D-VAR VVO™ FAQ's

Product overview questions:

1) Does the D-VAR VVO use superconductors?

No. The D-VAR VVO relies upon AMSC's proven grid power electronics technology. AMSC has over 20 years of experience in the design and manufacturing of utility-scale power electronics solutions. AMSC has deployed over 10 GigaWatts of utility-scale wind turbine power converters, and over 2 GigaVAR of power electronic-based reactive compensation solutions.

2) Does the D-VAR VVO use batteries?

No. The D-VAR VVO uses power electronics to provide continuous and step-free reactive power (inductive or capacitive) to the grid. For applications that require voltage regulation and/or power factor control, the D-VAR VVO is typically 10x lower cost than a solution based on a Lithium Ion based battery system.

3) How is it possible for the D-VAR VVO to control volt/VAR so rapidly?

The D-VAR VVO is a shunt-connected, power-electronics based solution and does not rely upon any mechanical parts or moving parts for operation. The solution is driven by a powerful control unit that performs corrective control actions thousands of times per second.

4) Is the D-VAR VVO available in a pad-mounted or metal-enclosed configuration?

The D-VAR VVO is initially available in the pole-mounted form factor. AMSC plans to support additional installation formats based on the common D-VAR VVO platform, including metal-enclosed options. Please contact your local sales representative for more information.

5) Is the D-VAR VVO available for voltage classes other than 15KV?

The D-VAR VVO is a standardized product solution and is designed for direct-connection (ie, no external transformer) in 15KV distribution systems. Applications at increased distribution voltages (eg, 25KV) can be accommodated with an external step-up transformer.

6) How long does it take to install the D-VAR VVO?

Minimal time is required to install the D-VAR VVO; the process is comparable to the installation of a step voltage regulator by a trained utility line crew. Installation of the D-VAR VVO requires no special tools and is compatible with existing installation standards for voltage regulation equipment.

7) How long does it take to commission the D-VAR VVO?

Minimal time is required to commission a D-VAR VVO; the process is comparable to the commissioning of a step voltage regulator. The D-VAR VVO incorporates an auto-commissioning tool to establish basic equipment operation by a trained utility line crew. Operators can then custom-configure and tune the system remotely via the SCADA link.

8) What are the maintenance requirements for the D-VAR VVO product?

The D-VAR VVO is engineered to meet feeder operational standards and requires no routine maintenance. Unlike conventional high-powered electronics, the unique D-VAR VVO design does not rely on fans or pumps, nor are there any moving parts in the equipment. In addition, there are no batteries and no toxic materials relied upon in the system.

9) How are spare components handled in the D-VAR VVO system?

Standard operational practice for distribution voltage regulation equipment requires proper planning for spare and/or replacement components. For typical utility applications, AMSC recommends holding spares to support multiple installation sites. AMSC's highly-experienced global service personnel can assist in providing the proper spare parts strategy for your needs.

Applications questions:

1) How do I determine the proper size D-VAR VVO for my application?

Since the D-VAR VVO is a shunt reactive current source, sizing of the D-VAR VVO is straightforward and is similar to the well-known guidelines for capacitor banks. For example, in a voltage regulation application the fault current (sometimes referred to as fault duty) of the installation location is typically sufficient to determine the range of achievable voltage regulation. As a specific example, if the fault duty at a proposed feeder installation site is 20MVA, a +/-1MVAR D-VAR VVO can provide +/-5% voltage regulation range. Additionally, AMSC application engineers are ready to assist you with sizing and integration questions.

2) Can I replace step voltage regulators with the D-VAR VVO?

A properly-sized D-VAR VVO can replace a step voltage regulator. Voltage regulators that operate frequently (eg, 25 times or more in a day) are good candidates for replacement, especially on feeders with intermittent loads or distributed generation such as solar. Replacement with a D-VAR VVO can substantially improve feeder power quality and voltage regulation, as well as eliminate the maintenance cost associated with frequent operation of regulator tap-changing mechanisms.

3) Can I replace capacitor banks with the D-VAR VVO?

Capacitor banks that provide compensation for average VAR loading on a circuit typically should remain installed. Existing switched capacitor banks that operate in areas with intermittent loads can be good candidates for replacement (such as feeders with growing solar adoption). Replacement with a D-VAR VVO can substantially improve feeder voltage regulation and power factor, as well as eliminate the power quality problems associated with switched capacitor banks (including voltage flicker, resonance, restrike, nuisance fuse tripping, etc).

4) How much can I increase solar installations on a feeder with the D-VAR VVO?

The D-VAR VVO is a highly cost-effective solution for increasing the solar hosting capacity (i.e., the number of solar installations) on distribution feeders while maintaining customer power quality. In addition to the use of solar inverters (typically operating in a fixed power factor mode), further improvements in feeder solar hosting capacities of 50% - 100% are typical with a D-VAR VVO solution.

5) For solar integration applications, can I use advanced inverters instead of a D-VAR VVO?

Advanced solar inverters (also known as “smart” inverters) are required for many new solar installations. Because advanced solar inverters are residential-grade equipment (or commercial-grade) and are not utility-owned assets, utilities cannot rely upon them to

provide system voltage regulation and system power quality. As DG and distributed solar adoption increases, an approach that employs the certainty of utility-owned D-VAR VVO systems while leveraging customer-owned advanced solar inverters is a highly cost-effective approach to enhance circuit solar capacity while ensuring excellent power quality.

6) How much can I improve CVR (conservation voltage reduction) with the D-VAR VVO?

Substation CVR (conservation voltage reduction) deployments can be limited by relatively few feeder-level power quality bottlenecks. Root causes include voltage flicker due to dynamic customer loads, and increasingly, the broad adoption of PV and distributed generation into feeders which tends to increase voltage. These type of bottlenecks cannot be addressed using conventional mechanical equipment (voltage regulators and cap banks), and as a result can prevent successful CVR operation on a substation.

The dynamic and bi-directional voltage regulation capability of the D-VAR VVO is a highly cost-effective solution to directly eliminate these bottlenecks. Depending on root cause, the D-VAR VVO can be deployed to obtain an additional 2-4% of voltage reduction in addition to CVR performance provided by a pure software-based CVR solution.

7) Can I integrate the D-VAR VVO with my existing Volt/VAR Optimization System?

Yes, the D-VAR VVO can use dispatched set points from a central VVO algorithm. In between receiving set point commands, the D-VAR VVO continues to provide fast dynamic response to load changes. AMSC works with VVO software vendors to incorporate a D-VAR VVO control interface into the vendor's supported devices. The standard SCADA protocol is DNP3.0-SA and other protocols can be readily supported. AMSC application engineers are ready to assist with specific Volt/VAR optimization objectives and system integration needs.

8) Can I integrate the D-VAR VVO with my existing EMS or DMS System?

Yes, see the answer to #7 above. AMSC application engineers are ready to assist with specific SCADA integration needs.