Large-Scale Test Bed in April 2023
A Comprehensive Power System Testing Platform

Motivation and Objectives

- To develop a comprehensive power system prototyping and simulation platform including both dynamic and dispatch
- To integrate dispatch and dynamic simulation together for dynamic information interfaced dispatch

Ongoing Tasks and Future Works

- Developing market simulator AMS for flexible dispatch modeling and dispatch-dynamic co-simulation simulation
- Improving the visualizer as a standalone tool
- Improving the usability of the platform by developing user-friendly API and documentation

Overview and Key Components

LTB Architecture

Hybrid symbolic-numeric power system modeling and simulation

ANDES — Dynamic Modeling and Simulation

DiME — Multi-terminal Data Streaming

Data messaging between multiple power system components

Dynamic information interfaced dispatch modeling and simulation (ongoing)

AMS — Dispatch Modeling and Simulation

AGVis — Energy System Visualization

Geographical visualization for energy system

LTB Functionality

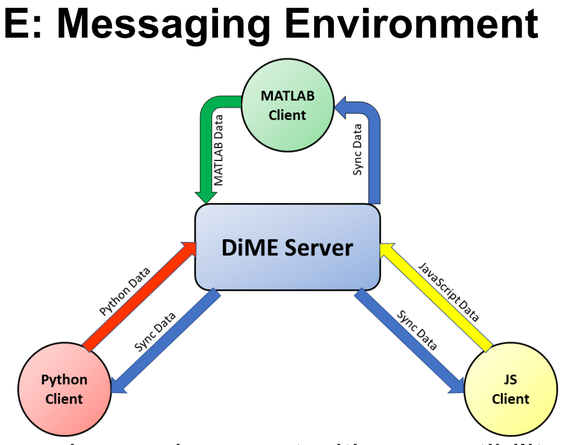
Independent use

- Dynamic modeling and simulation
- Dispatch modeling and simulation
- Customized energy system visualization

Federal use

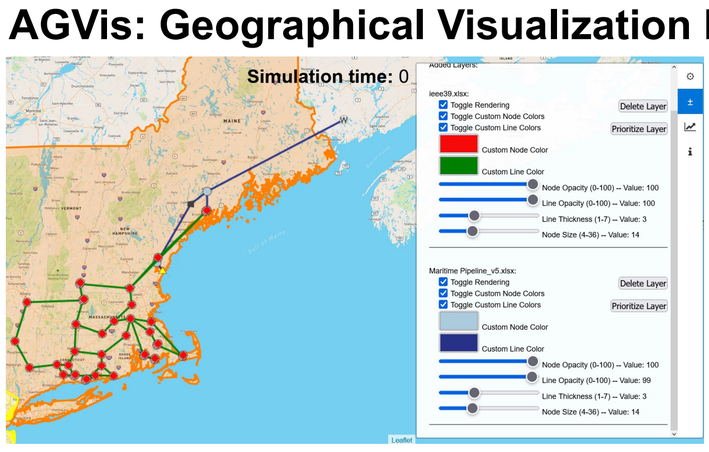
- Dispatch-dynamic co-simulation
- Close-loop real-time power system simulation

DiME: Messaging Environment

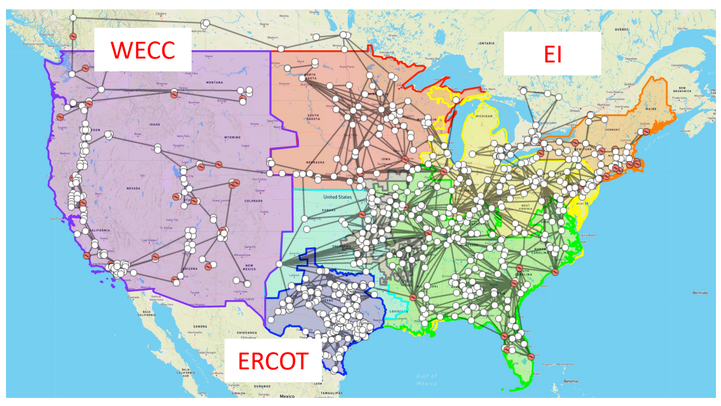


Messaging environment with compatibility for multiple programming languages

AGVis: Geographical Visualization Platform



IEEE 39-Bus System and Interconnected Gas Network with Customized settings



Synthetic North America System

LTB Platform Showcase

Virtual Inertia Scheduling for Power system with High Penetration of Inverter-based Resource

- Virtual inertia scheduling for security-constrained and economy-oriented inertia management
- Effective inertia management of IBR-penetrated system
- Virtual inertia and damping of IBRs are dispatched and delivered to support real-time security operation

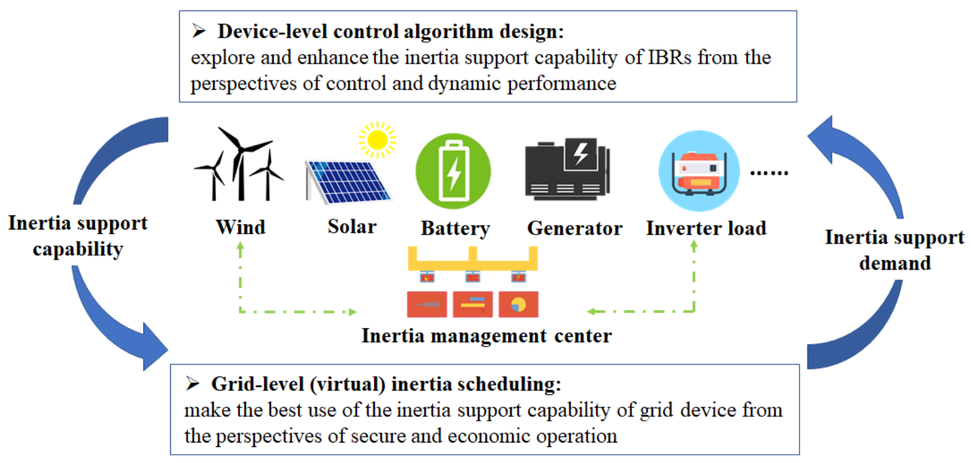
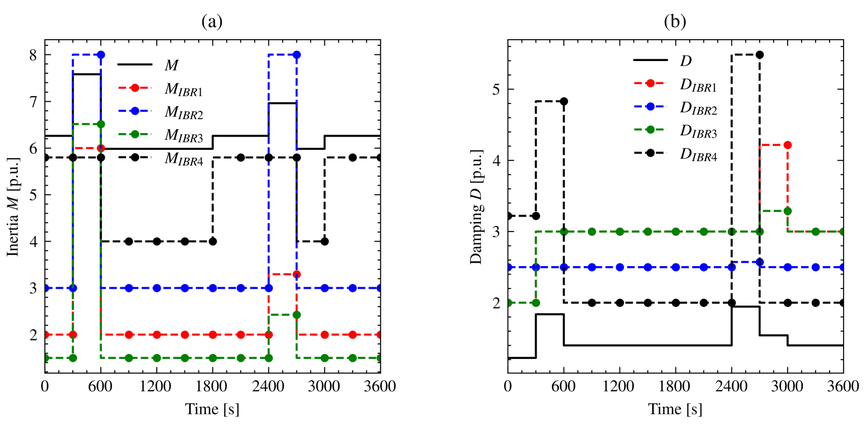


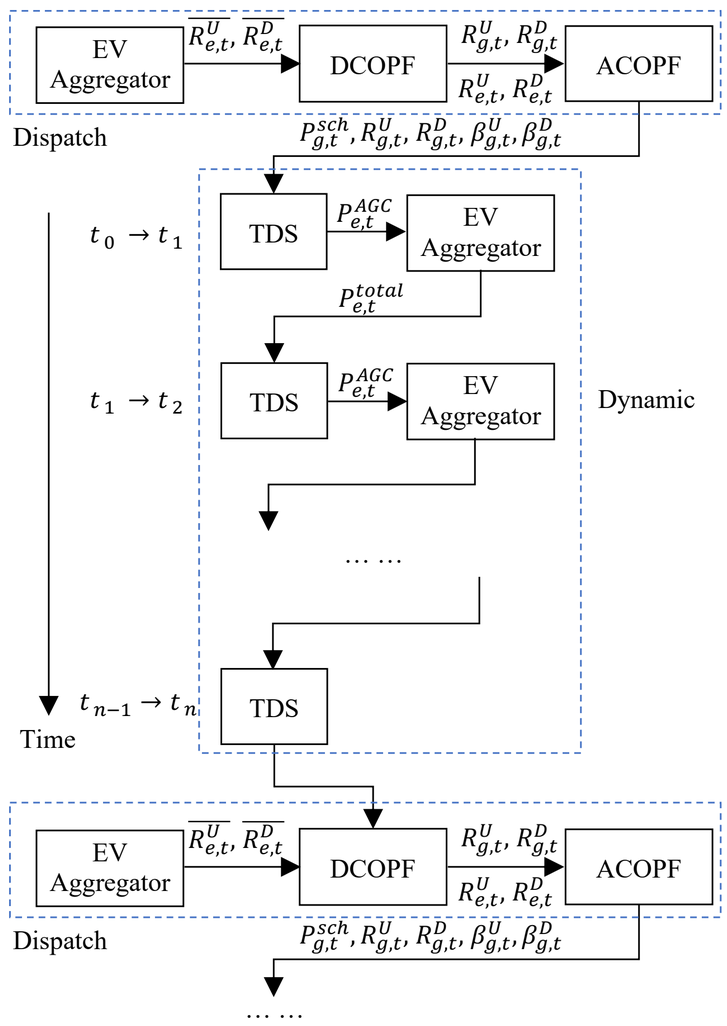
Diagram of virtual inertia scheduling for future low inertia power systems



IBRs inertia and damping: (a) virtual inertia; (b) virtual damping

Electric Vehicles Charging Time Constrained Deliverable Secondary Frequency Regulation Provision

- Decouple problem into dispatch modeling and EV aggregator modeling
- EV SFR provisions including both capacity procurement in dispatch stage and AGC power delivery in real-time operation stage
- The increased charging time caused by the SFR services is constrained by the EV owner's tolerance.



RTED-TDS co-simulation framework

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