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(Mínim 1 i màxim 4, podeu veure els codis a http://doctorat.upc.edu/gestio-academica/impresos/tesi-matricula-i-diposit/codis-unesco)

Resum de la tesi de 4000 caràcters màxim (si supera els 4000 es tallarà automàticament)

The demand of wind energy has considerably increased during the last decades. In order to fulfil this great energy demand, wind energy conversion systems (WECS) are designed to manage higher power ratings. Currently, the most attractive power converter topology in commercial WECS is the conventional two-level back-to-back voltage-source converter (2L-B2B). However, the 2L-B2B topology could have difficulties to achieve an acceptable performance with the available switching devices for the largest WECS, even though having the cost advantage. Instead, multilevel converters increase the power without increasing neither current nor blocking voltage of the power semiconductors, enabling a cost-effective design for the largest WECS using the available switching devices. Within the multilevel converters, the 3L-NPC topology offers high penetration in the market of large WECS. However, one of its major drawbacks is that the power loss is unevenly distributed among the switching devices. Therefore, the 3L-NPC output power capability is limited by the thermal performance of the most stressed switching device, which depends on the operating point. The 3L-ANPC topology was proposed in order to improve the power loss distribution among the power semiconductors. The 3L-ANPC provides a controllable path for the neutral current. Hence, the 3L-ANPC is able to offer certain freedom to distribute the power loss among the power semiconductors. As a consequence, and compared to the 3L-NPC, the thermal performance is more uniform and the output power capability increases. However, there is still room for improvement.

In light of the previous discussion, the proposed thesis defines enhanced design guidelines for the dc-ac grid-connected 3L-ANPC power converter, focused on improving its reliability and electrical performance, and following the trend of the current state of the art to define a feasible solution for the next generation of WECS. The thesis contributions are based on defining an enhanced power device configuration and a novel commutation sequence, avoiding concentrating both significant conduction and switching losses on a single power semiconductor device. This allows then selecting the most appropriate device for each converter position, which leads to a better converter efficiency and to a more uniform power loss distribution and thermal performance. This also leads to a higher converter power rating, and it is expected to improve the converter reliability.

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