

Data Center Service with Resilient Electric Grids (REG)

Data center technology is rapidly improving, creating opportunities to construct new data centers in urban areas; which was often considered ideal, but impractical. Driving this trend is continuous improvement, the efficiency of data centers (improving PUE) and increasing power density (greater kW/rack), along with an ever-increasing demand for shorter latencies.

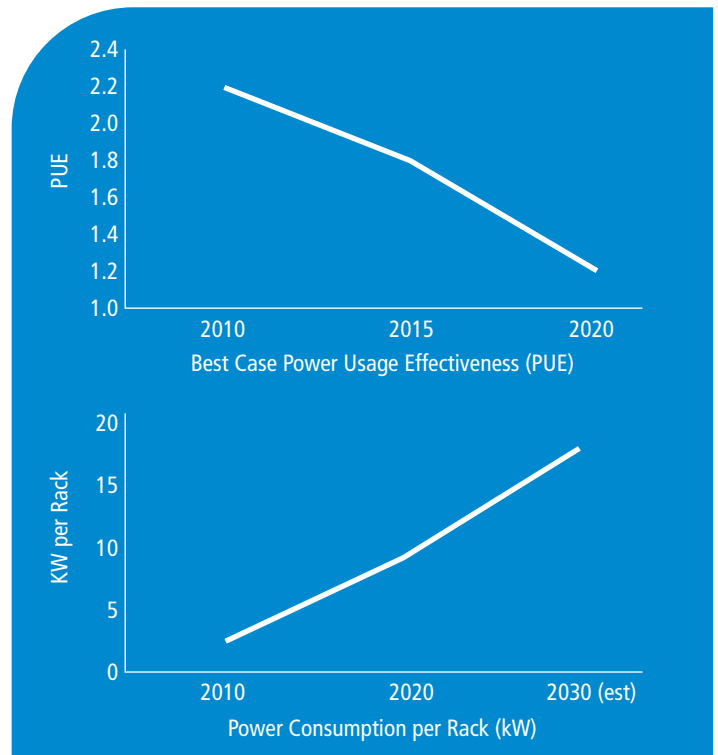
The efficiency and power density improvements mean that new data centers can be physically much smaller than older ones, while still providing ever greater computational and data storage capabilities. Locating data centers near customers (generally in urban centers) improves latency and therefore the value of the data center to customers.

These trends:

- 1) smaller, more efficient and powerful centers and
- 2) demand for locating in urban centers results in ever more attractive business cases for constructing urban data centers.

However, a key challenge in moving forward with such projects is getting sufficient power, at high levels of reliability and resiliency. Conventional electric utility urban infrastructure generally consists of moving power from the main substations to the new data centers via conventional copper cables. These cables have substantial limitations on how much power can be delivered and are difficult, expensive and time consuming to permit and install. Making electrical power capacity and reliability extremely expensive for both new project and expansion of existing centers.

Today, data center developers and utilities have a new option: Resilient Electric Grid (REG) systems based on AMSC's superconductor technology. REG systems can deliver more than 4 times the power capacity as conventional cables in a fraction of the space. Also, REG cables are far simpler to site, permit and install than conventional



cables. This is because the small cross section and other unique characteristics of the cable allow them to be installed without ripping up streets and disrupting traffic and commerce. For the same reasons, REG systems can

be used to increase the reliability of data centers by making it feasible and economical to add second and third power sources (i.e. feeders from multiple substations), adding layers of redundancy and increasing the value of the data center to customers.

Similarly, if existing data centers are upgraded to today's levels of efficiency and power density, increased power capacity and reliability may be needed to fully realize the earning potential of the facility. REG systems can provide cost effective and quicker to implement alternatives than conventional utility approaches.

AMSC can work with data centers and utilities to study the application of REG systems to determine if the technology can provide tremendous value to your project by unlocking the power capacity and reliability needed to achieve your data center's full potential!

	Conventional Utility Cables	Superconductor Based REG Cables
Increased Power Capacity	Conventional Cables generally limited less than 1000A per phase	4000A per phase available
Increased Reliability	Connections to Alternate (distant) substations often require difficult permitting	REG Cables are lower voltage for same power and easier to permit and install
Retrofit Urban Stations	Conventional utility service upgrades in urban areas extremely expensive with long approval process	REG Cables are ideally designed for urban applications