



**Pacific
Northwest**
NATIONAL LABORATORY

Synchrophasor Measurements in the Event Signature Library

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U.S. DEPARTMENT OF
ENERGY **BATTELLE**

PNNL is operated by Battelle for the U.S. Department of Energy

PNNL-SA-178551



Number of New Synchrophasor Events in the Signature Library:

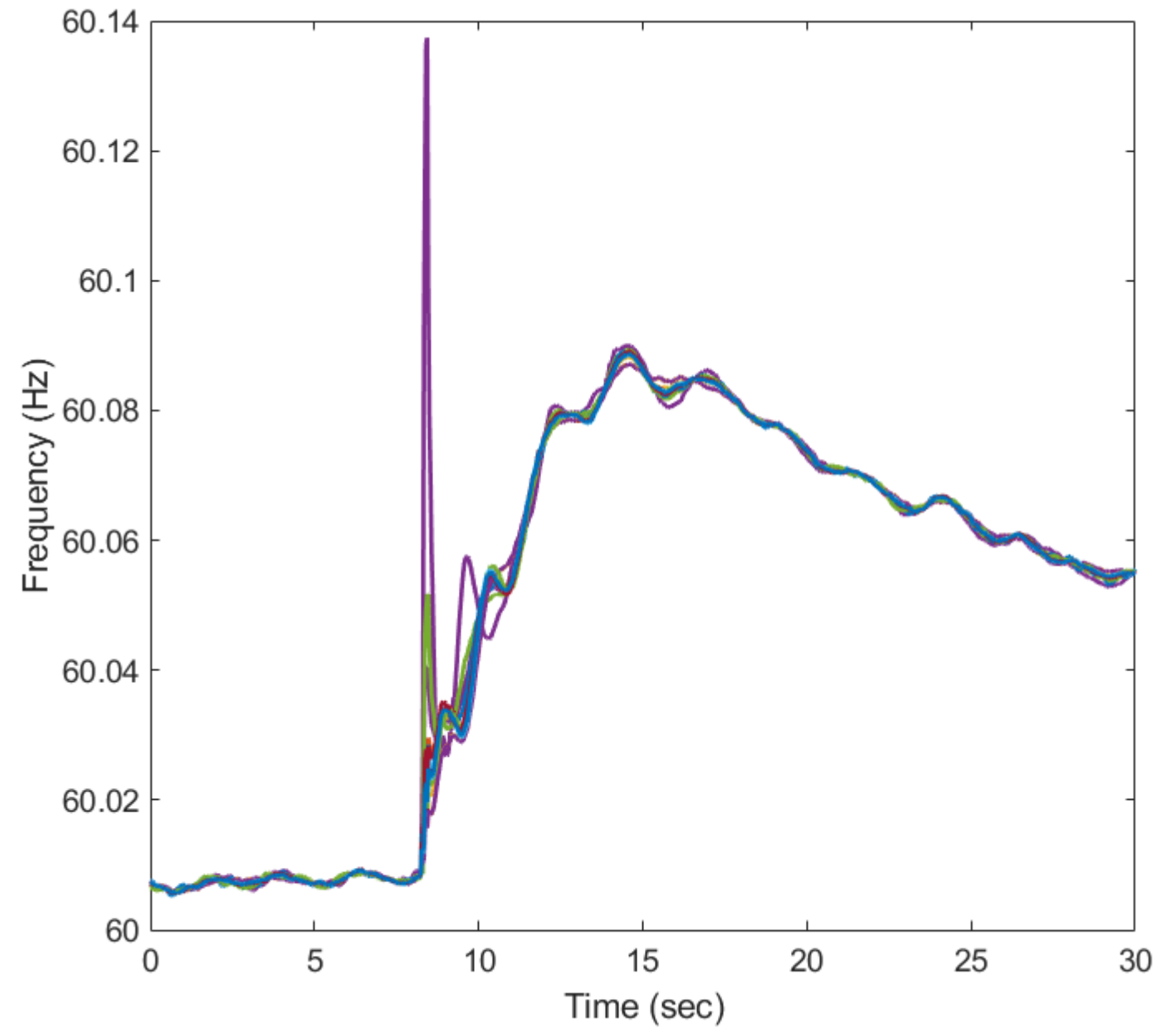
1694

FOA 1861: Big Data Analysis of Synchrophasor Data

- Goals
 - Derive additional value from sensor data already gathered
 - Advance the application of artificial intelligence and machine learning to grid data
- Eight teams received multi-year awards – results reported at NASPI
- PMU dataset
 - Covers the three US interconnections
 - Two-year duration
 - Includes event logs
 - Anonymized to protect data providers
- The Event Signature Library is a perfect way to extend the value of the dataset by making real-world synchrophasor measurements publicly available

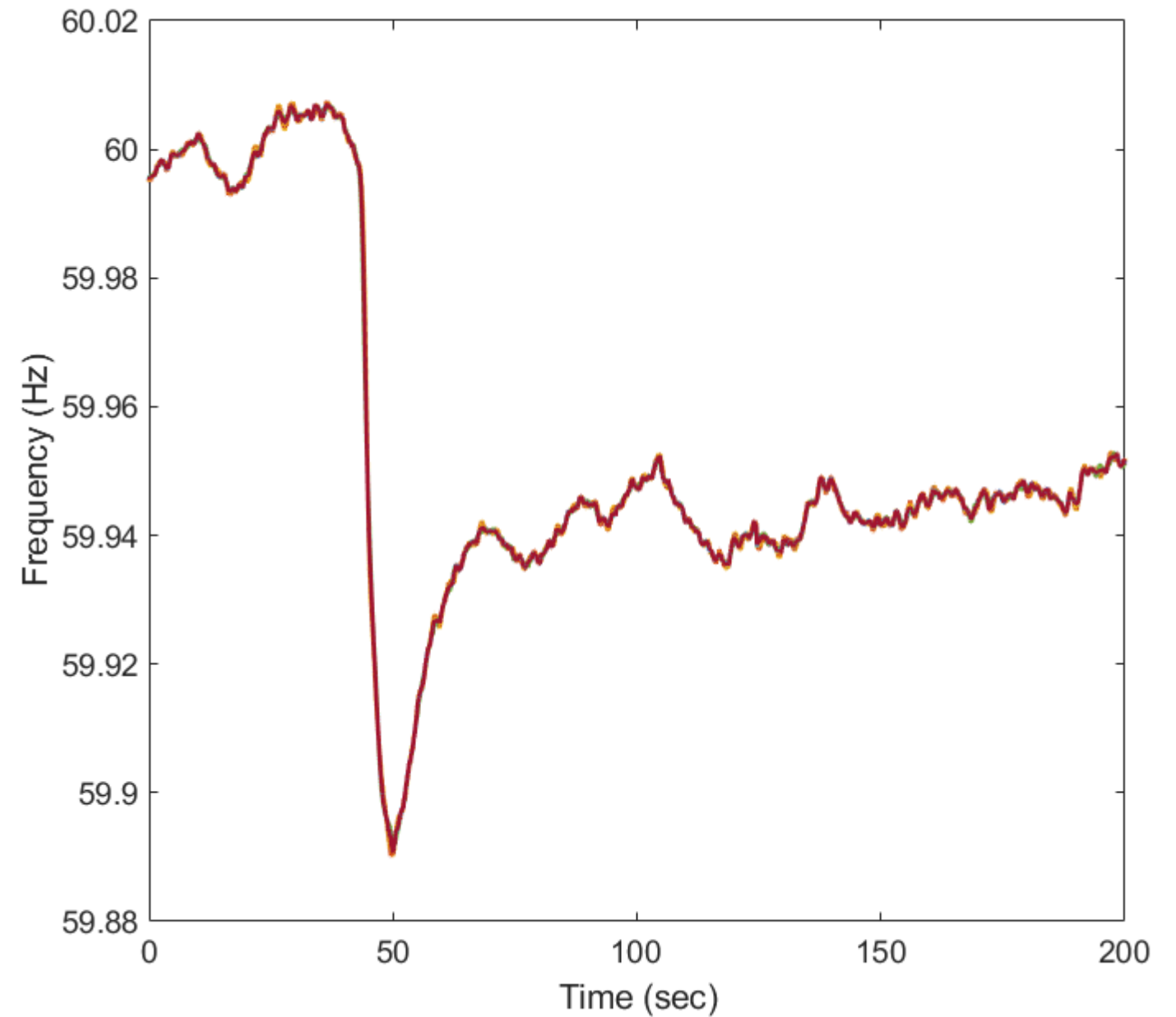
Event Types

- **Frequency Deviations**
- Generator Trips
- Oscillations
- Faults
- Ambient
 - 1 minute
 - 30 minute



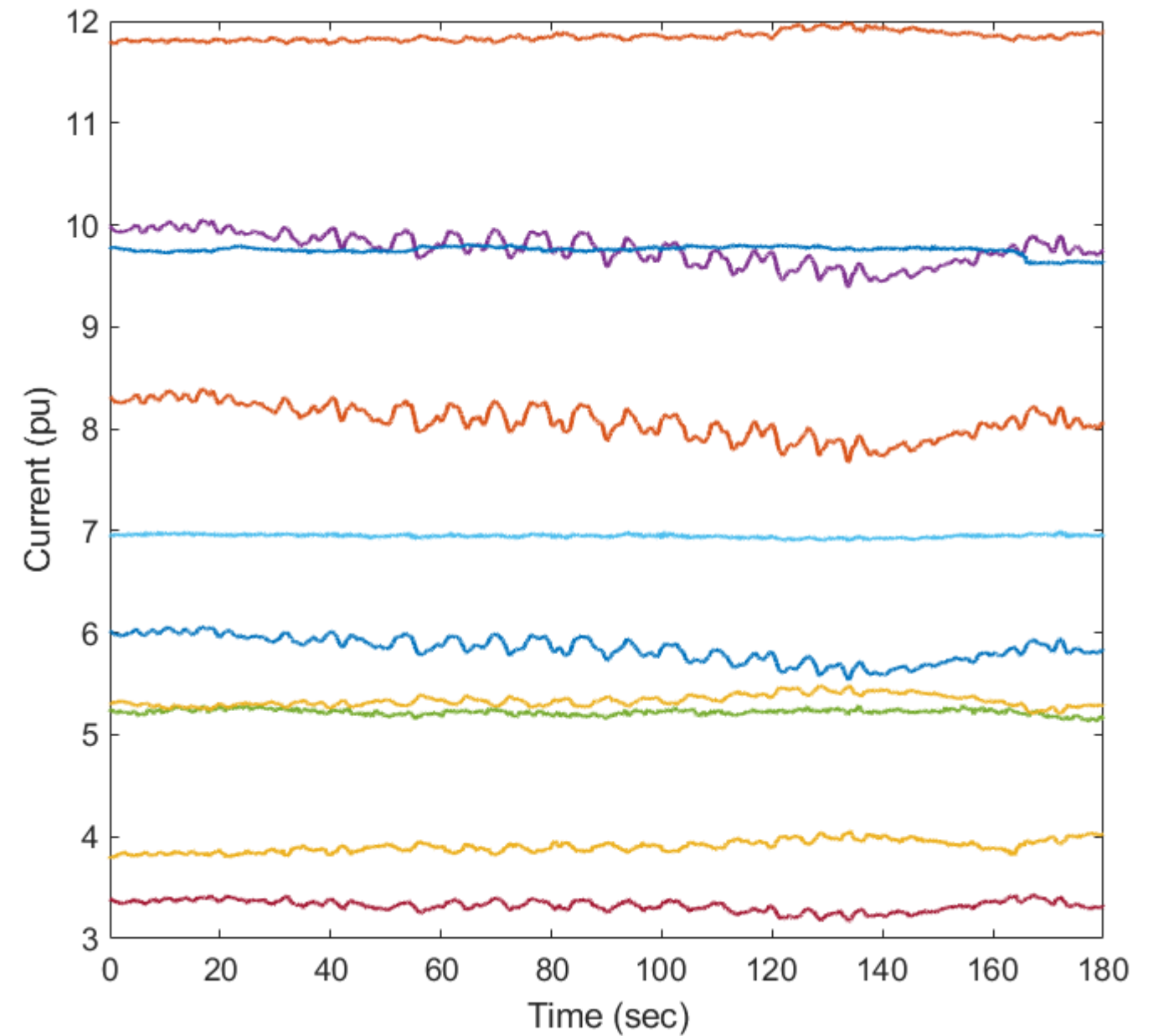
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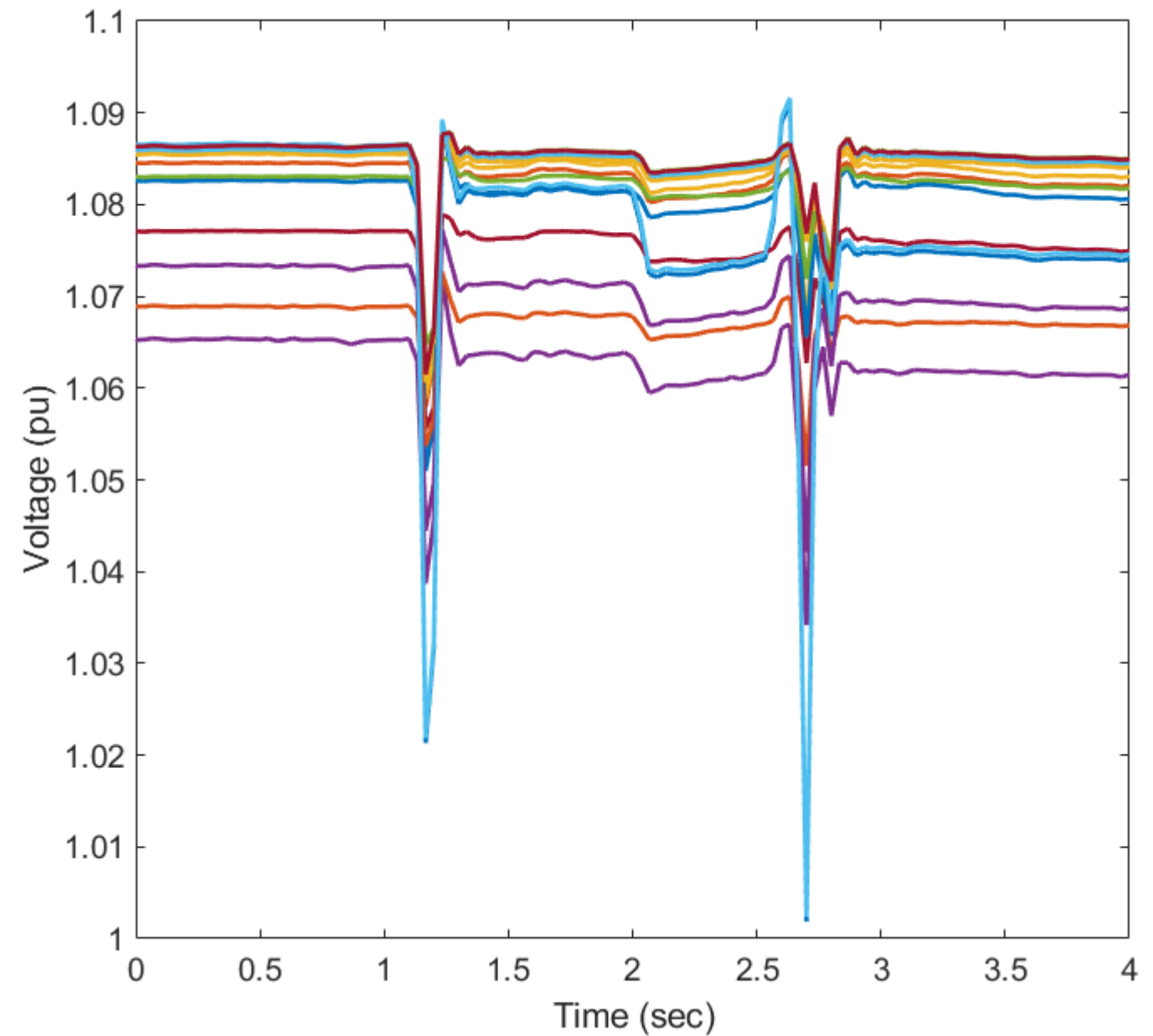
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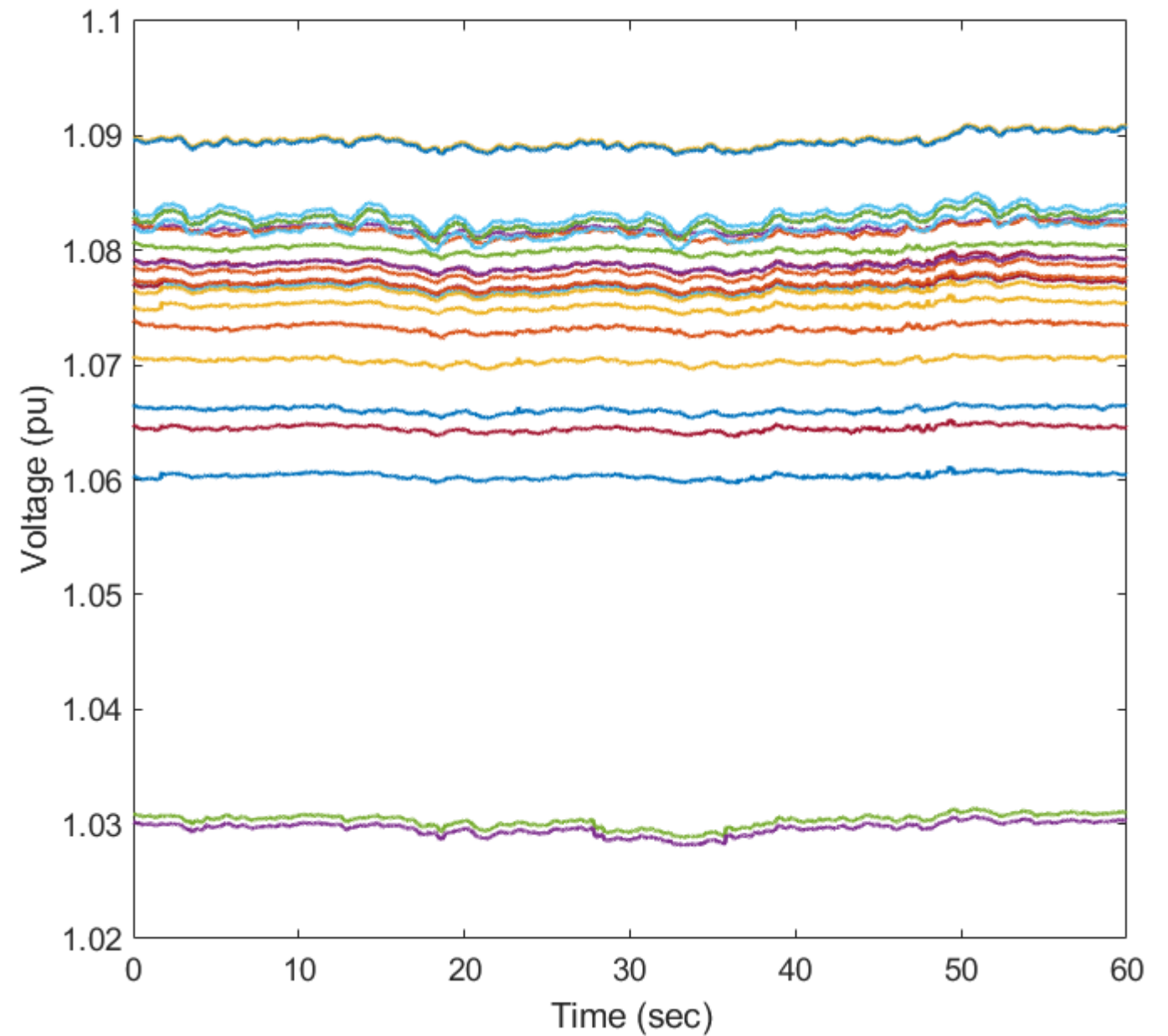
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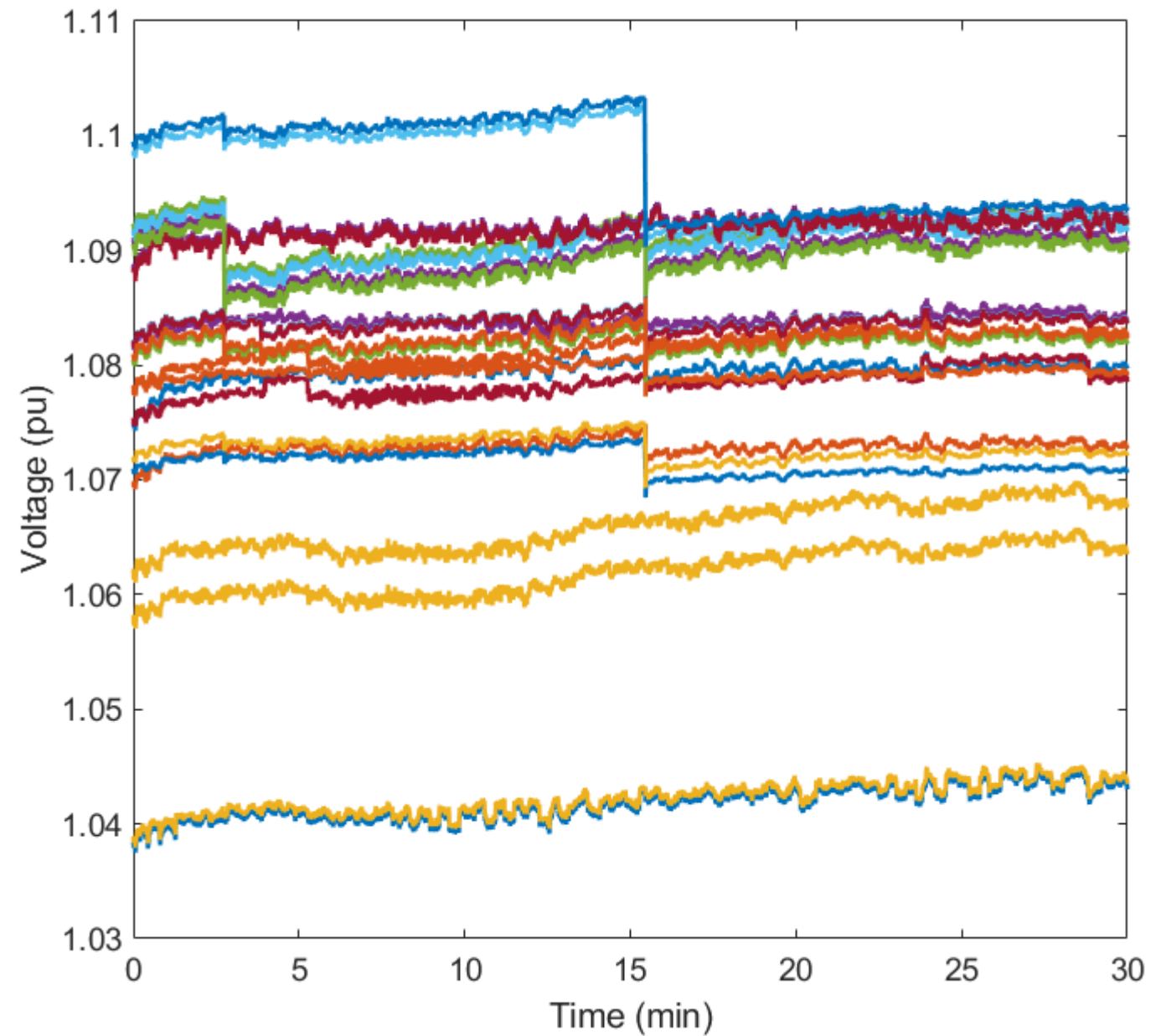
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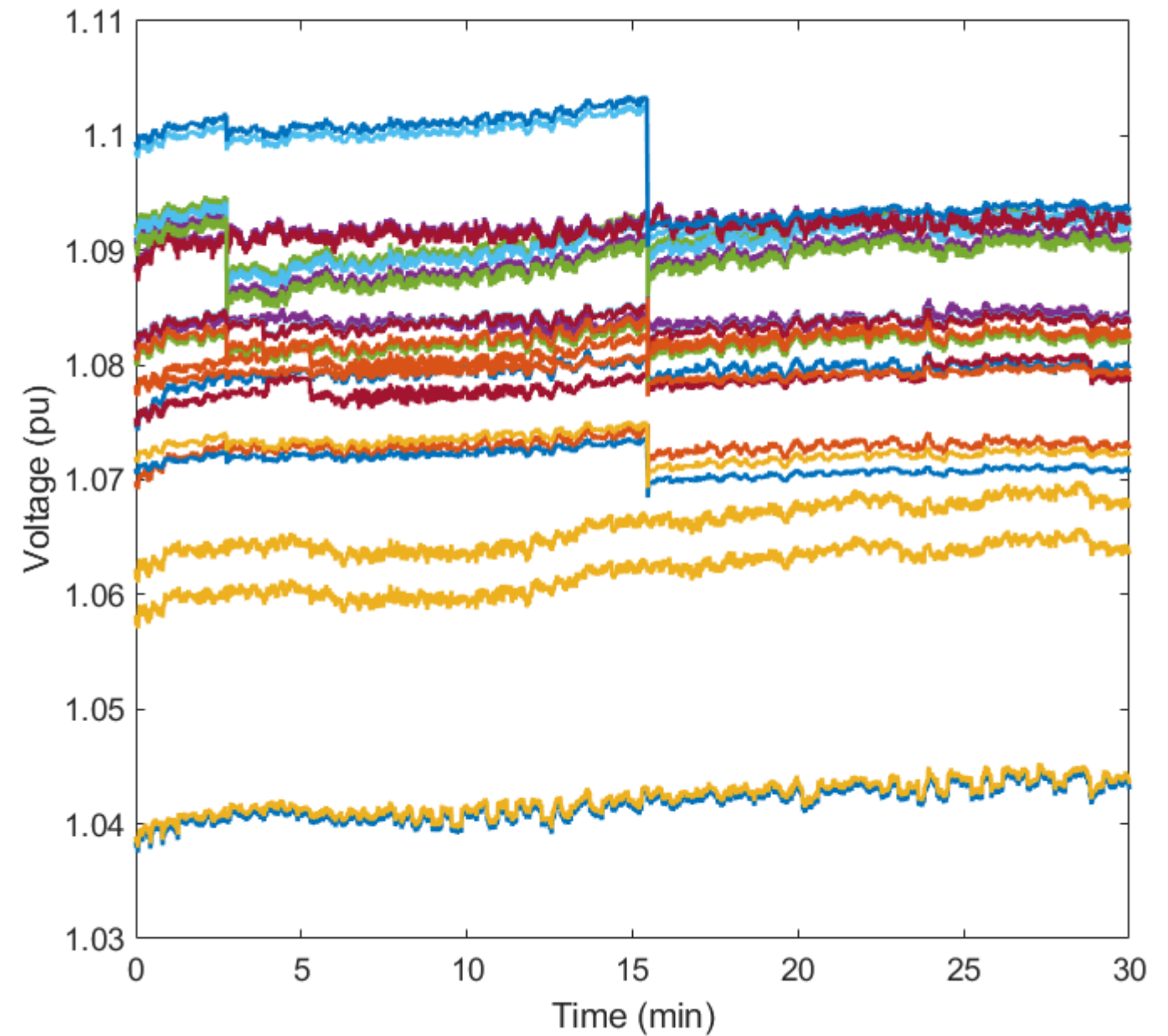
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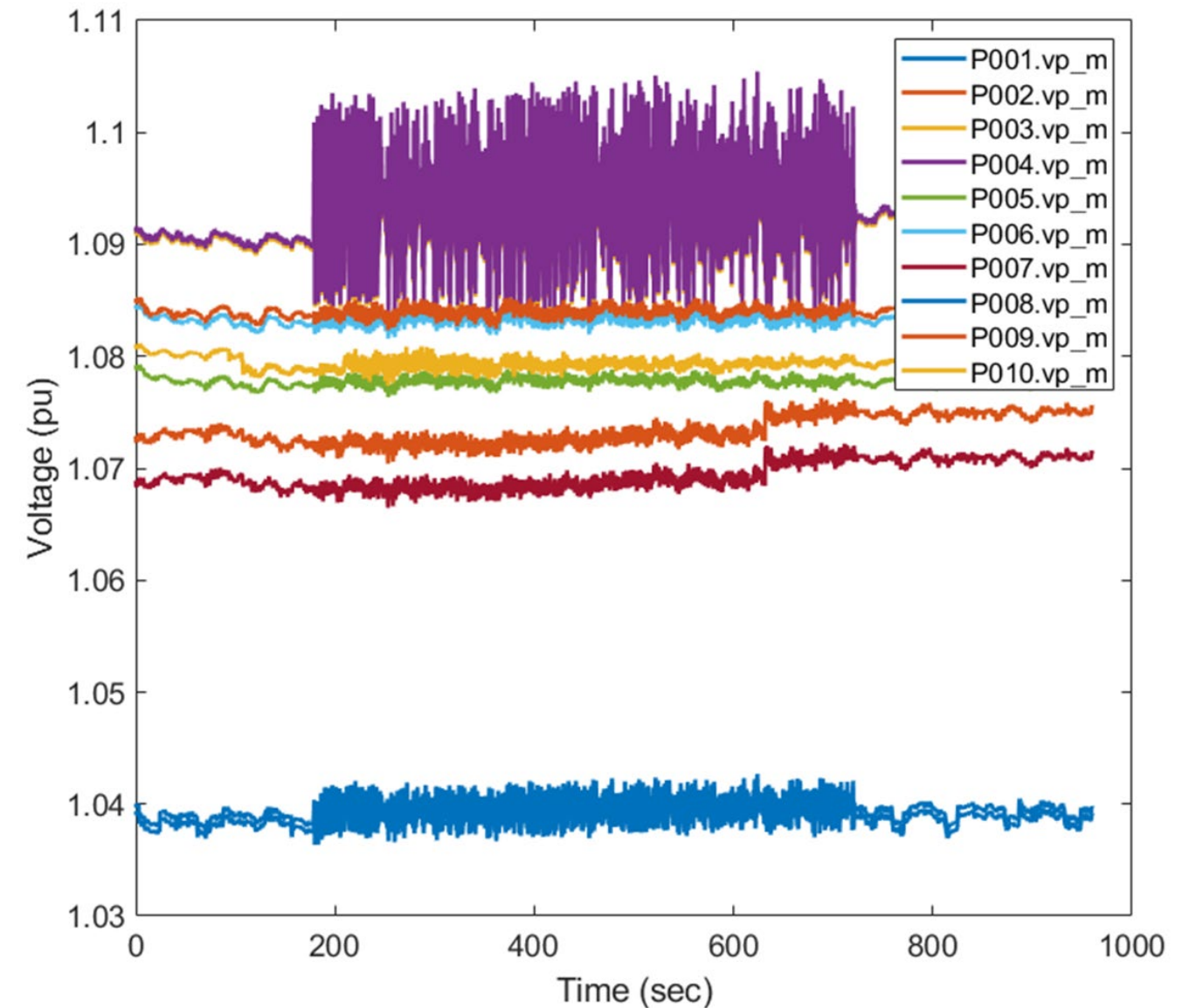
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And more!



Obfuscation

- Thank you to the utilities that provided data!
- “What do we need to do to make snapshots publicly available?”
 - No topology information
 - Substation names removed
 - IDs randomized for each event
 - One current measurement per substation
 - All data at 30 frames per second
 - UTC timestamps removed
 - Month and year retained
 - Voltage and current magnitudes converted to per unit



Suggested Uses

- Is obfuscated data useful for evaluating the grid?
Not really.
- Is it useful for education, development, testing, and demonstration?
Absolutely.

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- Educators
 - Familiarize students with real grid disturbances
 - Support students and professors without utility connections
- Researchers
 - Foster comparison as a reference dataset
 - Drastically reduce startup time for projects
 - Address risk that measurements will not be available
- Utilities
 - Reduce the burden of responding to frequent requests
 - Test capabilities developed in-house
- Vendors
 - Thoroughly validate tools
 - Demonstrate value with realistic test cases

Accessing the Data

- Go to <https://darknet-01.ornl.gov/apps/siglib> and request a pass
- Synchrophasor events are divided between two “providers”:
 - Provider 9 – Eastern Interconnection
 - Provider 10 – Western Interconnection



Thank you

