Distribution Task Team
Breakout Session

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April 25, 2018
Outline:

- Summary of DisTT session presentations.
- DisTT business summary.
Metrological characterization of a calibrator for static and dynamic characterization of Distribution Network PMUs

Guglielmo Frigo, Asja Derviškadić and Mario Paolone
Swiss Federal Institute of Technology (EPFL) - Distributed Electrical System Laboratory (DESL)

- Built a PMU calibrator to reproduce test conditions, with TVE \( \sim 0.00x \) in static conditions and TVE \( \sim 0.0x\% \) in dynamic conditions
- Derive accuracy requirements for distribution PMUs
- Discussed inadequacy of IEEE C37.118.1, particularly 1\%TVE
- Discussed validity and appropriateness of TVE and proposed and alternative performance index based on RMSE between acquired and recovered fundamental trends in the time domain.
Metrological characterization of a calibrator for static and dynamic characterization of Distribution Network PMUs

Guglielmo Frigo, Asja Derviškadić and Mario Paolone

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Monitoring of Active Distribution Networks using Synchrophasor Applications benefiting Joint T&D Operations

Luigi Vanfretti  Rensselaer Polytechnic Institute

Addressed need for interaction between Active Distribution Networks (ADN) and Transmission Network Operators (TNOs)
Monitoring of Active Distribution Networks using Synchrophasor Applications benefiting Joint T&D Operations

Luigi Vanfretti  
*Rensselaer Polytechnic Institute*

DSOs can enhance the way they operate by having better knowledge of the system’s performance in near real-time TSOs can gain visibility of the phenomena at lower voltage levels, and device actions.
Monitoring of Active Distribution Networks using Synchrophasor Applications benefiting Joint T&D Operations
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Apps discussed:

• Steady-State Model Synthesis
• Dynamic Line Ratings for Distribution Feeders
• Decoupled Voltage Stability Analysis of TNs and ADNs
• Distributed Mode Estimation
The Kaiser Richmond Microgrid: Scheduling and control of renewable power with phasor feedback
Raymond De Callafon and David Bliss
University of California San Diego and Charge Bliss
The Kaiser Richmond Microgrid:
Scheduling and control of renewable power with phasor feedback
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• PMUs for phasors and power flow at solar inverter and point of interconnection identified previously unknown kW demand spikes

• Intelligent control of battery storage
  • Power flow optimization & scheduling, time of use energy shifting, power smoothing, demand management provide significant savings
  • Energy Shifting: Clear Business Case Identified!
    • Cost savings of $4,500/month, ROI 5-6 years.
Future work:

- Islanding
- Visualization
- Real-time demand cost reduction
- Automated Demand Response (ADR Market)
- Automated power quality regulation (future market?)
Intelligent PMU
Alexey Danilin, Pavel Kovalenko and Viktor Litvinov
GRT Corporation

• Discussed importance of moving **computing to the network edge**.

• Presented PowerLink, a distributed platform exploiting cloud technologies.

• Key component: IntelligentPMU
  
  • PMU based on Industrial Internet of Things (IIoT) Intelligent Controller
  
  • Interconnects with other Intelligent Controllers for computing-load balancing and fault tolerance
  
  • Built-in analytics.
Intelligent PMU
Alexey Danilin, Pavel Kovalenko and Viktor Litvinov
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Excitation parameters and rotor angular position measurement subsystem
Business part of the DisTT Breakout Session:

Discussion of next work product(s) and methods
**Use Cases and PMU Applications for DER integration in distribution networks and micro-grids**

**Goal:** Define Use Cases and potential PMU Applications.

**Methods:** Literature survey, simulation-based studies, initial-results from deployed systems.

**Output:** Qualitative Requirements from Use Cases

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**Performance Requirements and Future D-PMU Standards**

- Estimation Algorithms
- Timing
- Communications
- Etc.

**Goal:** Define potential quantitative metrics, experiments & tests methods, procedures, etc., that guide in setting quantitative performance specifications and requirements for future distribution PMU standards.

**Methods:** Literature survey, experimental results, initial-results from deployed systems.

**Goal:** Identify the techno-economic potential and risks of embedding PMU functions in different assets.

**Methods:** Literature survey, simulation studies, physical prototypes.

**Output:** Quantitative metrics for performance & methodologies for their assessment

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**Integration of PMUs or PMU Functions into transformers, inverters and other devices**

**Goal:** Define potential quantitative metrics, experiments & tests methods, procedures, etc., that guide in setting quantitative performance specifications and requirements for future distribution PMU standards.
Discussion – next steps:

• We need to establish an **empirical baseline of high-resolution distribution system measurements to understand data quality needs and realities**, including point-on-wave (time-domain) data; the group discussed possibilities for curating and sharing measurement data.

• It’s time to develop business cases for distribution applications in the context of DER markets. **Microgrid discussion today was a good start.**

• We’d like to consider a **survey** regarding distribution system measurement data and their quality: what do you have, what do you wish you had?

• We want to learn about PMU performance requirements motivated by specific applications.
Join the conversation!

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