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Enhancing Charging Efficiency for School Bus Depots

Executive Summary

A school district seeks to establish an efficient and cost-effective charging infrastructure to support a fleet of **40** electric school buses. Given the long dwell times available for overnight charging, the focus is on minimizing dependence on grid upgrades, reducing operational costs, and ensuring seamless energy management. DG Matrix has developed a tailored solution[1] utilizing its Power Router technology to optimize energy distribution, lower costs, and enhance sustainability.

Challenges

The transition to electric school buses presents several key challenges:

- **Extended Charging Windows, Lower Power Requirements:** Unlike public fast chargers, school bus depots require slower charging solutions that efficiently utilize overnight energy availability.
- **Energy Cost Management:** Peak demand charges and fluctuating electricity rates necessitate a strategic approach to energy consumption.
- **Grid Reliability and Resiliency:** Ensuring uninterrupted charging without overloading the local grid.
- **Scalability:** Future expansion may require additional chargers and integration with renewable energy sources.
- **Sustainability Goals:** Compliance with environmental regulations and sustainability commitments by incorporating green energy solutions.

Requirements and Priorities

To address these challenges, the school district prioritizes the following:

- **Cost Efficiency:** Minimize both capital (CapEx) and operational expenditures (OpEx) while ensuring profitability.
- **Resiliency:** Ensure uninterrupted power supply for critical operations, even during grid outages.
- **Sustainability:** Maximize renewable energy usage and reduce carbon emissions.
- **Scalability:** Future-proof the facility for seamless integration of additional solar panels, battery storage, EV chargers, and other energy sources.
- **Operational Simplicity:** Implement a centralized energy management platform for efficient operation and monitoring.

[1] Project has not yet been deployed yet

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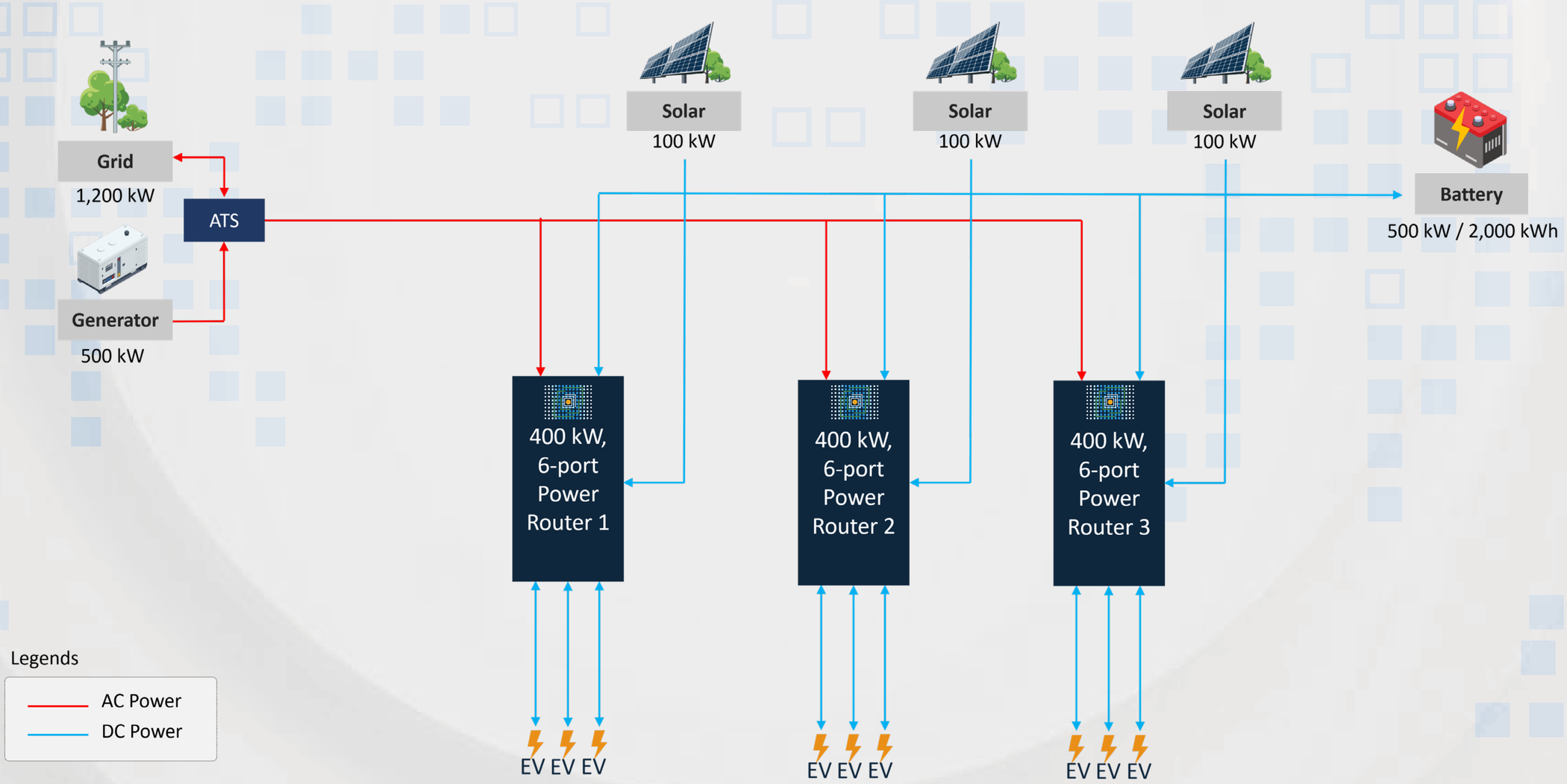
Proposed Solution: The DG Matrix Power Routers

DG Matrix deploys an advanced energy management system tailored for school bus depots. The proposed infrastructure includes:

- **Power Routers:**
  - 9 charging ports meet the needs of a fleet of 40 electric school buses utilizing overnight charging.
  - Each charging port is capable of delivering 400 kW.
  - Each bus is charged at 100 kW during overnight charging.
- **Battery Storage:** A 500 kW / 2,000 kWh battery system to store energy during off-peak hours and supply it during peak periods.
- **Generator:** 500 kW
- **Solar PV System:** A 300 kW solar array to offset grid electricity consumption.
- **Grid Interconnection:** A 1,200 kW utility service for consistent power availability.
- **Smart Scheduling Software:** AI-driven software that optimizes charging based on electricity rates and fleet schedules.



The DG Matrix Power Router provides distinct advantages over legacy systems:

- **Integrated Single-unit Power Router Technology:** Combines power conversion, protection, and energy management into a single, compact system—drastically reducing system footprint, simplifying deployment, and lowering equipment costs while increasing system efficiency to up to **98%**.
- **Dynamic Power Sharing with Ultra-high Granularity:** Balances power distribution among EV chargers and other on-site loads to maximize asset utilization and optimize energy usage.

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- **Smart Energy Management Software:** Provides real-time monitoring, predictive analytics, and automated load shifting to reduce peak demand charges and enhance system efficiency.

Results

CapEx Savings:

- **27%** lower infrastructure costs by consolidating power management hardware and reducing the need for grid upgrades.
- **30%** reduction in installation costs due to streamlined deployment and fewer components.

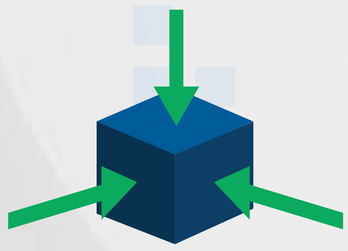
OpEx Savings:

- **25%** reduction in annual energy costs through demand charge mitigation and optimized energy utilization.
- **25%** lower maintenance costs owing to simplified architecture and advanced diagnostics.

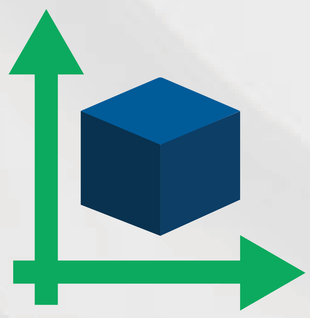
Financial Metrics:

- Payback period: **7 years,** compared to 20+ years for traditional systems.
- IRR: **14%** (estimated based on operator data).

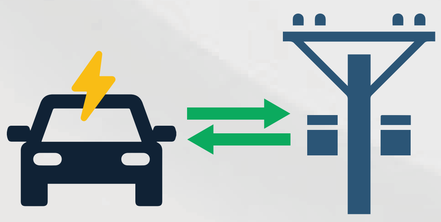
Value-Added Features and Additional Benefits



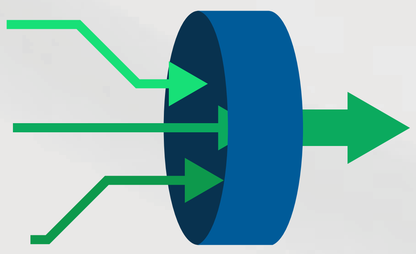
Enhanced Resiliency: Ensures reliability by maintaining operations during outages through a seamless transition to on-site DERs and EV chargers.



Future-Proof Scalability: Enables expansion with additional dispensers and new energy sources without requiring major upgrades.



Grid Support Services: Lowers costs and generates additional revenue by enabling vehicle-to-grid, virtual power plant, and demand response capabilities.



Operational Simplicity: Provides a unified control platform that reduces complexity and streamlines energy management across all sites.

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Conclusion

By adopting the DG Matrix Power Router solution, the school district can establish a cost-effective, scalable, and sustainable electric school bus charging depot. The implementation not only ensures reliable bus operation but also supports long-term environmental and financial goals.

To learn more about how the DG Matrix innovative Power Router solution can revolutionize your energy management, reduce costs, and future-proof your business, contact our team of experts today. We're ready to help you achieve your energy goals and stay ahead in the evolving market.

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