

Closure to Discussion of "Cogeneration System Design for a High-Tech Science-Based Industrial Park"

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The author would like to thank Dr. Hsu for his comments on the above paper [1]. The following is offered in response to the questions in the discussion by Dr. Hsu.

The cogeneration system should be designed to operate at any possible condition. As the paper states, the series reactor can be used to replace the 161/161-kV transformers to reduce the fault current. However, many difficult operating conditions may occur if the series reactor is installed. For example, the cogeneration system may collapse due to low voltage if all the cogeneration units are not in service and the industrial customers have to purchase electric power from the utility. It may also result in the overloading of cogeneration units by providing excessive reactive power to boost the 161- and 22.8-kV bus voltages when the utility is operating at the lower voltage conditions. It is the reason why we did not consider installing the reactor and making a comparison with the on-load tap changer (OLTC) transformer.

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The author agrees to the opinion of the discussor that the load model can affect the simulation results significantly. In the above paper, the dynamic load model of an induction machine is applied for the auxiliary load in the cogeneration plant. However, it is difficult to investigate the load characteristic of the industrial customers because we did not know which companies will be connected to the cogeneration plant when the project is executed. We therefore adopted the conventional static load model for the industrial customers in this paper.

One of the industrial customers has installed the DVRs in the medium-voltage level to enhance the voltage sags phenomenon. The DVR is not included in the computer simulation since it is installed at the customer side.

The voltages at the 161- and 22.8-kV buses are controlled by the cogeneration units; which is the reason why the prefault voltages at both buses can be maintained at 1.0 pu. To reduce the fault current supplied by the cogeneration units and to improve the operating conditions of the cogeneration system, the OLTC transformers have to be installed as described above. Also, the series reactor and the flexible ac transmission system (FACTS) can be used together to achieve the same purposes. However, the evaluation has not been done.

REFERENCES

- [1] C.-T. Hsu, "Cogeneration system design for a high-tech science-based industrial park," *IEEE Trans. Ind. Applicat.*, vol. 39, pp. 1486–1492, Sept./Oct. 2003.