VAAS & Dynamic Energy Response (DER)

Voltage as a Service (VAAS)™ is an energy-saving service solution for regulating and optimising the voltage supplied to electrical equipment to the optimal level for efficient operation. The purpose of VAAS is to reduce energy consumption, lower electricity bills, and decrease carbon emissions by ensuring that electrical devices operate at their most efficient voltage level.

VAAS & Dynamic Energy Response

Voltage as a Service (VAAS) can play a significant role in providing Dynamic Energy Response (DER) by adjusting the voltage levels in real-time to manage energy demand and supply. This capability is increasingly important in modern energy systems, especially with the growing integration of renewable energy sources and the need for grid stability.

The following table sets out how VAAS systems can be utilised for dynamic energy response.

Using VAAS to deliver DER

Capability	Method	Description
Real-Time Voltage Adjustment	**Demand Response Participation**	VAAS systems can adjust voltage levels in response to signals from the grid operator during peak demand periods. By reducing the voltage slightly across a network, VAAS can lower the energy consumption of connected loads without noticeable impact on their performance. This reduction in demand helps alleviate stress on the grid during peak periods, contributing to dynamic energy response.
	Load Shedding	In more critical situations, VAAS can be part of a load-shedding strategy where voltage is reduced to non-critical loads to ensure that essential services continue operating. This can be automated based on real-time data and predefined criteria, making the response both quick and efficient.
Integration with Smart Grids and IoT	**Decentralised Control via IoT**	VAAS systems integrated with IoT devices can communicate and respond to grid conditions in real time. For example, smart meters and sensors can detect voltage fluctuations or demand spikes, and VAAS systems can adjust voltage accordingly to balance the load dynamically across the grid.
	Smart Grid Compatibility	In a smart grid environment, VAAS systems can interact with other energy management systems to provide coordinated responses to fluctuations in supply and demand. This could include dynamically adjusting voltage levels in response to the output from renewable energy sources, such as solar or wind, which are inherently variable.
Enhanced Grid Stability	**Voltage Regulation during Renewable Integration**	Renewable energy sources often cause voltage fluctuations due to their intermittent nature. VAAS can help regulate voltage levels by dynamically adjusting them to compensate for the variability in renewable generation. This ensures a stable power supply and reduces the need for additional grid infrastructure to manage fluctuations.
	Frequency Response Support	By participating in frequency regulation, VAAS systems can help maintain grid frequency within acceptable limits. For instance, during a frequency dip, VAAS can reduce voltage to lower energy demand, helping to restore balance between supply and demand quickly.

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Capability	Method	Description
Dynamic Voltage Control	**Adaptive Voltage Control Algorithms**	Advanced VAAS systems use adaptive control algorithms that respond to real-time data inputs to optimise voltage levels dynamically. These algorithms can adjust voltage based on current grid conditions, predicted demand, and the status of distributed energy resources (DERs), such as battery storage or EV charging stations.
	Predictive Maintenance and Optimisation	By continuously monitoring voltage levels and system performance, VAAS systems can predict when and where voltage adjustments will be needed, allowing for proactive rather than reactive energy management. This can reduce energy waste and improve overall system efficiency.
Demand-Side Management	**Load Matching with Supply**	VAAS systems can adjust voltage levels to better match energy demand with supply, especially during periods of high renewable generation. By optimising voltage in real time, these systems can reduce the overall energy consumption of the grid, making it easier to integrate variable renewable energy sources without compromising grid stability.
	Customer-Specific Responses	VAAS can be tailored to specific customer needs, allowing for differentiated voltage levels based on the criticality of the load. For example, industrial customers might have voltage reduced to non-essential processes during peak periods, while critical processes remain unaffected.
Enhanced Energy Efficiency	**Reduction in Energy Losses**	By maintaining voltage levels closer to optimal, VAAS systems reduce energy losses in the distribution network. This not only improves efficiency but also reduces the need for additional generation capacity during peak times, contributing to a more balanced and responsive grid.
	Lowering Peak Demand	By reducing voltage during peak demand periods, VAAS can lower the overall peak load on the grid, which is beneficial for both the utility and the customer. This dynamic response helps flatten the demand curve, reducing the need for peaking power plants and lowering overall energy costs.

Conclusion

VAAS can provide dynamic energy response by adjusting voltage levels in real-time to manage energy demand, improve grid stability, and integrate renewable energy sources.

By leveraging advanced control algorithms, IoT integration, and smart grid compatibility, VAAS systems can respond quickly to changing grid conditions, helping to balance supply and demand, reduce energy losses, and support a more resilient and efficient energy system.

VAAS can provide a very useful contribution to a company's plans to meet its Carbon emission targets, as well as reporting requirements. VAAS provides the right voltage to electrical equipment, ensuring efficiency, cost savings, environmental benefits and performance reporting while maintaining equipment performance and longevity.

For further information, contact us at sales@vaasco.net

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