SweGRIDS

The technical power-based challenges of power systems with major share of power production infeed via power electronic devices

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**Problem Motivation/Objectives**

**SweGRIDS**

- Rapid increase of converter based non-synchronous generation (NSG)

- Power system stability issues associated with high penetration of renewable generation
  - Decrease in system inertia, higher ROCOF
  - Lower short circuit current, decrease in system strength
  - Existing grid operator challenges

- To facilitate a transition towards majority share NSG
  - Need to understand changing system characteristics

- Perform a small signal stability analysis of a small and large test system considering the impact of:
  - Increasing penetration of NSG
  - Location of NSG/Distribution of NSG in system
Results

Inter-Area Modes of 2-Area System, Uniform Distribution

Rotor Angle Deviation (Generator 1)

Table 1: Mode Frequency

<table>
<thead>
<tr>
<th>Scenario (%)</th>
<th>λ (Hz)</th>
<th>f(Ld Step) (Hz)</th>
<th>Damping Ratio (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>0.83</td>
<td>0.83</td>
<td>27.7</td>
</tr>
<tr>
<td>50%</td>
<td>1.13</td>
<td>1.17</td>
<td>29.5</td>
</tr>
<tr>
<td>80%</td>
<td>1.62</td>
<td>1.67</td>
<td>26.3</td>
</tr>
</tbody>
</table>