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Transforming Heavy-Duty Truck Charging with DG Matrix Power Router

Executive Summary

A major logistics and freight company aims to deploy large-scale public heavy-duty electric truck (eTruck) charging infrastructure to support the transition to zero-emission freight transportation. Rising fuel costs, tightening emissions regulations, and the need for scalable electrification solutions drive the company to seek an efficient, future-proof energy management system.

DG Matrix develops a solution[1] leveraging its Power Router technology to integrate solar energy, battery storage, and grid power while ensuring cost savings and reliability. The deployment achieves an internal rate of return (IRR) exceeding **12%** and a payback period of less than **8 years,** positioning the company as a leader in sustainable logistics.

Challenges

The customer faces multiple energy-related challenges, including:

- **High Fuel and Energy Costs:** Diesel price volatility and rising electricity demand charges make the transition to electric fleets financially challenging.
- **Grid Constraints and Infrastructure Limitations:** Limited grid capacity at highway locations poses a significant barrier to fast-charging deployment.
- **Long Charging Downtime:** Inefficient energy management and power limitations extend vehicle turnaround times, impacting logistics efficiency.
- **Sustainability Compliance:** Increasing pressure to reduce carbon emissions in line with government mandates and corporate ESG goals.

Requirements and Priorities

To tackle these challenges, the freight operator outlines key objectives:

- **Cost Optimization:** Lower overall energy costs while minimizing infrastructure upgrade expenses.
- **Scalability:** Deploy a flexible solution that grows with EV truck adoption.
- **Fast Charging Capability:** Enable high-power, megawatt-level charging with minimal downtime.
- **Energy Resiliency:** Ensure uninterrupted charging through renewable integration and backup power.
- **Simplicity and Efficiency:** Implement a standardized, user-friendly charging network with real-time energy monitoring and load balancing.

[1] Project has not yet been deployed yet

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Proposed Solution: The DG Matrix Power Router

DG Matrix deploys its Power Router technology to optimize the heavy-duty truck charging ecosystem. The solution equips each charging hub with:

- **Integrated Microgrid Architecture:**
  - **Solar PV System:** ~1,800 kW per site
  - **Battery Storage:** Up to 1,500 kW / 6,000 kWh capacity
  - **Grid Interconnection:** 4,800 kW service capacity
  - **Backup Generator:** 1,500 kW
- **High-Power EV Charging:**
  - **Charging Ports:**
    - 24 × 400 kW chargers
    - 3 × 800 kW chargers
    - 2 × 1,200 kW chargers
    - Megawatt Charging System (MCS): Compliance with the latest charging standards, e.g., MCS, NACS, and CCS1.
- **Smart Energy Management System:**
  - **Real-Time Monitoring:** Automated demand response to reduce peak loads
  - **AI-Based Predictive Analytics:** Optimizes power distribution for efficiency
  - **Intelligent Load Balancing:** Manages energy flow between solar, battery, and grid to prevent overloading

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

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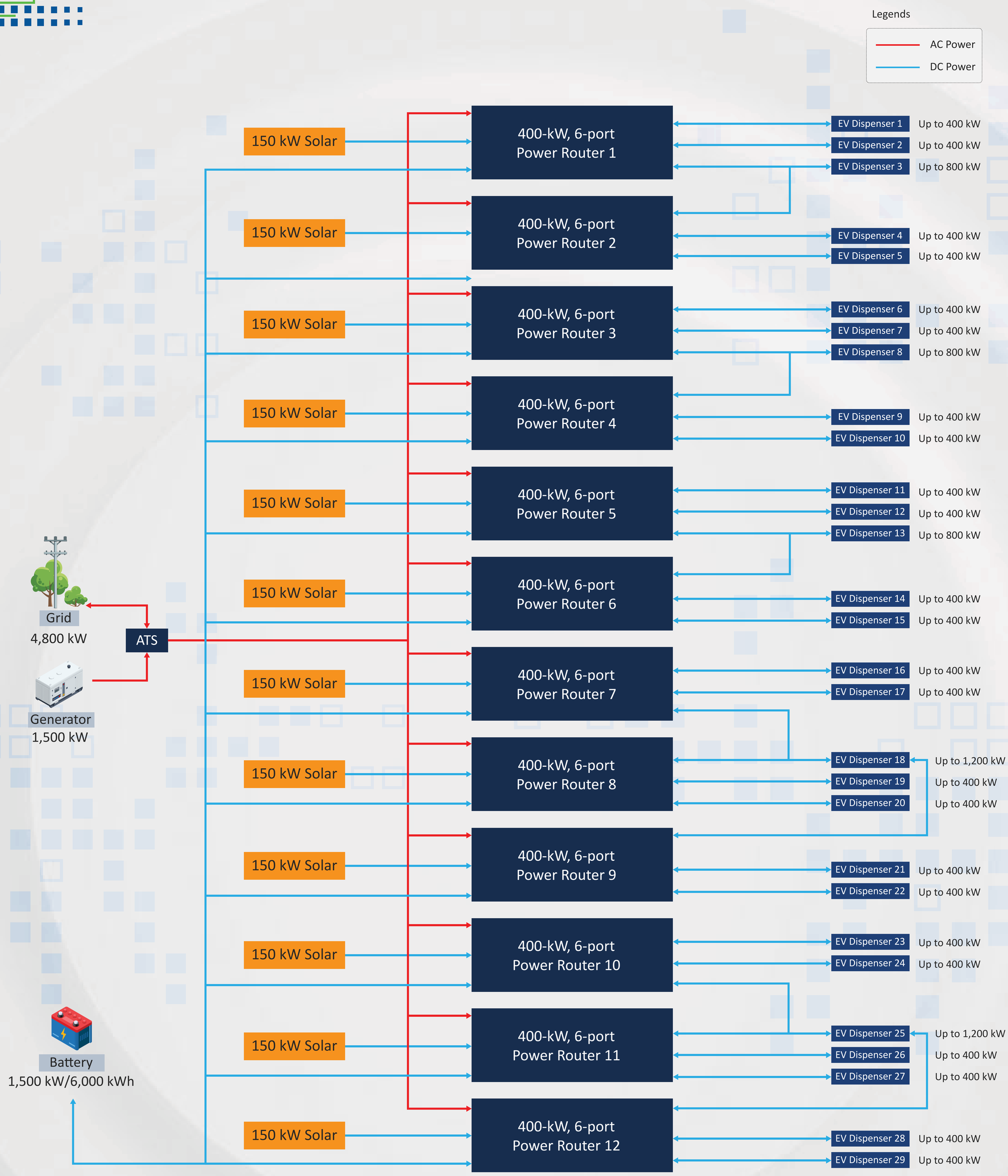

Results

CapEx Savings:

- **37%** cost savings over traditional charging infrastructure through integrated energy storage and optimized power conversion.
- **35%** lower installation costs by minimizing the need for extensive grid reinforcements.

OpEx Savings:

- **15%** reduction in energy costs through demand charge mitigation and direct solar utilization.
- **20%** lower maintenance expenses due to fewer hardware components and predictive diagnostics.

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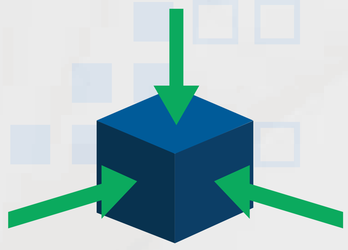
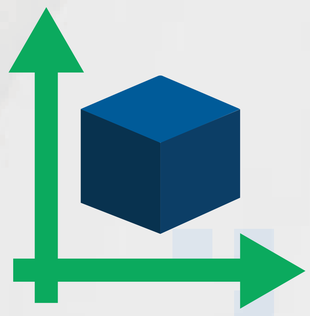
Financial Metrics:

- Payback achieved in **8 years,** outperforming conventional charging models.
- IRR: **12%**

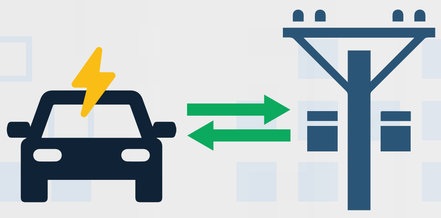
Value-Added Features and Additional Benefits



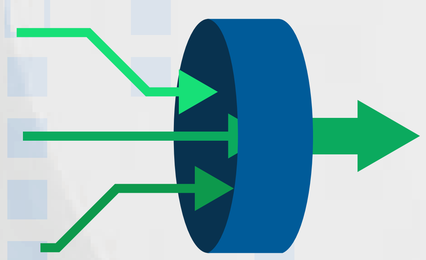
Enhanced Resiliency: Ensures reliability by maintaining operations during outages through a seamless transition to on-site DERs and EV chargers.



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.

Conclusion

By integrating the DG Matrix Power Router technology, the logistics operator has successfully deployed a cost-efficient, high-power public charging network that is future-ready, financially viable, and environmentally sustainable. With reduced energy costs, enhanced resilience, and a streamlined operational model, the company is now leading the transformation toward zero-emission freight transportation.

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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