CRSTT Advanced State Estimation Survey

• CRSTT prepared 20 questions on State Estimation (SE)
• Questions were programmed by PNNL as an online survey:
  – Thank you, Teresa!
• CRSTT received 46 Usable Responses
  – Some questionable and need additional clarifications
SCADA-Based SE

Do you run conventional SCADA-only State Estimation?

Yes: 76%
No: 24%

How frequently (in seconds) do you run SCADA-only State Estimation?

900 s: 2.17%
300 s: 17.39%
240 s: 2.17%
180 s: 8.70%
120 s: 6.52%
60 s: 10.87%
30 s: 6.52%
4 s: 2.17%
I don't know: 43.48%
SCADA-Based SE (continued)
Using PMU Data for SE

Do you use synchrophasor data for State Estimation?

- Yes: 33%
- No: 52%
- I don't know: 15%

Is there a plan to use synchrophasor data for State Estimation in the future?

- Yes: 46%
- No: 11%
- I don't know: 43%
Using PMU Data for SE (continued)

Approximately how many PMU signals do you use for State Estimation?

- 600+ signals: 2%
- 300 - 600 signals: 4%
- 100 - 300 signals: 9%
- 1-100 signals: 11%
- I don't know: 74%

Which PMU signals do you use?

- Voltage Angle: 26%
- Current Angle: 9%
- Voltage Magnitude: 28%
- Current Magnitude: 13%
- I don't know: 24%
Hybrid SE

Do you run Hybrid State Estimation?

- Yes: 26%
- No: 4%
- I don't know: 70%

How frequently (in seconds) do you run your Hybrid State Estimation?

- 300 s: 2%
- 60 s: 11%
- 30 s: 4%
- 20 s: 2%
- 15 s: 2%
- 5 s: 2%
- I don't know: 76%
Hybrid SE (continued)

Do you use higher weights for PMU data compared to SCADA in your Hybrid State Estimation?

- Yes: 4%
- No: 13%
- I don't know: 83%

What is the update rate (in seconds) for the synchrophasor data that is used for Hybrid State Estimation?

- 60 s: 2%
- 25 s: 2%
- 6 s: 4%
- 2 s: 2%
- 1 s: 9%
- I don't know: 80%
Pros and Cons of Using PMU Data in Conventional SE

Do you have any concerns about using PMU data in conventional State Estimation?

- Yes: 9%
- No: 13%
- I don't know: 78%

Can you quantify the observed benefit of using PMU data in conventional State Estimation?

- Reduction of critical measurements: 2%
- New measurements from unobservable stations: 2%
- Angular visibility: 2%
- Just a redundant measurement: 4%
- None at this time: 9%
- Increase in the Solution Robustness: 7%
- Solution Mismatch Reduction: 2%
- I don't know: 72%
Linear SE

Do you run Linear State Estimation?

- Yes: 4%
- No: 24%
- I don’t know: 72%

Do you plan to run Linear State Estimation in the future?

- Yes: 11%
- No: 11%
- I don’t know: 78%
Linear SE (continued)

How frequently (in seconds) do you run your Linear State Estimation?

- 1 sec: 4%
- 5 sec: 2%
- I don't know: 93%

What is the approximate size (in number of buses) of your Linear State Estimator model?

- 256 buses: 2%
- 500 buses: 2%
- I don't know: 96%
Linear SE (continued)

In what environment do you run Linear State Estimation?

- Research Lab: 2%
- Pre-production Testing: 4%
- Production: 4%
- I don't know: 92%

How are the results of Linear State Estimation used by your organization?

- Data quality reporting intelligence: 2%
- Back-up for Conventional State Estimation: 2%
- Bad data detection and conditioning: 7%
- I don't know: 92%
Conclusions

• Based on the survey results:
  – Too many “I don’t know” responses
  – PMUs are being used in conventional state estimators:
    • Limited number of signals are being used
  – Very few instances of deployment of PMU-based (linear) state estimator

• How can NASPI/CRSTT promote benefits of PMU-based state estimation?