Late Breaking News from TLI

IEEE PES GM

M. Kezunovic, President & CEO
Calgary, Canada, July 2009
Outline

- Introduction
- Data Integration Solution (FE)
- CBR Deployment (FE)
- Network based Fault Data Analyzer (NYPA)
- Low-Voltage Simulator (CCET)
Introduction

• TLI focus:
  – How to deal with “explosion” of IED data
  – How to assure the Smart Grid investments in IEDs (PMUs) is “safeguarded”
  – How to help utilities with tools for managing data reporting for NERC and other interested parties

• Late breaking news:
  – Substation IED data integration and analysis deployment at several utilities (FE, NYPA, CNP)
  – New tools for application and performance testing of PMUs, relays and other IEDs (CCET, BPA)
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Solution Overview and Data Flow
Data Integration Goals

- Data integration from variety of substation IEDs (DFR, DPR, CBR)
- Automated data processing functions
- Centralized data warehouse
- Universal user interface
Substation Assistant™ Features

• Universal solution for substation IED event data integration and processing
• Supports variety of DFRs and other substation IEDs
• Main features:
  – Data Integration (Data Warehouse)
  – Automated Processing (IED data)
  – Data Presentation (User Interface)
### Filter Results

<table>
<thead>
<tr>
<th>Event Chart</th>
<th>Event Table</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waveforms</td>
<td>Processed Date/Time</td>
</tr>
<tr>
<td></td>
<td>2009-03-04</td>
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<tr>
<td></td>
<td>2009-03-04</td>
</tr>
</tbody>
</table>

**User Comments**

No comment has been added for this event.

**System Events Help**

Click on event time stamp to select an event.
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  **CBR Deployment (FE)**
  
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Example: Reference Trip
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- *Network based Fault Data Analyzer (NYPA)*
- Low-Voltage Simulator (CCET)
Fault Locator Evaluation

- ATP simulated fault data
- Artificially time stamped
- Single- and Two-End

**TABLE I: IN-HOUSE EVALUATION RESULTS**

<table>
<thead>
<tr>
<th>#</th>
<th>Fault Type</th>
<th>Number of cases</th>
<th>Single-end Error [%]</th>
<th>Two-End Error [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A-G</td>
<td>10</td>
<td>0.61 - 3.75</td>
<td>0.05 - 0.27</td>
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<tr>
<td>2</td>
<td>AB</td>
<td>10</td>
<td>0.59 - 2.57</td>
<td>0.01 - 0.48</td>
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<td>3</td>
<td>AB-G</td>
<td>10</td>
<td>0.61 - 2.57</td>
<td>0.05 - 0.21</td>
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<tr>
<td>4</td>
<td>ABC</td>
<td>10</td>
<td>0.42 - 2.57</td>
<td>0.05 - 0.44</td>
</tr>
</tbody>
</table>

*Note: error % relative to line length*

Fig. 6. Two-end fault location vs. angle difference
Fault Location Calculation

• Single-end algorithm
  – Expected accuracy 1-5%
  – Data from one end of the line

• Two-end algorithm
  – GPS synchronized data required
  – Data from both ends of the faulted line required
  – Targeted accuracy 0.5%

• Reference
  – IEEE Guide for Determining Fault Location
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Relay Assistant™ Software

- Use of simulated and field data
- Automated testing and reporting
- Advanced editing features
- Testing aimed at application
Relay Assistant™ New Hardware

- Based on Relay Assistant™ simulator components
- 16-bit D/A synchronized outputs
- USB 2.0 communication to host PC
- External replay start (i.e. for use with GPS)
- Small factor
Relay Assistant™ LV-Simulator
Contact

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