Cigre JWG C4/C2.62

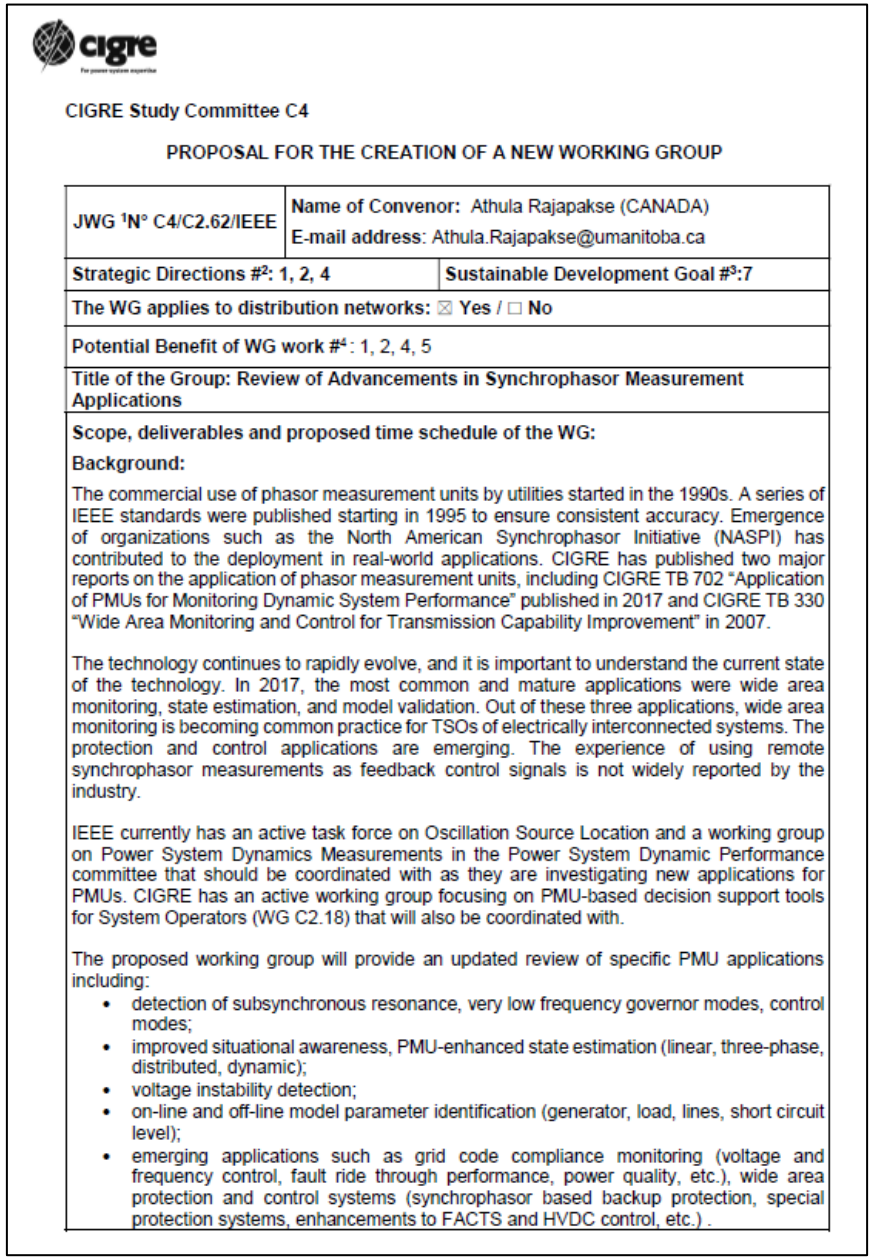
Review of Advancements in Synchrophasor Measurement Applications

NASPI Work Group Meeting
Charlotte, NC
October 15-16, 2024

Terms of Reference (TOR)

C4/C2.62 TOR

- C4: Power System Technical Performance
- C2: Power System Operation and Control



CIGRE Study Committee C4

PROPOSAL FOR THE CREATION OF A NEW WORKING GROUP

JWG [1]N° C4/C2.62/IEEE	**Name of Convenor:** Athula Rajapakse (CANADA) **E-mail address:** Athula.Rajapakse@umanitoba.ca
Strategic Directions #[2]: 1, 2, 4	**Sustainable Development Goal #[3]:7**
The WG applies to distribution networks: ☒ **Yes** / ☐ **No**	
Potential Benefit of WG work #[4]: 1, 2, 4, 5	
Title of the Group: Review of Advancements in Synchrophasor Measurement Applications	

Scope, deliverables and proposed time schedule of the WG:

Background:

The commercial use of phasor measurement units by utilities started in the 1990s. A series of IEEE standards were published starting in 1995 to ensure consistent accuracy. Emergence of organizations such as the North American Synchrophasor Initiative (NASPI) has contributed to the deployment in real-world applications. CIGRE has published two major reports on the application of phasor measurement units, including CIGRE TB 702 "Application of PMUs for Monitoring Dynamic System Performance" published in 2017 and CIGRE TB 330 "Wide Area Monitoring and Control for Transmission Capability Improvement" in 2007.

The technology continues to rapidly evolve, and it is important to understand the current state of the technology. In 2017, the most common and mature applications were wide area monitoring, state estimation, and model validation. Out of these three applications, wide area monitoring is becoming common practice for TSOs of electrically interconnected systems. The protection and control applications are emerging. The experience of using remote synchrophasor measurements as feedback control signals is not widely reported by the industry.

IEEE currently has an active task force on Oscillation Source Location and a working group on Power System Dynamics Measurements in the Power System Dynamic Performance committee that should be coordinated with as they are investigating new applications for PMUs. CIGRE has an active working group focusing on PMU-based decision support tools for System Operators (WG C2.18) that will also be coordinated with.

The proposed working group will provide an updated review of specific PMU applications including:

- detection of subsynchronous resonance, very low frequency governor modes, control modes;
- improved situational awareness, PMU-enhanced state estimation (linear, three-phase, distributed, dynamic);
- voltage instability detection;
- on-line and off-line model parameter identification (generator, load, lines, short circuit level);
- emerging applications such as grid code compliance monitoring (voltage and frequency control, fault ride through performance, power quality, etc.), wide area protection and control systems (synchrophasor based backup protection, special protection systems, enhancements to FACTS and HVDC control, etc.) .

Working Group Officers & Members

- Convener:
  - Dr. Athula Rajapakse – University of Manitoba, Canada
- Secretary:
  - Dr. Dinesh Gurusinghe - RTDS Technologies, Canada
- Currently 38 members from 16 countries

Scope

1. To provide an updated overview of synchrophasor technology including standard updates. Cover (micro)PMUs for distribution system applications as an additional area.
2. To provide an updated view of industry and academia experience on the concentration, archiving, and use of PMU data.
3. To describe emerging applications and any technology gaps such as high dependency on reliable telecommunication, precise time synchronisation, signal latency, etc. requiring further research and development.
4. To discuss the end-user's experiences of deploying synchrophasor measurement systems and applications and elaborate additional specially tailored applications for enhancing secure power system operation.
5. Elaborate and deliver application examples for new specific PMU applications

Deliverables

- Technical Brochure (TB) and Executive Summary in Electra
- Cigre Science & Engineering (CSE) journal
- Tutorial
- Webinar

Timeline & Status

- Start Date: May 2021
- Status: First draft of TB completed, and under final round of review by all WG members
- Expected Date for Submitting Final Report to SC Chair: December 2024

TB Chapters