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A new technique for islanding operation of distribution network connected with mini hydro

Key words: Islanding operation, Mini hydro, Distributed generation (DG), Islanding detection, Load shedding

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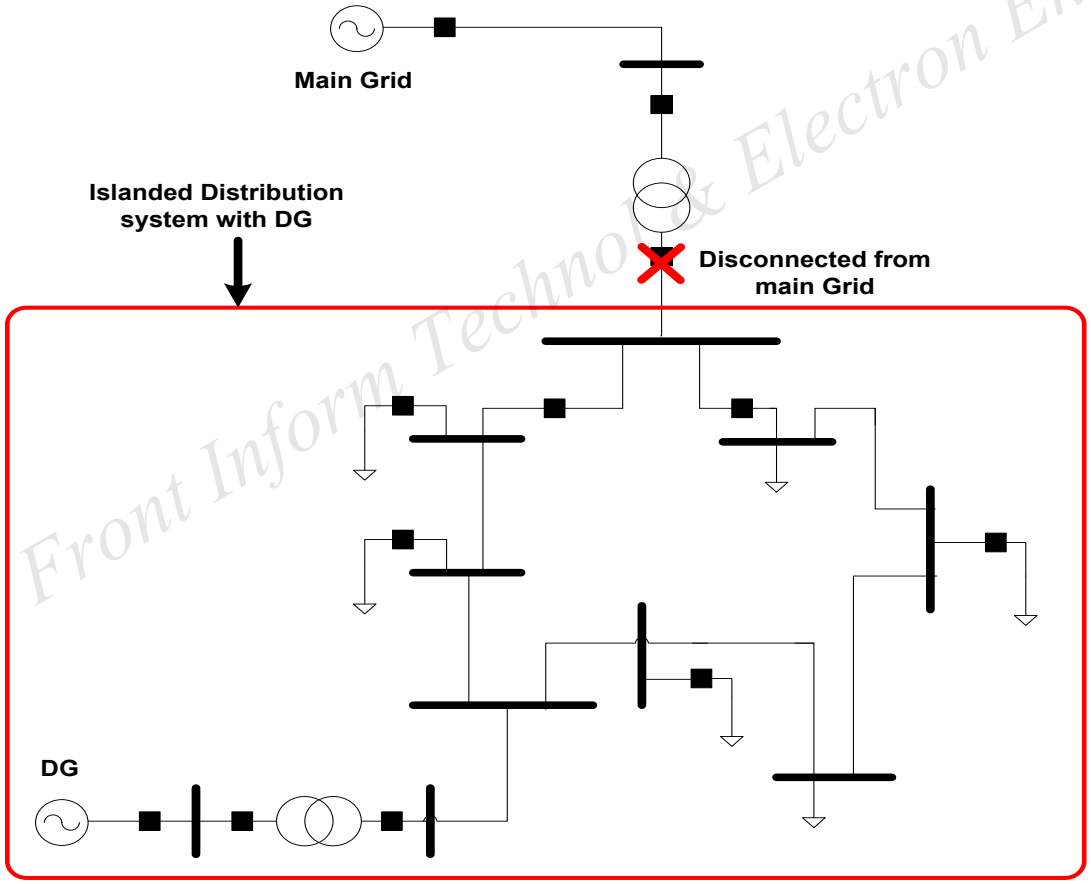
Islanding mode operation

According to IEEE standard, islanding mode operation is defined as:

"A condition in which a portion of utility system that contains both load and distributed resources remains energized while isolated from the remainder of the utility system"



Islanded DG connected with distribution network disconnected from Main Grid

Main issues to be solved for successful islanding operation

- It requires solution of two important factors.
- First, it requires an efficient islanding detection technique to detect the islanding event.
- Second, when a distribution system operating at maximum power is islanded, the frequency will go down if the total load is more than the total generation. Hence, it requires an efficient load shedding technique to shed accurate amount of load in order to stabilize the frequency.

Objectives of study

To develop a new strategy for islanding operation of distribution system connected that solves both islanding detection as well as under frequency load shedding scheme to make islanding successful.

Description of proposed strategy

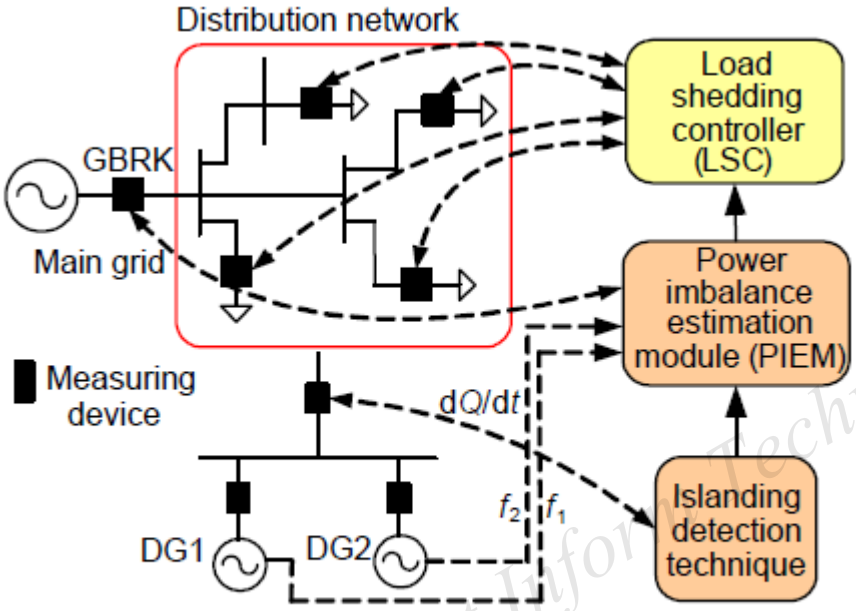


Fig. 1 Layout of the proposed technique

The proposed strategy for successful islanding operation consists of three stages:

First stage:

When islanding occurs, the first stage is activated that uses an islanding detection technique to detect islanding.

Second stage:

When the first stage of the proposed strategy correctly detects islanding, it sends signal to the second stage. The second stage is used to estimate the amount of load to be shed during islanding.

Third stage:

This stage performs accurate load shedding to make islanding successful.

Test system for proposed technique

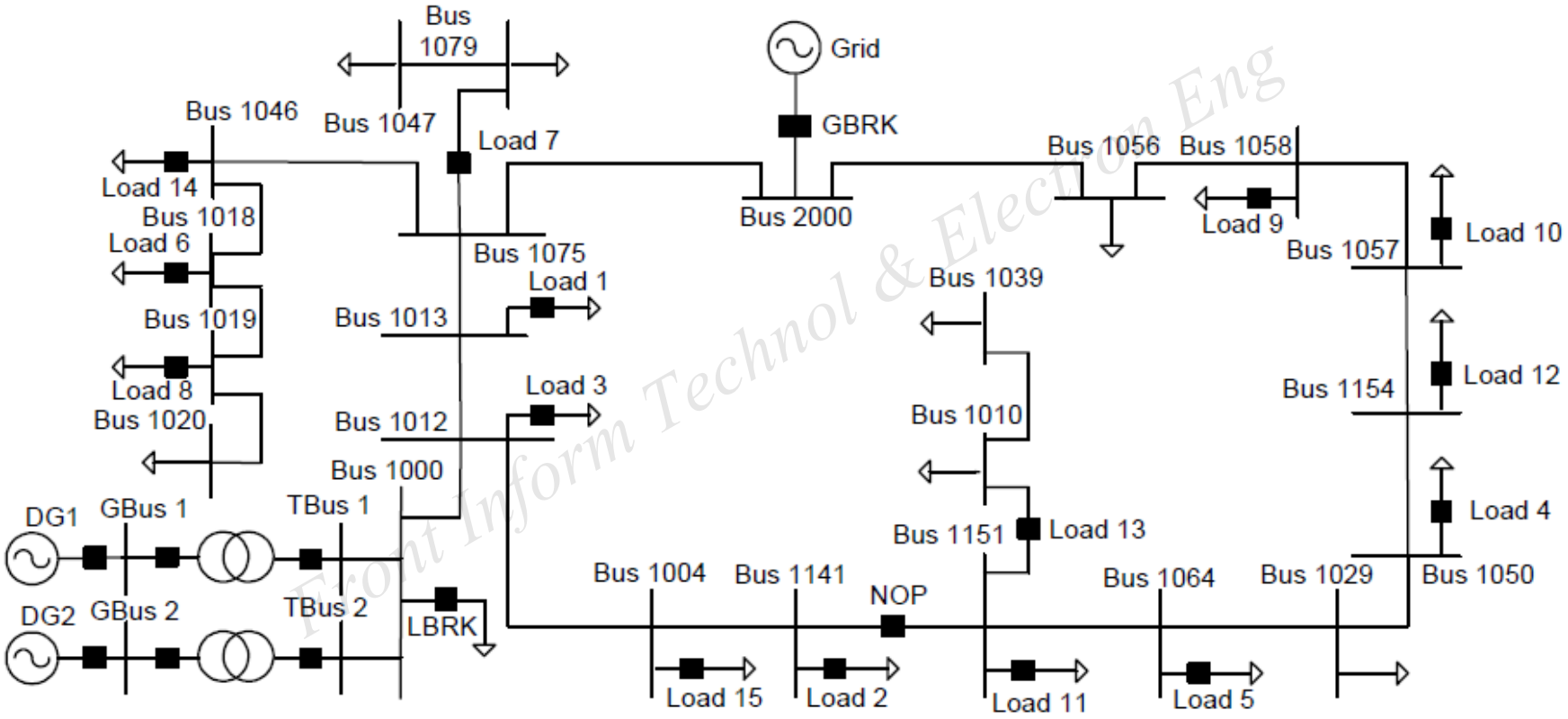


Fig. 3 Schematic of the test system

Simulation results
Case 1: Islanding at a large power mismatch

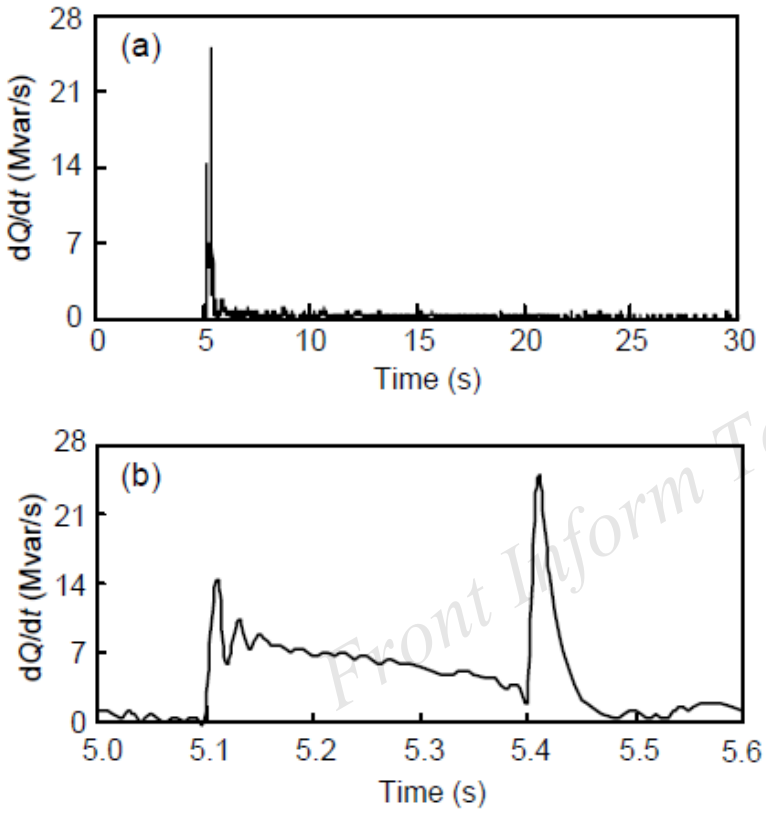
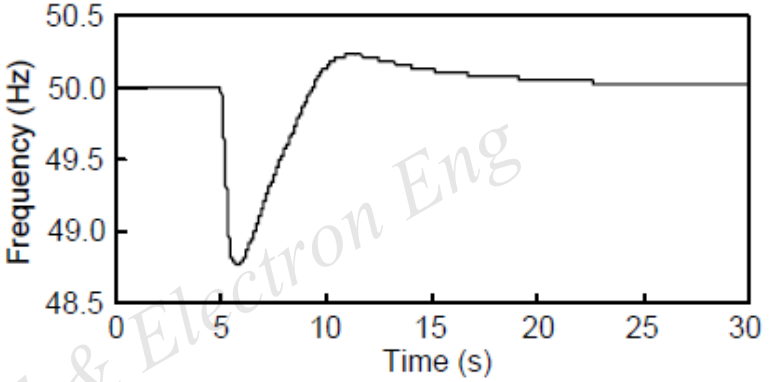


Fig. 4 Islanding detection at a large power mismatch (a) and the magnified view (b)



Frequency response for an islanding event at a large power mismatch

The d*Q*/d*t* is greater than 13 Mvar/s. Hence, islanding is detected successfully and the signal is sent to PIEM. PIEM checks the frequency limit of 49.5 Hz and estimates the power imbalance.
After this, PIEM sends this value to LSC which performs load shedding to make islanding operation successful.
Thus, the proposed technique enables the successful islanding operation of distribution network at a large power mismatch

Conclusions

- This paper has proposed a new strategy for successful islanding operation of distribution system connected with multiple mini hydro DGs.

- The proposed technique used islanding detection technique to detect islanding event, and a load shedding scheme to stabilize the frequency to its nominal value.

- The load shedding technique was developed using frequency, d*f*/d*t*, and load priority.

- The robustness of the proposed technique has been investigated for different islanding cases, such as islanding at a large power mismatch, moderate power mismatches, very small power mismatch, and a load increment case.

- The results showed that the proposed strategy is effective in performing a successful islanding operation of a distribution network.

- **This research concludes that islanding operation of a distribution network is a technically feasible option.**