Delta-Connected Cascaded H-Bridge Multilevel Converters for Large-Scale Photovoltaic Grid Integration - DTU Orbit (21/04/2019)

Delta-Connected Cascaded H-Bridge Multilevel Converters for Large-Scale Photovoltaic Grid Integration

The cascaded H-bridge (CHB) converter is becoming a promising candidate for use in next generation large-scale photovoltaic (PV) power plants. However, solar power generation in the three converter phase-legs can be significantly unbalanced, especially in a large geographically-dispersed plant. The power imbalance between the three phases defines a limit for the injection of balanced three-phase currents to the grid. This paper quantifies the performance of, and experimentally confirms, the recently proposed delta-connected CHB converter for PV applications as an alternative configuration for large-scale PV power plants. The required voltage and current overrating for the converter is analytically developed and compared against the star-connected counterpart. It is shown that the delta-connected CHB converter extends the balancing capabilities of the star-connected CHB and can accommodate most imbalance cases with relatively small overrating. Experimental results from a laboratory prototype are provided to validate the operation of the delta-connected CHB converter under various power imbalance cases.

General information
Publication status: Published
Organisations: Department of Electrical Engineering, Center for Electric Power and Energy, Electric Equipment Technologies, University of New South Wales, University of Newcastle, University of Technology Sydney
Pages: 8877-8886
Publication date: 2017
Peer-reviewed: Yes

Publication information
Journal: IEEE Transactions on Industrial Electronics
Volume: 64
ISSN (Print): 0278-0046
Ratings:
BFI (2017): BFI-level 2
Scopus rating (2017): CiteScore 9.07 SJR 2.192 SNIP 3.257
Web of Science (2017): Impact factor 7.05
Web of Science (2017): Indexed yes
Original language: English
Keywords: AC–DC power converters, Cascaded Hbridge (CHB) converter, Multilevel converter, Photovoltaic (PV)
Electronic versions:
07801007.pdf
DOIs:
10.1109/TIE.2016.2645885
Source: FindIt
Source-ID: 2391431457
Research output: Contribution to journal › Journal article – Annual report year: 2017 › Research › peer-review