Photovoltaic Distributed Generation Impact Analysis

A Rural Electric Cooperative Case Study

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Biographies

Dave Barton has worked for Clark County REMC for 32 years holding positions as groundman, lineman/meter tech, operations supervisor, supervisor of engineering services, and manager of operations and engineering. He obtained journeyman lineman and meter technician statuses from the Hoosier Energy Apprenticeship Training and Safety program. He has an Associate of Science in Electrical Engineering Technology from Purdue University and an Associate of Science degree in Line Technology from Ivy Tech Community College. Dave has been in his current position as manager of operations and engineering since 2007.

Trishia Swayne is a registered professional engineer with 13 years of experience in electric utility system planning and consulting. She obtained a Bachelor of Science in Engineering Physics and a Master’s Degree in Business Administration at Murray State University in Kentucky. She leads a team at Leidos that performs generation interconnection impact studies and distribution planning services such as capital improvement plans, voltage optimization, and system protection and coordination studies for utilities across the United States and Caribbean islands.
Agenda

• Introduction of Case Study
• Explanation of Analyses
• Findings
• Current Status of Project
Introduction of Case Study

- Clark County REMC > 23,000 members
- Hoosier Energy – G&T
  - 18 member systems with 300,000+ meters
- Hoosier board voted to have 10% of energy portfolio from renewable energy by 2025
- Hoosier survey – 90% members want renewables, only 17% knew this was already being done
Introduction of Case Study

- Hoosier decision to add solar to mix of renewables – 10 – 1 MW sites across 18 member systems

- Requirements
  - Highly visible
  - 15-20 acres flat open land
  - Little to no trees
  - Near a substation
Introduction of Case Study

- Chosen site – 4.4 miles north of Henryville Sub and adjacent to I-65
- Site construction – late spring 2016 to in service 10/4/16
- Site specs
  - 1,080 kW single axis tracking solar project
  - 18 SunGrow DC to AC string inverters
Introduction of Case Study
Explanation of Analyses

Data Collection → Model Clean-up/Preparation → Planning Criteria
## Explanation of Analyses

<table>
<thead>
<tr>
<th>Analyses</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steady State Analysis</td>
<td>&gt; Capacity, voltage, power factor, reverse power flow, tap movement</td>
</tr>
<tr>
<td>Voltage Flicker</td>
<td>&gt; Voltage fluctuations due to intermittent source</td>
</tr>
<tr>
<td>Short Circuit and Protection</td>
<td>&gt; Device ratings, effective grounding, reclosing, coordination</td>
</tr>
<tr>
<td>Risk of Islanding</td>
<td>&gt; Sandia report screening method</td>
</tr>
</tbody>
</table>
Findings

• Potential high voltage – remove capacitor bank
• Reverse power flow – no concerns
• Voltage flicker – no concerns
• Short circuit and protection
  • modify feeder reclosing to begin at 2 seconds
  • remove single-phase recloser
  • add adjacent tap single-phase fuse
  • site recloser required
• Risk of islanding – minor risk determined; use of site recloser as redundant protection to inverters
Current Status of Project

- Interconnected 10/4/2016
- Daily peak of 961 kW 10/8/2016
- All in cost was approximately 2.5 million dollars
- 10 sites vs. 1 costs more but provides more value
  - Lessons learned
  - Renewable energy and cooperative involvement
Current Status of Project
Current Status of Project

- **Lessons learned**
  - String inverters next to central road
  - Direct Transfer Trip not needed at all sites
  - String inverters over central inverters
  - Designing roads more efficiently
  - Standardized procedures for crews, more efficient
Current Status of Project

• One week of PV output
Current Status of Project

- Peak day PV site output
Conclusion

• G&T success story with solar power
  • Learning experiences
  • Listening to coop members
  • Control over generation sources
  • Meeting power supply portfolio requirements

• A 1.08 MW solar project can connect to our distribution circuit with minor upgrades and mitigation
Conclusion

• Only minor upgrades required but we need to stress the importance of the impact study

• Removing tap recloser, reconductoring, modifying protection, and including redundant protection reclosing at PV site could have major impacts to system operations, safety, and reliability if not addressed
Questions

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