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CHAPTER

CONCLUSION AND FUTURE SCOPE

The general conclusion of the thesis has been elaborated in section 6.1 and the future scope of the work is given in section 6.2.

6.1 Conclusion

In microgrid application, multi-output converters are required for different power requirement. Therefore, this thesis investigates two single and three-phase series-parallel multi-output hybrid converters, capable of supplying *n* number of single or three-phase AC outputs and one DC output. The proposed multi-output converters are generated by replacing the main switch of the quasi-Z-source inverter with *n*-number of series and parallel connected inverters. The topology developed from *n* number of parallel connected inverters give parallel mode of the converters. The proposed parallel mode converters are able to give *n* number of AC outputs with constant voltage and variable currents including one boost DC output. Similarly, the topology developed from *n* number of series connected inverters give series mode of the converters and can supply *n*-number of AC outputs with constant current and different voltage including single boost DC output. The proposed converters are suitable for various DC-DC and DC-AC power conversion in a single stage with the buck-boost operations. The proposed series-parallel multi-output hybrid converters with different voltage and frequency can be used for low and high power applications in microgrid and residential load.

In this way the proposed converters has the following advantages:

1. As the proposed converters derived from the quasi Z source inverters, they have all the inherent properties of the quasi-Z-source inverters.
2. They are able to produce multiple AC outputs and single DC output simultaneously.
3. They can fulfill more than one load demand at a time without using any extra adopter or regulator.
4. Due to single stage power coversion, the proposed converters are compact in size.
5. They have higher power density.
6. They have shoot-through protection capability.
7. They are less susceptible to electromagnetic interference.
8. Due to single stage architecture losses is less, which results in more efficiency compare to traditional multi-output converter.
9. They do not require any input filter as they have continuous input current.
10. They have less voltage/current stresses on passive components compare to Z-source inverter.
11. All the outputs of the proposed converters can be independently regulated.
12. Since the proposed converters able to supply multiple AC outputs along with single DC output, the electricity bill can be save. In addition to this, surplus power can be sold to the government.
13. The proposed converters can operates at different voltage and frequency i.e. 50 and 60 Hz.

In chapter 4 and 5, the DC output voltage equal to 380 V (parallel mode). In DC data centers, this voltage level has been used. Because this is a somewhat high voltage, it necessitates the use of highly effective grounding and protection procedures. Similarly, in series mode the DC output voltage 325 V is same as the AC phase voltage peak. The dc-link voltage of standard single-phase power supply with diode bridge input stage is 325 V. As a result, existing supply will work with this DC voltage level. Hybrid pulse width modulation (PWM) with constant frequency shoot-through technique is used to control the proposed topologies. The PWM signals are generated by a 32 bit TMS320F28335 DSP operating with a clock frequency of 150 MHz. All the converters are simulated using MATLAB 2017b software. Finally, 2.18 kW and 2.02 kW prototypes for the parallel and series version topology are developed in the laboratory to validate the performance for two AC outputs and one DC output. The measured efficiency of the parallel and series version of the proposed topology is 90.01% and 89.95% respectively.

6.2 Future Scope of the Proposed Work

The future scope of the proposed work are as follows:

1. For the proposed converters the constant frequency shoot-through (CFST) with simple boost control (SBC) technique is used. The simple boost control technique has a limitation between modulation index (m) and shoot-through duty cycle (d) that the addition of modulation index and shoot-through duty cycle should be less or equal to one i.e. ($m + d \leq 1$). However, using some PWM control technique like maximum boost, maximum constant boost and modified space vector the limitation between modulation index and shoot-through duty cycle can be eliminated. Using maximum boost, maximum constant boost and modified space vector control technique the performance of the proposed converters can be tested in future extension of this work.

2. Further to increase the boost factor and increase, the power density of the proposed converters inductors and capacitors can be replaced with switched inductors and capacitors technique.