Distribution Task Team Breakout Session

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Teresa Carlon (support)

April 25, 2018

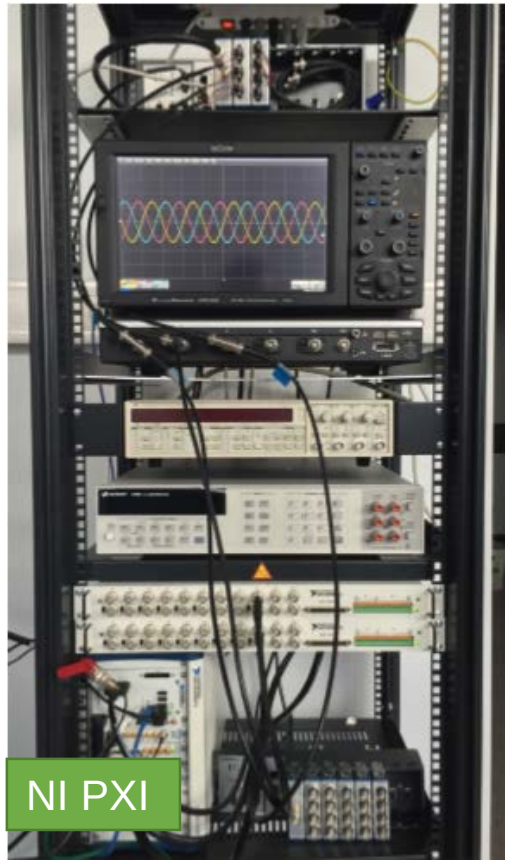
Outline:

- 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 ~ 0.00x in static conditions and TVE ~ 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.



DESL-METAS Calibrator

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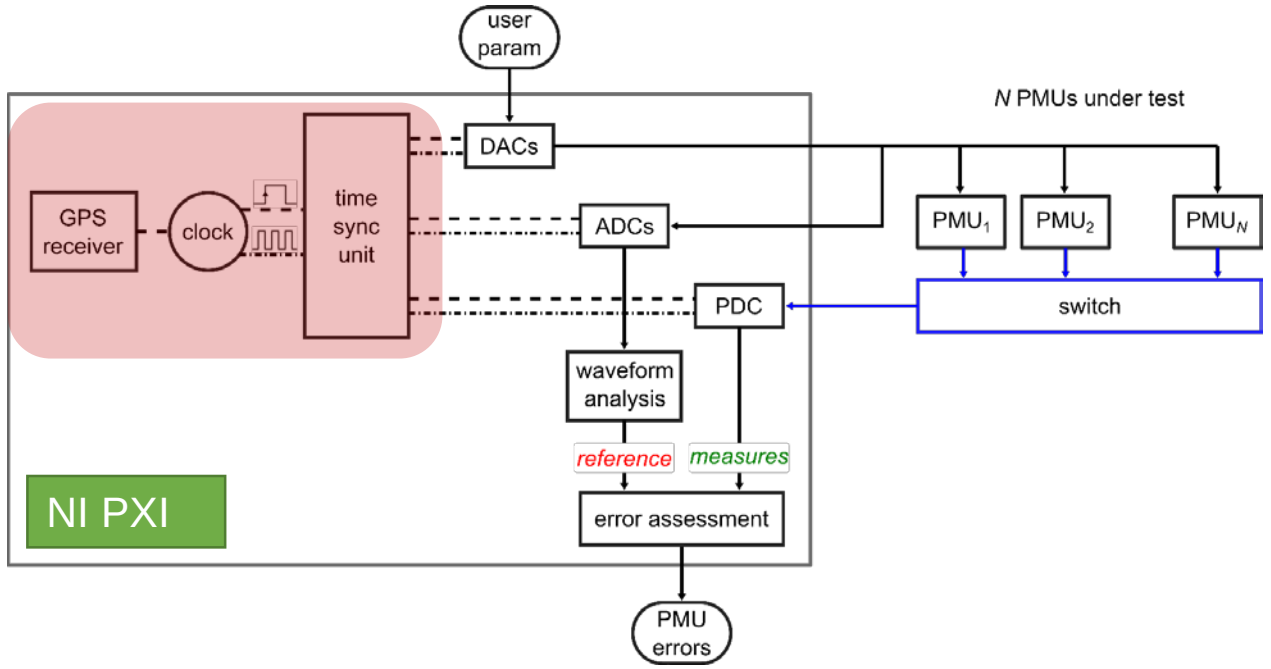
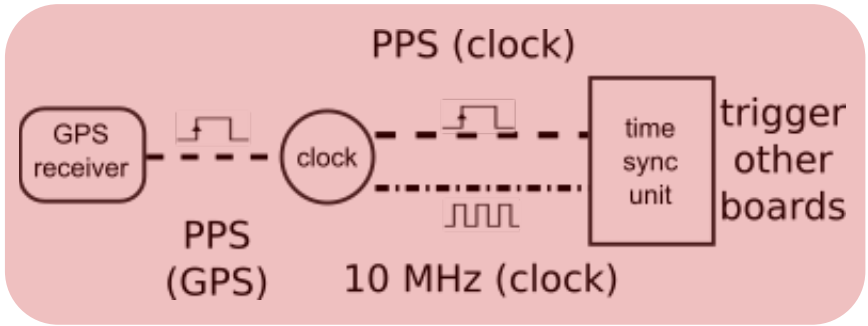
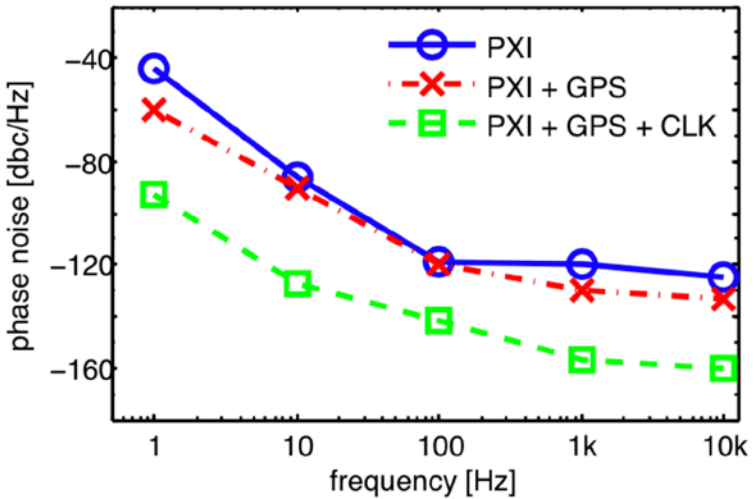


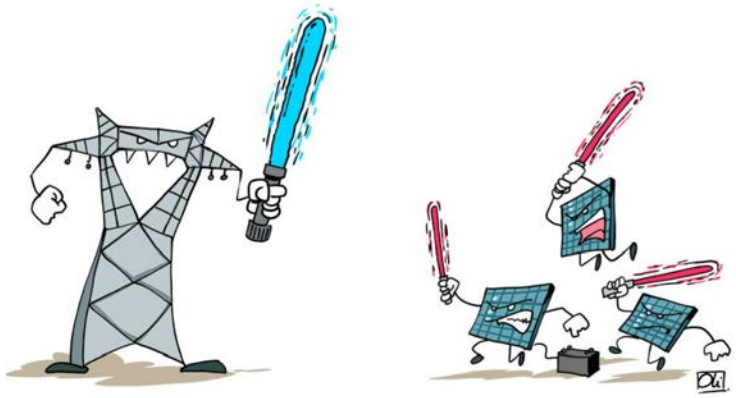




Monitoring of Active Distribution Networks using Synchrophasor Applications benefiting Joint T&D Operations

Luigi Vanfretti *Rensselaer Polytechnic Institute*

Addressed need for interaction between Active Distribution Networks (ADN) and Transmission Network Operators (TNOs)



View from ADN

View from TNO

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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.

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

Luigi Vanfretti *Rensselaer Polytechnic Institute*

Apps discussed:

- Steady-State Model Synthesis
- Dynamic Line Ratings for Distribution Feeders
- Decoupled Voltage Stability Analysis of TNs and ADNs
- Distributed Mode Estimation

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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

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The Kaiser Richmond Microgrid:
Scheduling and control of renewable power with phasor feedback

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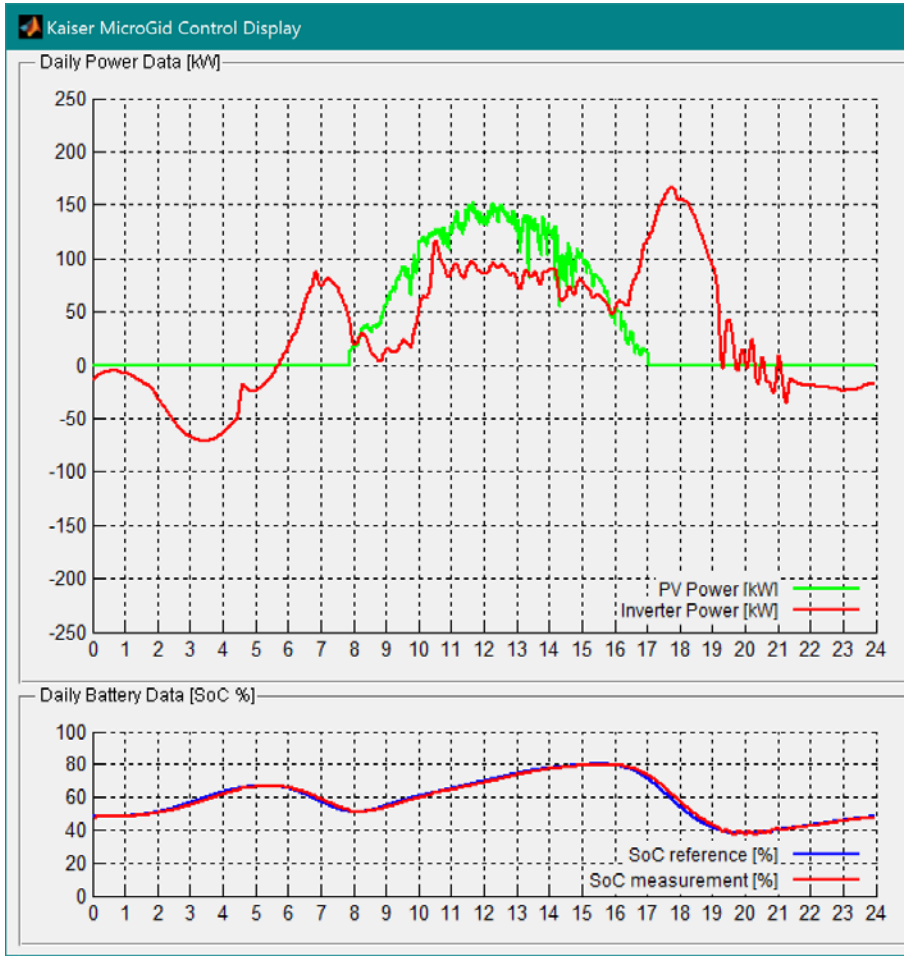
University of California San Diego and Charge Bliss

- 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.



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The Kaiser Richmond Microgrid:
Scheduling and control of renewable power with phasor feedback

Raymond De Callafon and David Bliss
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Future work:

- Islanding
- Visualization
- Real-time demand cost reduction
- Automated Demand Response (ADR Market)
- Automated power quality regulation (future market?)

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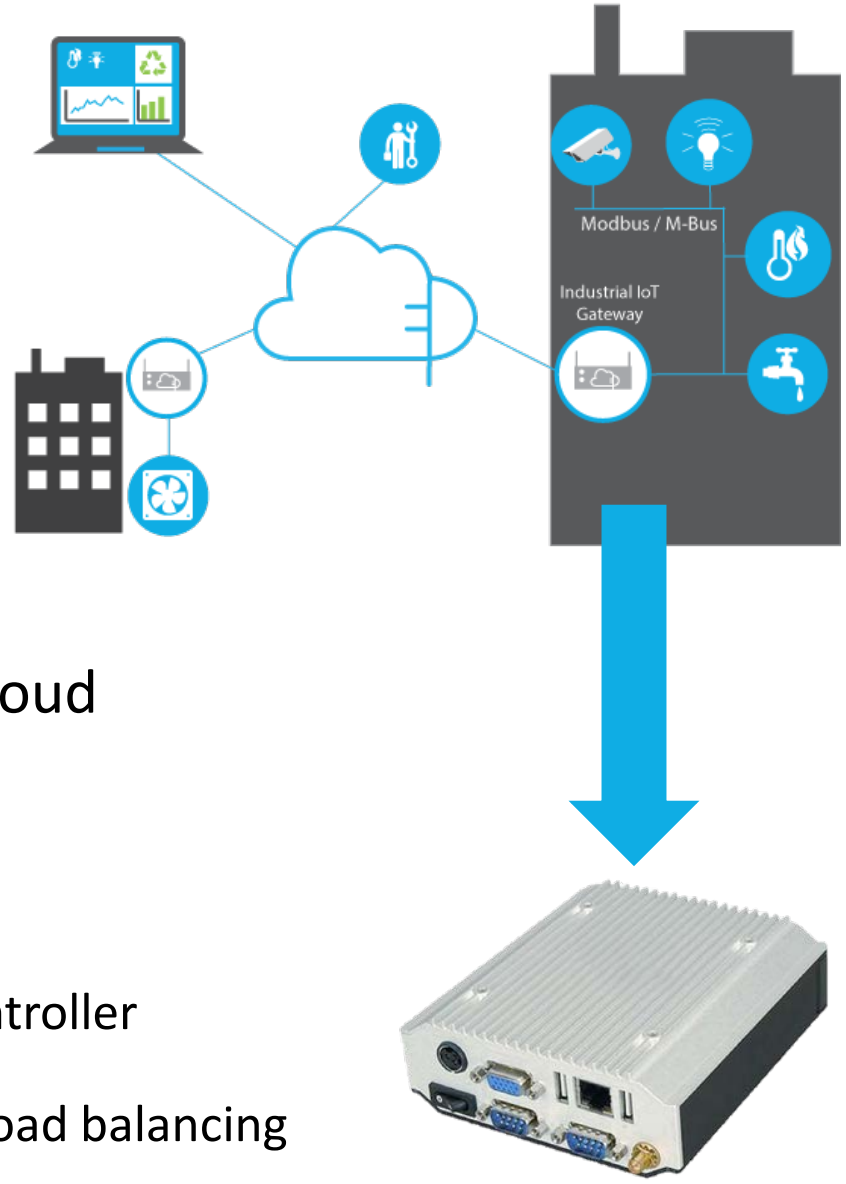
Intelligent PMU

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.

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Intelligent PMU

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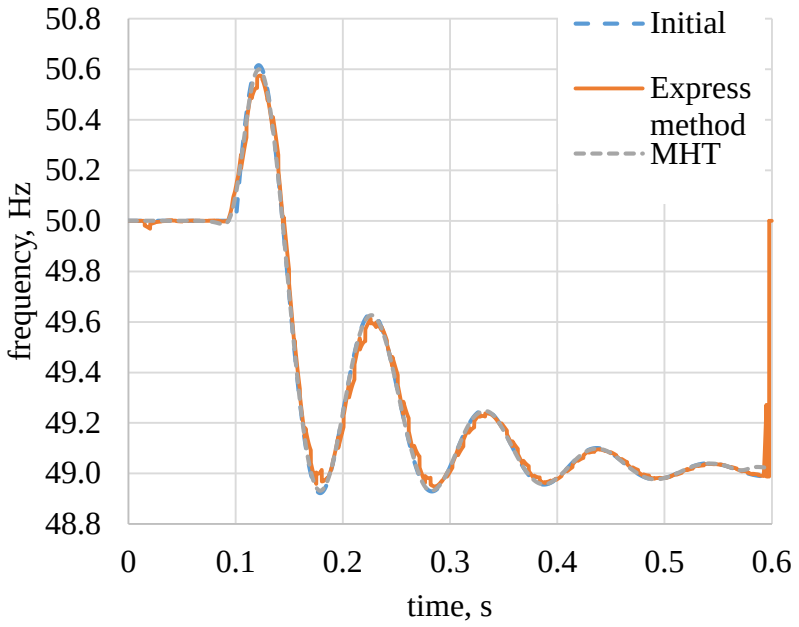

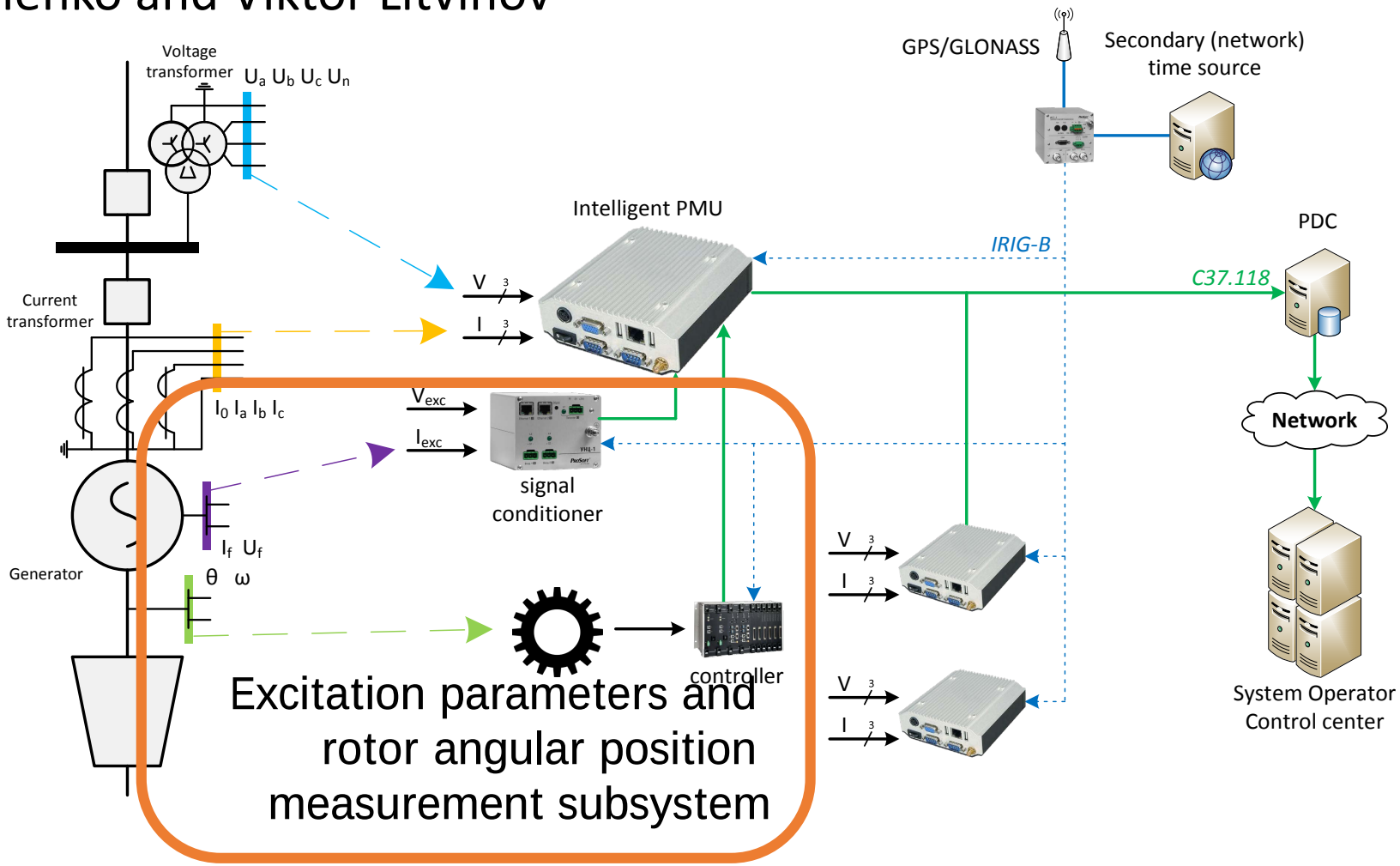

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Business part of the DisTT Breakout Session:

Discussion of next work product(s) and methods

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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

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.

Output: Quantitative metrics for performance & methodologies for their assessment

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

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

Methods: Literature survey, simulation studies, physical prototypes.

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.

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Join the conversation!

naspi.org/distt

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