

Engineering Analysis Task Team

Evangelos Farantatos (EPRI) – Co-Lead Matthew Rhodes (SRP) – Co-Lead

> NASPI Hybrid Meeting October 18-19, 2022

New EATT Mission Statement

- 1. Proliferate the development, testing, and validation of engineering applications and data analytical methods that use synchronized measurements systems.
- 1. Assist in the deployment and utilization of synchronized wide-area measurement applications.
- 2. Formulate and guide recommended R&D activities related to the advancement of wide-area synchronized measurement systems and their applications.

Advanced Model Validation & Calibration

- EATT White Paper
- Lead: Honggang Wang (previously with GE)

Objective: Document industry advancements in model validation and calibration

Drafting has been completed

1	Introduction		
	1.1	Motivation for Model Validation & Calibration	1
	1.2	Power System Model Validation Overview	3
	1.3	State-of-the-Art Toolsets	5
	1.3.1	Power Plant Parameter Derivation (PPPD)	7
	1.3.2	Power Plant Model Validation Tool (PPMV)	9
	1.3.3	Power Plant Model Validation Simscape Design Solution	11
	1.3.4	Generator Model Validation (GMV)	12
	1.3.5	PhasorAnalytics Dynamic Model Validation & Calibration	14
	1.4	Current Limitations	15
2	Adva	anced Model Validation	17
	2.1	Enhanced Model Validation Procedure	17
	2.2	Performance Metrics	20
3 Advanced Model Calibration		anced Model Calibration	25
	3.1	Advanced Parameter Selection	25
	3.1.1	Trajectory Sensitivity Approach	25
	3.1.2	Global Sensitivity Approach	26
	3.1.3	SVD Based Methods	28
	3.1.4	Similarity Based Methods	30
	3.1.5	Empirical Gramian Based Method	31
	3.2	Advanced Model Parameter Tuning	32
	3.2.1	Estimation Based Approach	32
	3.2.2	Optimization Based Approach	35
	3.	2.2.1 Efficient Trust Region Approach	35
	3.	2.2.2 Black-Box Optimization Based Approach	36
	3.	2.2.3 Approximate Bayesian Computation Based Approach	38
	3.2.3	Machine Learning Based Approach	40
	3.	2.3.1 Q-Learning Based Approach	40
	3.	2.3.2 Conditional Variational Autoencoder based Approach	42
	3.3	Performance Validation Process and Metrics	45
4	Mult	iple Event Based Model Validation & Calibration	48
	4.1	Motivation for Using Multiple Events	48
	4.2	Event Selection	50
	4.3	Multiple Event Model Calibration	52
	4.3.1	Simultaneous Calibration	52
	4.3.2	Sequential Calibration	54
	4.3.3	Distributed Calibration	58
5	Conclusions		61

EATT Edge Computing Survey

The EATT has released a survey to develop a beginning understanding of edge computing techniques and how synchrophasor data can contribute to such technologies.

Edge computing definition: Data collected, algorithms calculated, and decisions made at grid edge devices WITHOUT the translation of large amounts of system synchrophasor data to a central location. Local synchrophasor data transfer (say between substations) is considered an edge computing application.

The survey includes one question seeking your expertise and knowledge on existing or in-development synchrophasor edge computing applications.

Here is the link to the survey: <u>https://forms.office.com/g/nn82xy8e6M</u>