Timing Requirements for a Distributed Grid

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Time and Synchronization Across Industries: A 2020 Vision
March 26, 2019
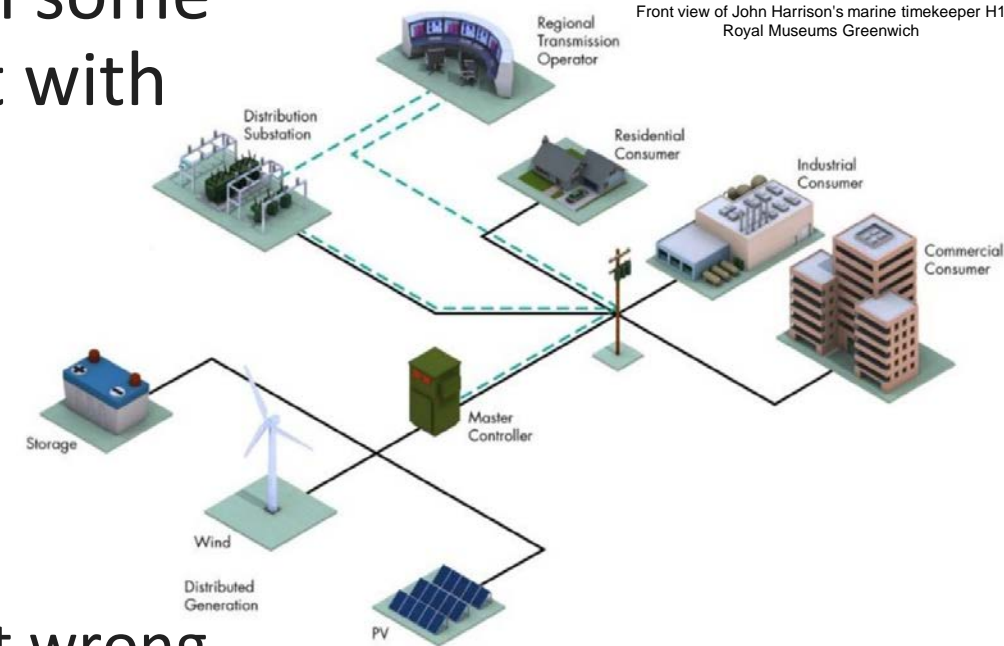
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Time – Why does it matter?

Front view of John Harrison's marine timekeeper H1
Royal Museums Greenwich

- The power delivery system has seen a significant increase in automated devices that act with some intelligence either individually or in concert with other devices.

- These devices tend to be quite reliable in performing their intended function.

- However,

  - when things <u>don't go as expected</u>

  - and someone needs to <u>troubleshoot</u> what went wrong

  - it is essential to create a <u>sequence of events</u> diagram

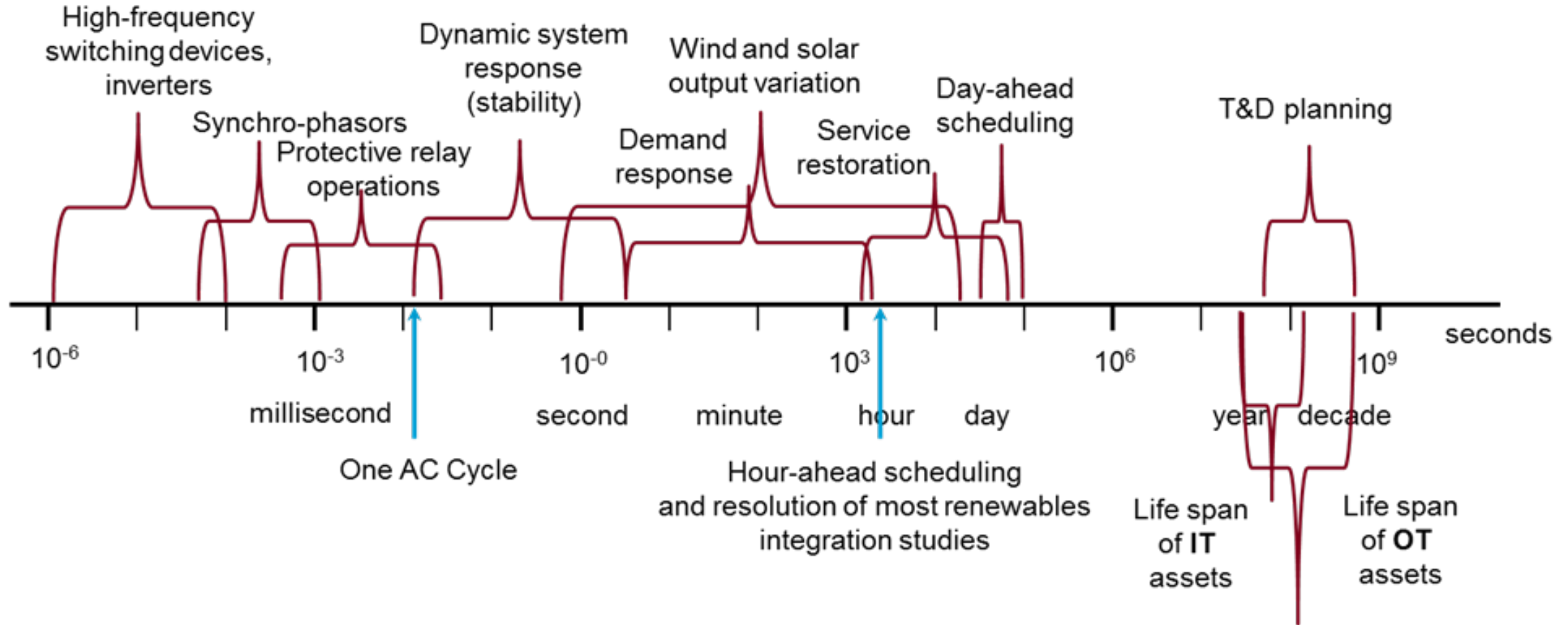 - then use the timeline to <u>interpret the actions</u> and conclude the results.

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Future Electric System

Highly Connected, Highly Interactive and Highly Interoperable

Utility Data Spans a Wide Time Scale

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Details Matter

- Developing the sequence of events diagram sounds simple to achieve however like most items the "devil is in the details"

- Knowing how each device is configured gets to be very important

- Important to also know when and where was the time stamp applied to the data.
  - In some cases the time stamp is applied at the source however the time stamp may be applied to the data when that data is received by the master process which is the case for many SCADA systems.

More Details

- Is the time clock in the device set for local time or Universal Coordinated Time (UTC)?

- Does the device adjust for daylight savings time or not?

- What time source is used to keep the device clock current or is it just set once at commissioning and left to drift over time?

- **These are just a few of the issues related to using time in an analysis.**

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Results from a Recent Survey on Precision Time

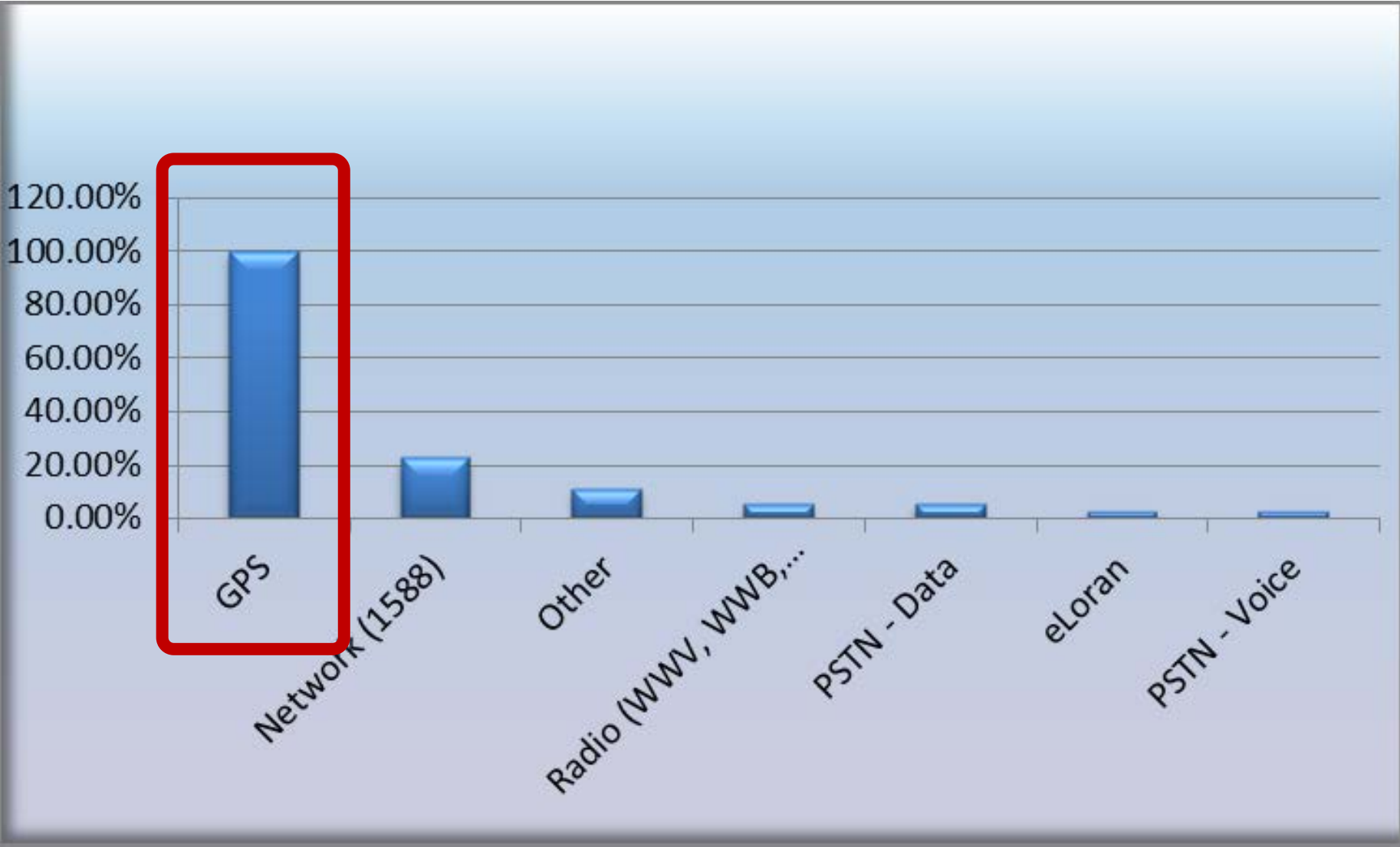## EPRI | ELECTRIC POWER RESEARCH INSTITUTE

Precision Time Survey

- Assess the current state of precision time use by electric utilities

- Responses from 35 individuals at 24 utilities

- Responses segregated by Gen, Tx and Dx

- Survey focused on the following:

  - Utility requirements for precision time

  - Technologies and standards

  - Applications that require accurate time

  - How precision time is being implemented

 - Alternative options being considered (if any) by utilities

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Primary drivers for installing and using precision time clocks

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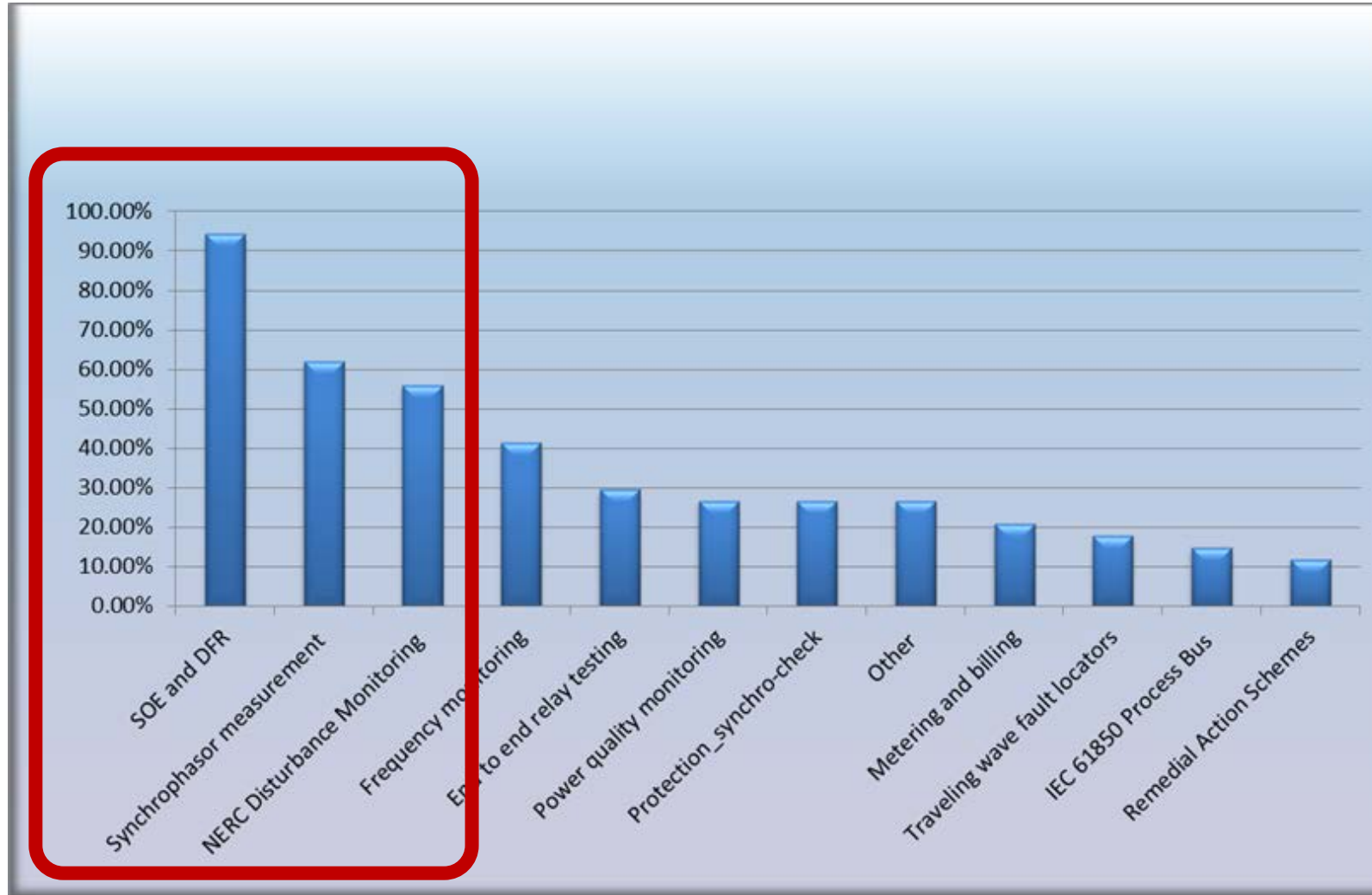
External sources for precision time

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Time distribution protocols / signals currently used

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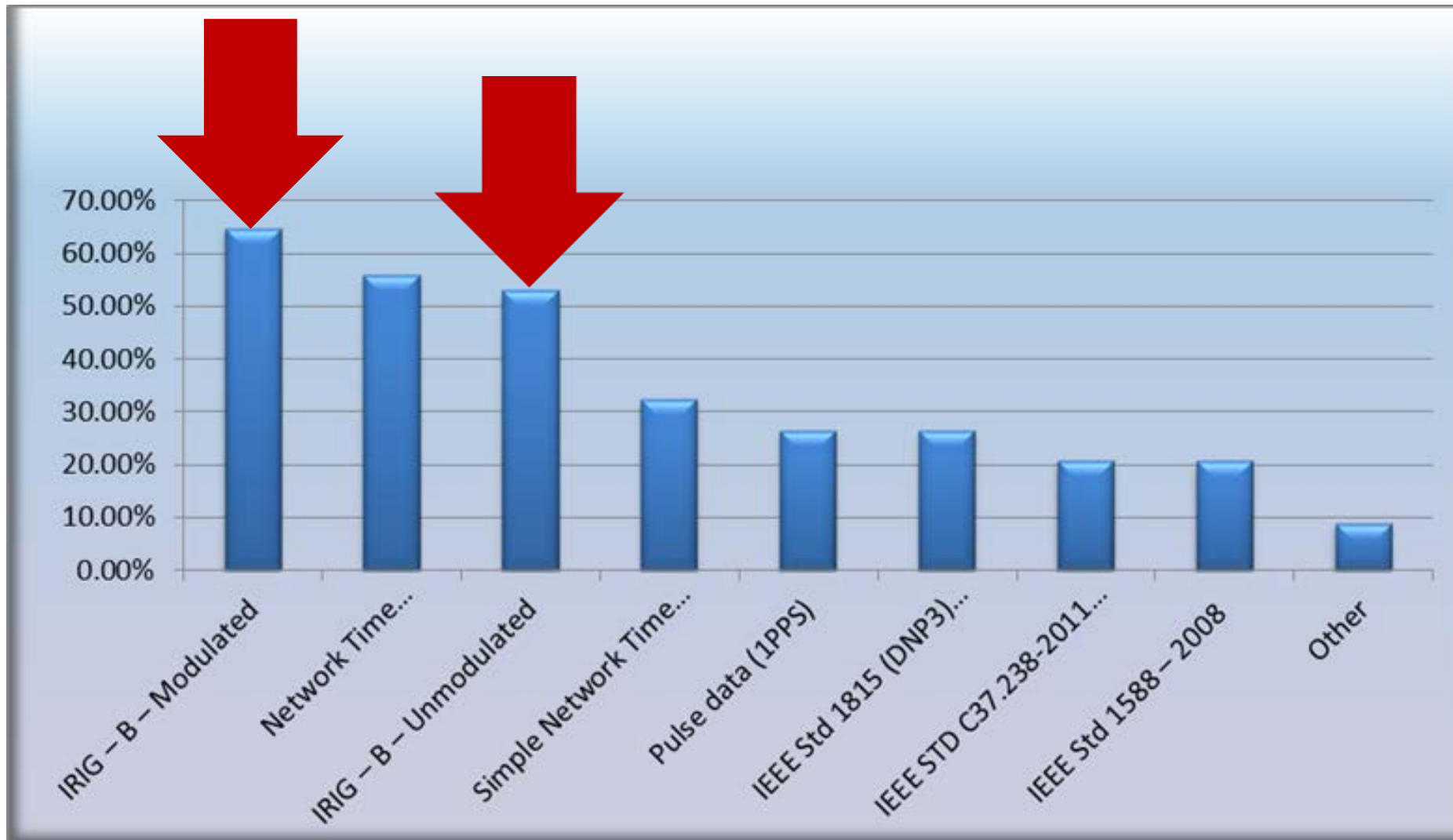
Summary of All assets connected to the precision time source

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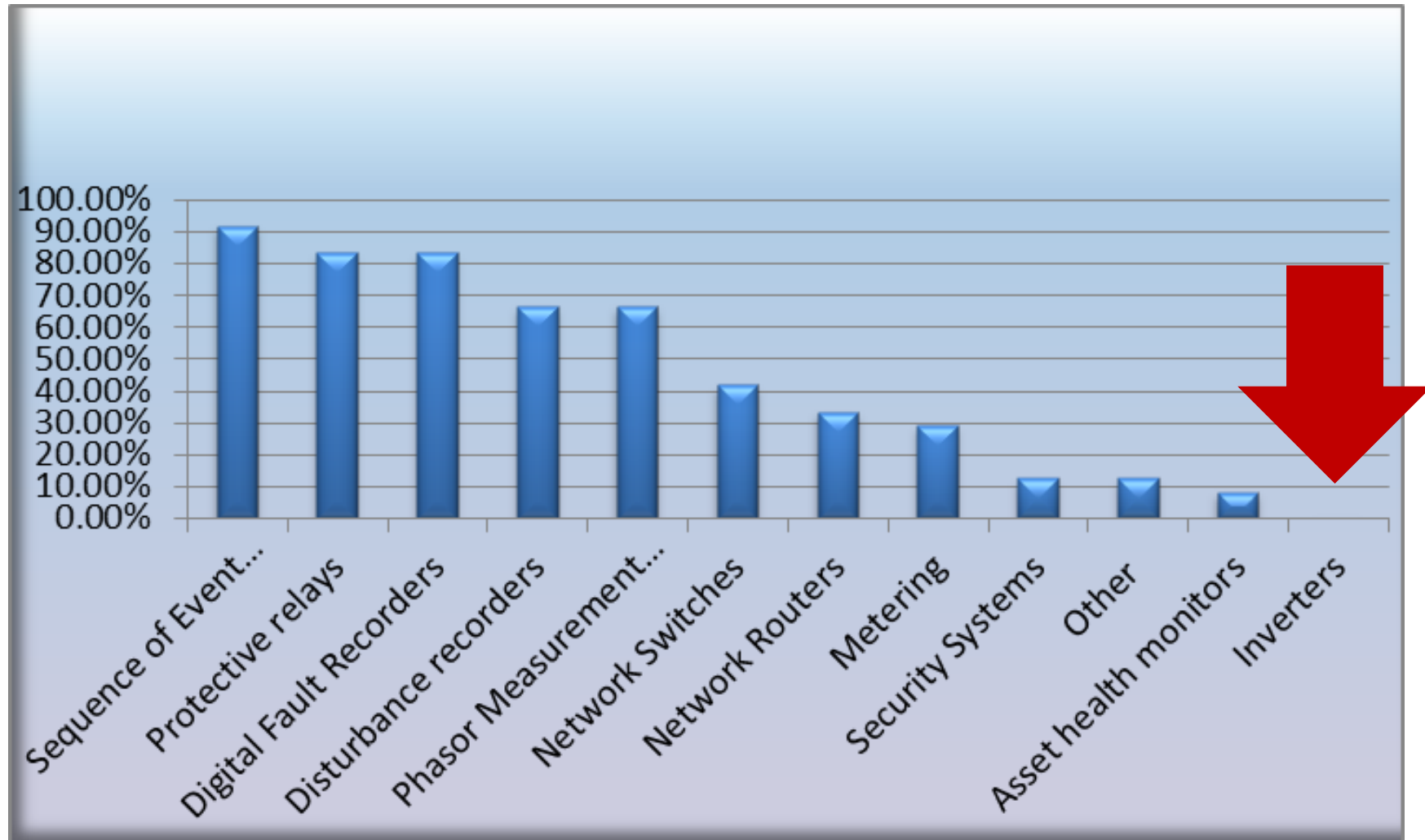
Distribution assets connected to the precision time source
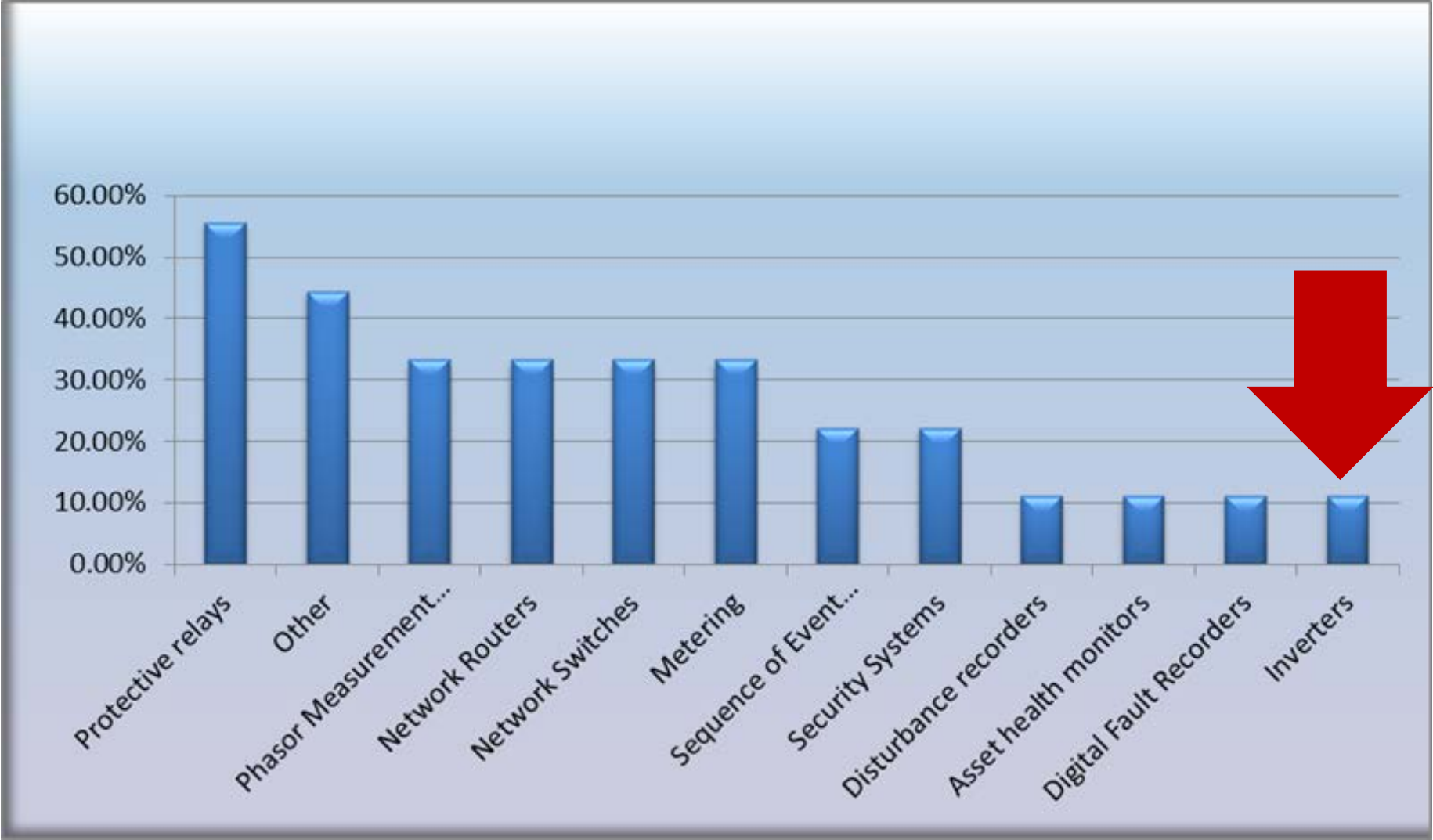
Holdover timing requirements by application
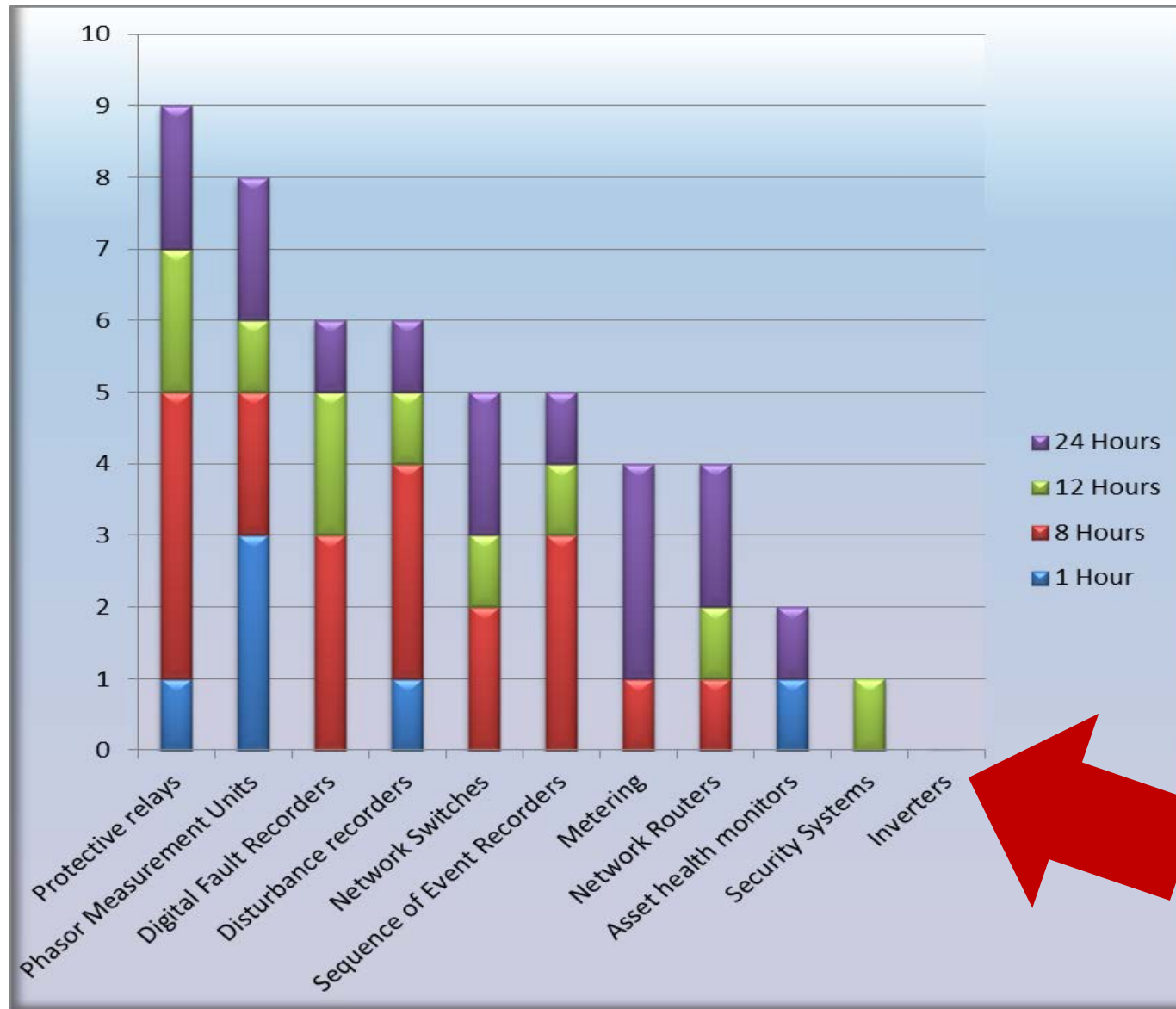
Additional assets planned for connection to the precision time source in the next 5 years

Closing Remarks

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Industry Trends

Based on the survey we identified the following trends:

- Over the next five years there is a significant planned increase in the use of the network based precision time protocol (PTP) as defined in IEEE Std c37.238 and IEEE Std 1588.

- Many utilities plan to increase the use of precision time over the next five years for synchrophasor measurement, network routers, network switches, asset health monitors, inverters and security systems.

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