DIMAAG-AI

ACTIONABLE INTELLIGENCE

A NEW 800VDC POWER ARCHITECTURE

SOLVES LVRT AND AI TRAINING POWER FLUCTUATIONS

ENABLES DEMAND RESPONSE

REDUCES POWER SYSTEM FOOTPRINT

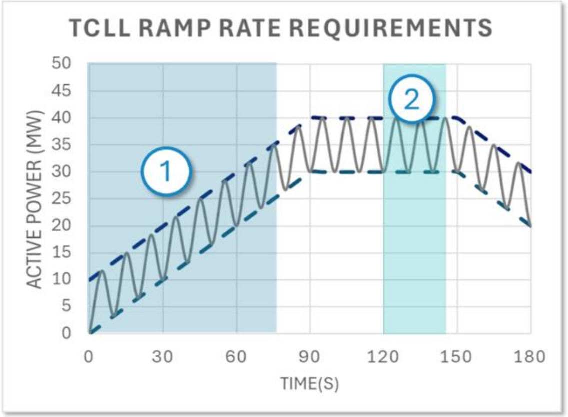
Ian Wright

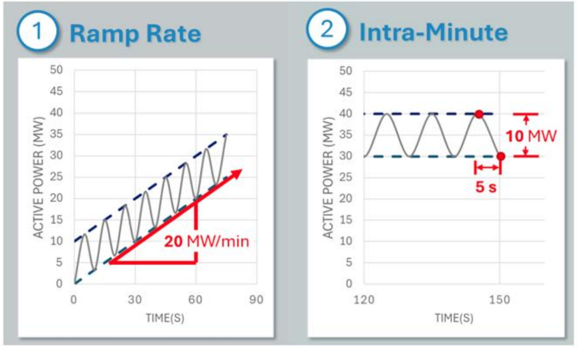
VP of Engineering

DIMAAG

Co-founder, Tesla

GRID – DATACENTER CHALLENGES – LOAD SMOOTHING



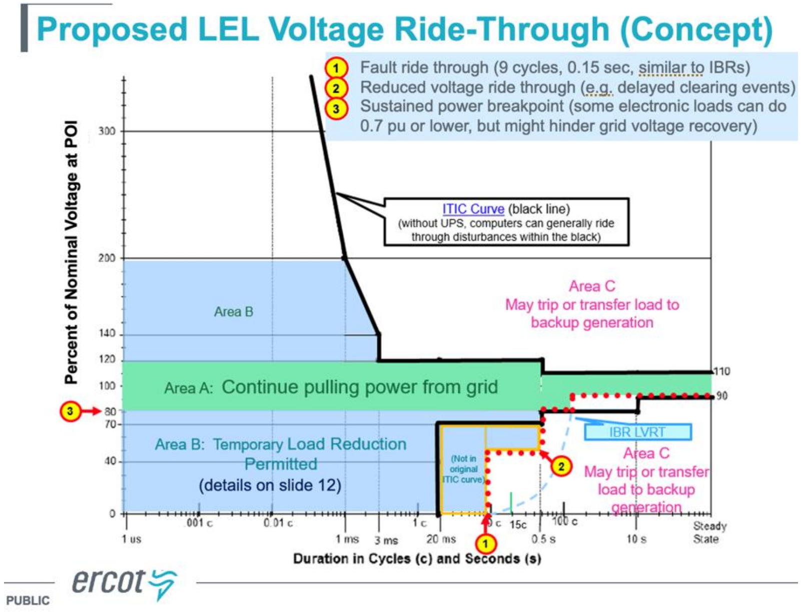


Reference – Southern Company

ERCOT Proposed Requirement:

"Load power shall not repetitively exceed 10 MW change in a sliding time window of 5 seconds"

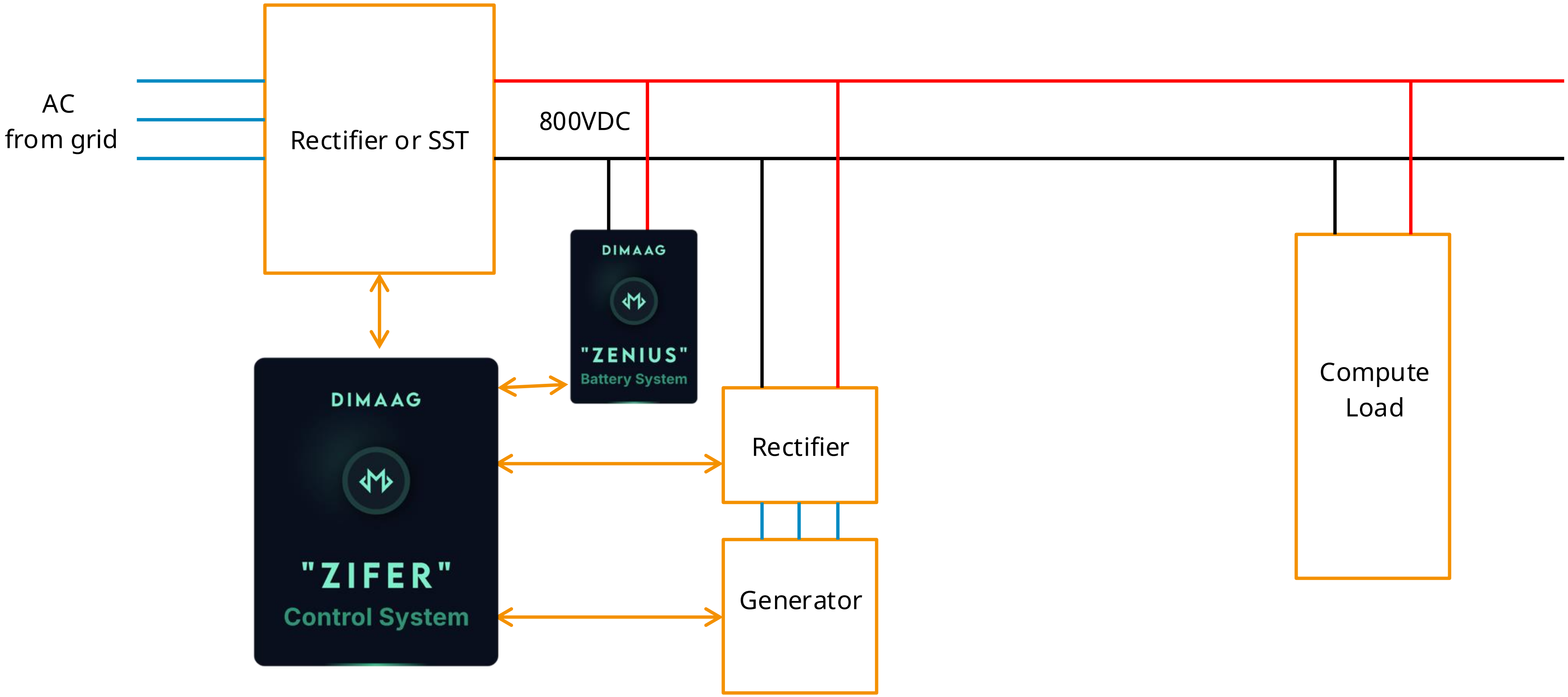
Note: In this screening assessment, an MCTV of 0.01 was assumed, limiting generator terminal power variation to 1% of MVA rating to avoid torque violations



ERCOT Proposed Requirement:

Future LELs will need to meet voltage ride-through requirements.

DIMAAG 800VDC POWER ARCHITECTURE



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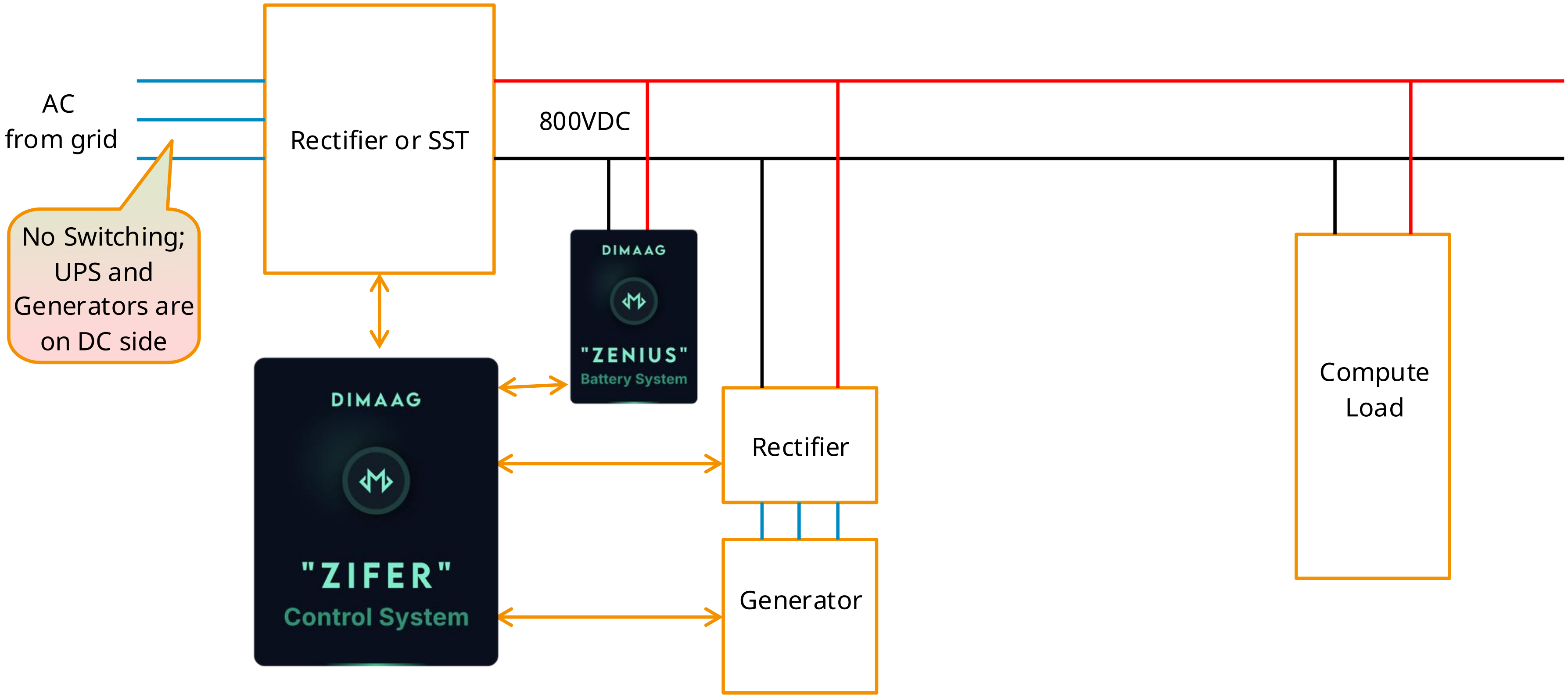
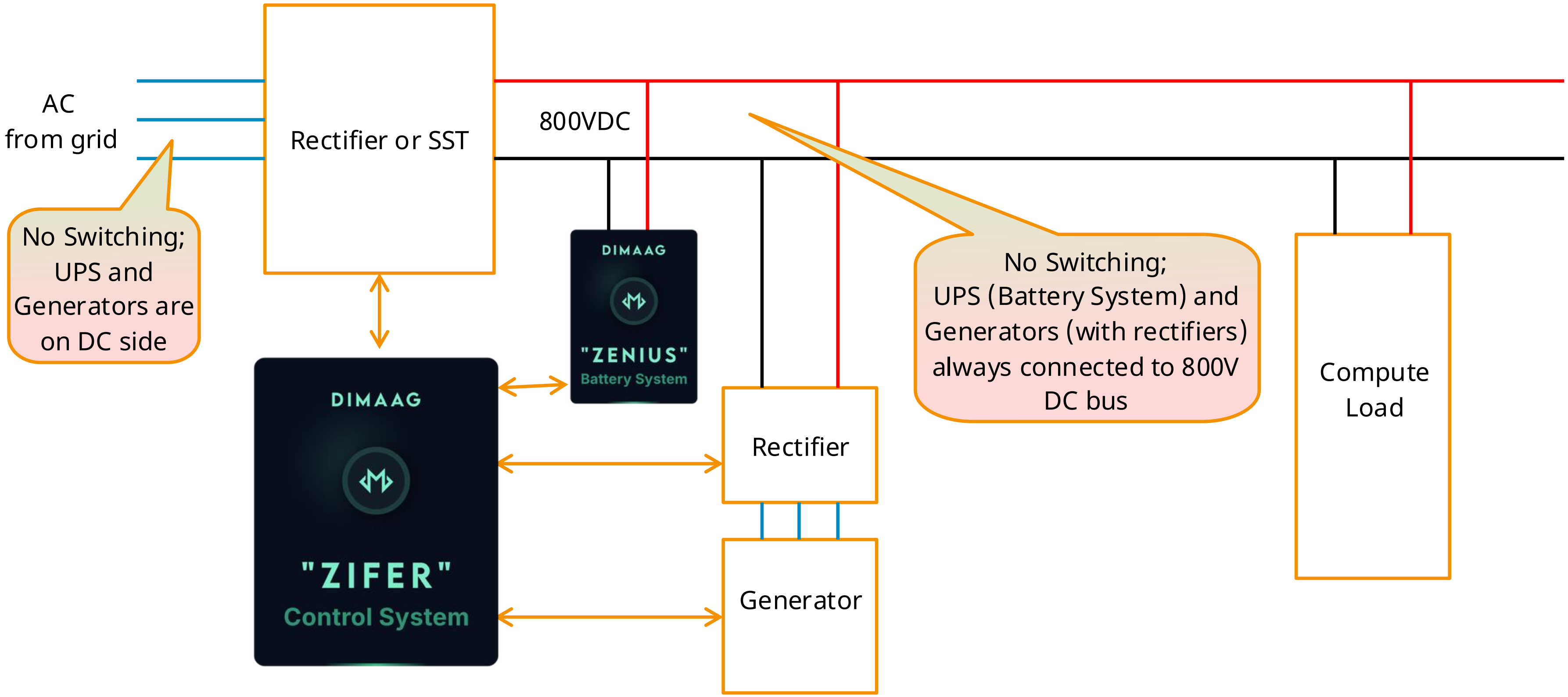
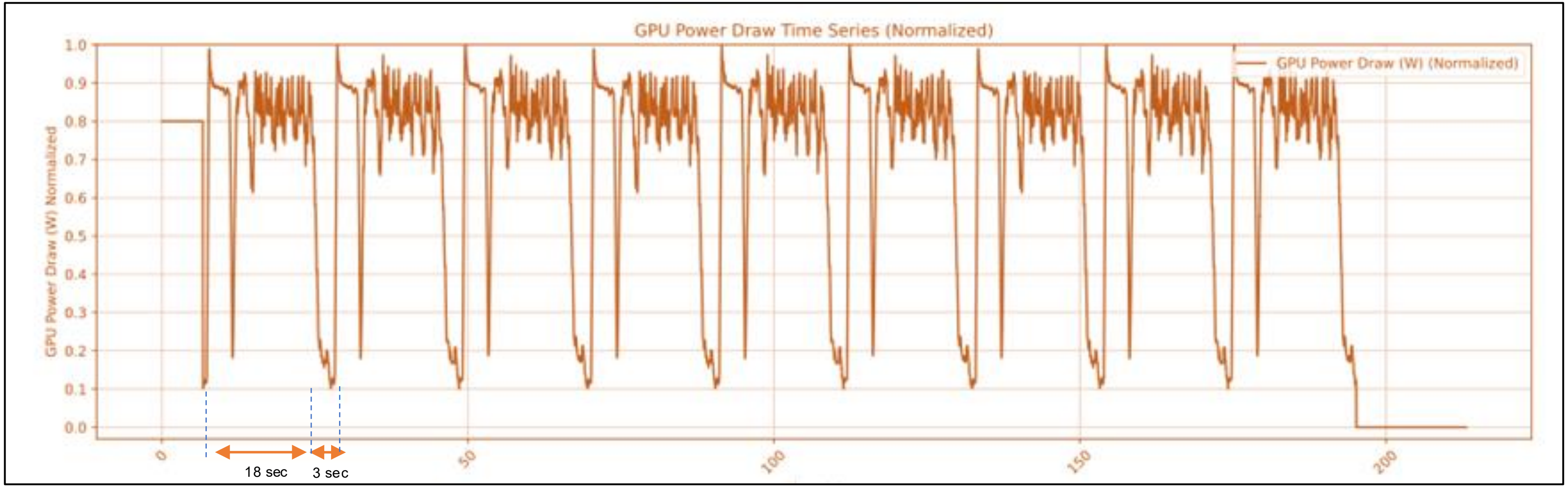


DIMAAG 800VDC POWER ARCHITECTURE



LOAD SMOOTHING

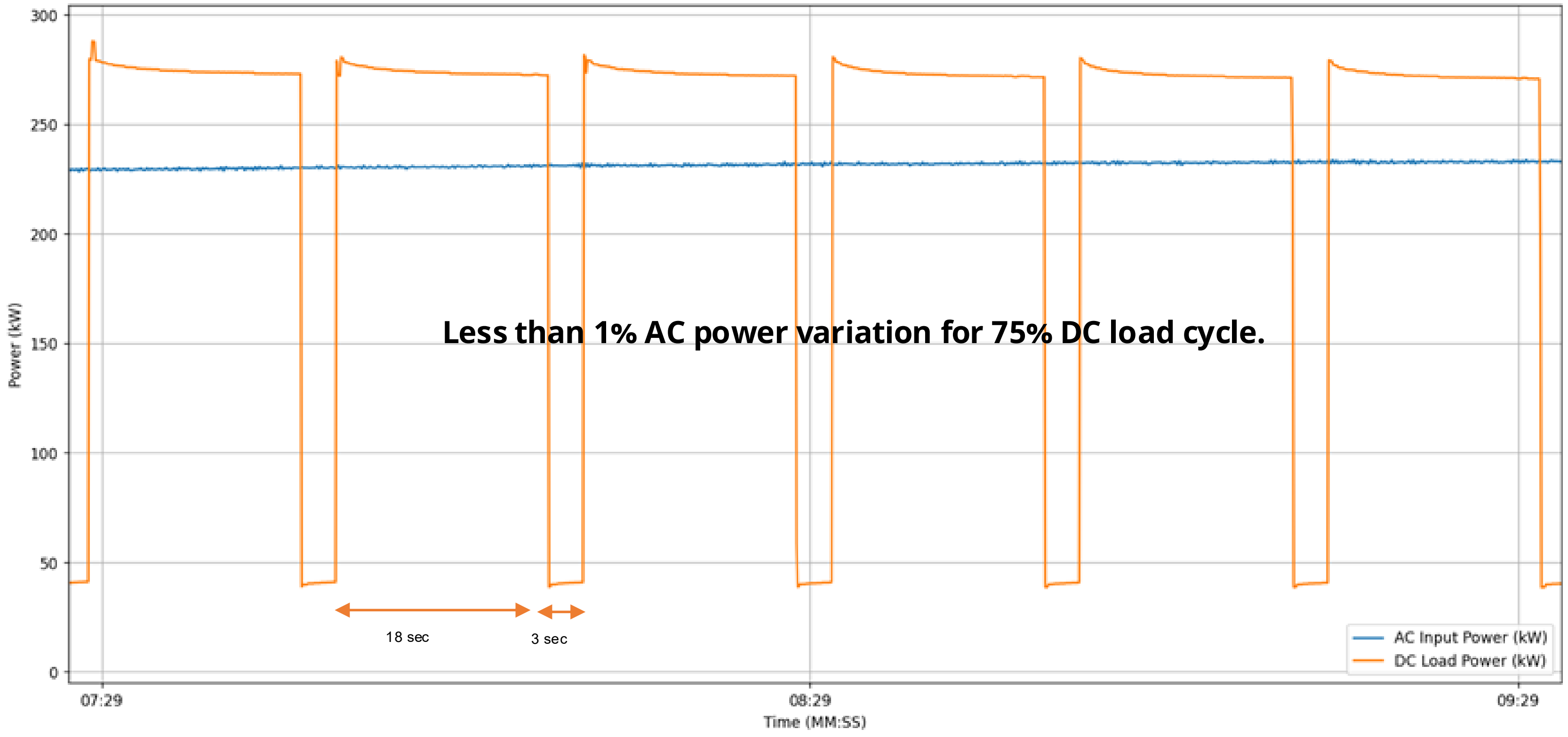
DC LOAD FOR HYPERSCALE AI TRAINING



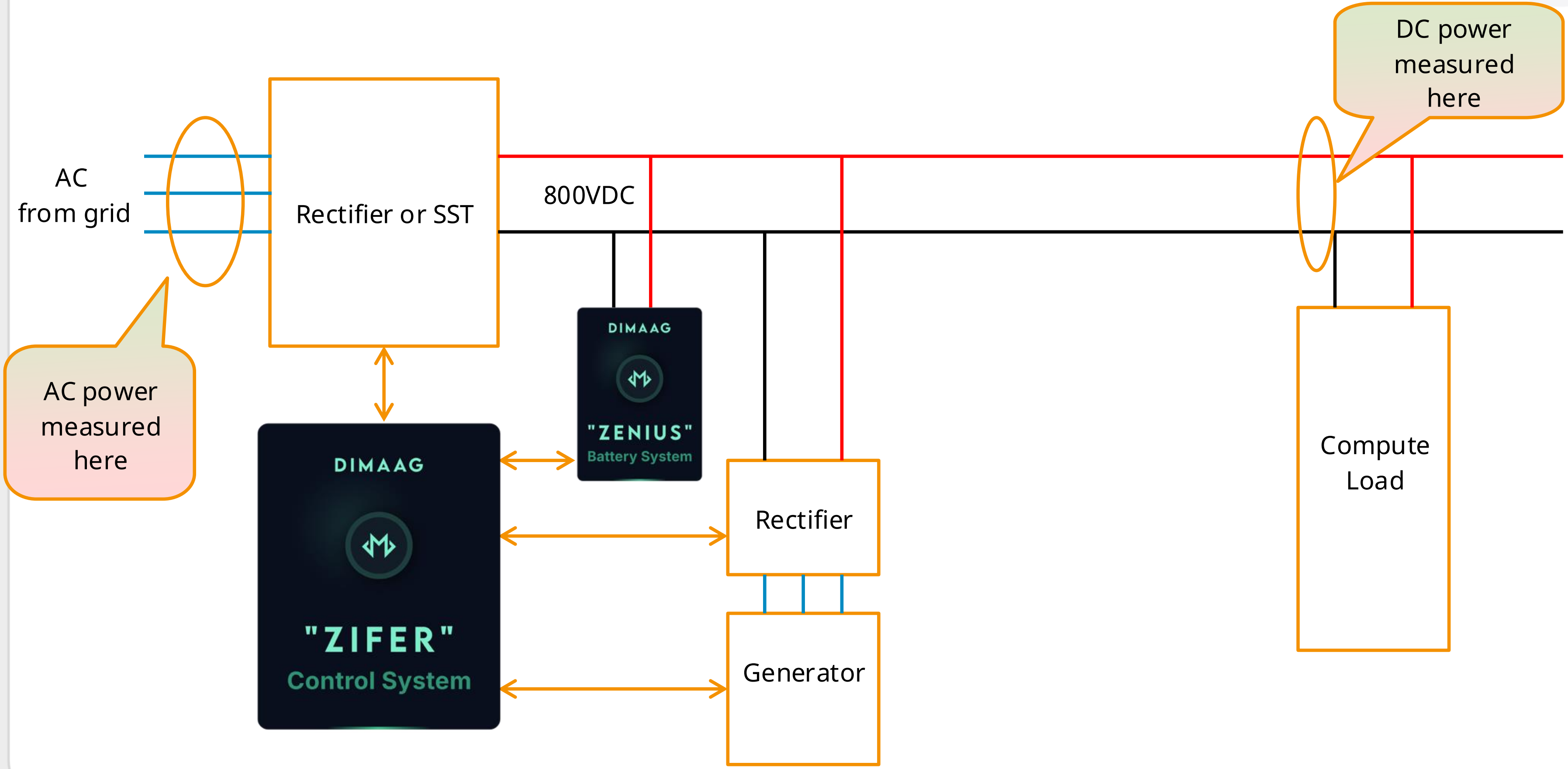
https://arxiv.org/pdf/2508.14318 -- *Microsoft, OpenAI, Nvidia*

AC INPUT POWER AND DC LOAD POWER

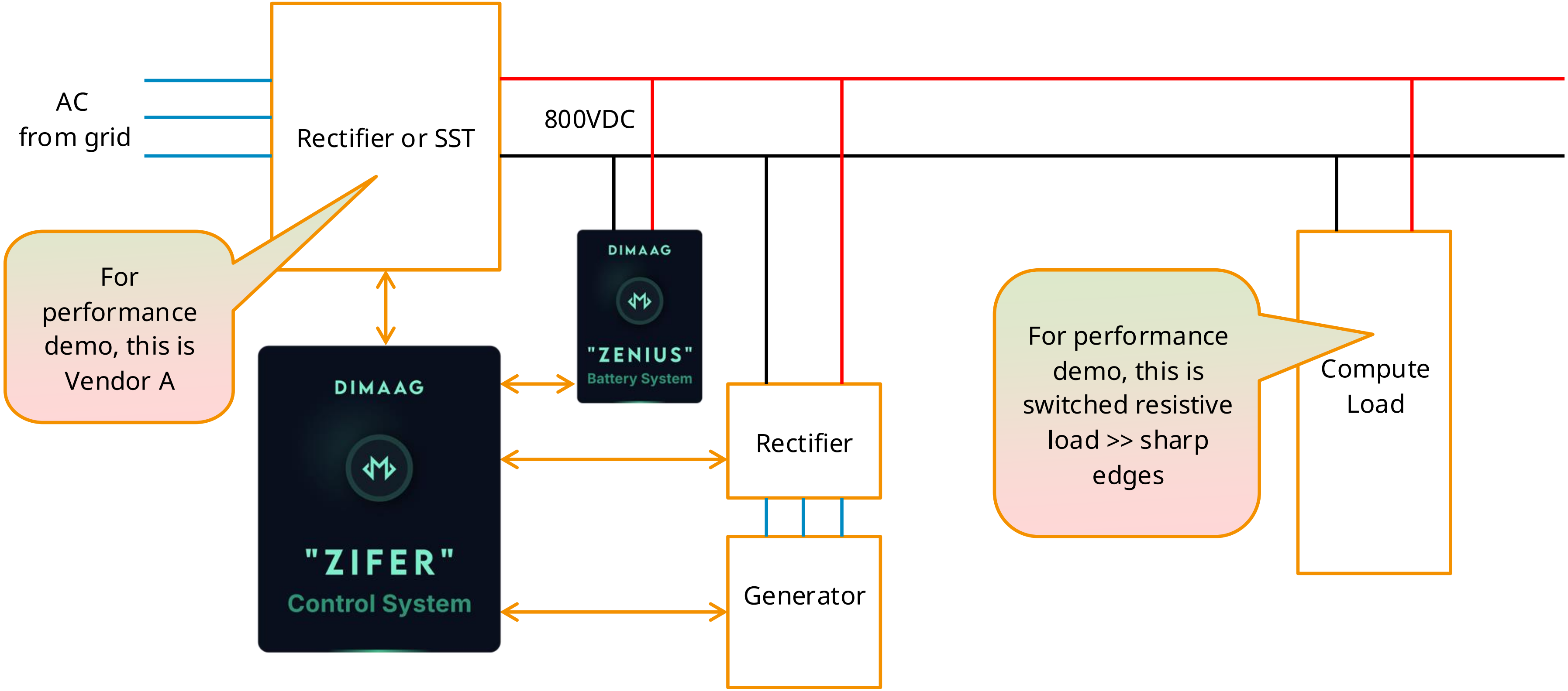
MEASURED RESULT



AI TRAINING CYCLE LOAD PERFORMANCE

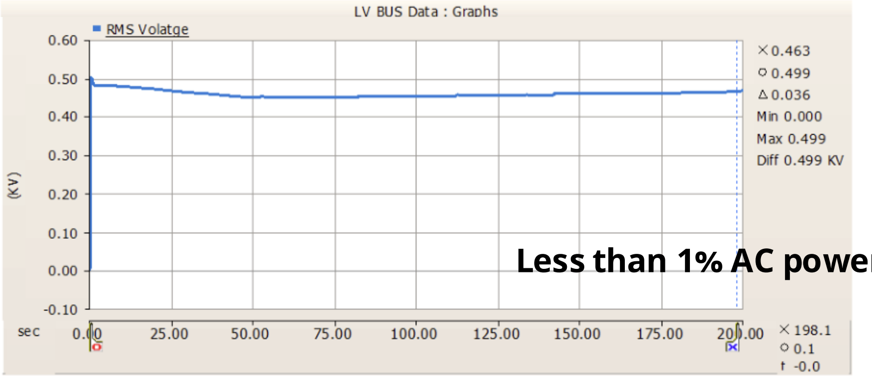


DIMAAG 800VDC POWER ARCHITECTURE

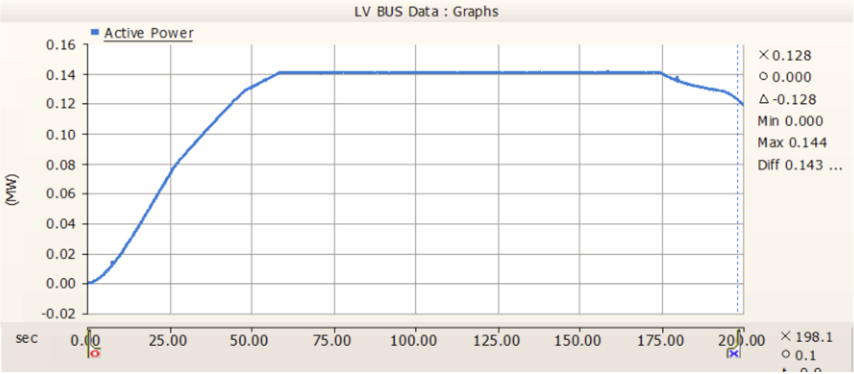


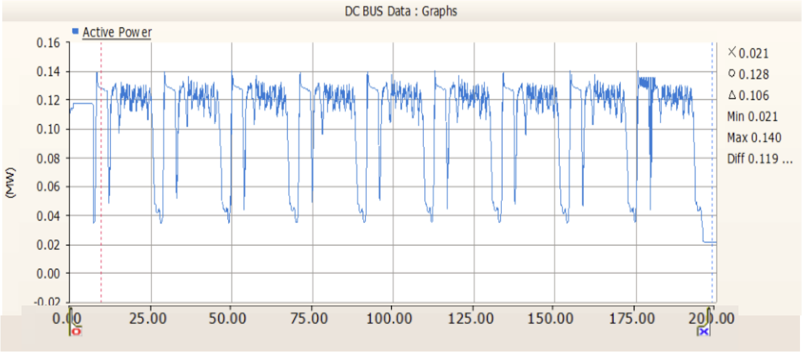
AC INPUT POWER AND DC LOAD POWER

EPE (Electric Power Engineers) Simulation Result



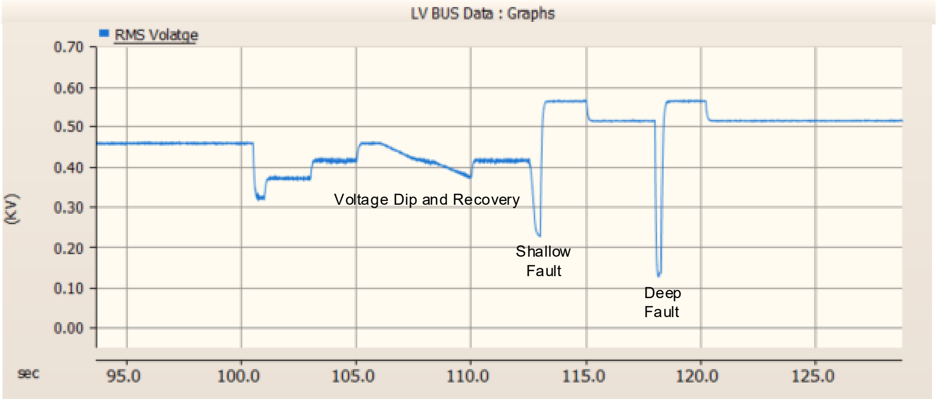
Less than 1% AC power variation for 75% DC load cycle.

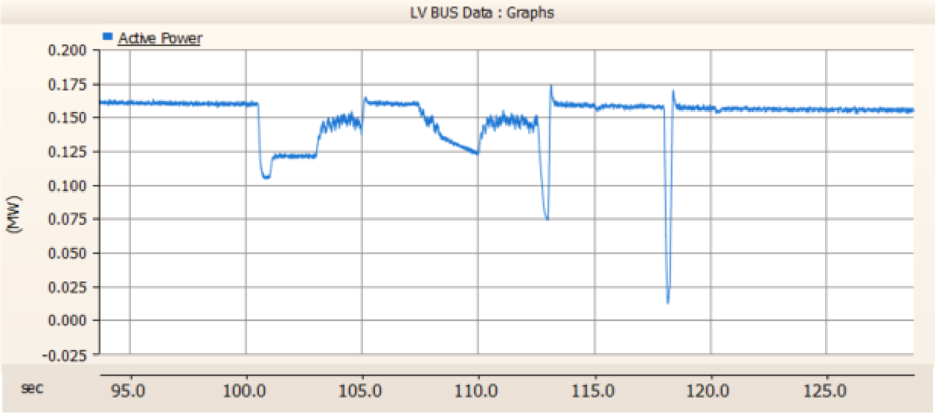




LVRT

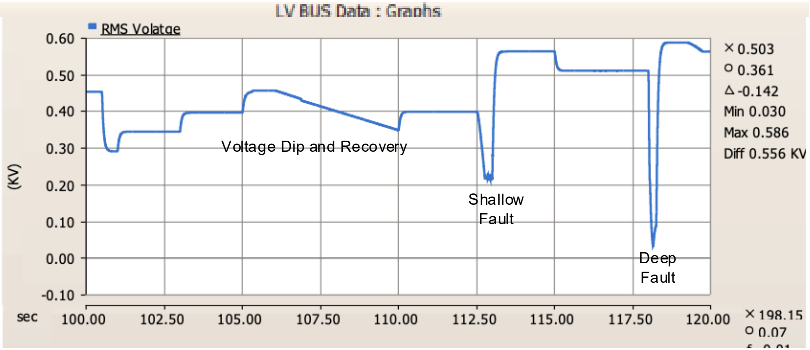
LVRT PERFORMANCE –RECTIFIER FROM VENDOR A

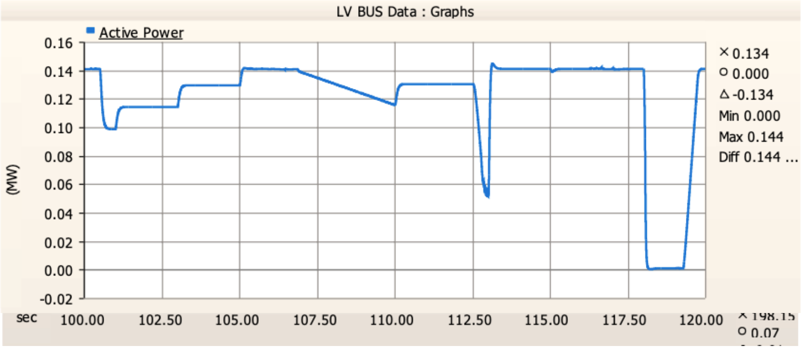




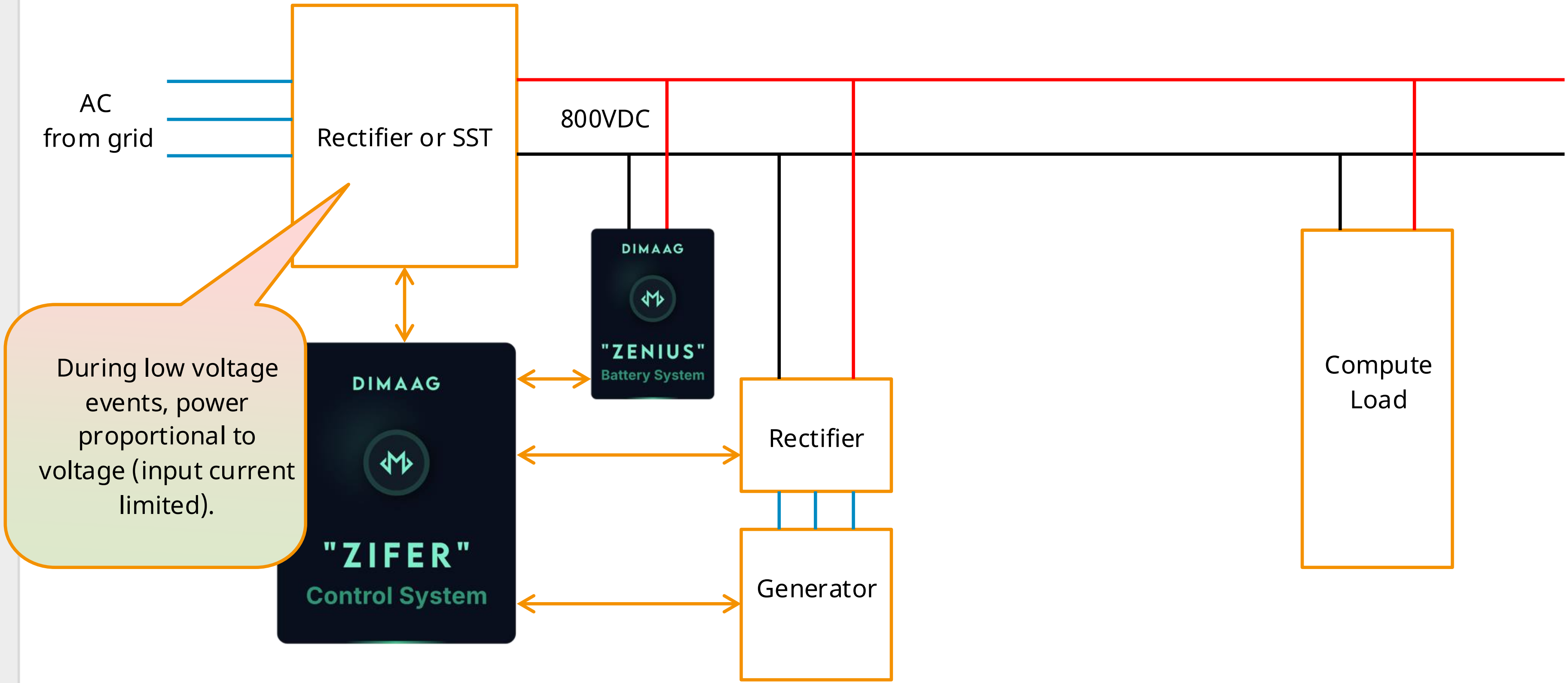
LVRT PERFORMANCE – RECTIFIER FROM VENDOR B

EPE Simulation Result



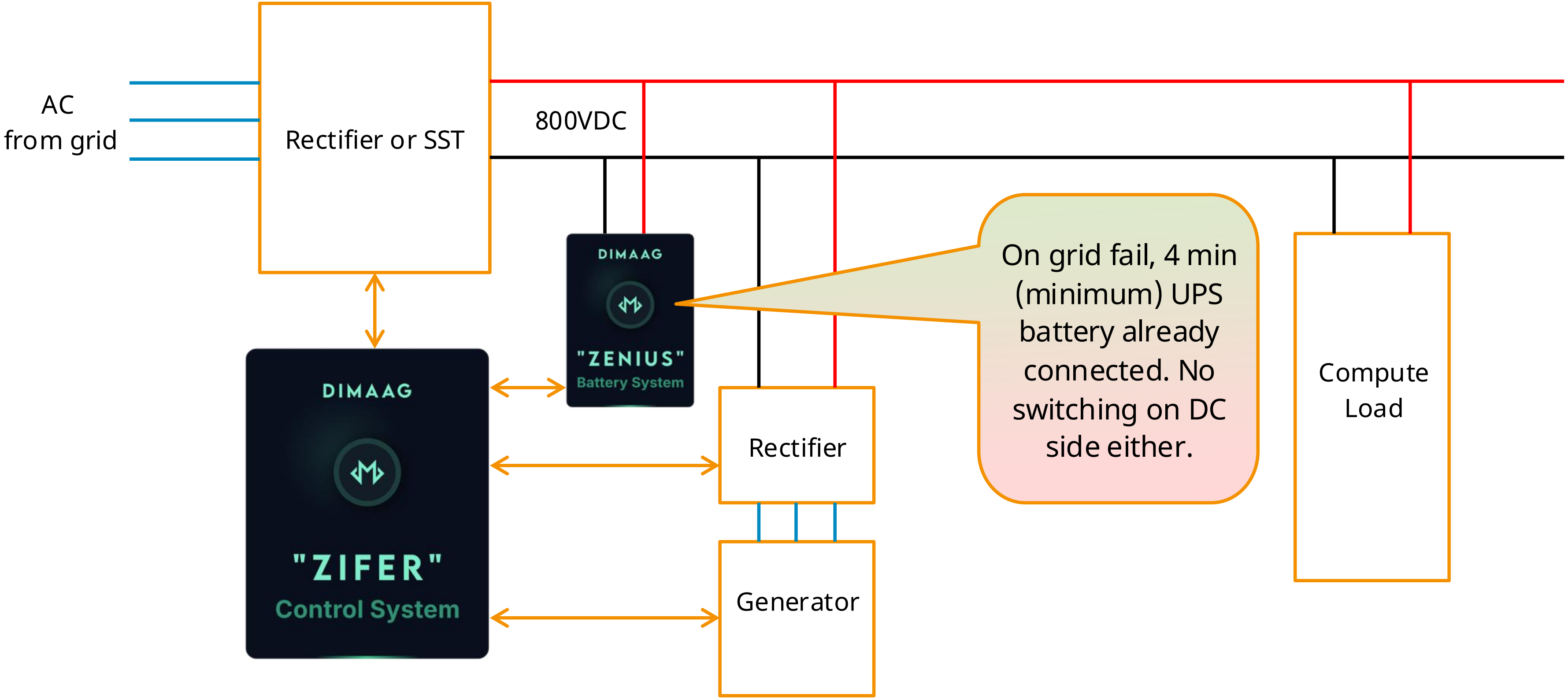


LVRT PERFORMANCE

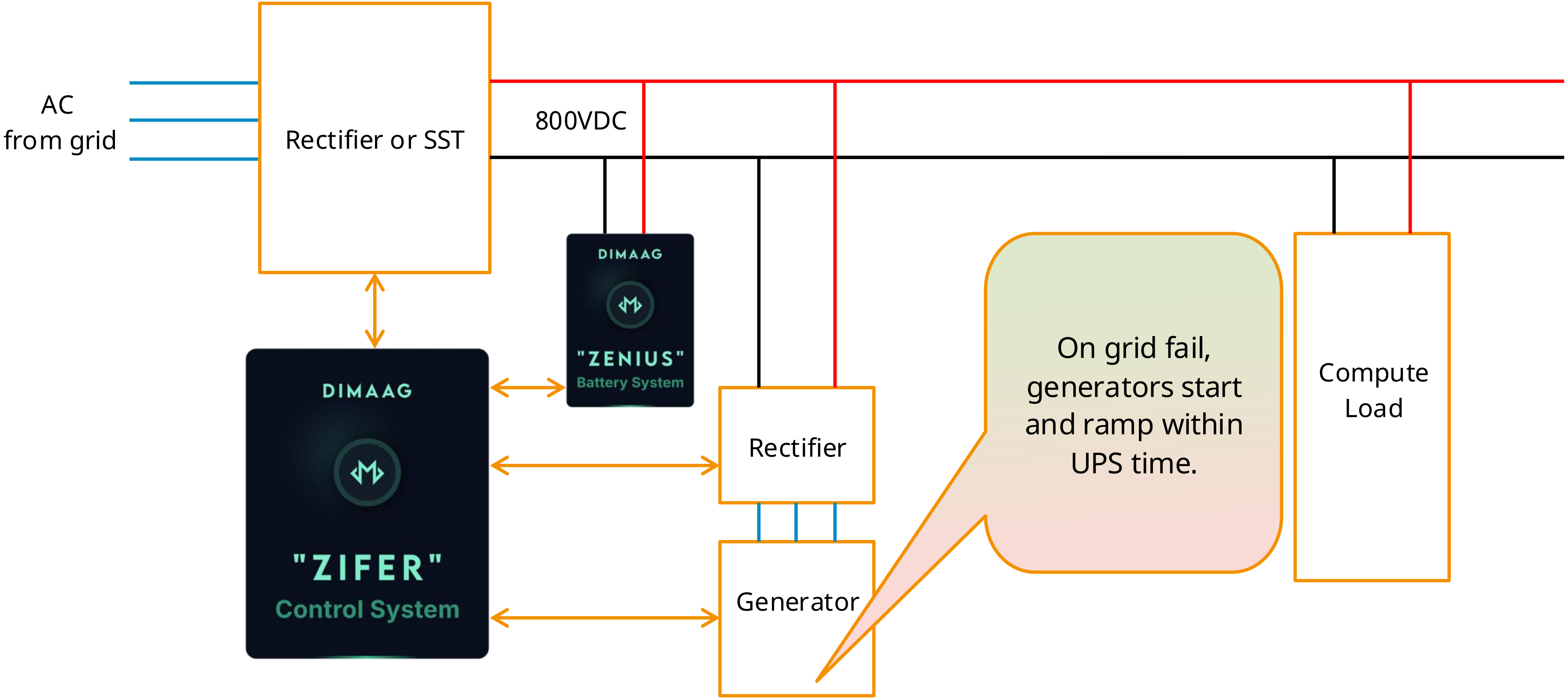


UPS

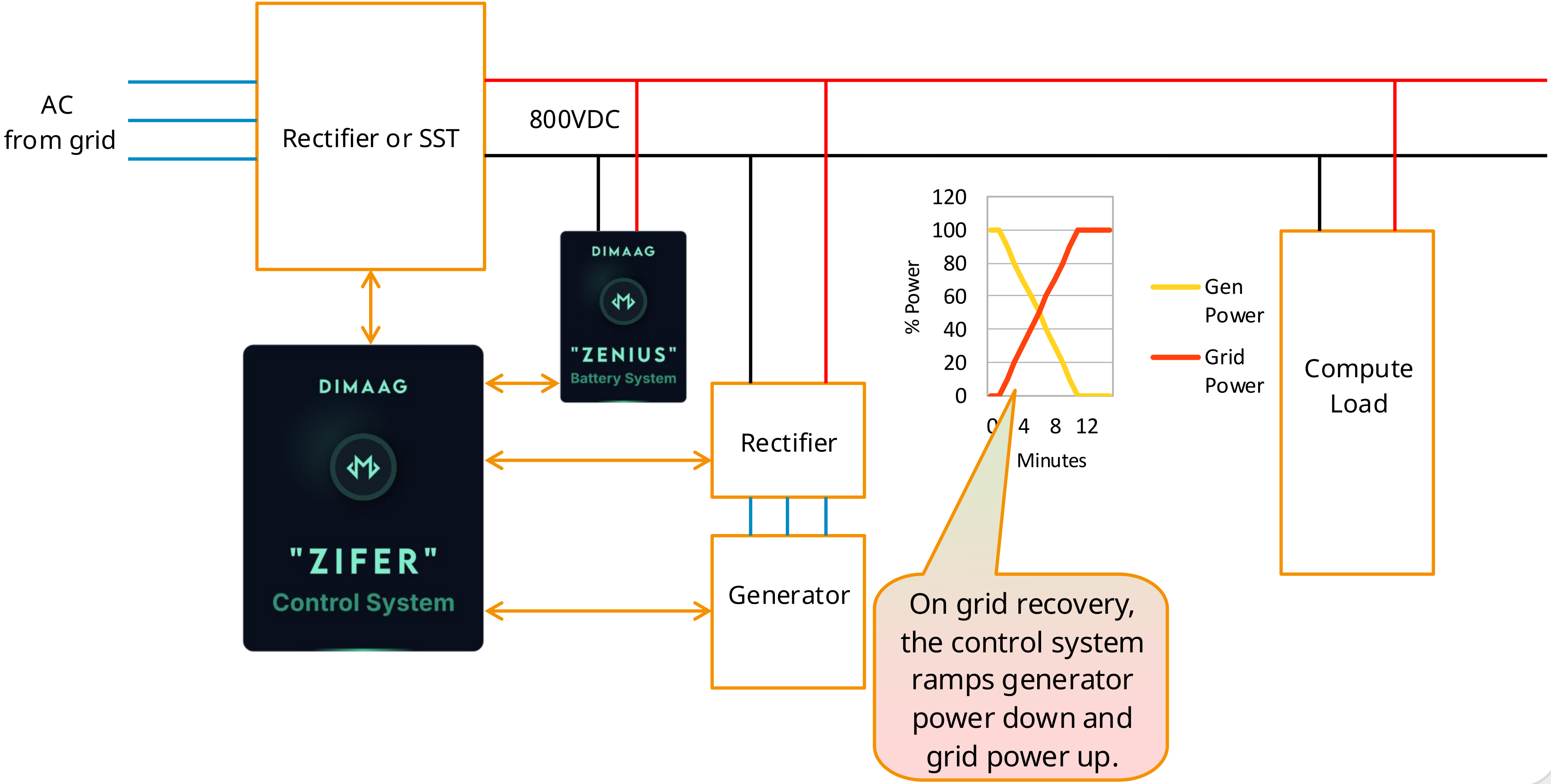
UPS PERFORMANCE



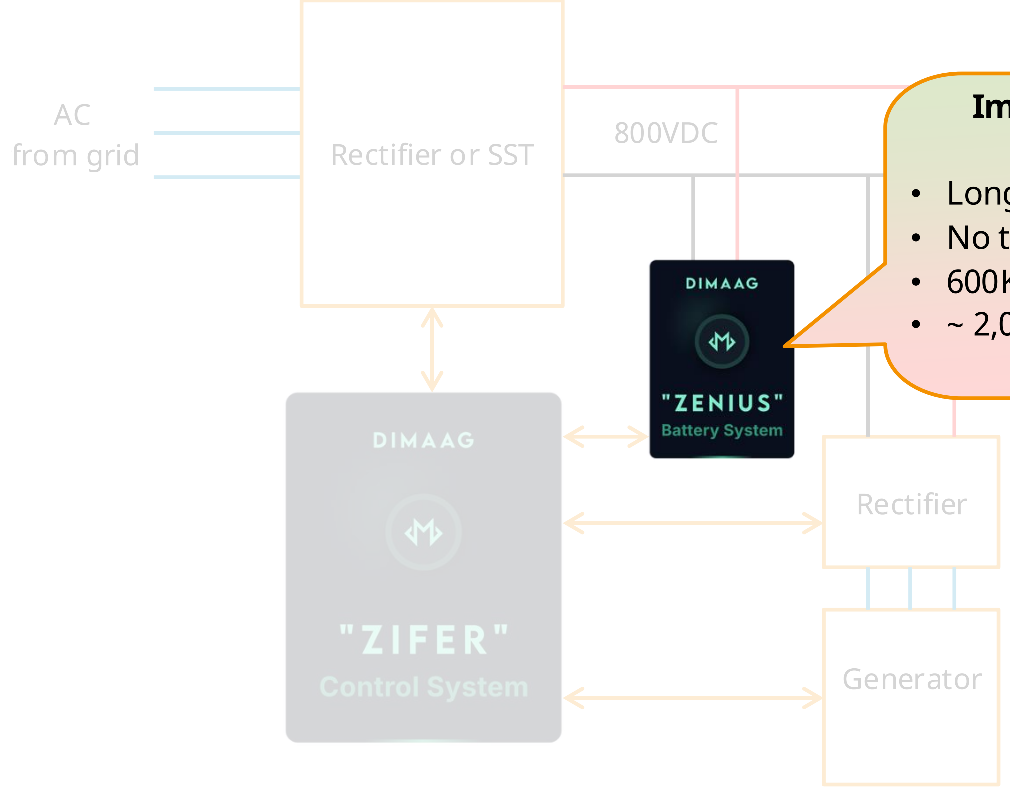
UPS PERFORMANCE



UPS PERFORMANCE



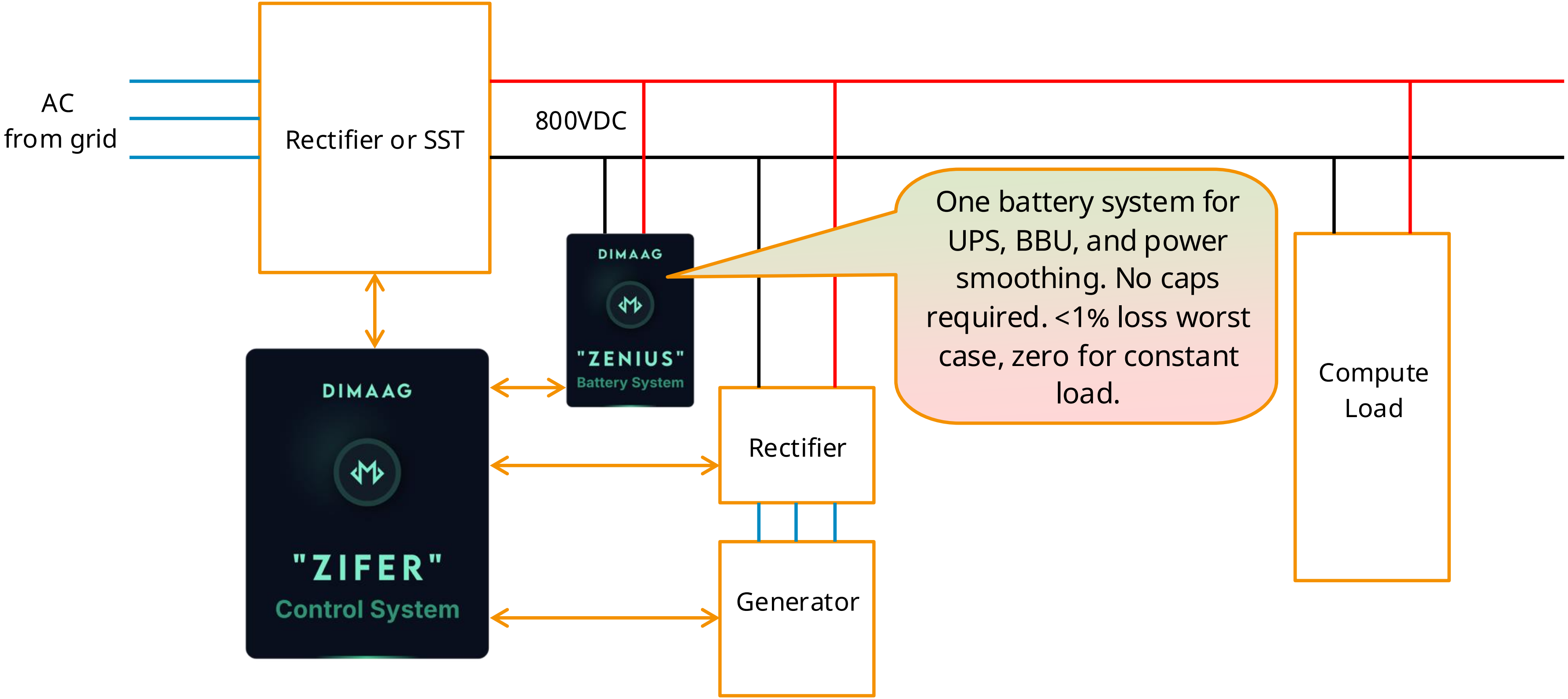
DIMAAG 800VDC POWER ARCHITECTURE



Immersion cooled LTO modules

- Long life
- No thermal runaway
- 600KW per 21” rack
- ~ 2,000 sq ft for 100MW.

DIMAAG 800VDC POWER ARCHITECTURE



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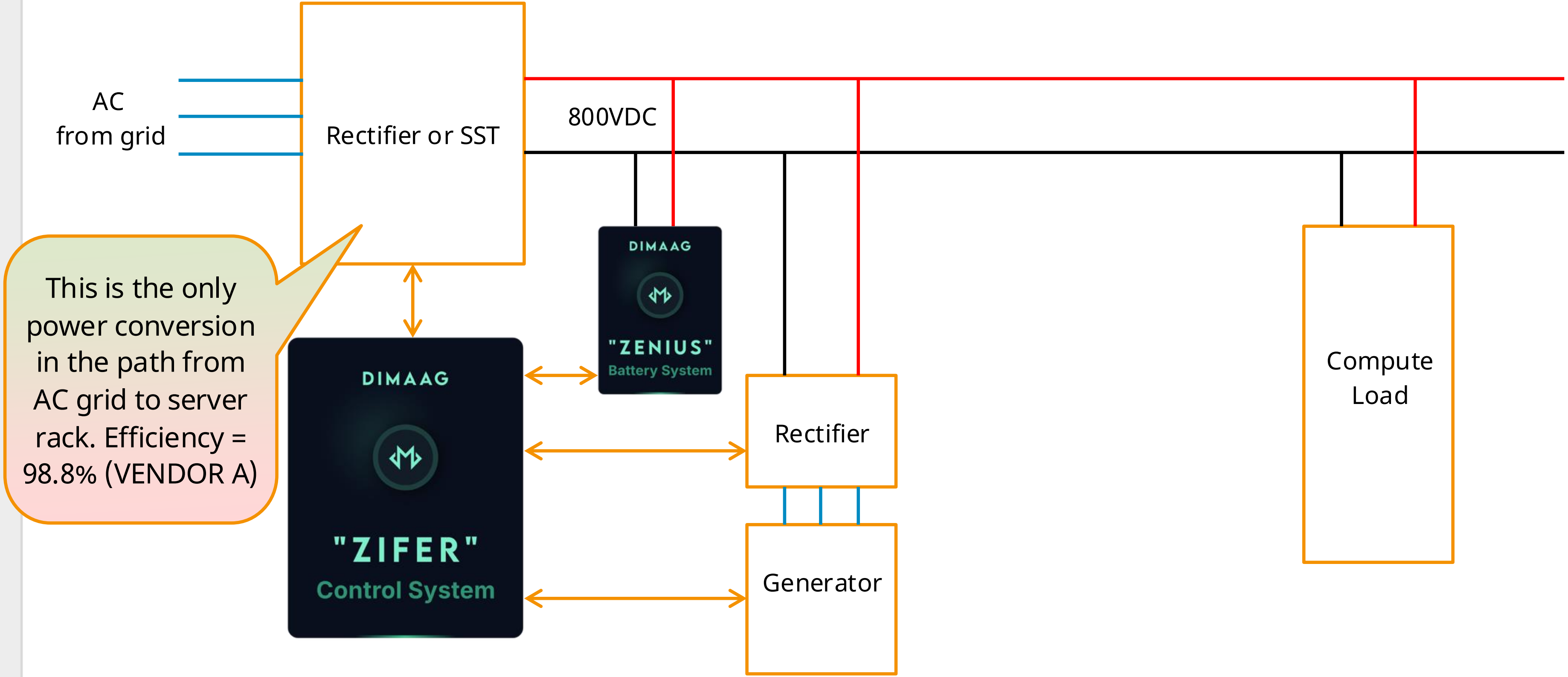

2. Introduction

This report presents a Power System Study conducted by Electric Power Engineers (EPE) to evaluate the performance of the DIMAAG AC/DC device within a modern data center environment. As high-performance AI training and GPU workloads introduce significant power fluctuations, specialized mitigation is required to maintain system stability.

The primary objective of this study was to investigate the effectiveness of the DIMAAG module in providing load smoothing, Low Voltage Ride-Through (LVRT), Backup Power and Demand Response capabilities. Utilizing a high-fidelity PSCAD model, the analysis integrates an equivalent and detailed grid representation with a Microsoft DC load model provided to replicate real-world GPU fluctuations. The study specifically measures the device's performance against the following criteria:

- **Load Smoothing:** Ability to flatten high-fluctuation GPU workloads to mitigate system-wide flicker.
- **LVRT Compliance:** Evaluation of the facility's ability to remain connected during grid disturbances, specifically testing against the latest ERCOT Large Load Working Group (LLWG) guidelines.
- **Backup Power:** During unplanned grid disturbance outside of LVRT envelope, load will be switched over to back up supply sources. Traditionally, UPS offers momentary power supply while back-up gensets are ramped up. DIMAAG device will provide interrupted power to the DC system during various grid faults and voltage levels.
- **Demand Response:** The PSCAD model implemented with an external dispatch signal similar to a traditional power plant controller. EMT simulations performed for various levels of curtailment to verify the DIMAAG's equipment accurately following the external command while maintaining same load output depending on the state of charge.

6. Conclusion

The dynamic simulations conducted in this study confirm that the DIMAAG AC/DC module is a highly effective solution for addressing the power quality and stability challenges inherent in modern data center operations. The module consistently demonstrated its ability to buffer extreme DC-side power fluctuations; often ranging between 0.035 MW and 0.14 MW; into a stable and smooth AC-side active power demand. This decoupling significantly maintains a stable AC voltage profile and near-unity power factor at the facility interface.

From a grid-resilience perspective, the DIMAAG device exhibited robust Low Voltage Ride-Through (LVRT) performance, in alignment with the stringent ERCOT Large Load Working Group (LLWG) requirements for Large Electronic Loads (LELs). Simulation results confirm that the control system responds appropriately during voltage disturbances, maintaining the DC bus voltage near 0.78 kV and ensuring that sensitive IT equipment remains within acceptable ITIC ride-through limits.

Furthermore, during unplanned grid disturbances outside the LVRT envelope; when the load is transferred to backup supply sources; the DIMAAG module provided uninterrupted power to the DC system, ensuring continuous operation of critical data center loads. The module also demonstrated strong demand-response capability, accurately following external dispatch signals analogous to those used by traditional power plant controllers. Across multiple curtailment levels, the system maintained consistent DC load output while adjusting grid-side power draw based on state of charge, highlighting the DIMAAG module's flexibility and suitability for grid-interactive data center applications.

CONCLUSION

- New architecture, including battery system and controls
- Solves the LVRT and power fluctuation problems
- **Simulated, built and tested**
- Small footprint, scales linearly

To see a demo contact us at :

datacenter@dimaag.ai

THANK YOU

DIMAAG