



# Engineering Analysis Task Team

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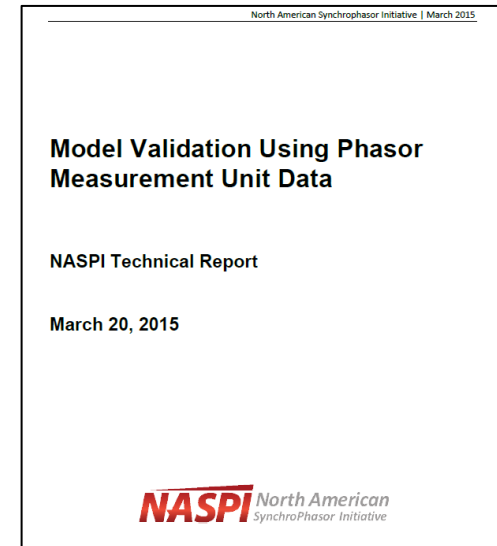
Shaun Murphy (PJM) – Co-Lead

NASPI Virtual Meeting

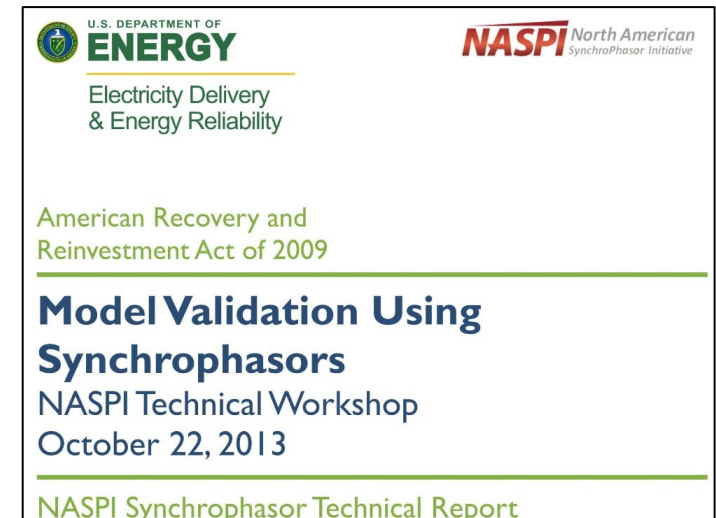
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# Advanced Model Validation & Calibration

- New EATT White Paper
- Lead: Honggang Wang (GE)



**Objective: Document industry advancements in model validation and calibration**



# Outline

## White Paper Link

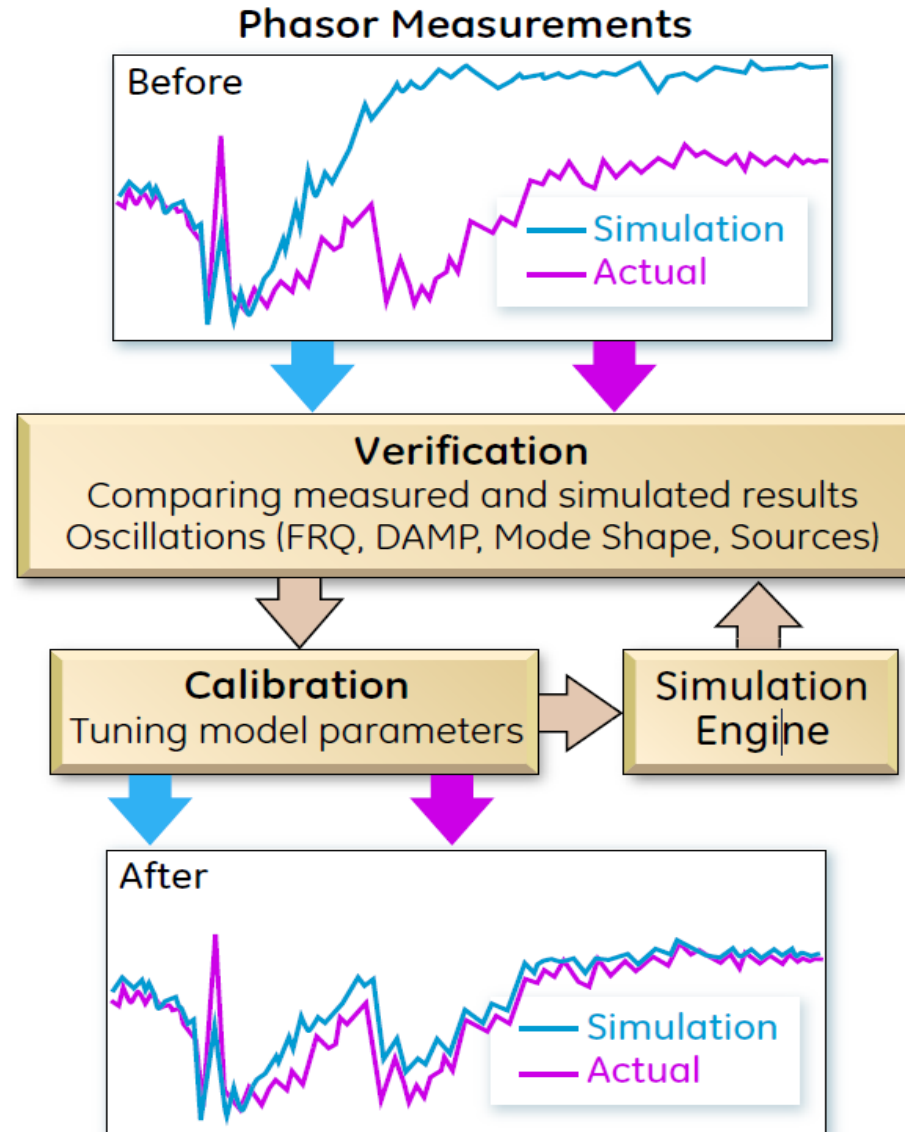
- 1 Introduction
  - 1.1 Motivation for Model Validation & Calibration
  - 1.2 Datasets and Data Requirements for Model Validation & Calibration
  - 1.3 Power System Model Validation Overview
  - 1.4 State-of-the-Art Methods and Tools for Model Validation & Calibration
  - 1.5 Limitations of Existing Methods and Desired Features of Advanced MVC
- 2 Advanced Model Validation
  - 2.1 Proposed Method (GE)
  - 2.2 Other Proposed Method
  - 2.3 Performance Validation Process and Metrics
- 3 Advanced Model Calibration
  - 3.1 Advanced Parameter Selection
    - 3.1.1 Trajectory Sensitivity Approach
    - 3.1.2 PCA and Similarity Based Methods (GE)
    - 3.1.3 Other
  - 3.2 Advanced Model Parameter Tuning/Estimation
    - 3.2.1 Estimation Based Approach
      - 3.2.1.1 Kalman Filter (PNNL)
      - 3.2.1.2 Other
    - 3.2.2 Optimization Based Approach
      - 3.2.2.1 Efficient Trust Region Approach (GE)
      - 3.2.2.2 Other
  - 3.3 Performance Validation Process and Metrics
- 4 Multiple Event Based Model Validation & Calibration
  - 4.1 Event Selection
  - 4.2 Aggregation of Performance Metrics Across Multiple Events
  - 4.3 Multiple Event Model Calibration
- 5 Conclusions
- 6 References

# MVC Motivation

- System reliability studies
  - Planning
  - Operations

NERC Standards	Validation Focus	Validation Method	Entities	Interval
MOD-026-1	Validate generator voltage and reactive power response	Staged test (for GO) and POI disturbance-based model validation (for TP)	TP, GO	Every 10 year or significant change to the plant that modify its response capability
MOD-027-1	Validate generator frequency and active power response	Staged test (for GO) and POI disturbance-based model validation (for TP)	TP, GO	Every 10 year or significant change to the plant that modify its response capability
MOD-032-1	Interconnected transmission system model	NA	PC, TP, BA, GO, LSE, RP, TO, TSP	Every 13 calendar months
MOD-033-1	Interconnected transmission system model	disturbance based model validation (for PC)	PC, RC, TO	Every 24 calendar months

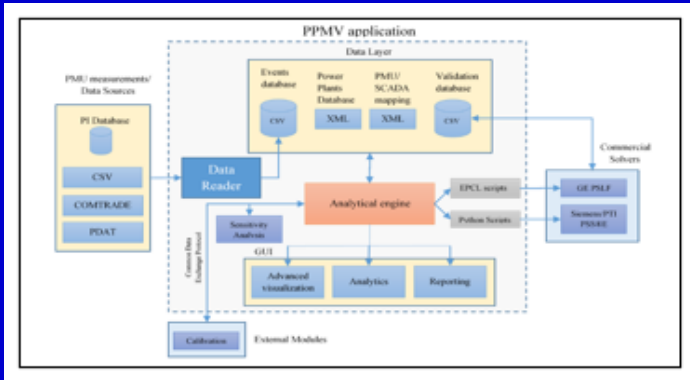
# MVC Process



# MVC Tools

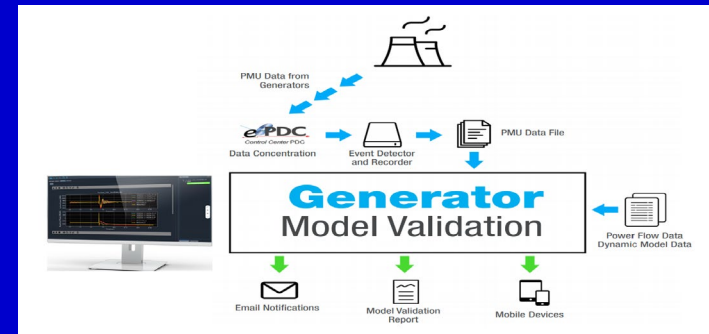
## PNNL/BPA

### Power Plant Model Validation (PPMV)



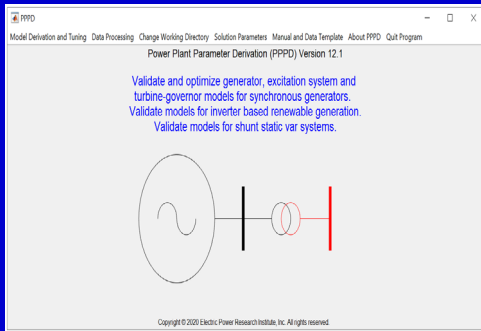
## Electric Power Group

### Generator Model Validation (GMV)



## EPRI

### Power Plant Parameter Derivation (PPPD)



## GE

### PhasorAnalytics Dynamic Model Validation & Calibration



## MathWorks

### Power Plant Model Validation Simscape Design Solution

