GR-1603 Prototyping Tri-window Compensator

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Project Deliverables

This project is aimed at the prototyping of a novel compensator for non-periodic loads.

- First deliverable is the refinement of the compensator to be feasible for practical implementation.
- Second deliverable is the implementation of an adaptive fast compensator that allow sharing of the bandwidth and rating between the fast and the slow compensator.
- Third deliverable is the real-time implementation of the proposed compensator using controller-in-the-loop structure.

Proposed Compensator

Adaptive Fast Compensator

Simulation Result

Controller-in-the-loop Implementation

Real-time results

Number | Description | Before Compensation | Compensation Parameters | After Compensation |
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Case 1</td>
<td>$I_{source} = 16.4$A</td>
<td>$f = 73.92%$</td>
<td>$PV_{in} = 124.45$V $PV_{in} = 124.45$V $PF_{in} = 0.95$</td>
<td>$%$</td>
</tr>
<tr>
<td>$I_{source} = 16.4$A</td>
<td>$f = 73.92%$</td>
<td>$PV_{in} = 124.45$V $PV_{in} = 124.45$V $PF_{in} = 0.95$</td>
<td>$%$</td>
<td>$%$</td>
</tr>
<tr>
<td>Case 2</td>
<td>$I_{source} = 12.4$A</td>
<td>$f = 69.8%$</td>
<td>$PV_{in} = 120.45$V $PV_{in} = 120.45$V $PF_{in} = 0.95$</td>
<td>$%$</td>
</tr>
<tr>
<td>$I_{source} = 12.4$A</td>
<td>$f = 69.8%$</td>
<td>$PV_{in} = 120.45$V $PV_{in} = 120.45$V $PF_{in} = 0.95$</td>
<td>$%$</td>
<td>$%$</td>
</tr>
<tr>
<td>Case 3</td>
<td>$I_{source} = 10.0$A</td>
<td>$f = 81.7%$</td>
<td>$PV_{in} = 115.45$V $PV_{in} = 115.45$V $PF_{in} = 0.95$</td>
<td>$%$</td>
</tr>
<tr>
<td>$I_{source} = 10.0$A</td>
<td>$f = 81.7%$</td>
<td>$PV_{in} = 115.45$V $PV_{in} = 115.45$V $PF_{in} = 0.95$</td>
<td>$%$</td>
<td>$%$</td>
</tr>
<tr>
<td>Case 4</td>
<td>$I_{source} = 5.5$A</td>
<td>$f = 78.1%$</td>
<td>$PV_{in} = 105.45$V $PV_{in} = 105.45$V $PF_{in} = 0.95$</td>
<td>$%$</td>
</tr>
<tr>
<td>$I_{source} = 5.5$A</td>
<td>$f = 78.1%$</td>
<td>$PV_{in} = 105.45$V $PV_{in} = 105.45$V $PF_{in} = 0.95$</td>
<td>$%$</td>
<td>$%$</td>
</tr>
</tbody>
</table>

Fixed- Longest available window
Adaptive Fast Compensator
Estimated by the Fuzzy Algorithm
Slow Compensator

1. Adaptive Fast Compensator
2. Fixed- Longest available window
3. Estimated by the Fuzzy Algorithm

Without Compensation
With Compensation