Automatic Grid Synchronization using Microcontroller

ABSTRACT

The project is designed to develop a system that detects synchronization failure of any external supply source to power grid on sensing the abnormalities in the frequency or voltage. There are several power generating units connected to the grid, such as hydel, thermal, solar, etc., to supply power to the load. For any deviation of the voltage or frequency from the acceptable limits of the grid, it becomes mandatory that the same feeder should automatically get disconnected from the grid, which by effect is termed as islanding. This prevents large scale brown out or black out of grid system. It is preferable to have a system that can warn the grid in advance so that alternate arrangements are kept on standby to avoid complete grid failure.

This system is based on a microcontroller of the 8051 family. The microcontroller monitors under/over voltage being derived from a set of comparators. As regards the frequency, since the mains supply it cannot be changed, the project uses a variable frequency generator (555-timer) for changing frequency, while a standard variac is used to vary the input voltage to test proper functioning of both these parameters of the project. A lamp load (indicating a predictable blackout, brownout) is driven by the microcontroller in case of voltage/frequency going out of acceptable range.

Furthermore, this project can be enhanced by using a power-electronic device to isolate the grid from the erring supply source by sensing cycle-by-cycle deviation for more sophisticated means of detection.
BLOCK DIAGRAM

HARDWARE REQUIREMENTS:

SOFTWARE REQUIREMENTS:
Keil compiler
Language: Embedded C or Assembly.