# a.s.r. Smart Car Park

Elevating urban mobility through sustainability

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# Elevating urban mobility through sustainability

The Smart Car Park of a.s.r., a leading Dutch insurance company, is the world's largest bi-directional electric vehicle car park. The impressive two-storey parking facility covers an area of almost 10,000 m² and has a roof with more than 2,000 solar panels.
This environmentally conscious project features 250 smart bi-directional (V2X) EV chargers and integrated batteries, in which the generated power can be stored, further supporting a.s.r.'s carbon-neutral office initiative.

In addition to its impressive scale and sustainability features, the Smart Car Park of a.s.r. also stands out for its innovative use of direct current (DC) technology. Out of the 2,000 solar panels installed on the roof, 96 panels were specifically dedicated to harnessing solar energy to directly power three DC bi-directional EV chargers. This pioneering DC installation is part of a research initiative led by the Amsterdam University of Applied Sciences. The project aimed at exploring the potential of direct current for bi-directional charging, which could offer greater efficiency and integration capabilities compared to traditional alternating current (AC) systems. Furthermore, the DC installation was designed to provide valuable insights for the insurance company to assess and adjust their insurance policy. This focus on DC technology underscores a.s.r's commitment to pushing the boundaries of renewable energy and electric vehicle infrastructure.

## Goal

- Introducing an innovative, eco-friendly urban parking model with bi-directional charging to tackle grid congestion.
- Highlighting the potential of DC technology to transform EV charging.

## Action

- Deployed a DC microgrid for maximal renewable energy use and smoother bi-directional operation.
- System includes a 50kW AFE, 96 solar panels, 3 bi-directional EV chargers (10kW each), and sensor-activated LED lighting system.
- Added a DC distribution cabinet with current routers for solid-state protection.

## Solution

- Bi-directional charging enables both EV charging and power transfer to the grid, maximizing renewable energy and stabilizing the grid.
- Autonomous power management using Current/OS adjusts power precisely within the DC grid, removing the need for centralized communication.
- The AFE bridges AC and DC grids efficiently, while current routers ensure grid safety.

## Results

- Achieved a 15% reduction in energy consumption compared to traditional AC systems.
- Less copper usage, improving resource and cost efficiency.
- Operates autonomously on solar energy without an AC connection, achieving CO2 neutrality and enabling island mode operation.
- V2G technology, optimized with DC/DC bi-directional charges,
can reduce grid congestion, especially in high-demand urban areas.

# Building the parking of tomorrow.

## Transforming urban parking into a hub of sustainability

The a.s.r. Smart Car Park project, led by a.s.r. in partnership with DC Systems, Amsterdam University of Applied Sciences, Kropman, and Venema E-mobility, represents a groundbreaking endeavor in the heart of Utrecht. This initiative sets new benchmarks for eco-friendly urban infrastructure, transforming a standard parking facility into a dynamic, sustainable energy hub.

## Far beyond a new parking facility

The urgent challenges of urbanization and climate change require innovative responses. The leading Dutch insurance company aimed to retrofit their existing parking area into a model of sustainability. The project's goal was not only to support the increasing demand for electric vehicle (EV) charging stations, but also to offer a CO2 neutral charging example for others to follow.

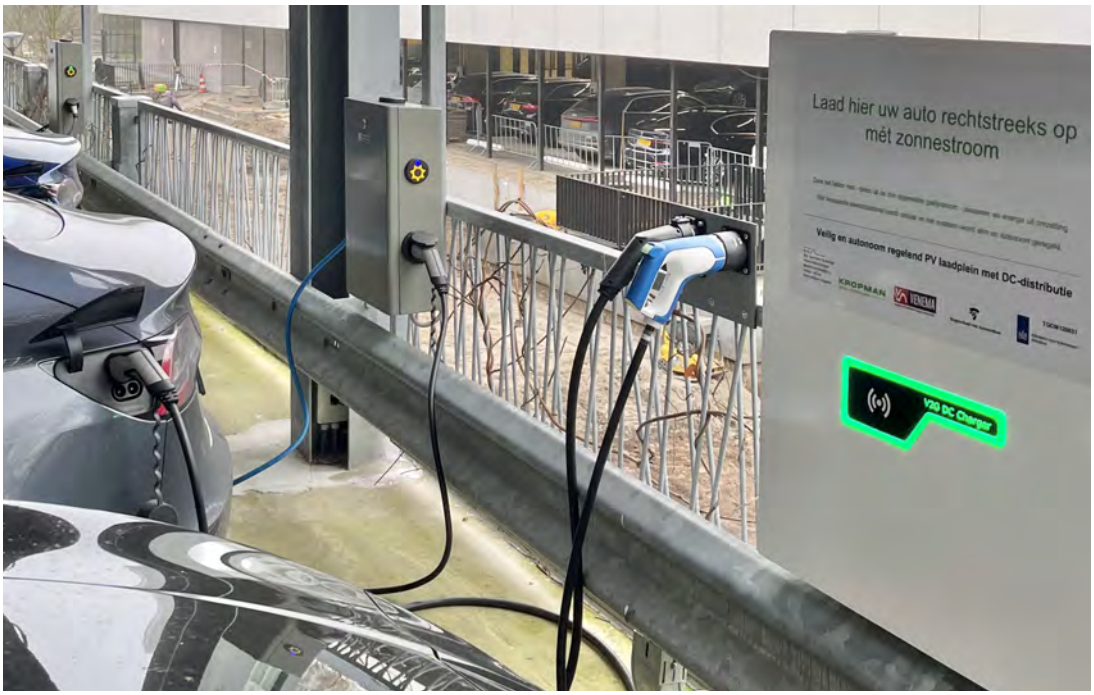
## Energy management at its finest

The core of the a.s.r. Smart Car Park project is its advanced DC microgrid, the first of its kind in a commercial parking lot setting in the Netherlands. This grid not only enhances energy efficiency but also enables seamless integration with renewable energy sources. The 96 solar panels connected to the DC EV chargers installed on the premises play a crucial role in this system. Depending on the weather conditions, they provide a significant portion, or all the energy required to power the parking lot and its array of 3 DC bi-directional electric vehicle chargers.

The bi-directional chargers installed are decisive in this energy ecosystem. They allow EV vehicles to feed energy into the grid when solar panels output exceeds demand, boosting power availability in congested areas. Additionally, V2X technology also allows vehicles to supply excess energy directly to the parking lot or nearby buildings. This system promotes energy autonomy and resilience, ensuring that the overall facility can maintain operational efficiency, even during power outages by using stored energy from EV batteries.

**"The a.s.r. Smart Car Park project stands as a powerful fundament to what can be achieved when innovation meets sustainability. This is more than a car park: it's a model for future urban development."**

- Jos Ruijter, Construction and Technology Manager, a.s.r.




**"Seeing the tangible benefits of the a.s.r. Smart Car Park, from CO2 neutrality to enhanced energy efficiency, inspires a new wave of innovation in green technology."**

- Jos Warmerdam, Lecturer - Researcher, Amsterdam University of Applied Sciences

## Achievements and impact

- **Reduced grid reliance:**
  The interlink converter offers behind-the-meter flexibility, empowering customers to reduce their grid reliance and enhance energy independence. Also, in the event of an AC power supply failure, the DC microgrid remains operational, supported by solar energy and the batteries of the EVs, creating a resilient and autonomous (island mode) energy system.

- **Energy efficiency:**
  The implementation of the DC grid has led to a measurable decrease in energy consumption: a.s.r. mentions energy improvements of over 15%. The efficient management of power flows within this grid means that the a.s.r. Smart Car Park uses significantly less energy than comparable AC-powered facilities.

- **Resource optimization:**
  The project has seen a reduction in the use of materials such as copper, thanks to the efficient high voltage power distribution. The adoption of DC technology not only minimizes environmental impact but also reduces overall project costs.

- **Enhanced sustainability:**
  The system has achieved 100% autonomous operation powered by renewable energy, resulting in carbon-neutral performance. This marks a significant environmental advantage compared to similar projects that depend on conventional energy sources.

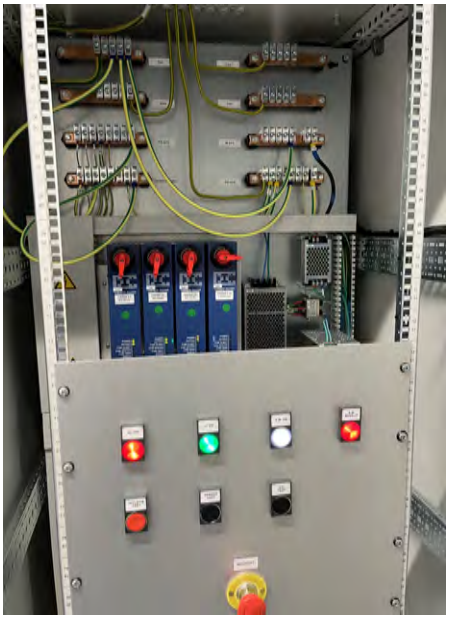
# Features and functions

**The a.s.r. Smart Car Park is equipped with:**

- An autonomous, direct current-powered local energy grid that utilizes solar energy and battery storage from the EVs.
- Bi-directional (V2X) charging stations that allow for energy sharing between electric vehicles and the grid.
- A sophisticated energy management system that operates under the Current/OS set of rules, enabling efficient and seamless energy distribution, without a communication layer.
- Advanced safety features, including solid-state protection with current routers, offering fast protection in the event of a fault.
- Island Mode operation: In the event of an AC grid failure, the parking facility's DC grid can sustain operations through the integrated EV and solar power sources, ensuring uninterrupted service and grid stability.

**"By leveraging on DC technology guided by the Current/OS set of rules, we can accelerate the energy transition with self-sustaining microgrids that regulate their own energy needs to draw from or supply energy to the grid as efficiently as possible."**

- Jonathan van der Heiden, Projects Lead and System Integrator, DC Systems.



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## Technical specifications:

96 high-efficiency solar panels, producing 48kW in total, integrated with AMPT string optimizers to enhance the DC energy output.

3 scalable DC bi-directional EV chargers, each providing 10kW. These chargers support EV vehicle charging while enabling energy to flow back to the grid when needed.

A robust 50kW Active Front End ensuring a seamless and safe interlink between the AC grid and DC microgrid, offering behind-the-meter flexibility.

A DC distribution cabinet that features advanced solid-state protection via current routers, ensuring rapid and reliable protection against electrical faults.

Sensor-activated LED lighting systems using direct current to improve energy efficiency and provide illumination to the DC EV parking spots.

The electrical system allows for seven different earthing configurations, that are variations of the standard TN-S. This, combined with embedded sensors, allows for the assessment of DC stray currents and enhances steel structure durability.

Energy Management System (EMS): Features an advanced EMS that maximizes efficiency by adjusting voltage and power characteristics (V-P) based on real-time energy demand and availability.

The system follows DC Systems' Safetywire patent, incorporating a dedicated safety wire across all DC sources to boost operational safety. If the safety wire signal is lost, all sources automatically disconnect from the DC bus, ensuring immediate isolation and protection. This mechanism provides an additional safety layer by preventing unintentional power flow in the event of a fault or source failure.

## Looking ahead

The a.s.r. Smart Car Park is more than just a parking facility; it is a forward-thinking project that showcases the potential of DC technology in creating self-sufficient, sustainable infrastructure. With its successful implementation and the ongoing monitoring of its performance, the project serves as a proof-of-concept for future urban development projects worldwide.

This project can also contribute to the standardization of DC installations. The research and test results have been converted into draft guidelines and actively submitted to the Dutch standardization working groups.

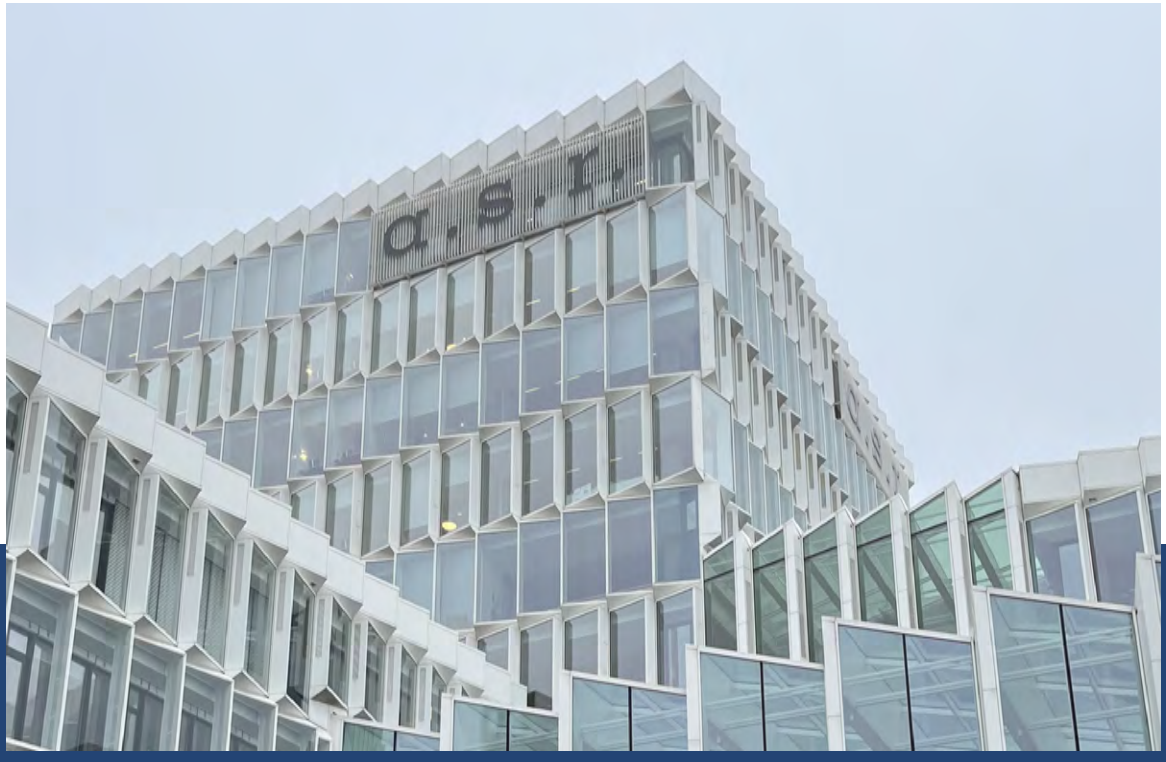
As we move forward, the collaboration between DC Systems, a.s.r., and their partners continues to drive innovation in the field of smart DC microgrids. With the Current/OS set of rules defining clear guidelines for power management, we are laying the groundwork for the widespread adoption of sustainable energy solutions.

# Conclusion

The a.s.r. Smart Car Park project represents a significant milestone in the journey towards sustainable urban mobility. By combining innovative technology, renewable energy, and smart design, DC Systems, along with its partners, has not only provided a practical solution to today's challenges but also inspired a new direction for the future of urban infrastructure.

For more information about the a.s.r. Smart Car Park project and our future initiatives, visit our website or contact our team at DC Systems.

Let's drive towards a sustainable future together.

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