Short-term Frequency Prediction in Bulk Power System

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MOTIVATION

Frequency prediction enables grid operators to anticipate and respond to dynamic changes in supply and demand, ultimately ensuring the reliable and secure operation of electrical grids.

- System Stability
- Energy Balance
- Renewable Integration
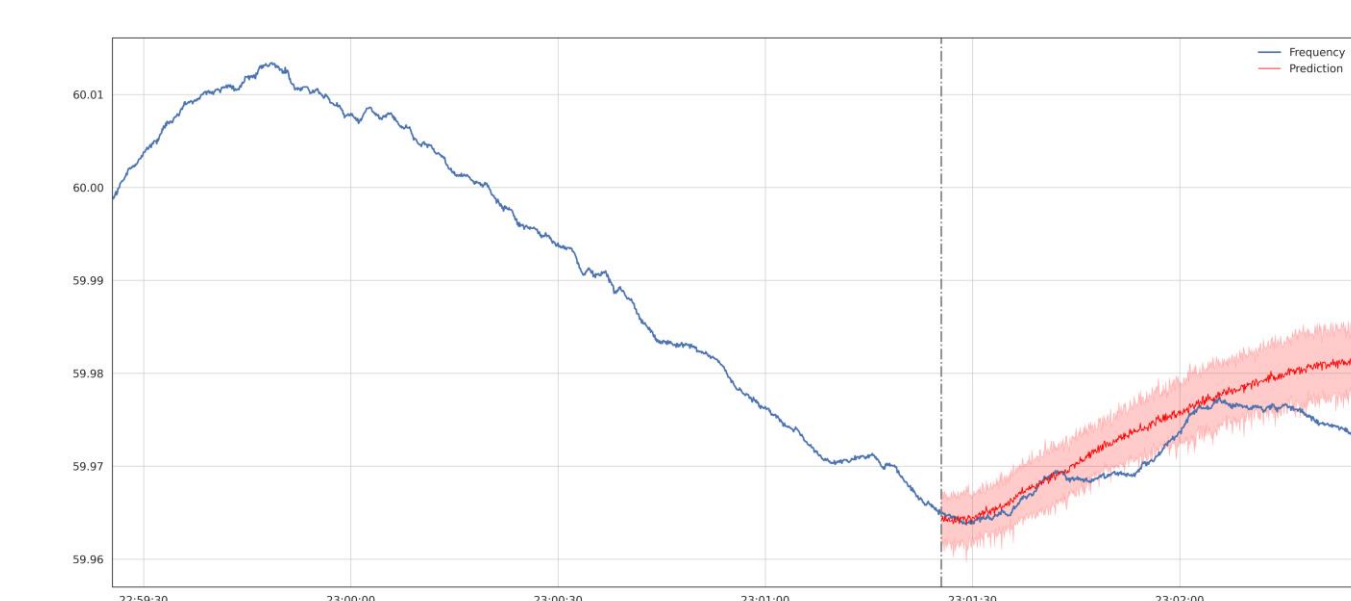
- Grid Resilience
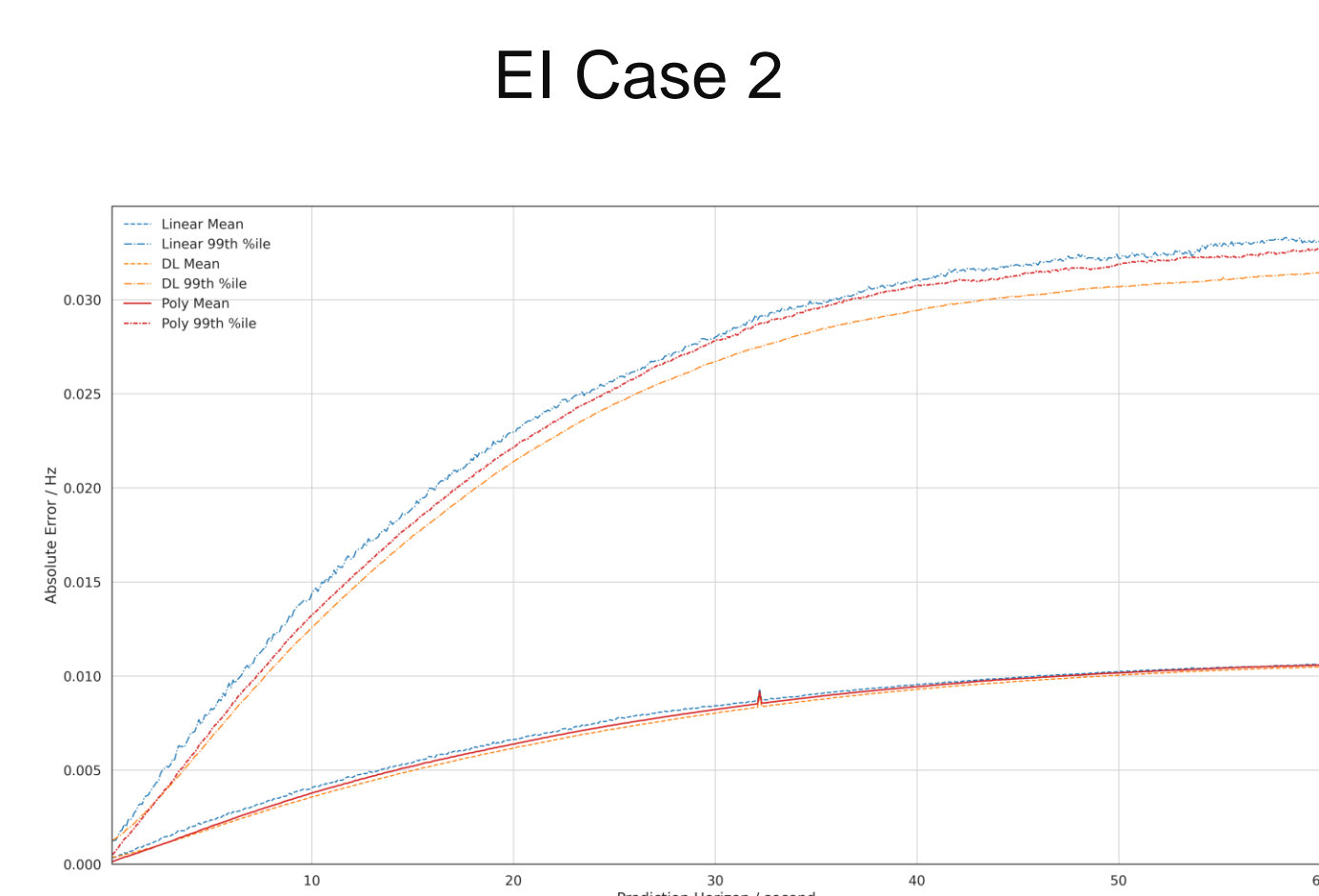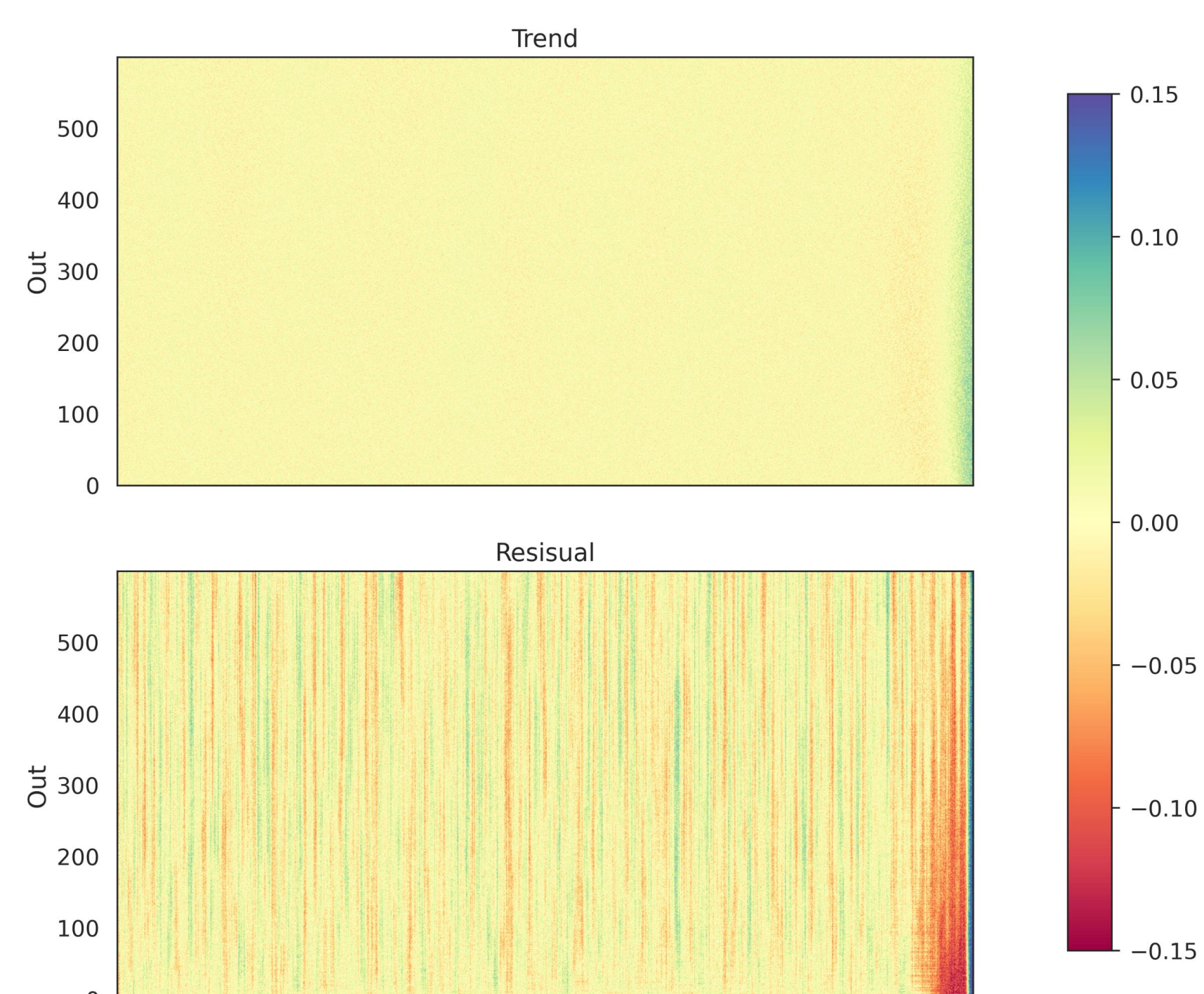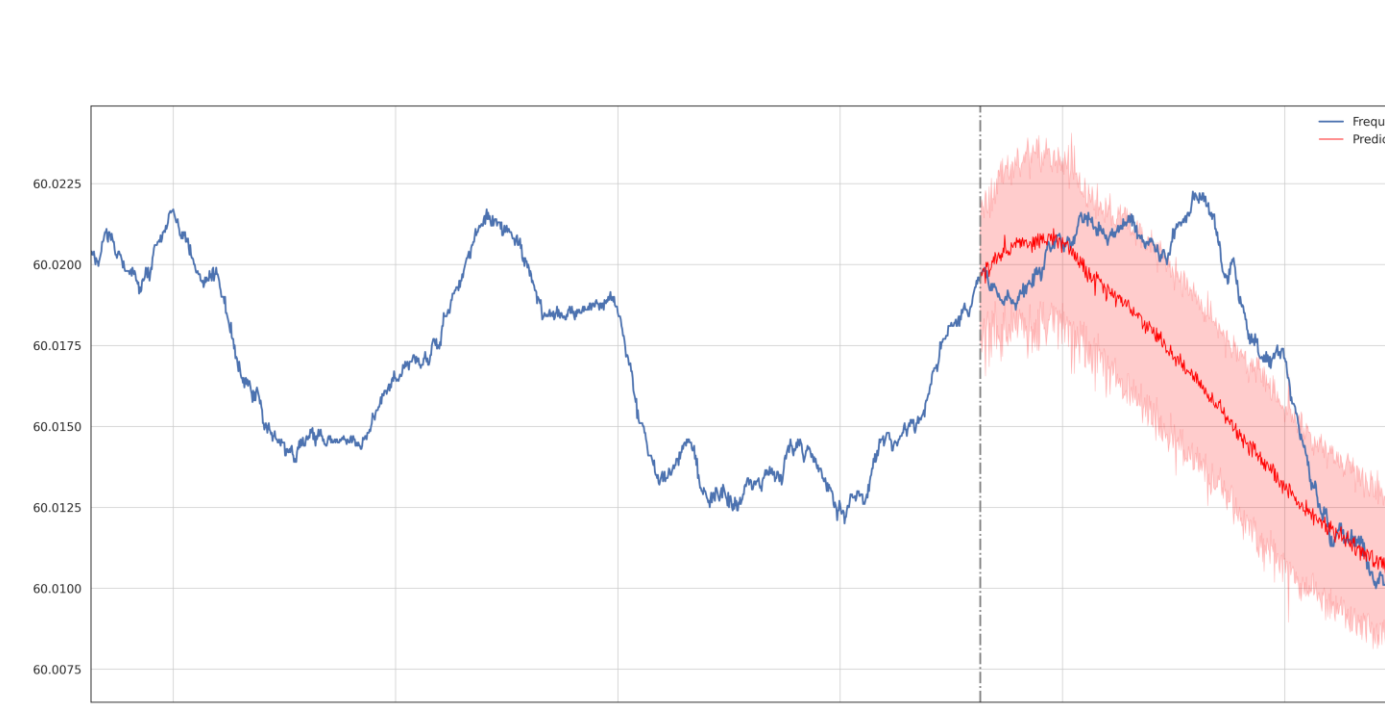- Efficiency

DIFFICULTIES

Factors impacting frequency:
- Load Power Change
- Generator Power Change
- Generator Control and Protection
- Load Control and Protection
- Fault, Oscillation, and Stability Issue
- Measurement Issue

ACF

Southwest China

United Kingdom

WECC
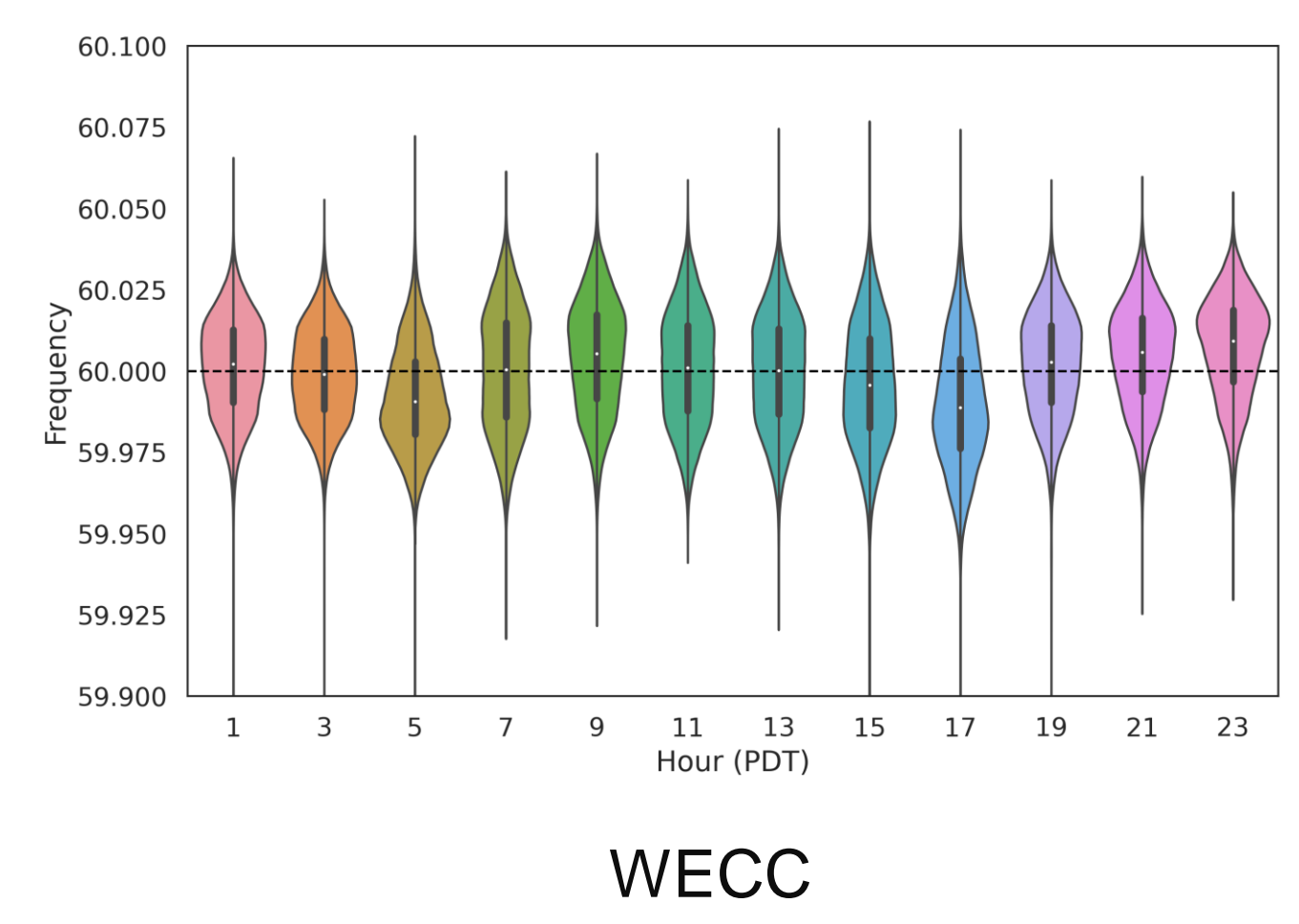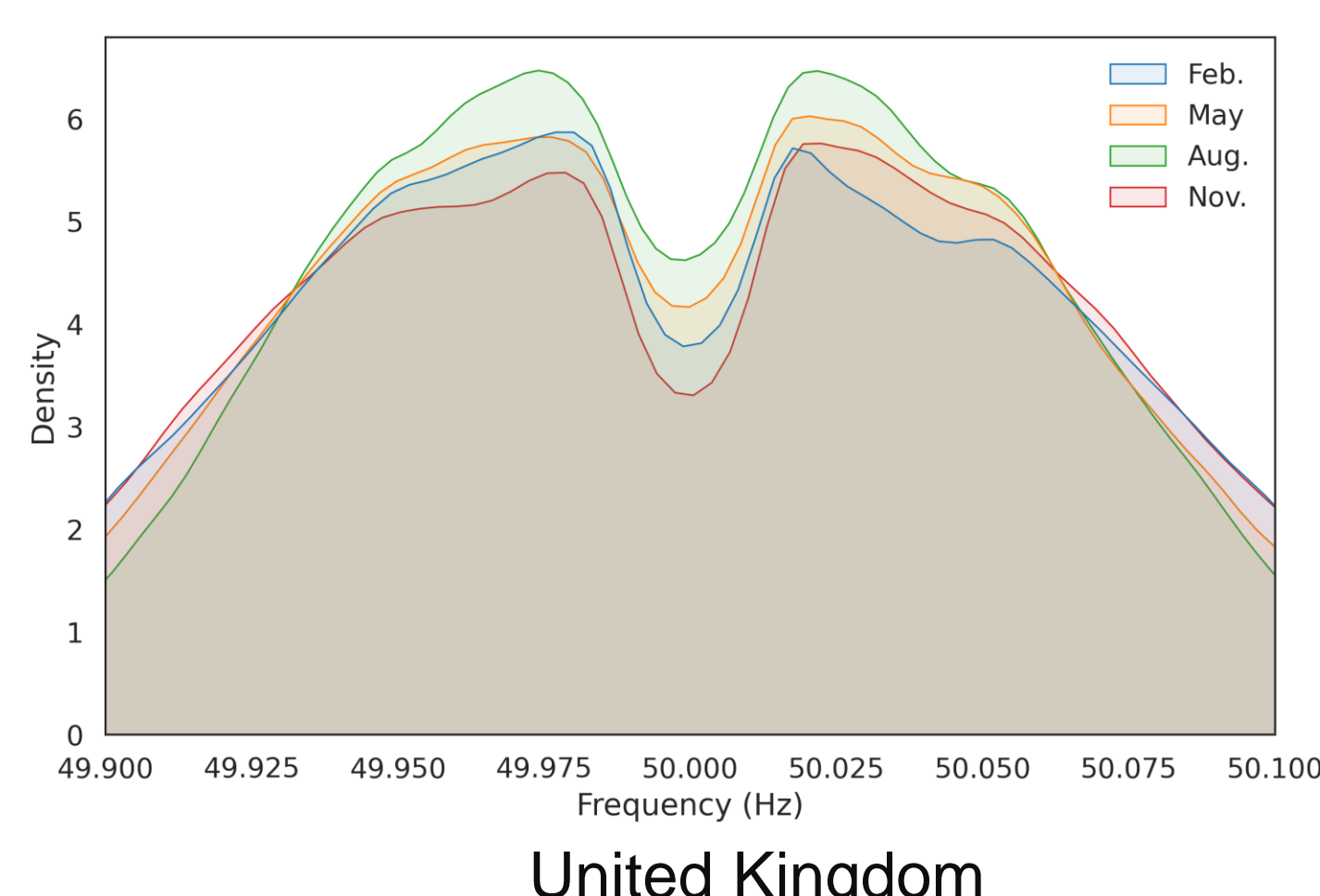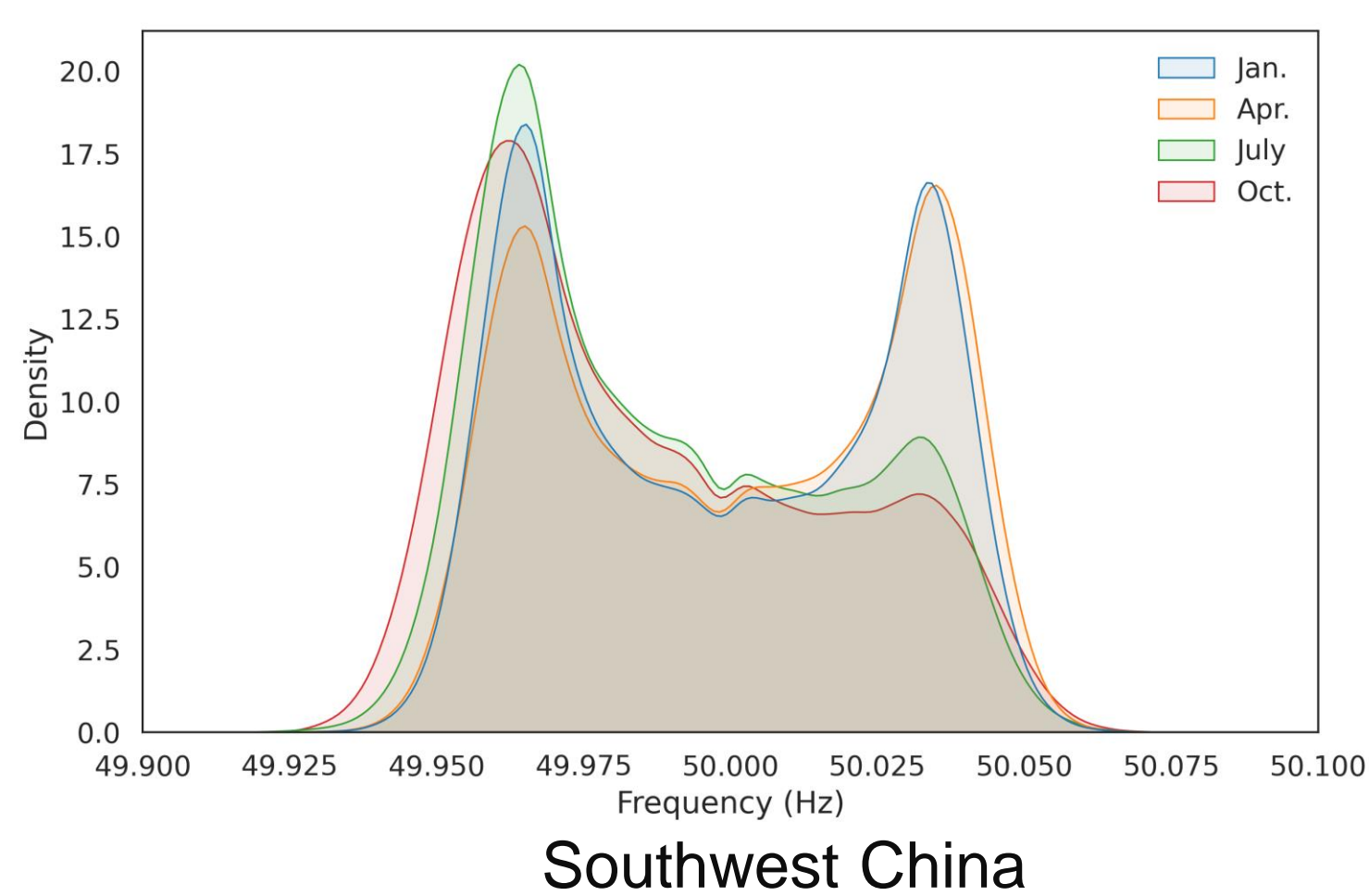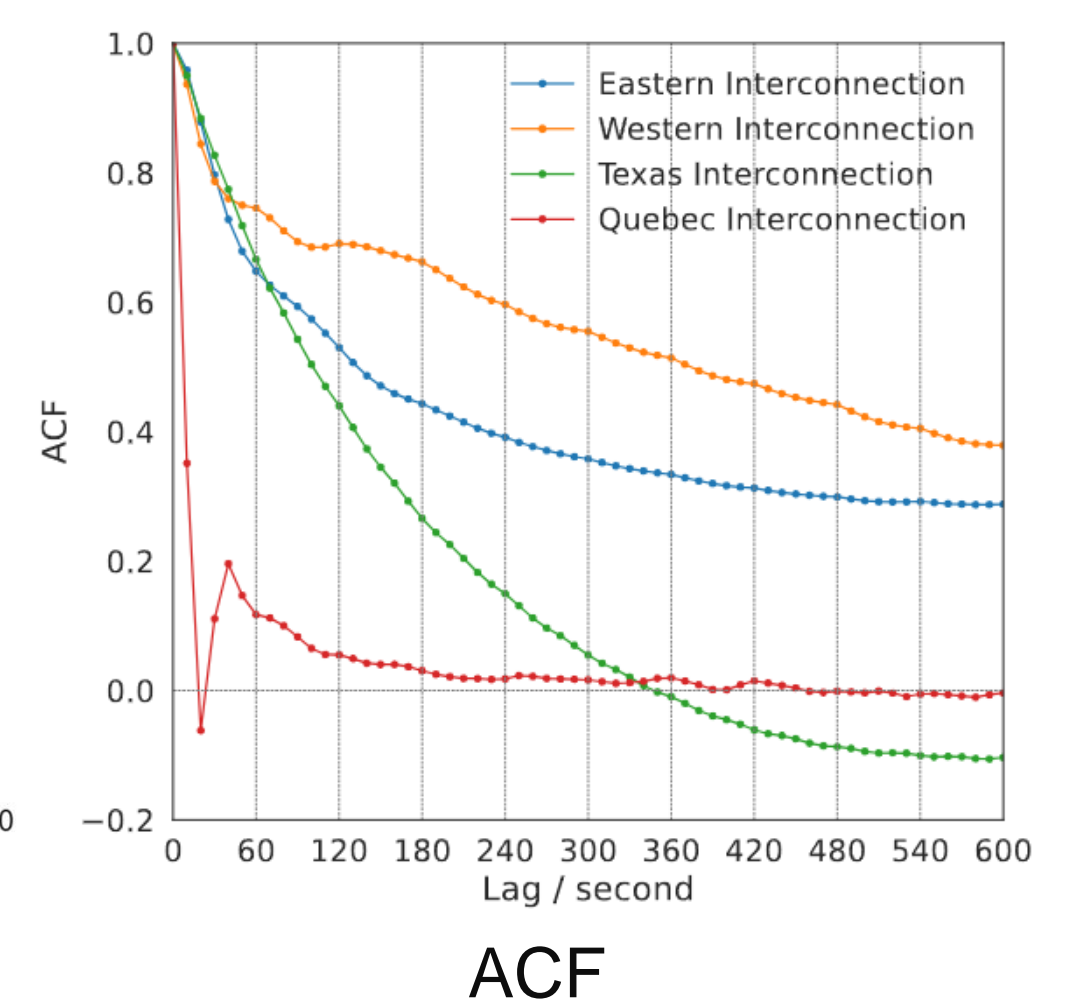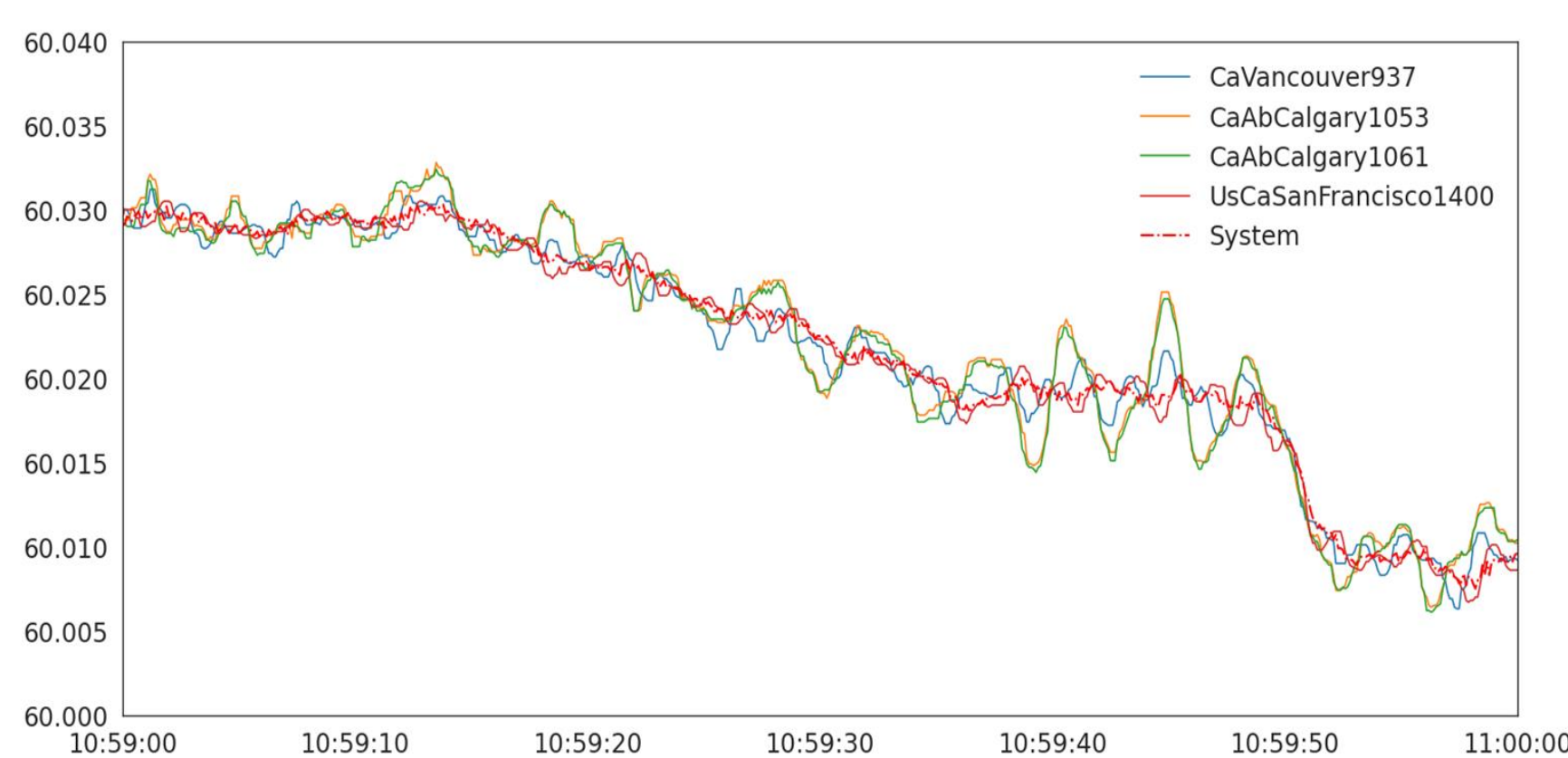
CONCLUSION

- Deep Learning (DL) model has highest accuracy, max error 0.012 Hz for 10-sec in Eastern IC.

- Polynomial model yields slightly worse accuracy but provides better interpretability thus more favorable

EI Case 2

Trend

Resisual

Learned Weights Visualized

EI Case 1

EI Prediction Error