**Response to Reviewers Comments (UEMP-2013-0706)**

Comment:  
**In particular, the new contributions of your paper should be clearly stated. At the same time, you are invited to briefly comment in the introduction on how your research compares with other work on similar topics recently published in our Electric Power Components and Systems Journal.**

**We have added a paragraph in the introduction section which summarises the comparison of the work on similar topics published in the Electric Power Components and Systems.**

Reviewer: 1

1. **Authors should explain why the zero sequence currents (at different buses) has large variation in case of LLG fault but almost same value in LG fault (ref Table III).**

**It was an editing mistake; for which we are sorry. The correct value is 6.4 A. It has now been corrected in the paper. It follows the same trend as the LG fault on the other buses.**

1. **No case was presented about the operation of static switch (authors claims that operation can be achieved in 10 ms). This seems to very impractical because the latest Numerical relays that are available in market requires a minimum of 20 ms to detect the fault and send it trip signal. Then how it is possible to detect and operate static switch in 10 ms**

**The static switch operating time was chosen to be 60 ms in the proposed protection scheme. The SEMI F47 standard, enlisting specifications for all fault types and locations, does not permit voltages below 50%, even with durations as short as 0.05 s (3 cycles at 60 Hz). If a utility feeder fault causes the voltage to drop below 50%, the faulty section must be separated as quickly as possible [18]. The static switch must be a power electronic switching device and it can have a switching time in the range of a few milliseconds. The sensing circuit might take 15-20 ms for the fault detection. Please note that in the proposed protecting scheme, the operating time is chosen to be 60 ms keep this thing in mind. This explanation has been included in the paper.**

1. **No mathematical equations are present to validate the proposed methodology, only authors claims that both are giving same results without any proof/equations.**

**A few mathematical calculations have now been added in the paper. Other calculations are similar.**   
  
Reviewer: 2  
The authours analysed the limitations of some different protection principles when being applied to the microgrid. A new scheme was devised which combined those different principles complementary and it is believed that the protection selectivity and reliability would be ensured.  
My suggestion is the article be accepted on the condition of minor revisions, for there still exist some problems:

1. **In section IV, page 13: "One big problem in this technique is that any relay upstream (relay connected to bus C) will not detect the differential current and the downstream source will continue to feed the fault. The differential current seen at bus bar C must be equal to zero, but as shown in Fig. 7, a very small magnitude (less than 0.1 A) is observed. It is due to the leakage current and the limitation on the accuracy of current measurement", it should be the downstream relay can not detect the differential current. Meanwhile, I suggest the reasons should be explained more clear.**

**Thank you. We have corrected this mistake and the reason is explained with a little more detail in the paper.**

1. **The time settings of the backup protection in table IV are all 3 cycles, the time delays of backup protection should not be shorter than those of the main protection.**

**Thermal capacity relay is used as a backup protection in all zones with a time delay setting of 3 cycles and pick up value of 250 A. In zone A, zone C and SS the main protection is faster than 3 cycles. The only zone where the main protection is slower than 3 cycles is zone B where the main protection is time delayed to co-ordinate it with the protection in zone C. This faster backup protection in zone B will not have any problem as it is set to operate at a very large value of current (250 A) as compared to the main protection. This protection will only operate if there is a fault in the grid connected mode and the SS fails to operate. These details have now added, in the paper, for better explanation.**

Reviewer: 3

Protection scheme for a micro-grid containing only renewable sources that are interfaced with the system through PWM based inverters is proposed.  
The title clearly indicates that different protection schemes (existing/proposed in the literature) are evaluated in this paper. However, a protection scheme is proposed that basically combines various schemes proposed earlier for micro-grids. Thus the contribution of this paper is to put together in one box a variety of schemes proposed in the literature and hope that at least one will provide a proper signal if a fault occurs.  
Title is misleading. It neither says a protection scheme is proposed nor that it is limited to micro-grids with only PWM based inverter interfaced renewable sources.

**We have modified the title.**

1. **There is a fair bit of repetition and elementary material, tutorial in nature, is included. It can be easily removed or summarized. What is the need to define what symmetrical components are at this level?**

**Agreed! We have removed the repletion and the material which was tutorial in nature.**

1. **Beyond giving some general material about the network, hardly any detail is provided about the DG simulation models that seem to be simply taken from a commercial program. How good are the models? Similarly, Figs. 2 and 3 seem to be taken from the commercial literature with no useful information about the models used.**

**The distributed-generation model, used in the study, is of a fuel cell with a voltage-controlled inverter. It is modeled in Simulink using the built-in model of the fuel cell and using the basic blocks to model the voltage-controlled inverter. Some details of the model have now been included in the paper. A lot of details of the models have not been provided due to the space constraints. Figs. 2 and 3 have been drawn by the authors and they represent the actual models of the relays which have been developed in Simulink by the authors by using the basic blocks.**

1. **One major argument given in support of the proposed scheme is that there will be a very large current in case of a fault with the micro-grid connected to the grid. Therefore, relays on feeders within the micro-grid are set at 150 A, Table 1. This high relay setting complicates protection schemes. Considering that "the static switch will operate faster than any other circuit breaker in the microgrid" with zero time delay, why set the relays on the feeders within the micro-grid at such high values?**

**The relays on the feeders are to be set at 150 A if there is only over-current protection in the system. We can not set a lower value as we have to make sure that the ratio of fault pickup value to normal load current is close to 2.0 so that the system is secure. When a static switch is added, the relay settings on the feeders are set at much lower values but some modifications are done in the normal over-current protection. Please refer to Table IV. We can not take low relay settings without major modification in the protection system as it will cause false trips.**

1. **Studies, for example Fig. 7, are for a fault at bus B. Why not in the middle of the feeder? A fault on the feeder near bus C will give very different results than a fault on or near bus B.**

**Studies were carried out for all possible fault locations. However, only selected cases have been presented in the paper. If there is a fault between bus B and bus C, it will result in even smaller fault current, which will in fact strengthen our case that we need a modified protection scheme. The new protection scheme was tested to be functional for all fault locations.**

1. **It is stated that "The fault detection scheme must...not be dependent on any communication signal...". It is further stated that "After operation of the zone circuit breaker (in response to a fault in the zone) the static switch should reclose." Without some communication from the opened zone circuit how will the static switch know that it is safe to reclose?**

**The fault detection should not be dependent on a communication signal as it will hamper the peer-to-peer and plug-and-play functionalities of the microgrid. Protection scheme must be able to identify faulty and normal conditions based on the local parameters only. The operation of the static switch is triggered by the voltage level at the point of common coupling. It opens when the voltage at the point of common coupling falls below a certain value. It can reclose if the voltage at the PCC is restored indicating that the grid fault has been removed. Reclosing will, however, require re-synchronizing with the grid.**

1. **The paper requires proper editing. Also, following some of the above comments, the presentation can be made more succinct and the protection scheme simplified.  
   Page 13, 5th. line, is "that any relay upstream " correct?**

**It should be relay downstream. We have corrected it.**

**Page 21, 2nd. line, "0.04 seconds." See Fig. 10(a) that shows 0.06 s.**

**We have corrected it. We are sorry for these editing mistakes.**