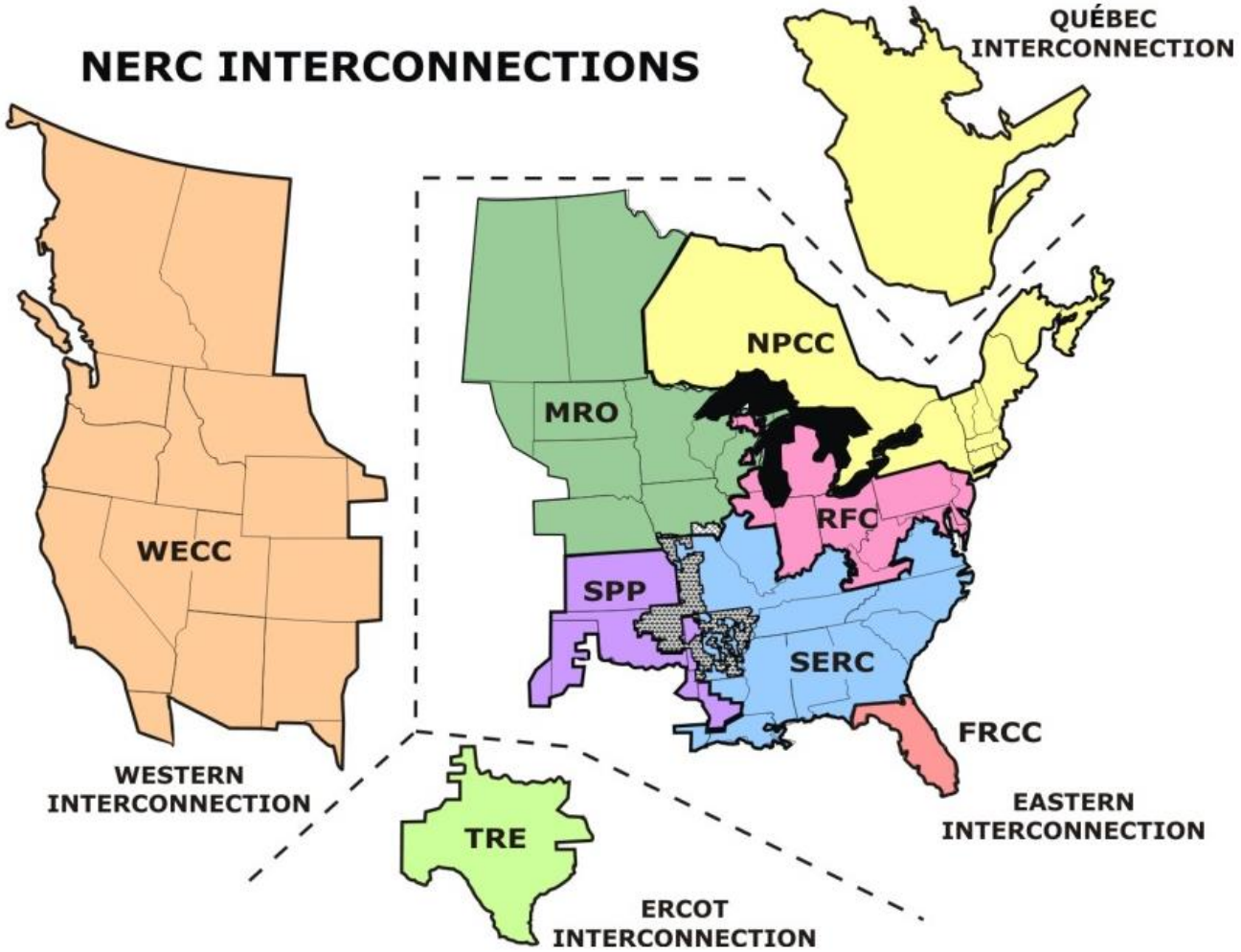
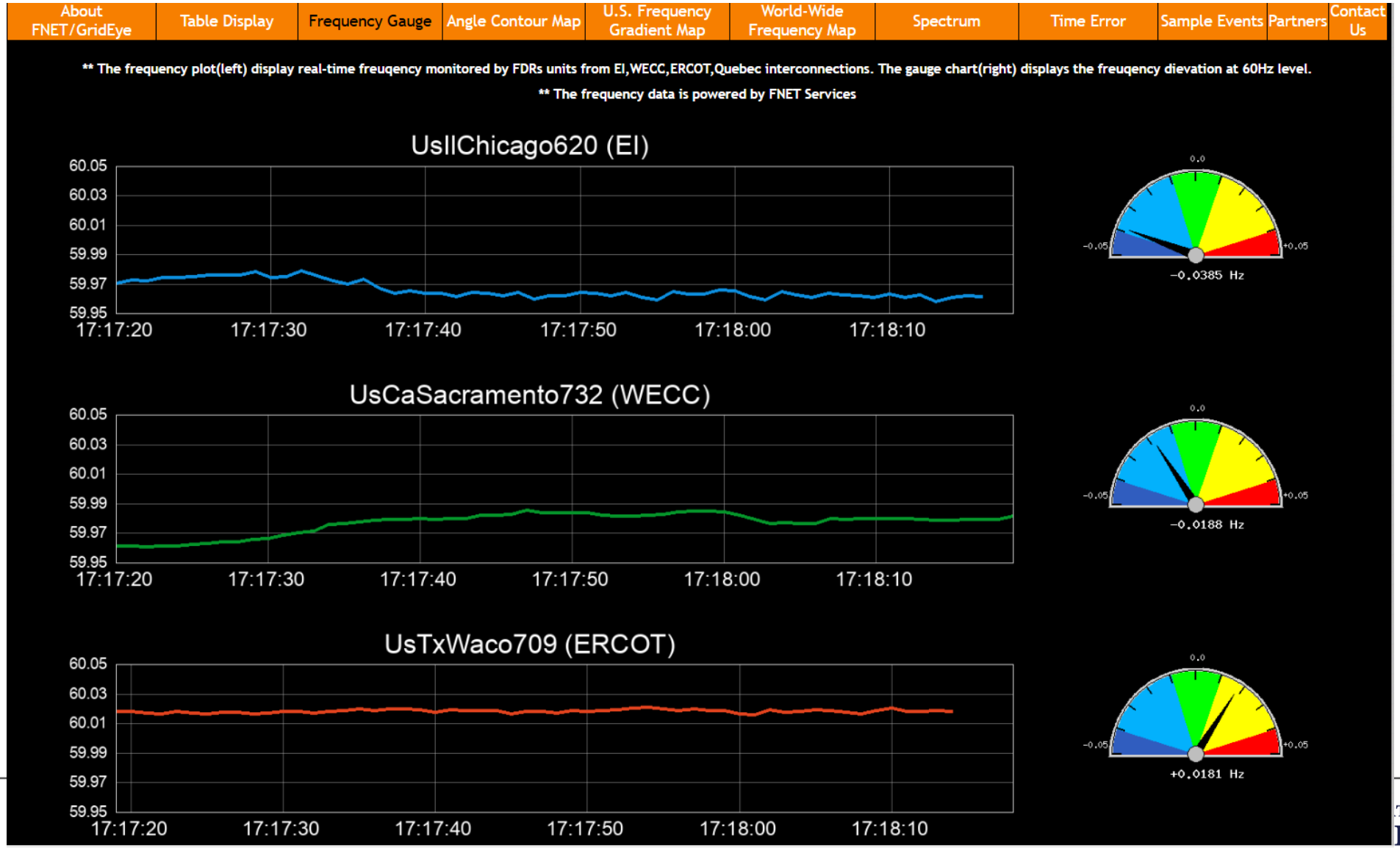
CGSIC 2026
Timing in the Energy Sector

Four North American Grids



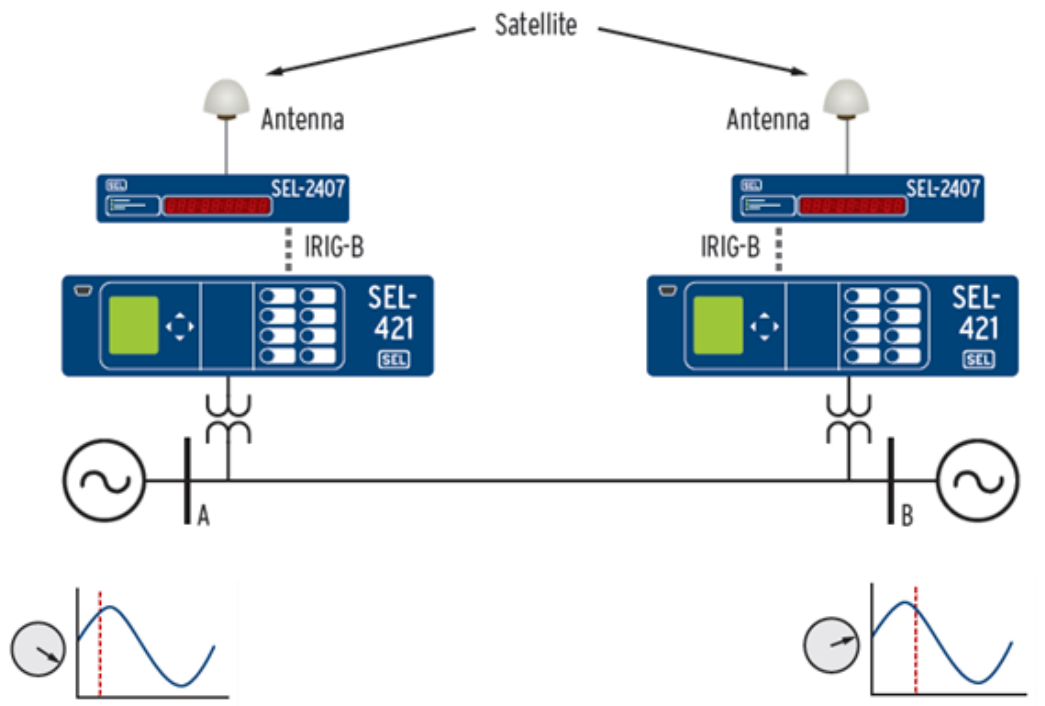
- Each interconnect is synched electrically.
- Each interconnect requires synchronized timing.

Actual frequency across the interconnects



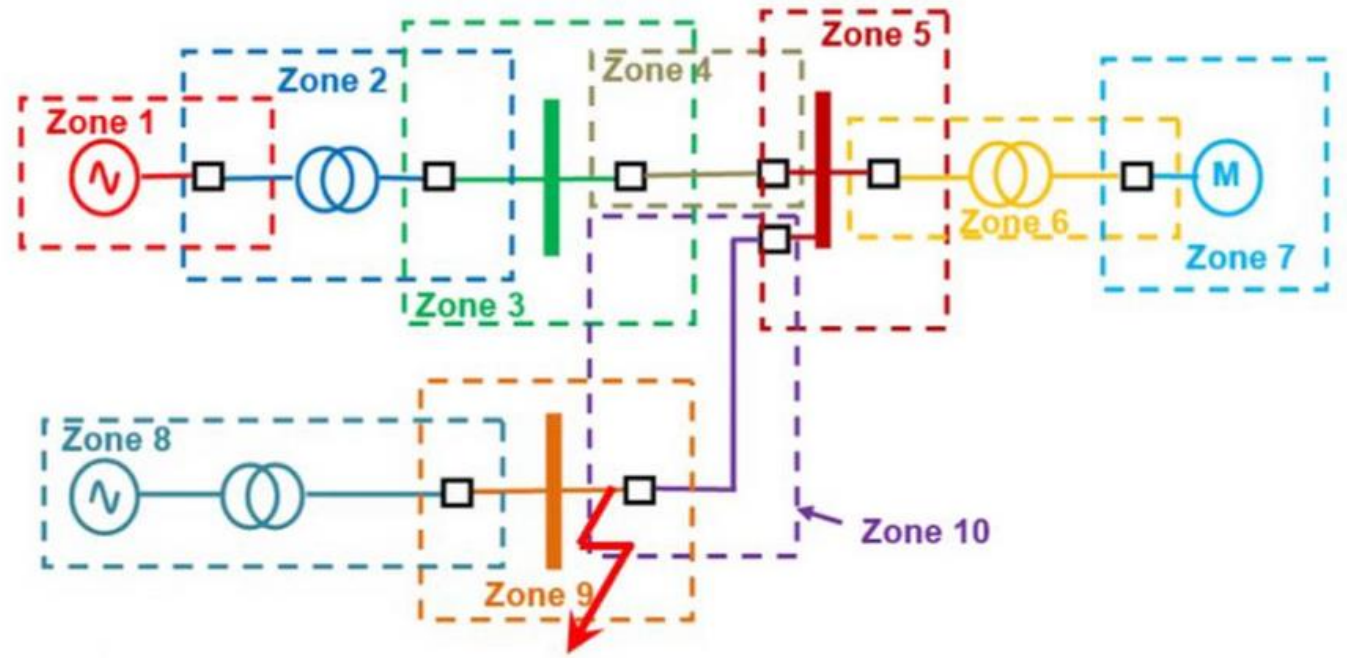
Synchrophasors, aka Phasor Measurement Units

- What does it do?
- Matches magnitude with time for a single measurement
- Allows comparison of various places in the interconnect with respect to time – if there is wide area synchronized time.



Zones of Protection

A power system is divided into 10 protection zones, as illustrated in the figure below. If a fault occurs at the overlap region of Zone 9 and Zone 10, which zone(s) should open circuit breakers?



- ○ Zone 9
- ○ Zone 8, Zone 9, Zone 10, and Zone 5
- ○ Zone 9 and Zone 10
- ○ Zone 10

Energy Sector PNT Work

1. Completed March 2021, PNNL-30780
    1. Version 2 available
2. PNT Testing
    1. Testing the 5 electric grid use cases of IEEE P1952
    2. PNNL team working with Volpe
3. eLORAN Testing
    1. PNNL
4. DHS - Iridium
    1. Testing with multiple utilities

We will work with any federal partners to test systems on the electric grid.

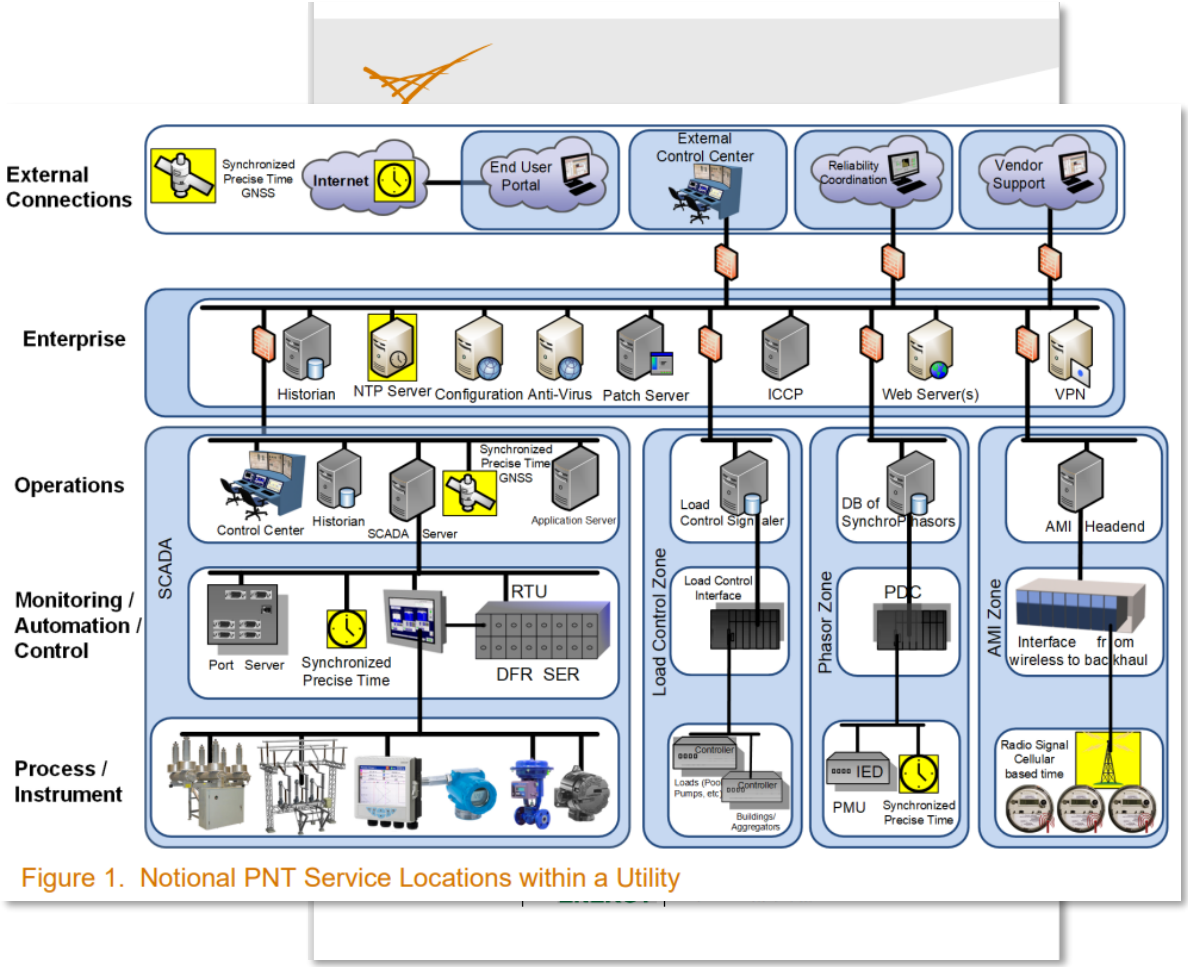
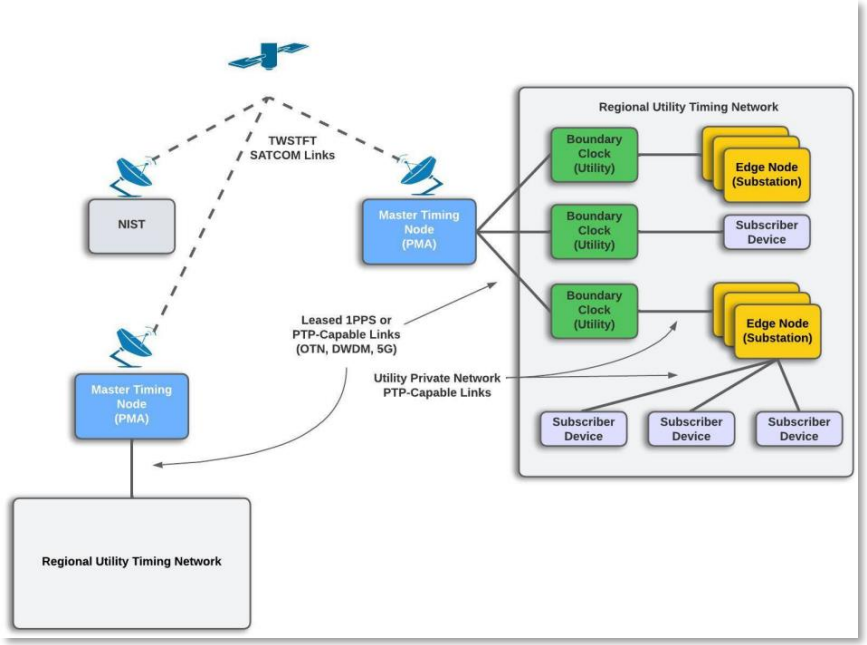


Figure 1. Notional PNT Service Locations within a Utility

DOE Timing Initiative

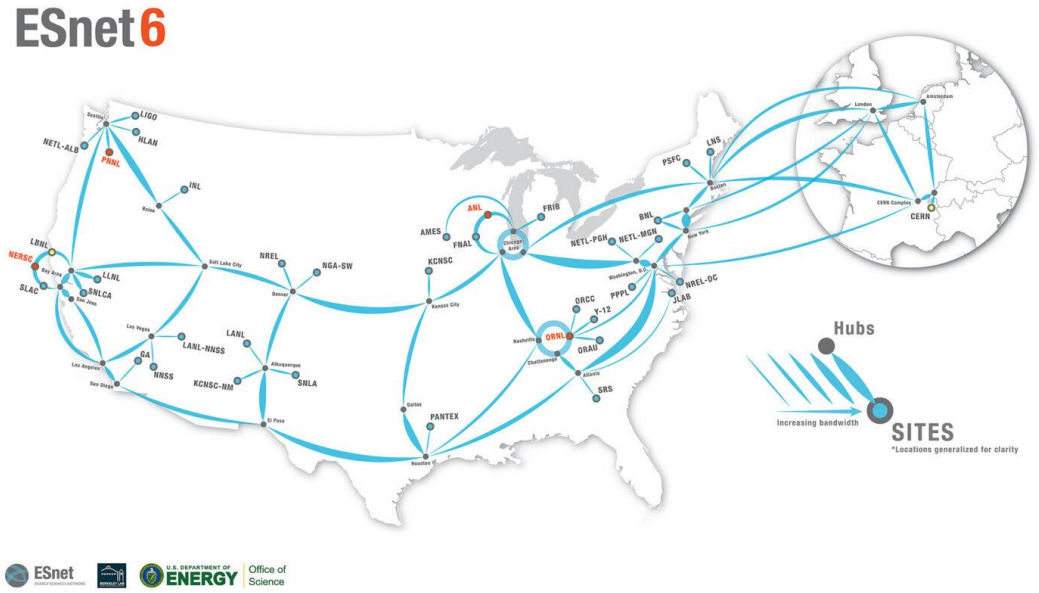
- Focused on the design, R&D, testing, and validation of timing and synchronization architectures that can broadly support grid applications (PTP).
- Emphasis on COTS
- Team:
  - Oak Ridge National Laboratory
  - Idaho National Laboratory
  - Sandia National Laboratory
  - NIST
  - Western Area Power Administration
  - Tennessee Valley Authority

CAST
— Center for Alternative — Synchronization and Timing



What we would like to do

- Test actual impact of P1952 use cases to determine the consequences of a loss or manipulation of any time source.
  - Past events in Denver and Dallas had no impact on electrical service.
- Develop a DOE PNT Strategic Plan (very jealous of DOT) in FY27.
- Work with USNO in getting their time on ES-NET



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