DIGITAL SYSTEMS CENTER (DSC)

EV load management

Driving greener energy futures

The ABB EV load management solution optimizes charging infrastructure by intelligently distributing available power across all connected vehicles. This innovative system enables more charging points and connectors to be installed at your site without requiring costly grid upgrades. By dynamically adjusting power allocation in real time, the system helps ensure that the charging load never exceeds the available grid capacity, allowing connection of more vehicles at the same time.

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Challenges facing the EV charger landscape

As the world moves towards reducing carbon emissions, the need for robust electric vehicle (EV) charging infrastructure has become increasingly important. However, the development of this infrastructure faces several challenges that must be addressed to help ensure the smooth and widespread adoption of EVs.

The rapid adoption of electric vehicles has created a pressing need for a robust charging infrastructure. However, the expansion of this infrastructure is fraught with challenges that must be addressed to help ensure the successful transition to electric transportation.

Grid integration — The integration of a large number of charging stations into the existing electrical grid can strain its capacity, especially during peak charging times. In some areas, the grid may not be able to support the required load without substantial upgrades, adding time and cost.

Technical complexity — EV charging sites often require integration of various systems. From navigating how to leverage multiple energy sources to helping ensure real-time data exchange between software platforms, finding the right partners and technical solution is critical to delivering reliable site operations.

Scalability and future-proofing — Designing charging sites that can scale as EV adoption grows and offer compatibility with future technologies, such as faster charging systems, requires careful foresight and planning.

Cost management —High upfront costs for equipment, installation and possible utility upgrades, as well as optimizing energy and maintenance costs, must be managed to help ensure a reasonable return on investment.

Regulatory barriers — Complex regulatory frameworks can hinder the deployment of charging infrastructure, including permitting processes, zoning restrictions and interconnection requirements.

Addressing these challenges requires a collaborative effort from governments, utilities, manufacturers and charging infrastructure providers. By investing in infrastructure development, promoting standardization and addressing range-anxiety concerns, we can accelerate the transition to a cleaner and more sustainable transportation future. Additionally, incorporating digital solutions can strengthen energy efficiency and load management, enable rapid fault detection and clearance and enhance overall system performance.

EV charging electrical infrastructure

Electrical power distribution is a crucial aspect of electric vehicle charging infrastructure. It helps ensure safe and efficient delivery of electricity to all the charging stations.

Power source
Utility grid or a microgrid with renewable power and battery backup system to supply the electricity needed for charging.

Distribution switchboard
Distributes power to individual chargers and incorporates switching, protection and monitoring functions.

Transformer
Steps down the voltage from the grid supply to a level suitable for the charger.

Electric vehicle chargers
Connects to and charges the EV battery using AC or DC power.

Essential criteria for designing supply distribution for EV charging

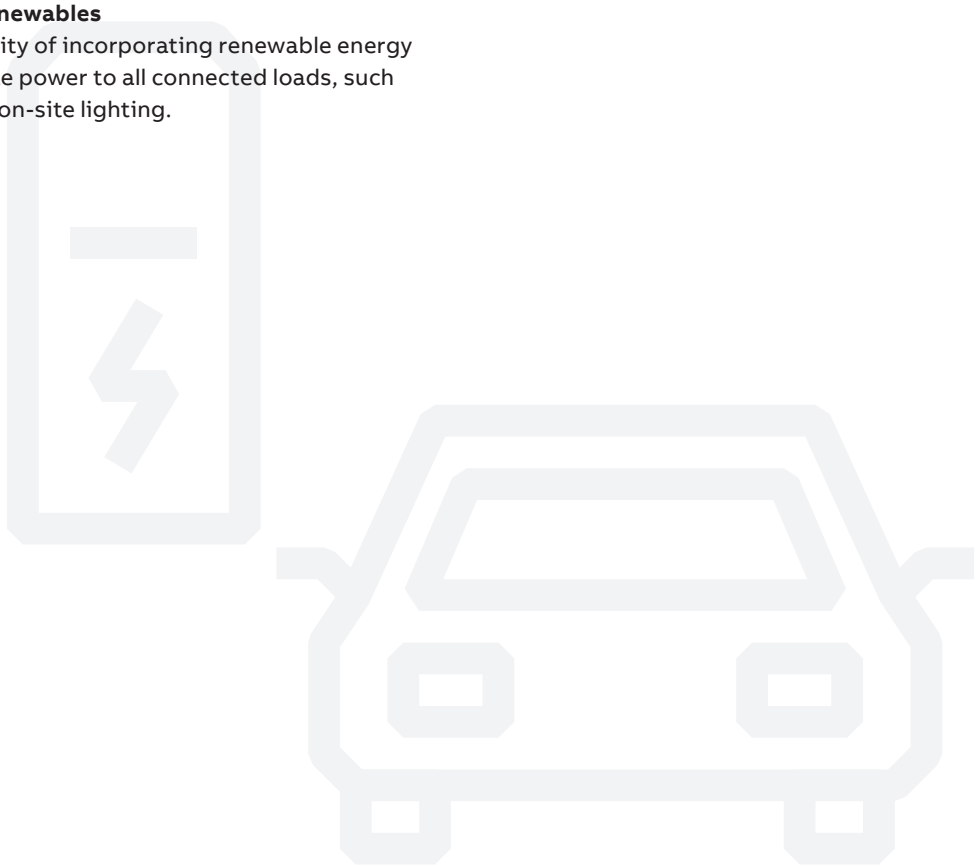
Charging speed and capacity
Determine the quantity and types of charging stations to be deployed, such as slower charging and rapid charging.

Installation type
Analyze existing utility infrastructure to determine whether it can support existing and future charging needs or if additional capacity is required.

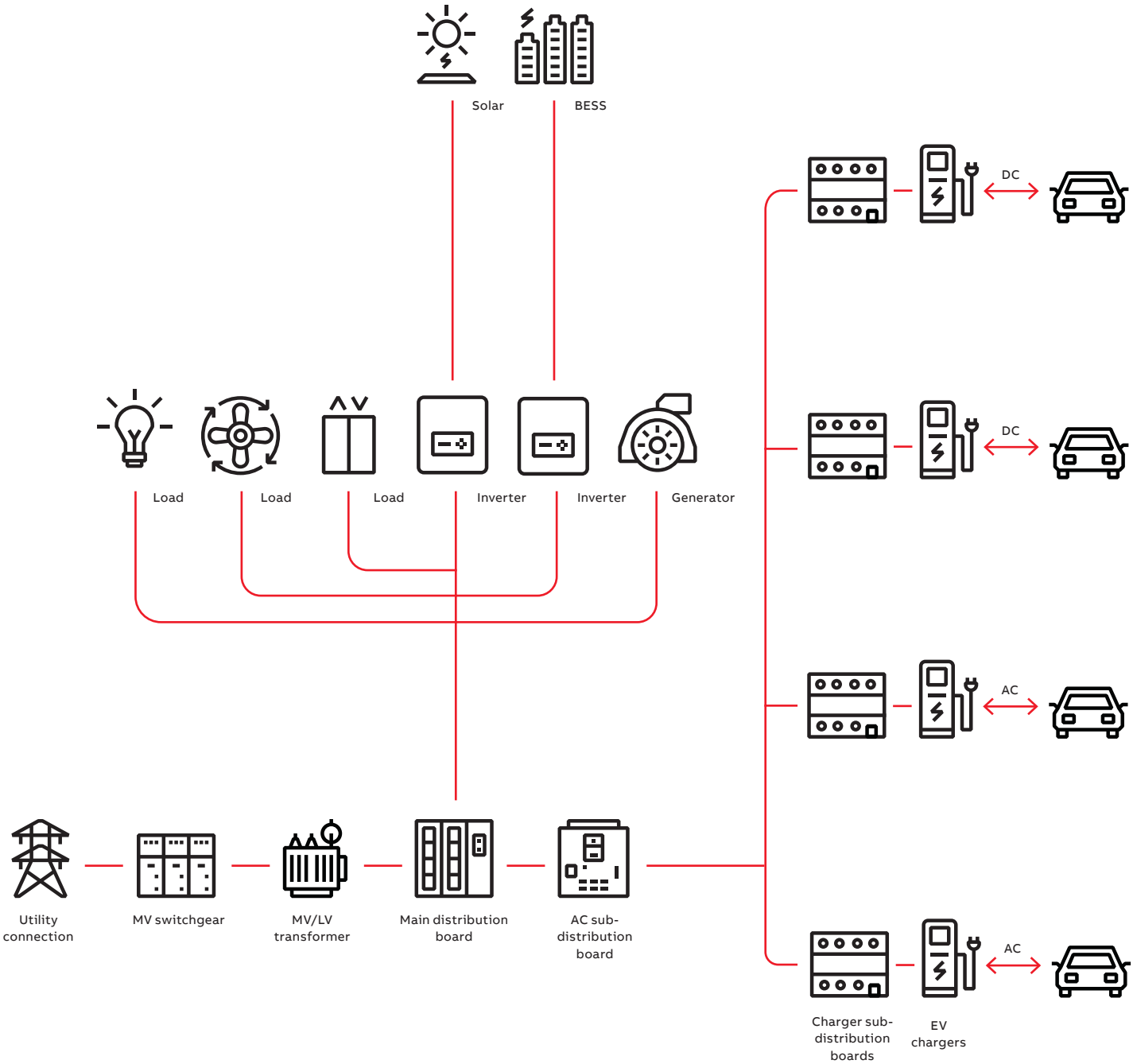
Integration with renewables
Explore the possibility of incorporating renewable energy sources to distribute power to all connected loads, such as EV chargers and on-site lighting.

Scalability and future-proofing
Anticipate the growing demand for EVs and ensure that the infrastructure can be expanded easily to accommodate increasing numbers of vehicles. Future-proof the design by considering emerging charging technologies.

Applicable standards and regulations
EV charging stations installed in new and existing buildings must comply with relevant electrical and EV charging standards to help ensure safety, efficiency and interoperability.



Typical architecture for AC distribution in EV charging infrastructure



EV load management solution

EV load management is a critical aspect of integrating electric vehicles into the power grid. As the number of EVs on the road continues to grow, managing the charging load becomes increasingly important to ensure grid stability, optimize energy consumption and minimize costs.

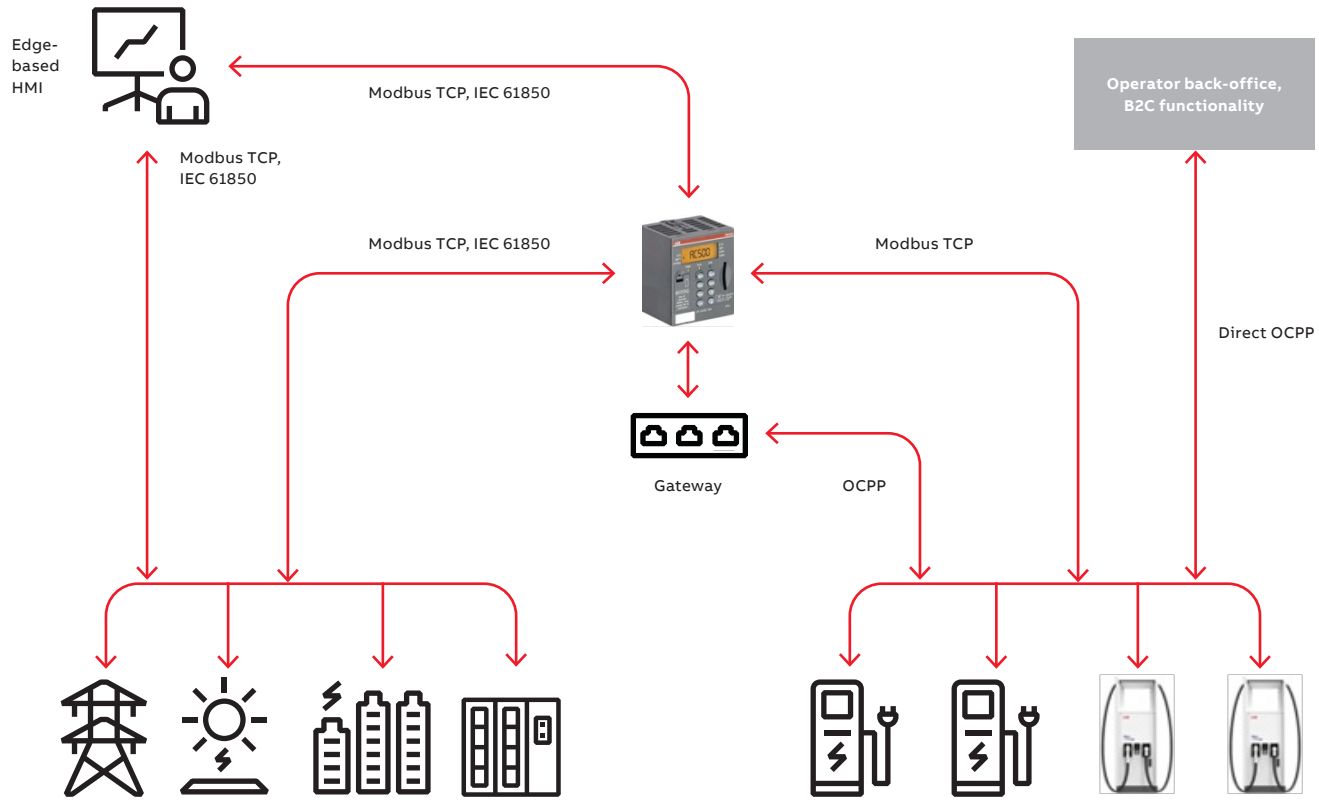
The ABB EV load management system is a PLC-based load management solution that combines benefits of the EV load management platform with direct OCPP (Open Charge Point Protocol) setup.

This solution allows control and monitoring of your entire power infrastructure as well as the management of the EV chargers to deliver an end-to-end solution for customers.

Capabilities include continuous power monitoring and optimizing power consumption by EV chargers to minimize strain on the grid. It balances energy demand throughout the day, with a focus on reducing energy use during peak demand.

In extreme cases of grid congestion, load management systems can temporarily curtail charging to prevent power outages.

Integrating energy storage systems with charging infrastructure can further enhance peak-shaving capabilities by storing excess energy during off-peak hours and releasing it during peak times.



Key features

The EV load management system optimizes the charging of EVs to minimize strain on the power grid and reduce energy costs. Key features include:

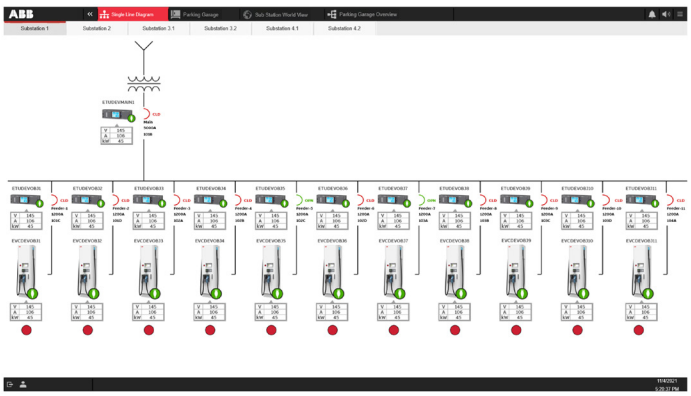
- Dynamically balances EV charger load demand based on grid power availability.
- Provides peak demand management while preventing overloads.
- Offers the capability to distribute available power among chargers with load-balancing feature.
- Balances energy demand throughout the day, with a focus on reducing energy usage during peak demand.
- Communicates with EV chargers seamlessly via OCPP.
- Vendor-agnostic solution can connect to ABB and third-party EV chargers.

Human machine interface (HMI) overview

The ABB EV load management solution includes an HMI with intuitive and customizable graphical interface.

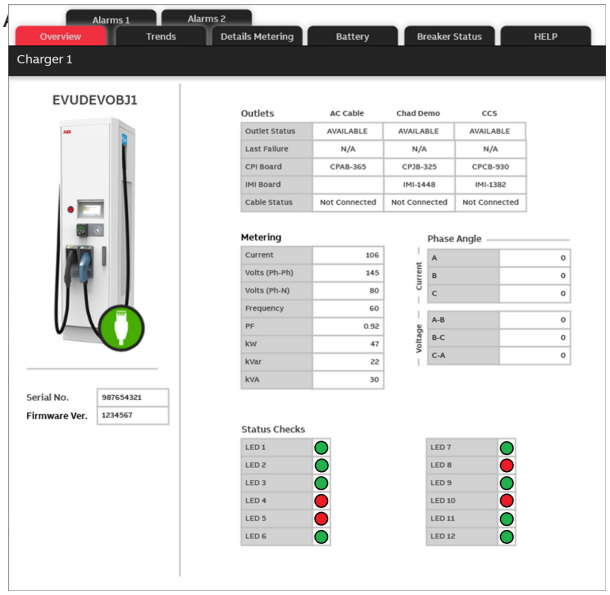
The HMI can display the individual substation's single-line diagram and all data, allowing for proper load control. It supports real-time monitoring, response conditions and status of devices in the single-line diagram.

Multiple substation integration is also possible.



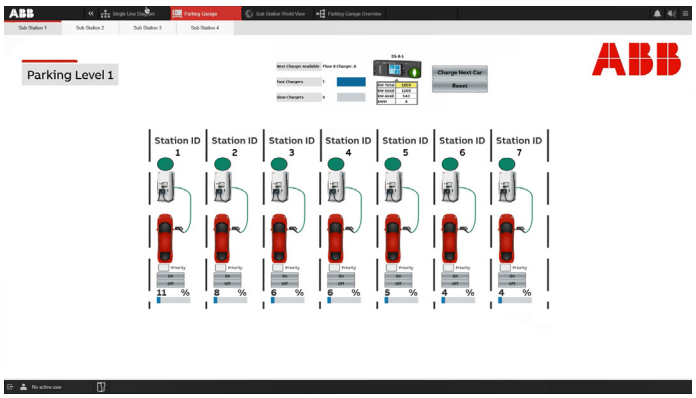
The smart object for an EV charger provides access to detailed information, such as logs and trends data.

Connection status access of each charger type is available and allows operators to define priority charging status.



The HMI provides the capability to manage individual parking sites through different interface tabs.

The ABB EV load management system can monitor a parking site, automatically connecting and disconnecting chargers or setting the charging speed for individual cars to help ensure that all vehicles are charged efficiently and cost-effectively. The interface allows operators to define "high-priority members" with priority charging status.



The solution can also represent multiple substations on a single page with its "substation world view" feature.

Substation world view displays the entire EV charging system, based on geolocation, allowing system managers to jump between individual substations with versatile control of a greater density of chargers.

It’s also possible to represent multiple parking sites on a single page.

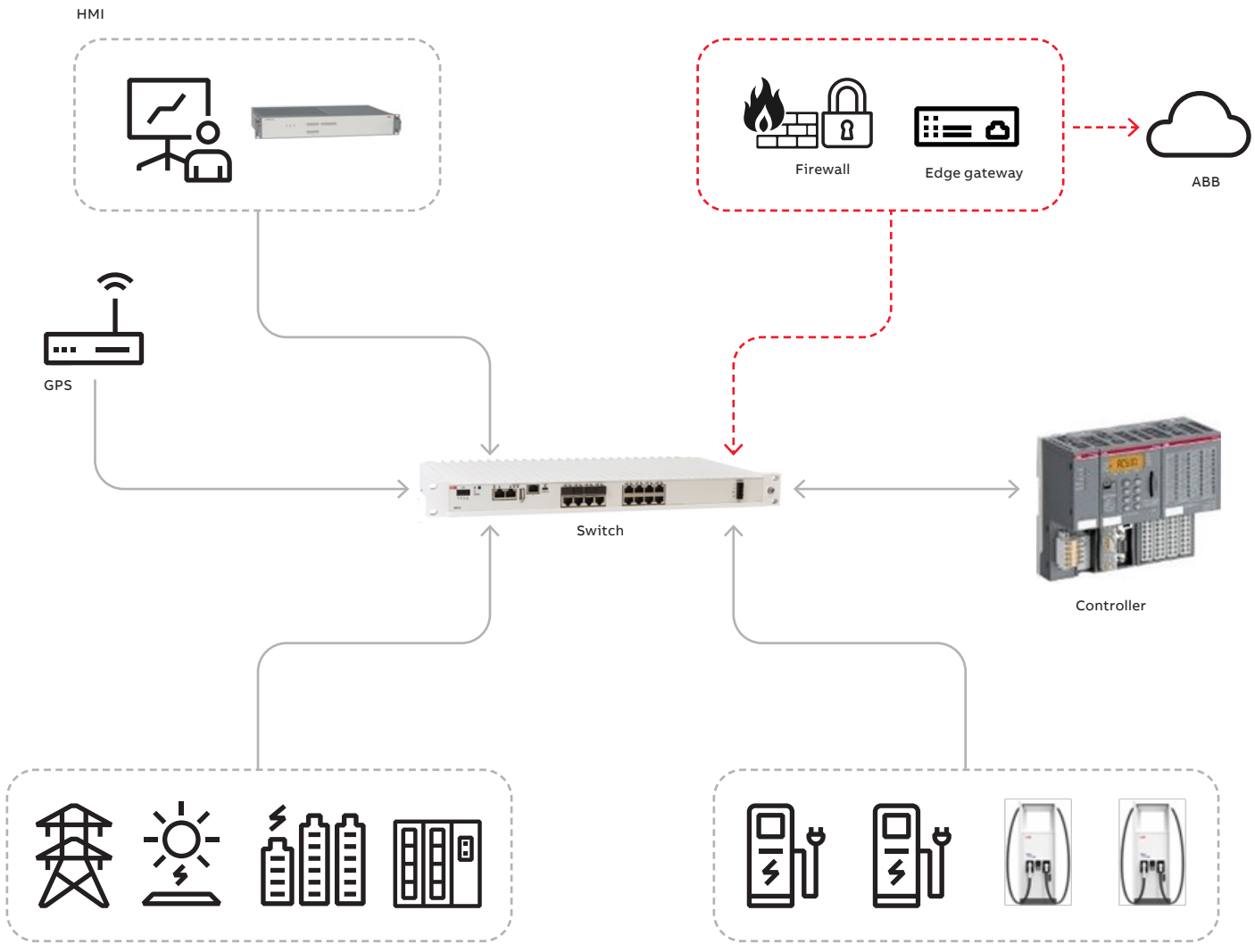
The ABB EV load management can display all parking sites connected to the system to maximize charging capacity, performing load management to allow for future charging station additions without exceeding existing electrical capacity.

Cloud options

The ABB EV load management solution can be extended to a cloud solution through a gateway or firewalls.

CogniEN is a custom-tailored native cloud solution for EV charger infrastructures consisting of both ABB and third-party products and equipment. It offers:

- Intuitive, interactive and user-friendly widgets and dashboards.
- Alarm notifications for handheld devices.
- Differentiating analytics.
- Real-time data on electrical network performance 24/7 from anywhere in the world.



Benefits overview

Maximize utilization and uptime
- Increases the number of charger points that can be enabled at the site.
- Prevents power outages as a result of exceeding site capacity.

Reduced peak demand
- Load management helps distribute charging demand more evenly throughout the day.
- By avoiding sudden spikes in electricity use during peak hours, the grid remains stable and reliable.

Load control
- Lower energy outputs from the charger to the vehicle during peak hours.

Cost savings
- Reduces or eliminates necessary grid upgrades.
- Reduces demand charges and optimizes energy usage.
- Integrates local power generation.

Managing multiple sources
- New EV charger assets within the parking site increase the need for management load control.
- Better power management helps mitigate lack of power on chargers.

Safety
- Offers safety and protection of the charging process for smooth operation without hazards.

HMI
- Customizable HMI interface.

Avoiding overloads
- Helps prevent overloading of local transformers, distribution lines and substations, which can lead to outages.

Electrification
Digital Systems Center (DSC)

The Digital Systems Center team at ABB is your trusted partner, providing ongoing technical and functional support throughout your journey.

Unleashing operational efficiency
Modernize your operations and overcome challenges. Our expert consultants assess your needs and design cost-effective, future-proof solutions. We also offer a wide range of customized applications specifically designed to boost your operational efficiency.

Optimizing performance
Reaching your performance goals while controlling costs can be a balancing act. Our team creates solutions that help you achieve both and provides software applications that deliver actionable insights for continuous improvement.

Fully equipped laboratory
The ABB US Digital Systems Center team has a fully equipped laboratory with cutting-edge technology in IEDs, network switches, centralized protection devices, virtual machines, servers and SCADA systems to support you with:

- Testing
- Simulation
- Live demos
- Validation
- Troubleshooting on installed systems

Global support, local expertise
ABB's Digital Systems Center has a network of over 10 customer excellence centers strategically located around the world. These one-stop shops are staffed with industry veterans who possess deep knowledge of a wide range of power equipment and systems. Our team of experts and analysts are here to help you tackle today's toughest power challenges and prepare you for the future.

ABB is accelerating the adoption of sustainable energy solutions across the world.

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