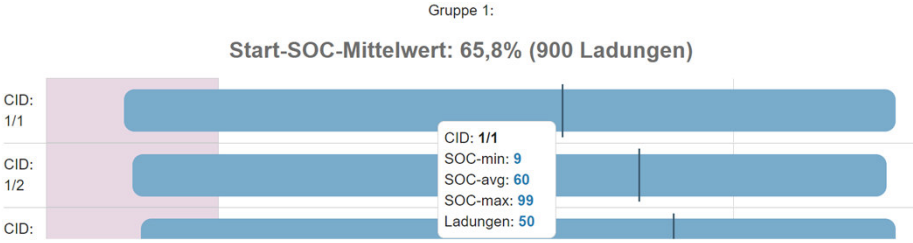
- Live data of all connected chargers and connected batteries
  - Current total power
  - State of charger
  - Charging current
  - etc.



- 24 hour load profile of the total power



- Optimal battery pool management through evaluation of the last 50 charging cycles (Start-SoC)



Thank you for your attention!