# Advanced Wide-Area Monitoring and PMU Analytics Training Course

2 – 13 May 2027
Langkawi

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**Ref:** 876_166167 **Date:** 2 – 13 May 2027 **Location:** Langkawi **Fees:** 15000 Euro

## Overview

Advanced Wide-Area Monitoring and PMU Analytics Training Course is a two-week course for power system engineers, control-center analysts, protection and stability specialists, utility data engineers, and transmission operations managers who leave with a Wide-Area Monitoring and Analytics Pack. Participants connect synchronized measurement chains, PMU streams, phasor data concentrators, data quality, visualization, oscillation analysis, and event reconstruction. The course turns high-rate phasor data into governed operational evidence. Agile Leaders Training Center develops wide-area monitoring practice.

## Who Should Attend

- Power system functions responsible for transmission analysis, stability, and operating limits
- Control-center functions responsible for situational awareness and event response
- Protection functions responsible for disturbance evidence and coordinated schemes
- Utility data functions responsible for PMU streams, concentrators, quality, and access
- Operations management functions responsible for monitoring use cases and decision governance

The course assumes participants already interpret power-system quantities and operating diagrams; it leaves out PMU product certification, relay setting design, and software coding.

## Departments and Industries

The course supports departments and industries that monitor and operate interconnected electric power systems.

- Transmission operations, system planning, protection, automation, and control centers
- Generation, renewable integration, interconnection, and grid-support functions
- Utility data engineering, telecommunications, cybersecurity, and analytics functions
- Engineering consultancies, equipment vendors, testing laboratories, and research organizations
- Industrial power networks, transport electrification, and critical infrastructure operators

## Learning Objectives

By the end of this course, participants will be able to:

- Build a wide-area measurement architecture and data-flow map.
- Apply IEEE C37.118.2-2024 messaging concepts and PMU data-quality controls.
- Analyze phase angle, frequency, oscillation, and disturbance evidence.
- Diagnose timing, coverage, consistency, and stream-availability problems.
- Evaluate monitoring displays, alerts, and operational use cases.
- Build a Wide-Area Monitoring and Analytics Pack.

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## Course Agenda

### Day 1: Frame Wide-Area Monitoring

- Wide-Area Monitoring Use-Case Canvas
- Synchrophasor Measurement Chain Map
- PMU, PDC, and Application Role Model
- SCADA and Synchrophasor Comparison Matrix
- Monitoring Decision and Evidence Register

### Day 2: Examine PMU Measurements

- Voltage and Current Phasor Representation Model
- Frequency and Rate-of-Change Measure Dictionary
- Time Synchronization and Timestamp Trace
- PMU Reporting Rate and Latency Profile
- Measurement Accuracy and Metadata Record

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## Day 3: Design Data Concentration

- Phasor Data Concentrator Architecture Diagram
- PMU Stream Aggregation and Alignment Method
- Hierarchical PDC Routing and Redundancy Map
- Communication Delay and Availability Budget
- Source-to-Application Data Lineage View

## Day 4: Apply Data Transfer Concepts

- IEEE C37.118.2-2024 Message Structure Map
- Configuration, Data, Header, and Command Frame Table
- Data Type and Format Validation Checklist
- Stream Interface and Protocol Boundary Matrix
- PMU-to-PDC Interoperability Test Record

## Day 5: Control Synchrophasor Quality

- Accuracy, Availability, and Timeliness Scorecard
- Coverage and Consistency Assessment Grid
- Missing, Stale, and Outlier Data Diagnostic
- Timestamp and Topology Alignment Checklist
- Data Quality Exception and Remediation Log

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## Day 6: Build Monitoring Displays

- Phase-Angle Difference Visualization Pattern
- Frequency and ROCOF Trend Display
- Voltage Magnitude and Corridor Stress View
- PMU Stream Health and Quality Dashboard
- Alert Threshold and Escalation Matrix

## Day 7: Analyze Oscillations

- Oscillation Detection Signal Review Method
- Mode Frequency and Damping Evidence Table
- Inter-Area Oscillation Location Map
- Event Window and Baseline Comparison Profile
- Oscillation Alert Confidence Record

## Day 8: Reconstruct Grid Events

- Disturbance Timeline Reconstruction Method
- Phase-Angle Separation and Recovery Plot
- Frequency Excursion and ROCOF Event Profile
- Protection Operation and PMU Evidence Crosswalk
- Post-Event Analysis Report Structure

## Day 9: Govern Operational Use Cases

- Wide-Area Monitoring Use-Case Priority Matrix
- Display, Alert, and Decision Ownership Model
- Data Retention and Access Requirement Register
- Monitoring Limitation and Decision-Risk Log
- Deployment and Operational Readiness Checklist

## Day 10: Practice PMU Analytics Reviews

- Exercise: Diagnose a PMU Stream Quality Issue
- Exercise: Interpret a Phase-Angle Separation
- Exercise: Analyze an Oscillation Event
- Exercise: Reconstruct a Grid Disturbance
- Capstone: Wide-Area Monitoring and Analytics Pack

## Practical Exercises

The course uses suggested activities based on transmission corridors, generation events, renewable integration, and industrial-grid cases.

- Suggested activity: trace synchronized measurements from PMUs through concentrators to an operational display.
- Suggested activity: diagnose timing, availability, consistency, coverage, and metadata defects in a PMU stream.
- Suggested activity: compare phase angle, frequency, damping, and disturbance evidence across an event window.
- Suggested activity: present a monitoring use case with limits, thresholds, owners, and response actions.

## FAQs

### Who suits wide-area monitoring and PMU analytics training, and what does it assume?

Power system, control-center, protection, stability, utility data, and transmission operations functions suit the training. Wide-area monitoring assumes regular interpretation of power-system quantities and operating diagrams.

### How does PMU analytics differ from conventional power-system monitoring training?

PMU analytics focuses on time-synchronized phasor streams, phase-angle relationships, high-rate frequency evidence, data concentrators, quality controls, oscillations, and event reconstruction, while conventional monitoring relies on slower and less synchronized operational measurements.

### Why is IEEE C37.118.2-2024 relevant to PMU analytics?

IEEE C37.118.2-2024 defines messaging for real-time communication between PMUs, phasor data concentrators, and applications, providing the data-transfer structure that PMU analytics workflows must interpret.

### How does PMU data quality affect wide-area monitoring?

PMU data quality affects whether phase angle, frequency, oscillation, and disturbance evidence can be trusted; accuracy, availability, timeliness, coverage, consistency, metadata, and stream paths must be assessed.

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## What does a wide-area monitoring review produce?

A wide-area monitoring review produces a documented interpretation of system conditions, data limitations, alerts, event evidence, operational implications, decision ownership, and follow-up actions.

## Conclusion

Participants take back a Wide-Area Monitoring and Analytics Pack containing architecture maps, data-flow views, quality controls, display designs, oscillation records, event reconstructions, use-case priorities, and readiness checks. It changes raw PMU streams into governed operational evidence. The pack supports traceable monitoring, consistent reviews, and accountable grid decisions.