**Problem Statement**

- The goal of this research is to determine the largest wind farm alongside which small modular reactors (SMRs) can load follow in the presence of extreme wind conditions while under restrictions imposed by industry standards.
- Induction generator (IG) and doubly fed induction generator (DFIG) style turbines will be analyzed to determine which system is most optimal for pairing.

**Requirements**

- Research wind power generation applications.
- Research nuclear power generation applications.
- Using IG and DFIG wind farm models, calculate output power from given wind speed profiles.
- Determine the largest wind farm size that SMRs can be paired with for each case study.
- Publish the team’s research.

**Concepts**

- The initial approach was to carry out the project using wave power (variable generation) and hydroelectric power (base load) in addition to wind and nuclear.
  - This concept was abandoned because it became apparent the scope was too large.
- Additionally, a nuclear model (figure 1) was constructed to incorporate the limits on the SMRs and calculate nuclear power output using this method.
  - This concept was abandoned because the team could not gain access to the necessary constants and values needed to build a detailed enough model.

**Final Design**

- The final approach to this study was to calculate the required nuclear power output by subtracting wind farm power output from gathered load data. This is represented by equation 1 below.

\[
\text{SMR Output} = \text{Load Profile} - \text{Wind Turbine Output}
\]  

**Results**

- The project goal was to find the maximum wind farm size still compatible with the SMR nuclear plant for the IG and DFIG systems using the unique 28 cases. The corresponding results are shown in figures 4 and 5 below.

**Summary**

- The maximum allowable wind farm size for a given month’s load data is determined by the lowest value in that wind data set. The results are listed in the table below.

<table>
<thead>
<tr>
<th>Load Data Set</th>
<th>January</th>
<th>March</th>
<th>August</th>
<th>November</th>
<th>All Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>IG (MW)</td>
<td>22.5</td>
<td>7.5</td>
<td>15</td>
<td>7.5</td>
<td>7.5</td>
</tr>
<tr>
<td>DFIG (MW)</td>
<td>28.5</td>
<td>9</td>
<td>13.5</td>
<td>9</td>
<td>9</td>
</tr>
</tbody>
</table>

**Team & Acknowledgements**

**The Team**

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