INTRODUCTION

- High instantaneous wind penetration: 50% - 60% - 70% ...
- Occasionally operating points close to technical and physical limits e.g. voltage stability
- Costly remedies: load shedding and network reinforcement
- Well chosen allocation of wind capacity

Objective(s):

- Enhance Voltage Stability

METHODOLOGY

- Two set of variables
- Multiple wind and demand levels
- Voltage stability index: loadability margin
- Voltage Stability Constrained Optimal Power Flow
- Unit Commitment fed in VSCOPF iteratively
- Maximize the minimum loadability margin

TEST SYSTEM

- IEEE 73 Bus
- 30 candidate buses for wind capacity allocation
- 80 wind-demand scenarios

RESULTS

- Minimum loadability margin in first and last iterations

<table>
<thead>
<tr>
<th>Unit Commitment</th>
<th>Wind Capacity Allocation Iteration</th>
<th>Number of Items in Critical List</th>
<th>Minimum Loadability Margin, $\kappa$, (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1</td>
<td>80</td>
<td>38.34</td>
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<tr>
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<td>2</td>
<td>84</td>
<td>30</td>
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<td>D</td>
<td>1</td>
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<td></td>
<td>2</td>
<td>126</td>
<td>31.08</td>
</tr>
</tbody>
</table>

- Pattern of wind capacity allocation (MW)

- Test system loadability margin

- Cumulative probability of loadability margin across all buses and wind-demand scenarios.

CONCLUSIONS

- The pattern of wind capacity allocation affects both the voltage stability and the total wind capacity allocated in the system
- Wind capacity allocation to certain buses in the system may increase voltage stability margin
- A well chosen wind capacity allocation has the potential for improving voltage stability margin.

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