

Task Force: Application of Big Data Analytic on Transmission System Dynamic Security Assessment

July 19th, 2021

Officers:

Rafael Segundo (Chair), segu@zhaw.ch

Yanli Liu (Vice-Chair), yanliliu@tju.edu.cn

Emilio Barocio (Secretary), emilio.barocio@cucei.udg.mx

Petr Korba (Secretary), korb@zhaw.ch

Agenda

- Task Force Introduction
- Summary of Activities done (up today)
- Description of Upcoming Activities (2021-2022)

Introduction

Period of Time: 36 months (2020, 2021 & 2022)

Mission and Scope

- Achieve **transfer of knowledge between different scientific communities** to solve challenging power system problems and bridge the gap between these communities.
- **Evaluate how innovative algorithms could be used in the control room** of power system operators to facilitate the decision making and to find stability margins in order to guarantee a secure operation.
- **Enhance the value of available data in control rooms**, quickly, easily and precise.
- **Development of offline/online tools** for parameter validation in control rooms.
- **Provide a high quality report** with a compilation of data mining, artificial intelligence and machine learning applications for the secure operation of transmission systems.

Board & Core Members

- Rafael Segundo, Zurich University of Applied Sciences, Switzerland
- Liu Yanli, Tianjin University, China
- Emilio Barocio, University of Guadalajara, Mexico
- Petr Korba, Zurich University of Applied Sciences, Switzerland
- Mario Paolone, EPFL, Switzerland
- Vladimir Terzija, Skoltech, Russia
- Hjörtur Jóhannsson, DTU, Denmark
- Marcos Netto, National Renewable Energy Laboratory, USA
- Venkat Krishnan, National Renewable Energy Laboratory, USA
- Yingchen Zhang (YC), National Renewable Energy Laboratory, USA
- Yoshihiko Susuki, Osaka Prefecture University, Japan
- Simon Tindemans, TU Delft, Netherlands
- Jose Luis Rueda Torres, TU Delft, Netherlands
- Jochen Cremer, Imperial College London, UK
- Federica Bellizio, Imperial College London, UK
- Mingyang Sun, Zhejiang University, China
- Yajun Wang, Dominion Energy, USA
- Robert Eriksson, Svenska Kraftnät, Sweden
- Mats Larsson, ABB Corporate Research, Switzerland
- Hector Chavez, University of Santiago de Chile, Chile

Summary of Activities Done (up today)

Activities done in 2020

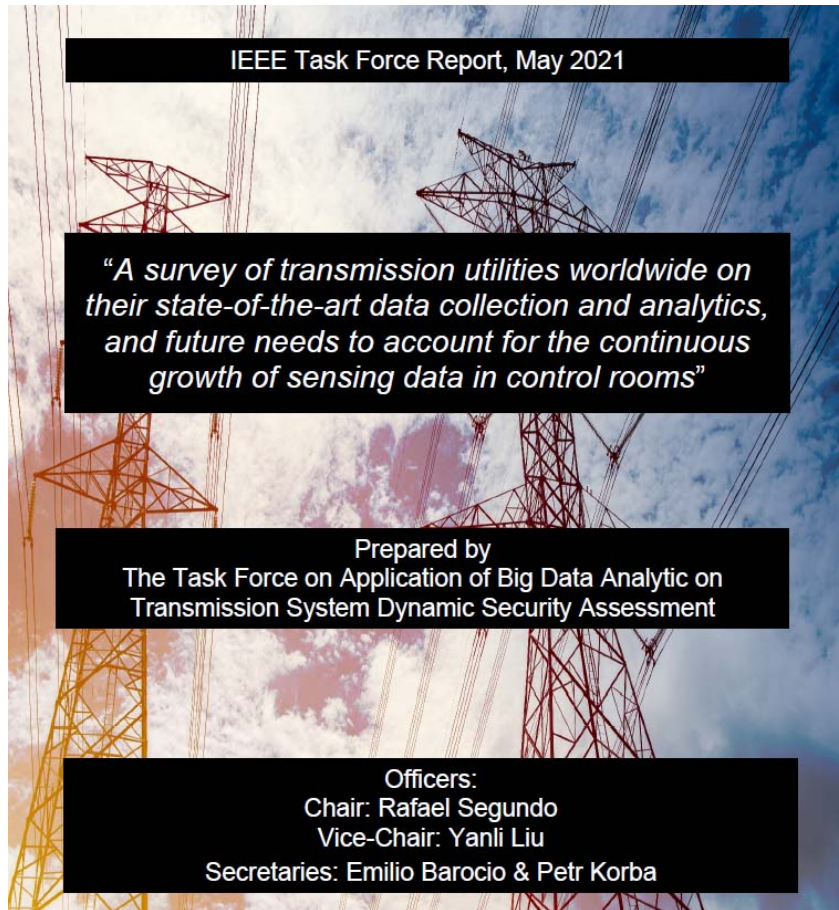
- A1.1 Opening of TF website
- A1.2 Official Kick-off Meeting during IEEE PESGM2020
- A1.3 One panel session during IEEE PESGM2020
- A1.4 Organization of 2 virtual workshops
 - Organized by Tianjin University in October 2020
 - **DynPOWER** organized by ZHAW on Monday 7th September 2020
 - 264 Registrations, 46 countries

Statistics of the fourth edition of the workshop



One Technical Report

Document front page



List of Authors

North America		
USA		
Marcos Venkat	Netto Krishnan	National Renewable Energy Laboratory (NREL)
Michael Yajung	Ingram Wang	National Renewable Energy Laboratory (NREL)
Junbo	Zhao	Dominion Energy Mississippi State University
Mexico		
Emilio Manuel	Barocio Andrade	University of Guadalajara Universidad Autónoma de Nuevo León UANL
Juan Jose	Guerrero	National Electrical Control System Northeast Area
South America		
Colombia		
Jorge	Mola	XM Colombia
Chile		
Hector Alberto	Chavez Trigueros	Electrical Engineering Department USACH National Electric Coordinator of Chile
Miguel	Herrera	National Electric Coordinator of Chile
Europe		
Netherlands		
Jose Luis Simon	Rueda Torres Tindemans	Delft University of Technology TU Delft Delft University of Technology TU Delft
Marnick Jorrit	Huijsman Bos	TenneT TSO B.V. TenneT TSO B.V.
Danny	Klaar	TenneT TSO B.V.
Switzerland		
Petr Mats	Korba Larsson	Zurich University of Applied Sciences Hitachi-ABB Power Grids
Mario Miguel	Paolone Ramirez	Distributed Electrical Systems Laboratory, EPFL Zurich University of Applied Sciences
Rusejla Walter	Sadkovic Sattinger	Swissgrid AG Swissgrid AG
Rafael	Segundo	Zurich University of Applied Sciences
Sweden		
Camille Robert	Hamon Eriksson	RISE Research Institutes of Sweden Svenska kraftnat
UK		
Jochen Federica	Cremer Bellizio	Delft University of Technology TU Delft Imperial College London
Panagiotis Balarko	Papadopoulos Chaudhuri	University of Strathclyde Imperial College London
Russia		
Vladimir	Terzija	Skolkovo Institute of Science and Technology
Asia		
China		
Yanli	Liu	Tianjin University

Report Highlights

North American Power Systems



South American Power Systems



European Power Systems



- Over 30 authors (academia, industry, government)
- 10 utilities interviewed
- Companies from 8 countries from 2 continents involved
- 50 pages long approximately

- Full Report would be available on IEEE Subcommittee and TF website
- A compact version has been submitted for potential journal publication (Elsevier, IJEPES)

State-of-the-art of data collection, analytics, and future needs of transmission utilities worldwide to account for the continuous growth of sensing data

Rafael Segundo¹, Yanli Liu², Emilio Barocio³, Petr Korba⁴, Mannel Andrade⁵, Federica Bellizzi⁶, Jerrit Bos⁷, Balazs Chaudhri⁸, Hector Chavez⁹, Jochen Cremer¹⁰, Robert Eriksson¹¹, Camille Hamou¹², Miguel Herrera¹³, Marnick Huijsman¹⁴, Michael Ingrani¹⁵, Danny Klar¹⁶, Venkat Krishnam¹⁷, Jorge Mola¹⁸, Marcos Netto¹⁹, Mario Paolone²⁰, Panagiotis Papadopoulos²¹, Miguel Ramirez²², Jose Rueda²³, Walter Sattinger²⁴, Vladimir Terzija²⁵, Simon Tindemann²⁶, Alberto Trigueros²⁷, Yajun Wang²⁸ and Junbo Zhao²⁹

¹North University of Applied Sciences, Switzerland; ²Princeton University, China; ³University of Guadalajara, Mexico; ⁴ILIRIA, Mexico; ⁵Imperial College London, UK; ⁶TUM 7303 F, Netherlands; ⁷USACH, Chile; ⁸TU Delft, Netherlands; ⁹Summa Inghelt, Sweden; ¹⁰IEE, Sweden; ¹¹CEZ, Chile; ¹²IEEE, USA; ¹³XM, Colombia; ¹⁴EPFL, Switzerland; ¹⁵University of Strathclyde, UK; ¹⁶University of Bath, Bath, UK; ¹⁷Stibach, Austria; ¹⁸Dominion Energy, USA; ¹⁹Mississippi State University, USA

Abstract

Nowadays, transmission system operators require higher degree of observability in real-time to gain situational awareness and improve the decision-making process to guarantee a safe and reliable operation. Proliferation of advanced sensing infrastructure, such as phasor measurement units (PMUs) allows system operators to monitor the system dynamic performance in real-time over a wide area of the system at faster time scales. The use of such technology has opened up new opportunities to introduce new analytics algorithms for improving the stability assessment and control of the system. Motivated by these challenges, the IEEE Task Force "Application of Big Data Analytic on Transmission Systems for Dynamic Security Assessment" have worked together to highlight and establish a baseline set of these common concerns within the power system community, which will be used as motivations to propose innovative analytics and data-driven solutions in future efforts. In this document, we present the survey performed to 10 transmission system operators around the world to understand the current practices in terms of data acquisition, handling, storage, modeling and analytics. As result, we have jointly created this document, which is a compact version of an official report and that describes in more detail the ongoing activities by different utilities worldwide and how they handle these data, what analytics they perform, and what their future needs are for control room integration. The objective of this document is to capture the real-world details from the participating system operators, thereby providing to the power system community the basis for valid modeling assumptions as well as motivation for developing advanced algorithms in this domain.
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Keywords: Transmission systems, data analytics.



Activities done in 2021

- A2.1 We had a very successful participation in the last IEEE SG SMA 2021 Virtual Conference May 25th (Panel 3)
 - Most visited panel in the conference (out of 9 panels)

Panel 3
Synchrophasor and Monitoring data handling:
A perspective of ongoing TSOs approaches

IEEE SG SMA 2021
International Conference on Smart Grid Synchronized Measurements and Analytics
2021 May 25th



Description of Upcoming Activities

Upcoming Activities in 2021

- A2.2 Organization of panel session
 - IEEE PESGM 2021, Monday, July 26th 12:00 PM **[USA Eastern Time]**
 - ***“Advanced Data Analytics for Probabilistic Security Assessment”***

- A2.3 TF Regular meeting
 - IEEE PESGM 2021, Monday, August 2th 11:30 AM **[USA Eastern Time]**
 - [Webex Link to Meeting](#)
 - Meeting number (access code): 137 079 5922
 - Meeting password: fUwdpRpf822

- A2.4 Open Call for Papers on Special Issue
 - ***“Applications of machine learning for dynamic security assessment on transmission systems”***, in Sustainable Energy, Grids and Networks, Elsevier **[deadline 29 August 2021]**

Upcoming Activities in 2021



- A2.5 Organization of International Workshop
 - 5th edition of DynPOWER (**virtual**), Monday, **September 13th 2021**



Format DynPOWER 2021:

- 2 sessions with 4 speakers each
- Free registration on website
- For more information: [DynPOWER Website](#)

Some confirmed speakers:

- Vladimir Terzija, Skoltech, Russia
- Giorgio Gianuzzi, Terna, Italy
- Vrettos Evangelos, Swissgrid, Switzerland
- Armando Guzman, SEL, USA
- Guillermo Bautista, California ISO, USA

Upcoming Activities beyond 2021- Report 2

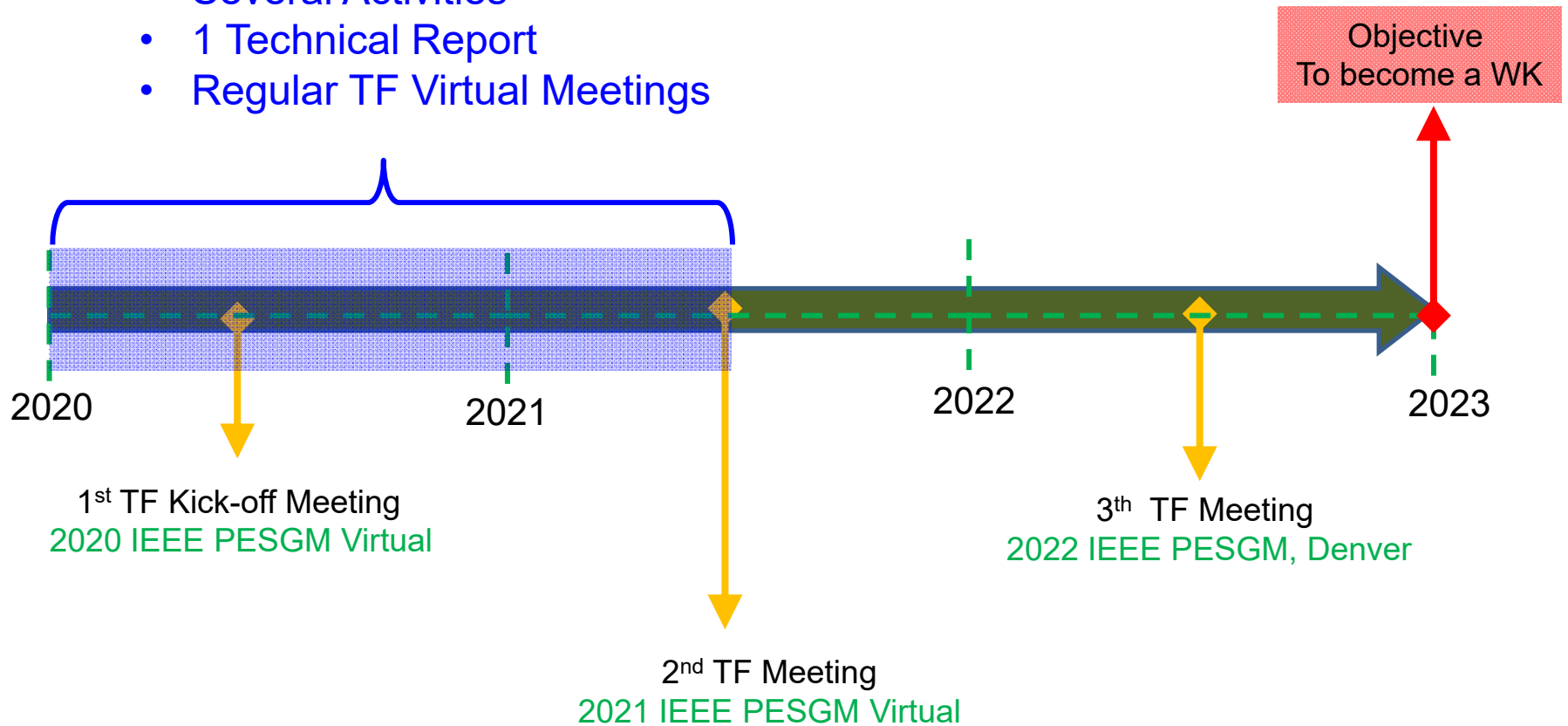
“Application of data mining, artificial intelligence and machine learning algorithms to maintain the secure operation of transmission systems”

- **12 research groups already confirmed for participation in second report**
 - Yoshiko Susuki (Osaka Prefecture University, Japan)
 - Emilio Barocio (University of Guadalajara, Mexico)
 - Miguel Ramirez, Rafael Segundo and Petr Korba (ZHAW)
 - Hjörtur Johansson, (DTU, Denmark)
 - Vladimir Terzija, (Skoltech, Russia)
 - Simon, Jose Luis,(TU-Delft, Netherlands)
 - Federica Bellizio (Imperial College London, UK)
 - Hector Chavez (USACH, Chile)
 - Junbo Zhao (Mississippi State University, USA)
 - Panagiotis Papadopoulos (University of Strathclyde, UK)
 - Daniel Dotta (Unicamp, Brazil)
 - Mario Paternina (UNAM, Mexico)

**Expected Delivery Time:
July 2022**

Summary

- Several Activities
- 1 Technical Report
- Regular TF Virtual Meetings



Thank you for your attention

Rafael Segundo,

segu@zhaw.ch

Zurich University of Applied Sciences
Switzerland