These two values for the length of the time windows were chosen so that the shorter one captures the “instantaneous” behaviour of the frequency, while the longer one captures the normal behaviour of the frequency. If the chosen window is too long, the standard deviation no longer captures the sudden change in behaviour and responds too slowly (see the green line, corresponding to a window of length 10 s in figure 3).

This allows the rapid detection of the starting oscillation fenomena without having to set a specific value of standard deviation over a time period to detect rapid oscillations.

5. Conclusions

In this paper, a phenomenon has been described that can occur in small electric power systems with low inertia when the demand responds to frequency deviations with too much slope and a method to detect these without derivative calculations has been proposed.

This method can be applied to adjusting the demand response based solely on local measurements so to avoid disturbances to the grid while maintaining the contribution to frequency regulation.

The main limitation of this method is that it requires the oscillation to start, even if only in a limited scale, to have an effect on the standard deviation and then be mitigated. Further analysis will be carried out to detect excessive contribution of the demand to the frequency regulation and adjust accordingly. The appropriate response to this scenario has yet to be developed.

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