



High Current Density Superconductor Cables for LVDC Power Distribution

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*Smarter, cleaner
... better energy*

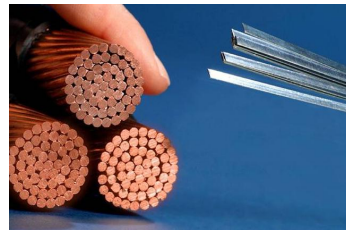
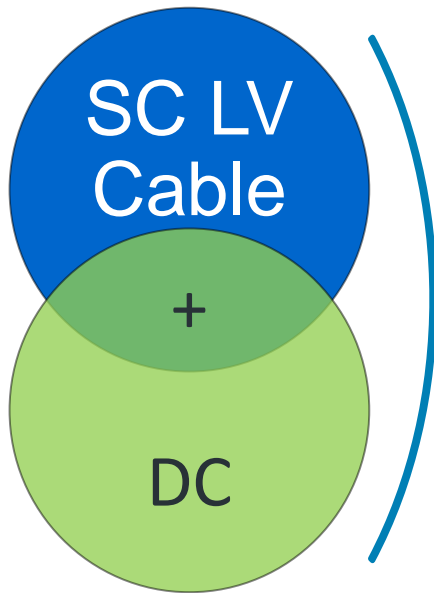


Why Superconductor LVDC Cable?



A unique option for LVDC power distribution

Superconductor wires
(r) and equivalent
copper (l)



A new option for connecting bulk sources of power to load centers with a minimal footprint

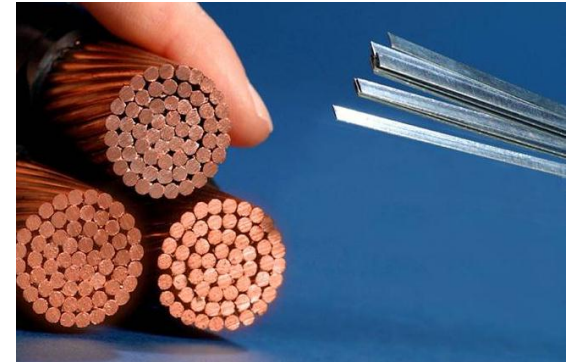
- Effectively unlimited current capacity
- Only one circuit required
- No voltage drop
- Extremely compact
- No space penalty for higher capacity

Superconductors and DC

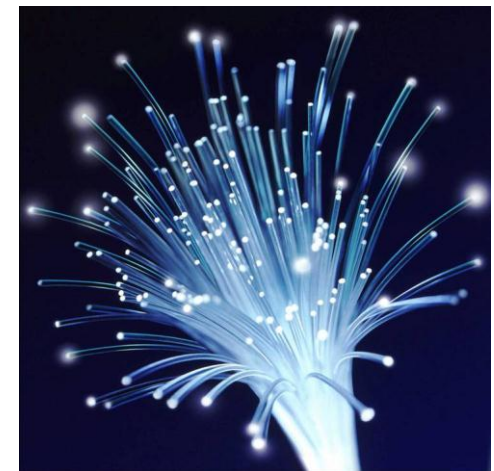
Ideal characteristics for bulk power runs



- When carrying DC current, superconductors themselves are perfectly lossless
 - Regardless of length
 - Regardless of power rating
- Benefits
 - No voltage drop along the length of the cable
 - No power limitations based on current-based losses
 - Allows higher current levels
 - Allows for long, low voltage cable runs
 - Eliminates cabling weight concerns
- As for all superconductors, refrigeration is required
 - Best economics on bulk power runs, limiting number of tap points



Current carrying equivalents
Copper and Superconductors



Superconductors are the
fiber optics of DC current

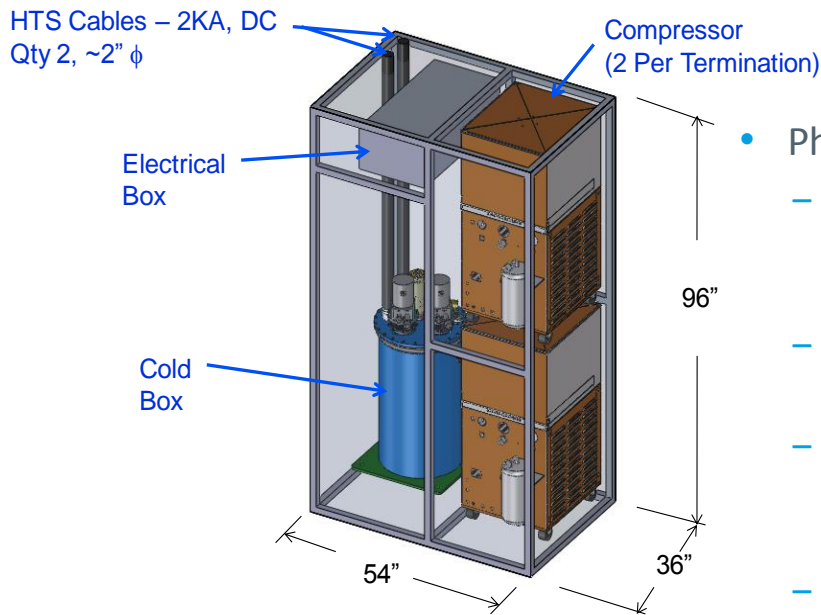
Physical Benefits

LVDC Superconductor Cable Physical Characteristics:

5 cm (2") in diameter	Weight 1.5 kg/m (1 lb/ft)
Ampacity: 1,000 – 10,000A +	Voltage: 48 - 1000 VDC



Superconductor LVDC Cable being readied for shipment



Typical cooling system

- Physical Benefits:
 - Reduced installation costs: Vastly lower installed weight, simplified bus and hanger systems, reduced ceiling and/or floor loading.
 - Faster installation: Faster placement compared to dozens of conventional copper cables or rigid bus
 - Simplified placement requirements: Minimal space requirements simplifies installation of high power cable runs in constricted areas
 - In-place upgradeability: Current can be increased with cooling system upgrade

Complements conventional bus and cable systems



No Voltage Drop

New Options in Telecom Data Center Design

- Better Floor Space Utilization
 - Locate DC plants further away from BDFBs
 - Centralize DC plants to free data center floor space
- Reduced Float Voltage
 - Reduced float voltage results in power savings
- Sustained 48VDC Design
 - Achieve many, if not all, of the benefits of converting to 208/277/415 VAC or 380VDC-class distribution systems without investing in new equipment

Improved Design Flexibility

Sample SC LVDC Cable Applications



- Field tested by the US Navy on multiple platforms
- Telecom Data centers
 - Replace tons of Cu cabling with one SC LVDC cable
 - Improve facility seismic response
- Large building power distribution
- Separation of batteries from inverters
- Commercial campuses
- Ideal for high current “transmission” from high power sources to tap points



Eliminate AC conversions or heavy DC bus runs

Summary



- Superconductor LVDC cables are unique:
 - Lightweight and compact (1 lb/ft and 2” diameter)
 - No voltage drop regardless of length
 - Current ratings up to 10,000A
 - Refrigeration (required) is supplied as part of the cable system
- Superconductor LVDC cables can help enable commercial, industrial and data center applications where long, space efficient, high current DC supply runs are needed

Contact AMSC for more information



For more information
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