Frequency Regulation in Isolated Microgrids Through Load Voltage Regulation

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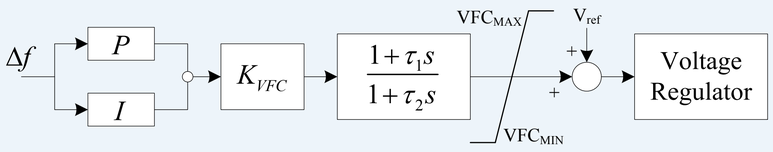
SUMMARY

➢ A voltage-based frequency controller (VFC) for an isolated microgrid through load voltage regulations is proposed.

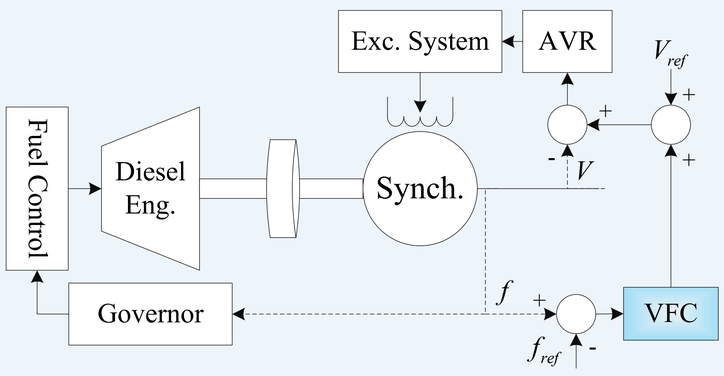
➢ Main advantages:
- ✓Less dependency on energy storage systems
- ✓No need for communication infrastructure
- ✓Facilitation of higher renewable energy penetration
- ✓Zero steady-state error
- ✓Straightforward implementation

MODELING

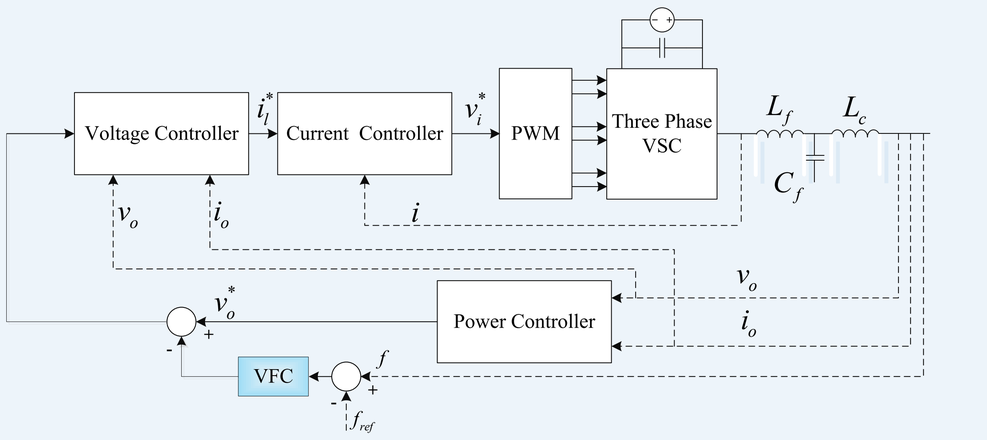
➢VFC model:



➢Integration with synch. machine:

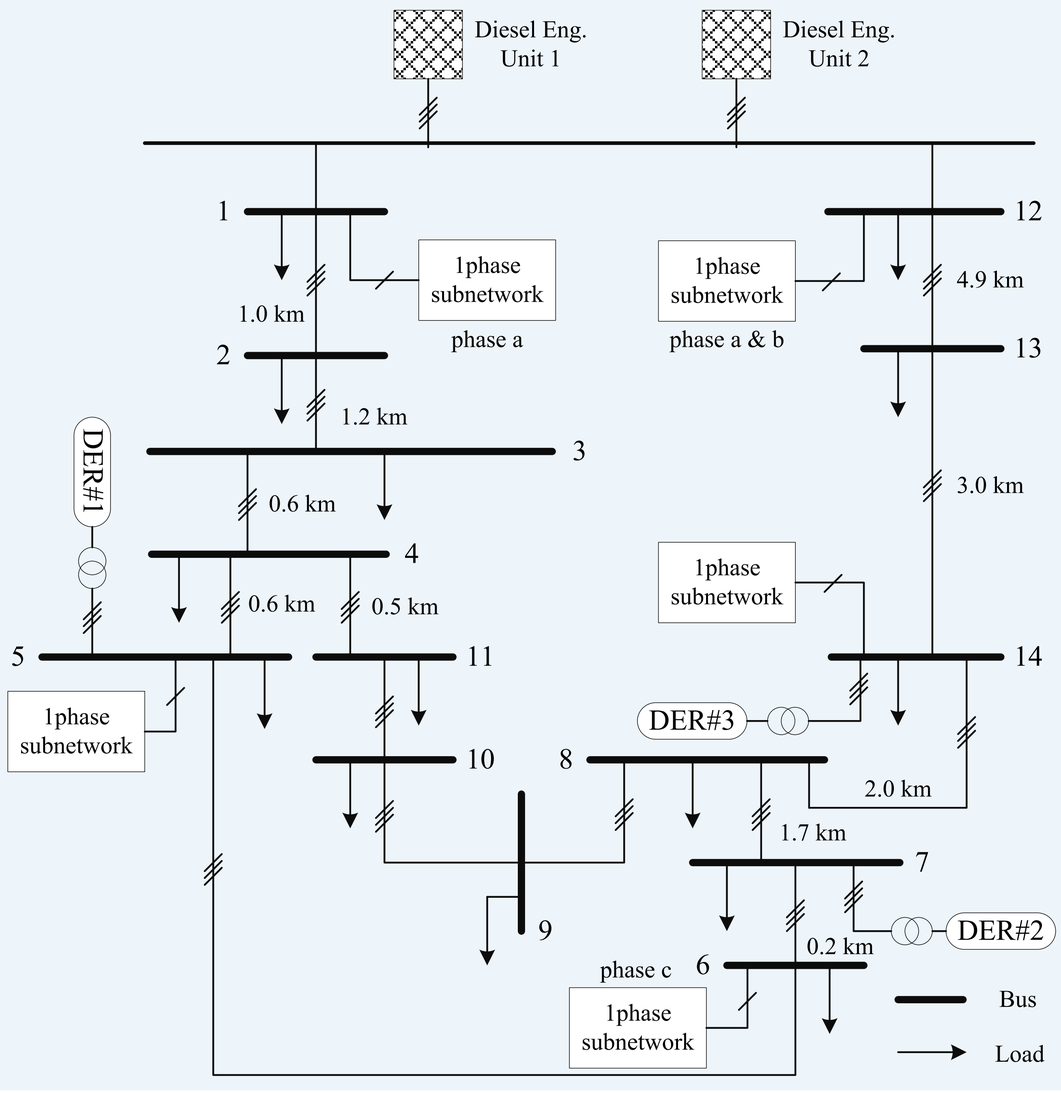


➢Integration with electronically interfaced DER:



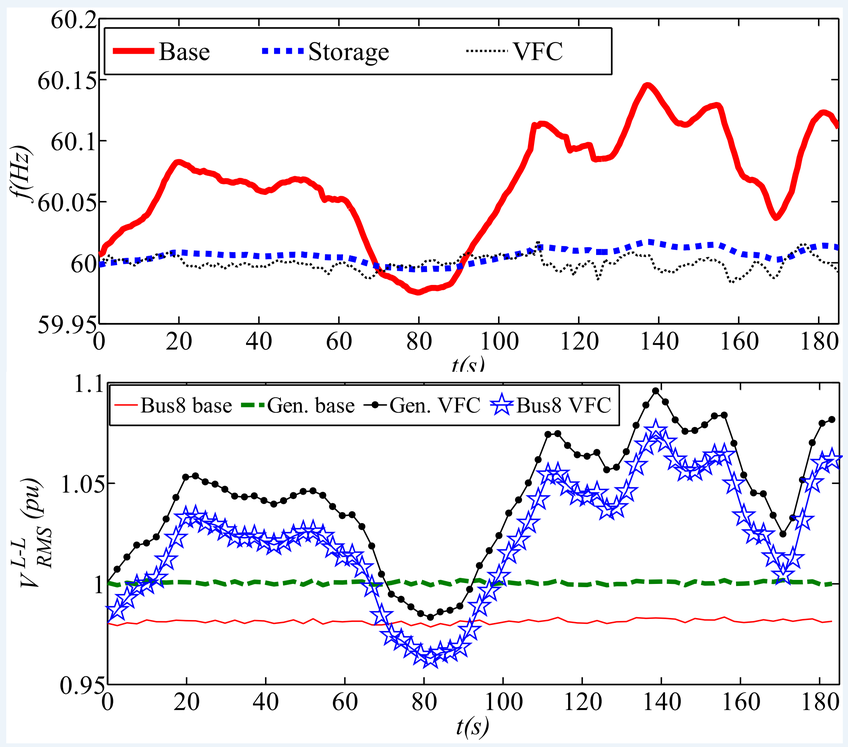
SAMPLE SYSTEM

➢CIGRE benchmark for medium voltage distribution network:

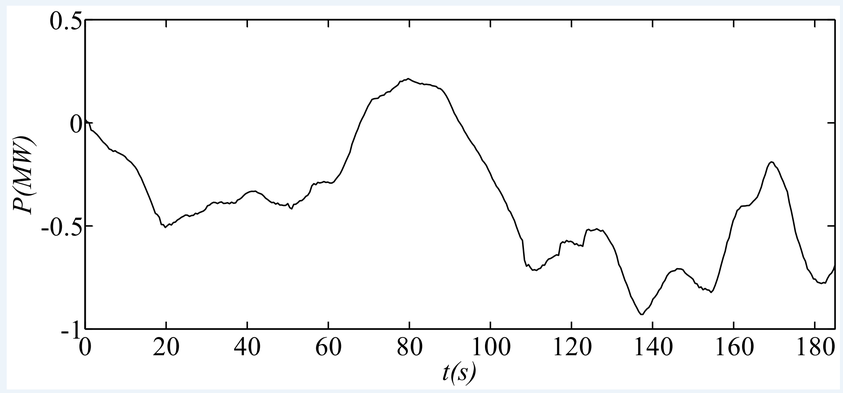


RESULTS

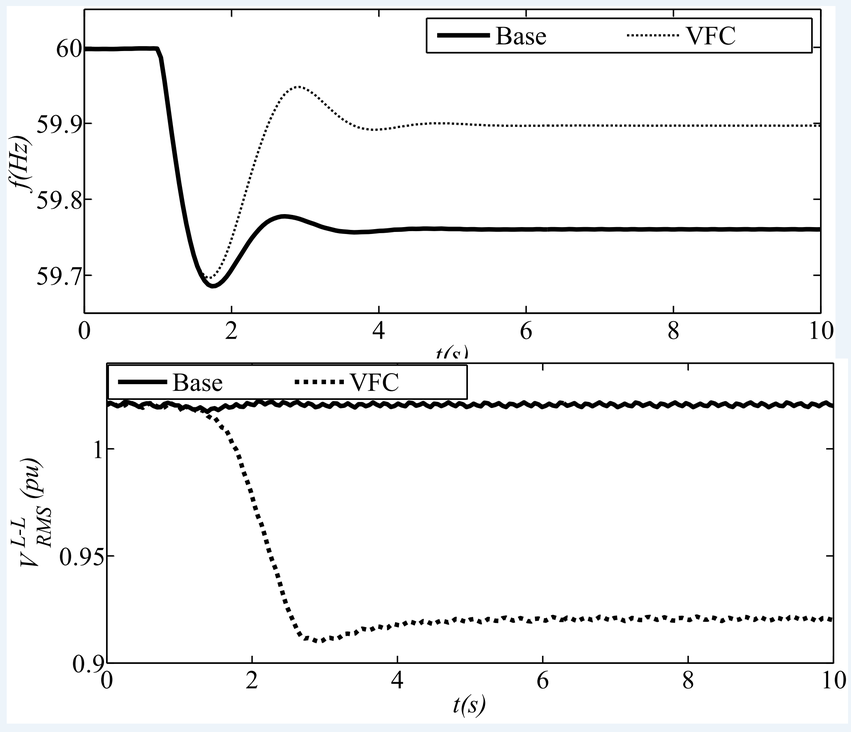
➢Wind variation: VFC vs. ESS



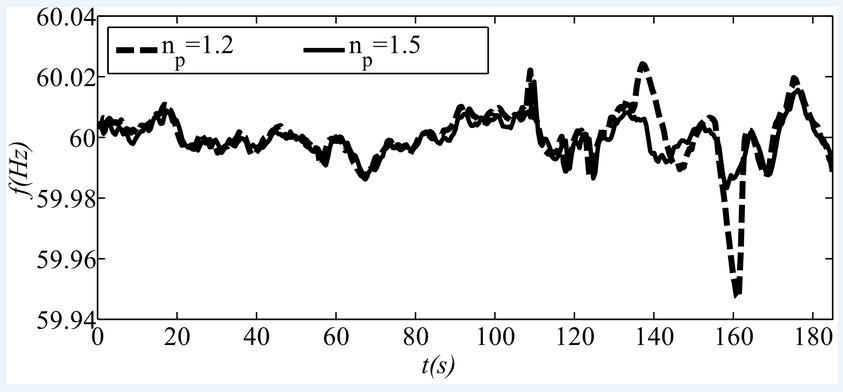
➢Battery Output:



➢Disconnection of DERs:



➢Effect of load composition:



CONCLUSIONS

- The proposed VFC facilitates integration of higher penetration of renewable energy, thus saving diesel fuel; it also decreases the system dependency on expensive ESS.
- The proposed VFC is simple, has a straightforward implementation, and would require a relatively small investment.