Y9.GEH1.4 Islanding and Seamless Reconnection of SST-based Microgrid System

Y. Cho, D. Lubkeman, S. Bhattacharya

FREE**D**M SYSTEMS CENTER

NC STATE UNIVERSITY

Background

FREEDM system consists of SST, FID, DESD, DRER, and DGI. The SST-based microgrid system can have many functionalities using communication capability provided by DGI and other components such as DESD, DRER, and DESD. A new type of islanding and seamless reconnection strategies are developed to cope with the case when the utility grid is disconnected and to increase stability and reliability of the FREEDM system.

Problem Statement

With conventional method, the islanding operation of the SST is achieved by using its own DESD or DRER. However, if a SST does not have enough capacity of DESD or DRER, the SST cannot operate in islanding mode.

A novel islanding strategy is developed to solve this problem. A SST with not enough capacity of DESD or DRER can operate in islanding operation using abundant power capacity of other SSTs in the microgrid system.
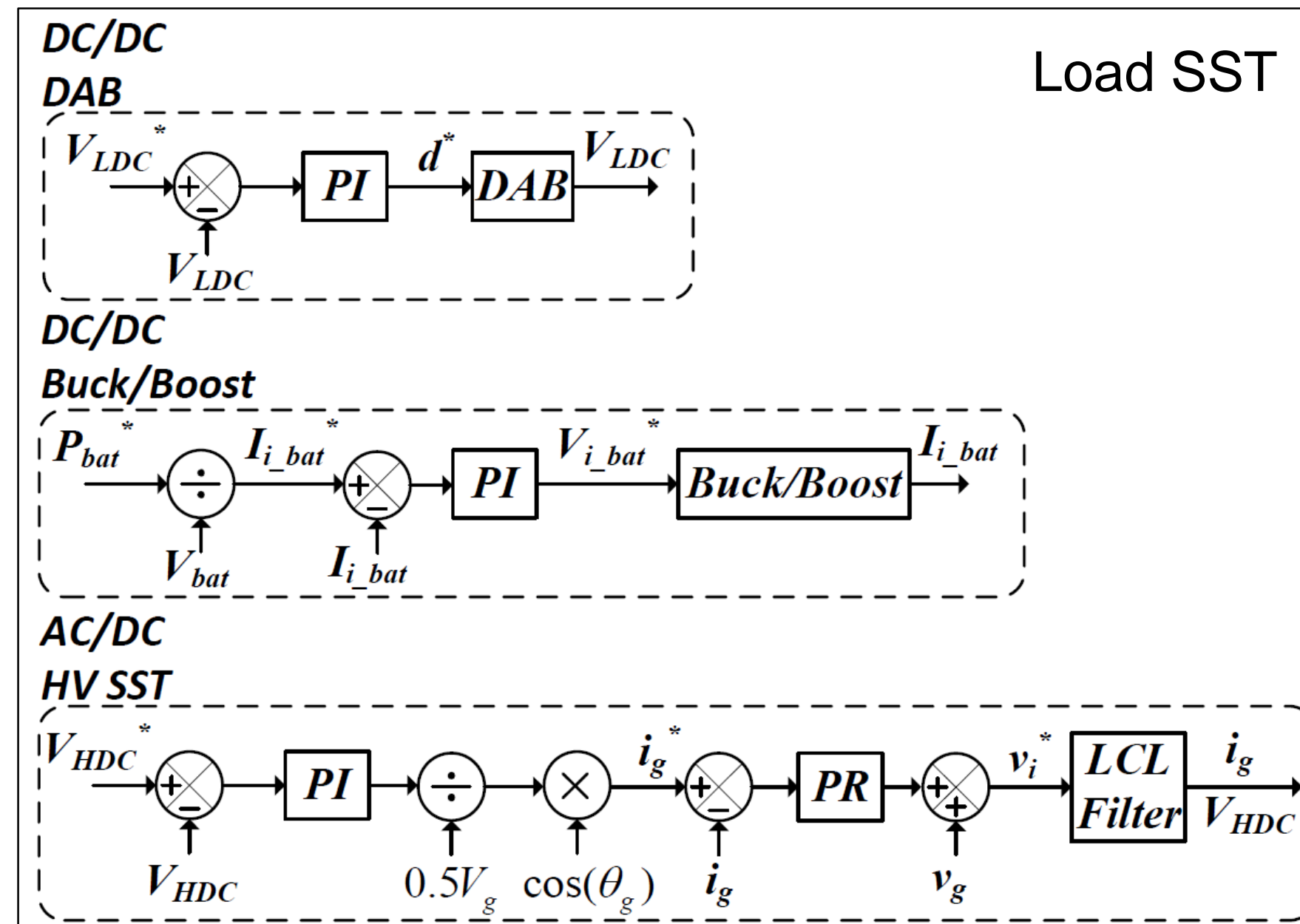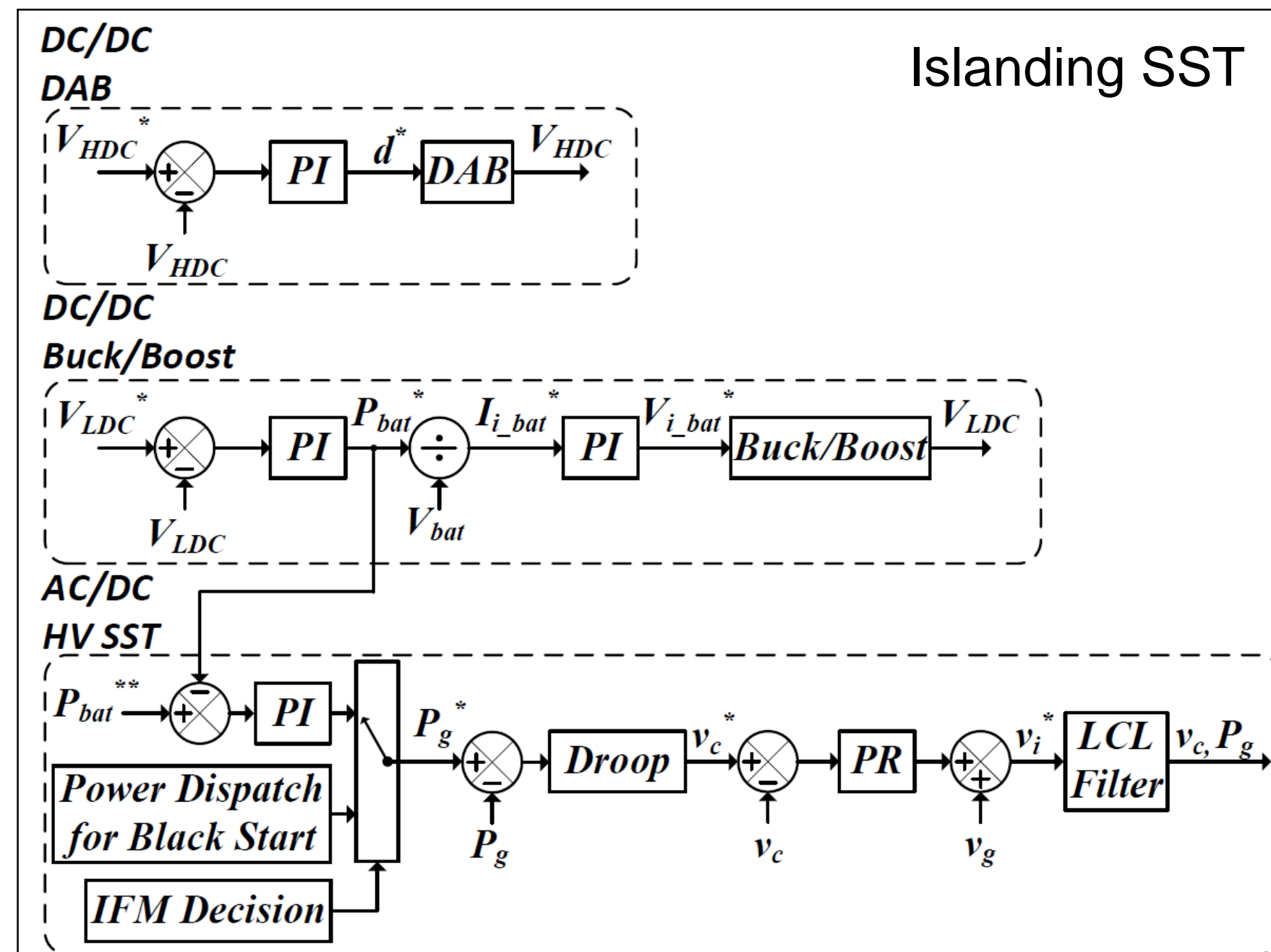
A seamless reconnection strategy is also proposed to connect the microgrid to the utility grid without any interruption or delay once it is recovered from any system fault situation and ready to be used again.
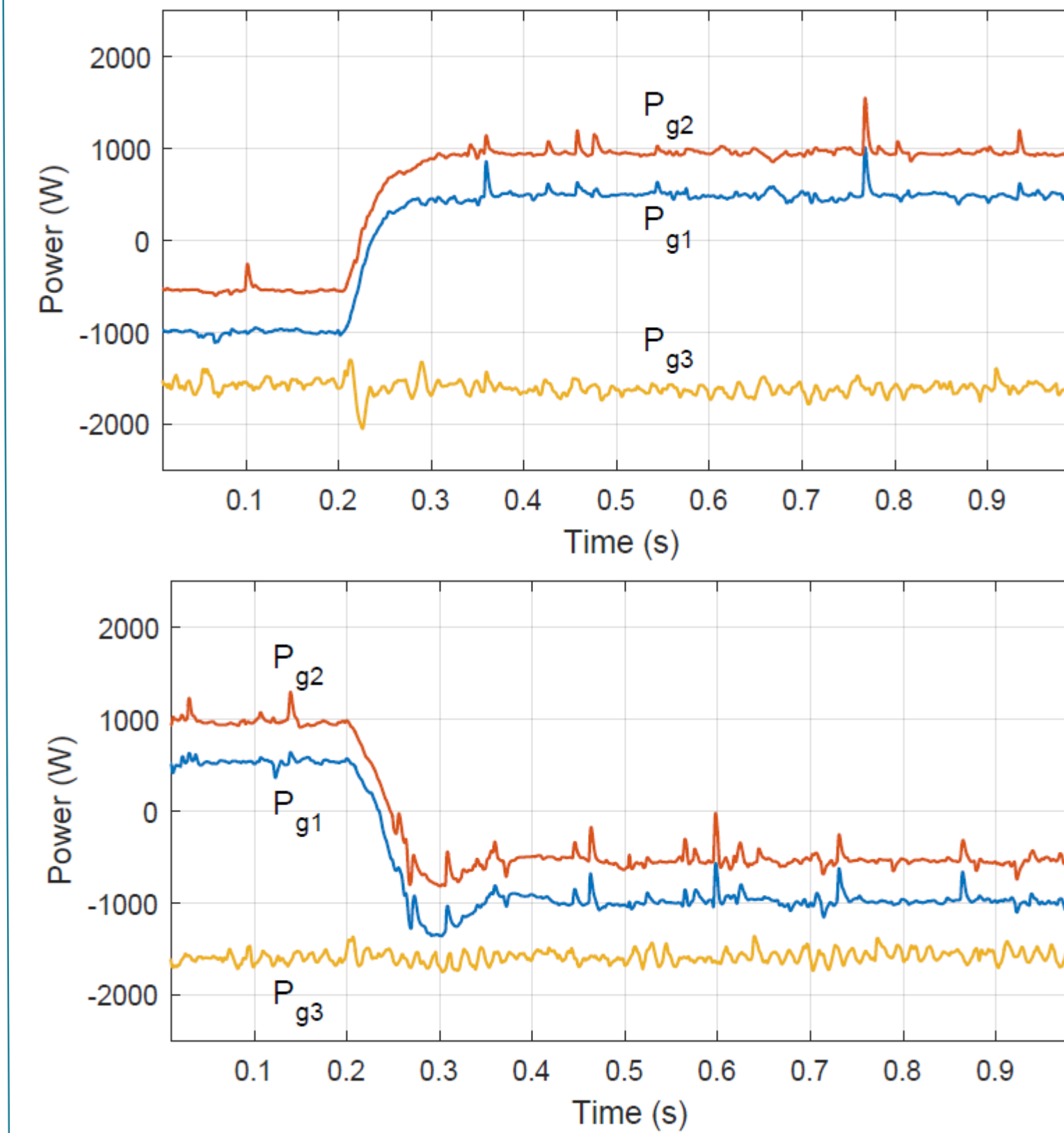
Method

1. Low-voltage scaled Multi-SST testbed
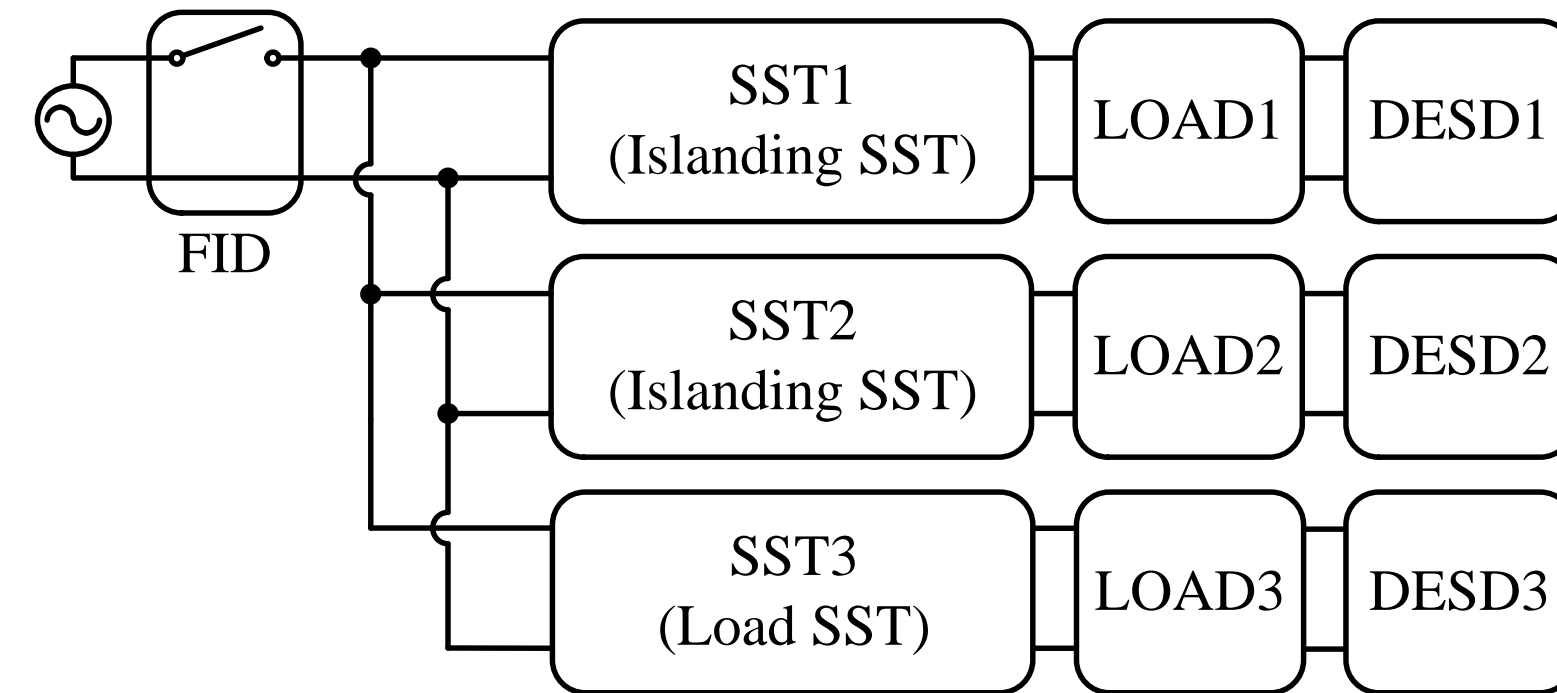
2. Control Strategy

Conclusion

Control strategy development, validation of multiple control modes and seamless transition between control modes of three LVSST as a microgrid platform is accomplished.
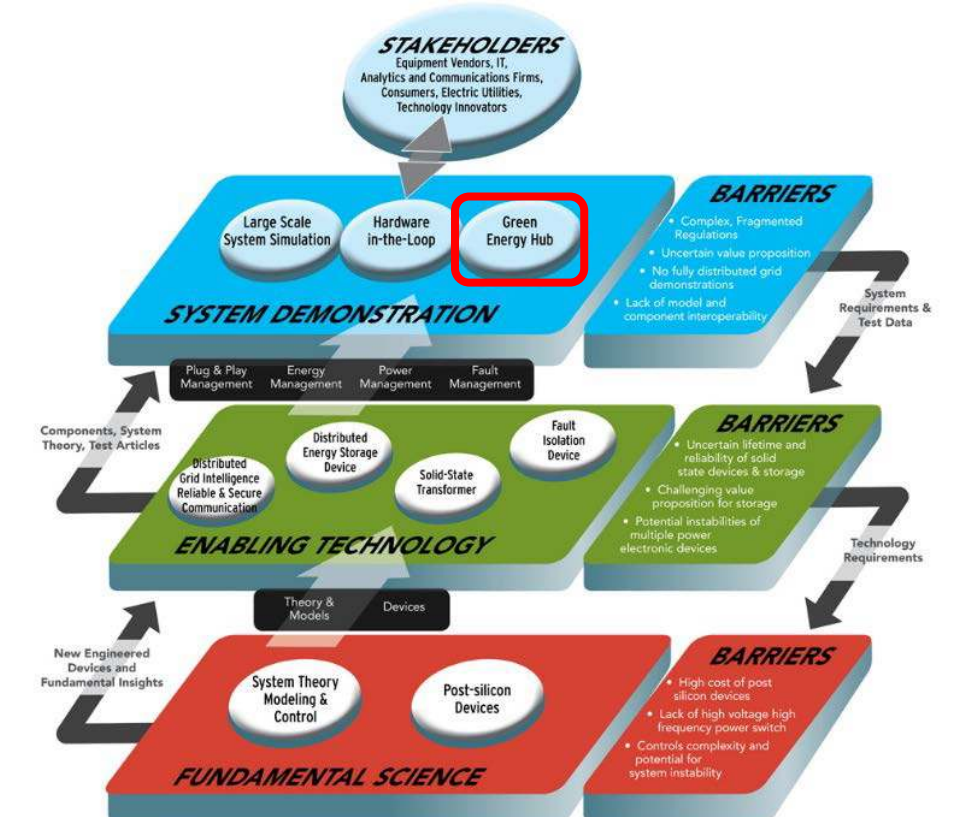
Impact

- Developed SST controls with DESD, DRER, and FID.
- Broadens ability to share and enable GEH testbed resources and technology.

Future Work

- Stability analysis of the multiple-SST microgrid.
- Utilizing DGI communication

References

[1] Y. W. Li and C. N. Kao, "An accurate power control strategy for powerelectronics-interfaced distributed generation units operating in a low voltage multibus microgrid," *IEEE Trans. Power Electron.*, vol. 24, no. 12, pp. 2977-2988, Dec. 2009.

[2] N. Parks, S. Dutta, V. Ramachandram, K. Hatua, and S. Bhattacharya, "Black start control of a solid state transformer for emergency power restoration," in *Proc. IEEE Energy Convers. Congr. Expo.*, 15-20 Sept. 2012, pp. 188-195.

[3] Y. W. Li, D. M. Vilathgamuwa, and P. C. Loh, "Design, analysis, and real-time testing of a controller for multibus microgrid system," in *IEEE Trans. Power Electron.*, vol. 19, no. 5, pp. 1195-1204, Sep. 2004.

Partners

NSF