Monitoring and Controls of Intermediate DG systems

ITWG Discussion

December 19th, 2018
Basic Control Example

**Background:**
- For intermediate sized project, only 1 RTU based control system found in NY by NYSEIA, though there may be others
- 352 kW AC system connected to a 12.47kV Distribution Circuit with substantial load (3.7MW)
- Control was requested for Safety and Security – no specific standards considered

**Costs:**
- Utility Protection Upgrades: $37,700
  - RTU, 50' Pole, CT’s, Radio Telemetry
- Customer Costs: $26,000
  - $4k Engineering, $14k for equipment, $10k for labor
- Operational Costs:
  - Power requirements, communications costs, maintenance
Basic Control Example

Customized RTU

CT Cabinet

Disconnect w/ Shunt Trip

Pole Containing Ratio Transmitter

Back Panel Contains: RTU, (2) UPS Units, Aux. Transformer
Instructive Example of what to avoid:

• Unclear Requirements: unclear standards and lack of justification for the M&C led to prolonged arguments

• Inefficient design and equipment selection
  • Highly customized RTU
  • 2 UPS units – one for the RTU, another for Communications
  • Expensive and cumbersome telemetry
    • Radio Signal for RTU
    • POTS line for Meter
    • Customer Owned Cellular

• Financial Assessment
  • This could work with a project at 300kW with incentives at 2015 levels
Less Restrictive M&C Thresholds

- **PSE&G**
  - No Control Requirement, Monitoring over 1MW
  - Approximate Cost: $75-$80k
  - Can use Cellular Connection

- **APS – Arizona Public Service Utility Company**
  - Monitoring and Control above 1MW

- **CA Rule 21**
  - Monitoring required above 1MW
  - Monitoring MAY be required above 250kW if connected to distribution systems below 10kV
    *Only required if less intrusive / more cost effective measures are not available
  - Quarterly Renewal of Justification for Monitoring
Intermediate M&C Thresholds

• **Tucson Electric**
  - Above 300kW – RTU based SCADA
  - 50kW through 300kW – RTU or Interval Data required situationally
  - No specific information available on what situations trigger need for control
  - Largest C&I PV installer in the area has not seen any RTU’s required
  - Approximate costs: $10,000 – 15,000

• **HECO**
  - Massive Distribution Capacity / High PV Penetration Grid
  - Required for aggregate capacity above 1MW
  - MAY be required above 250kW under specific conditions

• **Xcel (Minnesota)**
  - Above 1MW – M&C Required
  - Approximate Costs are $10,000 – $15,000
  - 250kW - 1MW - Monitoring and Telemetry, not Control
  - Excel provides a complete monitoring package – customer / developer picks up from the Utility’s facility.
  - Monitoring systems connect to the site’s LAN – no need for separate and expensive telemetry.
More Restrictive M&C Thresholds

- **Detroit Edison**
  - MAY be required 150kW – 550kW
  - Required above 550kW
  - No listed conditions that necessitate RTU

- **Toronto Hydro**
  - All DEG > 50kW require M&C
  - Customer owned package, with some Utility Standards
  - Estimated Cost: $5,000
Originally JU Proposed Costs - From Presentation July 2017

- Proposed M&C costs for smaller projects are prohibitive – even exceeding cost of modules
- M&C costs for larger projects stifle otherwise successful projects
- A 10% cost increase Changes typical IRRs from 16% to 12% and changes paybacks from 6 years to 7-8 years

<table>
<thead>
<tr>
<th>Cost Components (Median Values) for 50kW – 300kW systems</th>
<th>Monitoring</th>
<th>Control</th>
<th>Engineering, Installation &amp; Commissioning</th>
<th>Utility Total</th>
<th>Developer Costs to accommodate Utility Equipment</th>
<th>Total</th>
<th>Typical 50kW-AC system cost</th>
<th>Cost increase on typical 50kW system</th>
<th>Typical 300kW-AC system cost</th>
<th>Cost increase on typical 300kW system</th>
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</thead>
<tbody>
<tr>
<td>Monitoring</td>
<td>$7,000</td>
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<td>$22,000</td>
<td>$29,000</td>
<td>$5,000</td>
<td>$34,000</td>
<td>$150,000</td>
<td>23%</td>
<td>$630,000</td>
<td>5%</td>
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<tr>
<td>Monitoring / Control (RTU)</td>
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<td>$7,000</td>
<td>$22,000</td>
<td>$36,000</td>
<td>$26,000</td>
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<td>10%</td>
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<td>-</td>
<td>-</td>
<td>$85,000</td>
<td>-</td>
<td>$85,000</td>
<td>-</td>
<td>-</td>
<td>$630,000</td>
<td>13%</td>
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Recommended M&C Cost Goals

- Intermediate Size Projects are already a challenged sector of the market
- Often these projects are for Small Businesses, Schools, Churches, etc. that need positive cash flows quickly
- Therefore, certainty on when these costs are applied is necessary

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<td>Monitoring</td>
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<td>$2,000</td>
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<td>1%</td>
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<tr>
<td>Monitoring / Control (RTU)</td>
<td>$10,000</td>
<td>$5,000</td>
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<td>$150,000</td>
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<td>$630,000</td>
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Conclusions and Next Steps

Conclusions:

• Reclosers at 500kW and Control Systems at 50kW are some of the most stringent requirements in the country
• Utilities with lower thresholds for requiring M&C typically offer easy and low cost solutions
• The Industry needs consistency of standards and reduction of costs to incorporate M&C successfully

Next Steps:

• Seek funding or sponsors for Test Case
• Industry proposes a simplified Two-Tier approach
• Industry proposes target costs of $10,000 or less
• Define ‘Aggregate’ - In all utility territories surveyed, this is meant only as combined interconnection, and NOT as aggregated along the circuit.