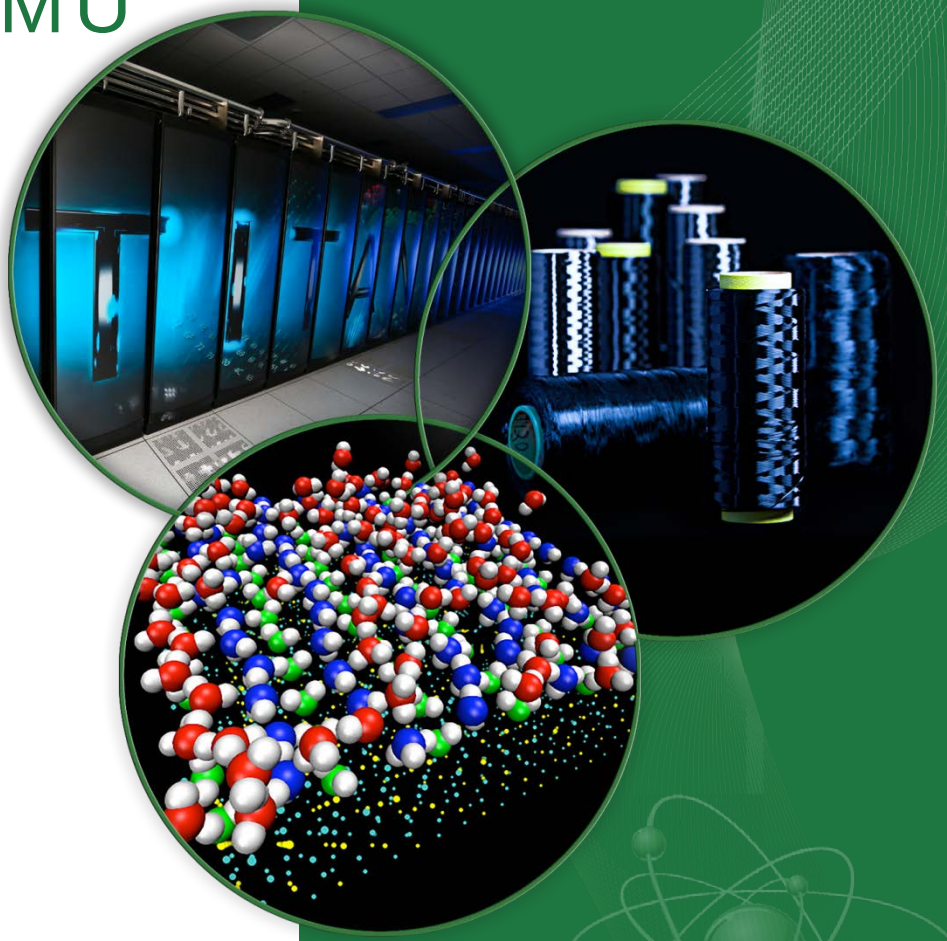
Factors Affecting PMU Installation Costs



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NASPI Work Group Meeting
Houston, TX

October 22-23, 2014

ORNL is managed by UT-Battelle
for the US Department of Energy

OAK RIDGE National Laboratory

Overview

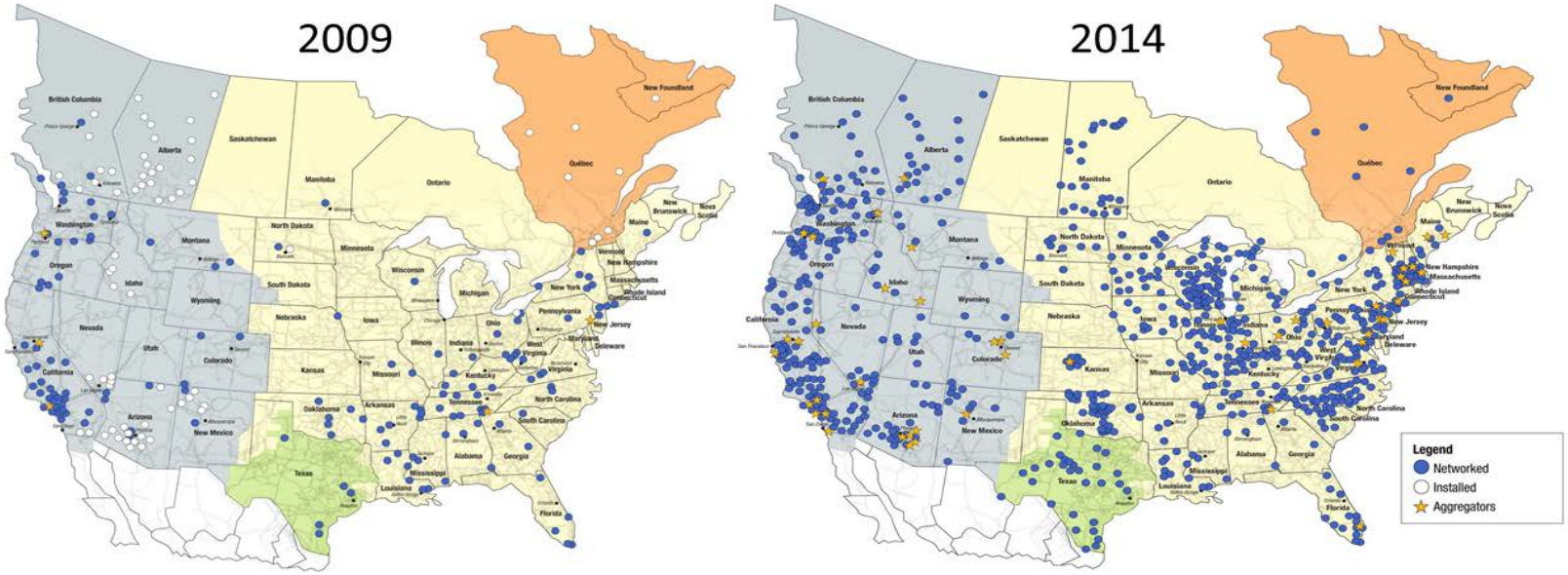
Installing synchrophasor systems involves a number of strategic and tactical decisions.

- Applications and design choices have cost implications for the synchrophasor system.
- There is little empirical data about the detailed cost implications of different system design choices.
- ORNL performed a DOE-sponsored study to explore high level requirements and cost impacts.
- Participants -- Nine transmission owners and reliability coordinators that were part of the SGIG/SGDP projects

This study focused on PMU acquisition and installation costs.

American Recovery & Reinvestment Act

- Smart Grid Investment Grants (SGIG) and Smart Grid Demonstration Projects (SGDP)
- Public funds matched by private investment
- Managed by the U.S. Department of Energy – Office of Electricity Delivery and Energy Reliability (DOE-OE)



Source: North American Synchrophasor Initiative (NASPI)

Approximately 1,500 PMUs Installed from 2009 to 2014

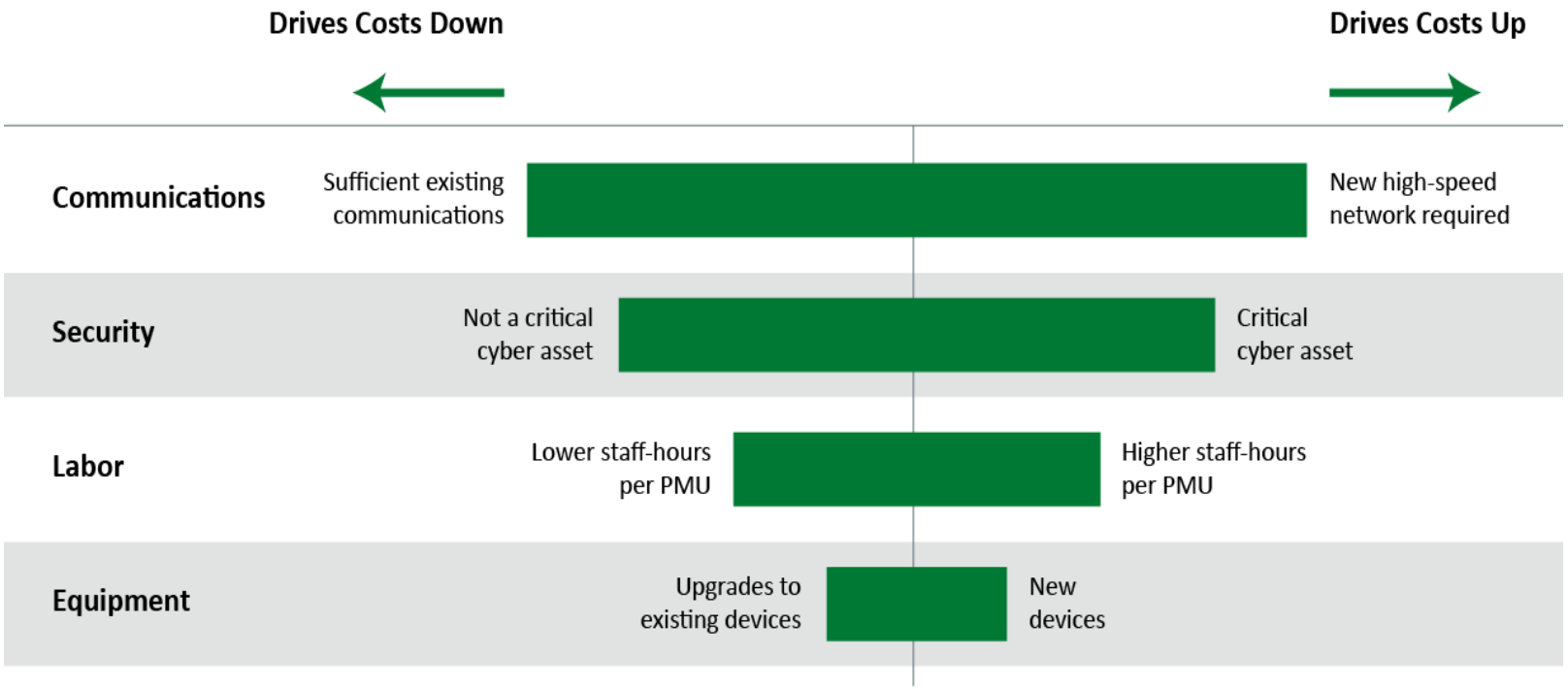
Participants

- 8 TOs and 1 ISO
- Consisted of prime and indirect recipients
- Participation through interviews and document review

NERC Region	Entity
WECC	BPA
	Idaho Power
	PG&E
SERC	Duke
	Entergy
Midwest Reliability, Reliability First	MISO
	ATC
	Manitoba Hydro
Texas Reliability Entity	Oncor

Historically, many of these participants have shared their experiences in the NASPI community

Key Cost Drivers

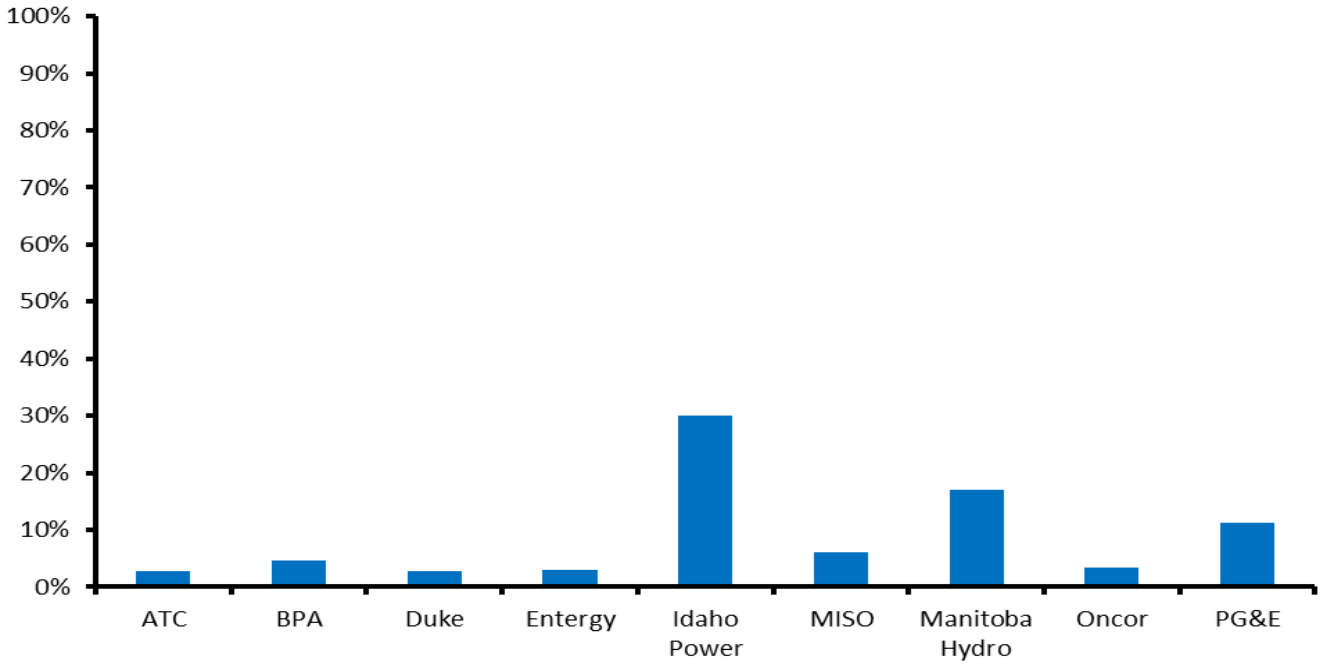


Ranges are illustrative.

The availability of communications was the single largest driver of the total costs.

Average PMU Device Cost

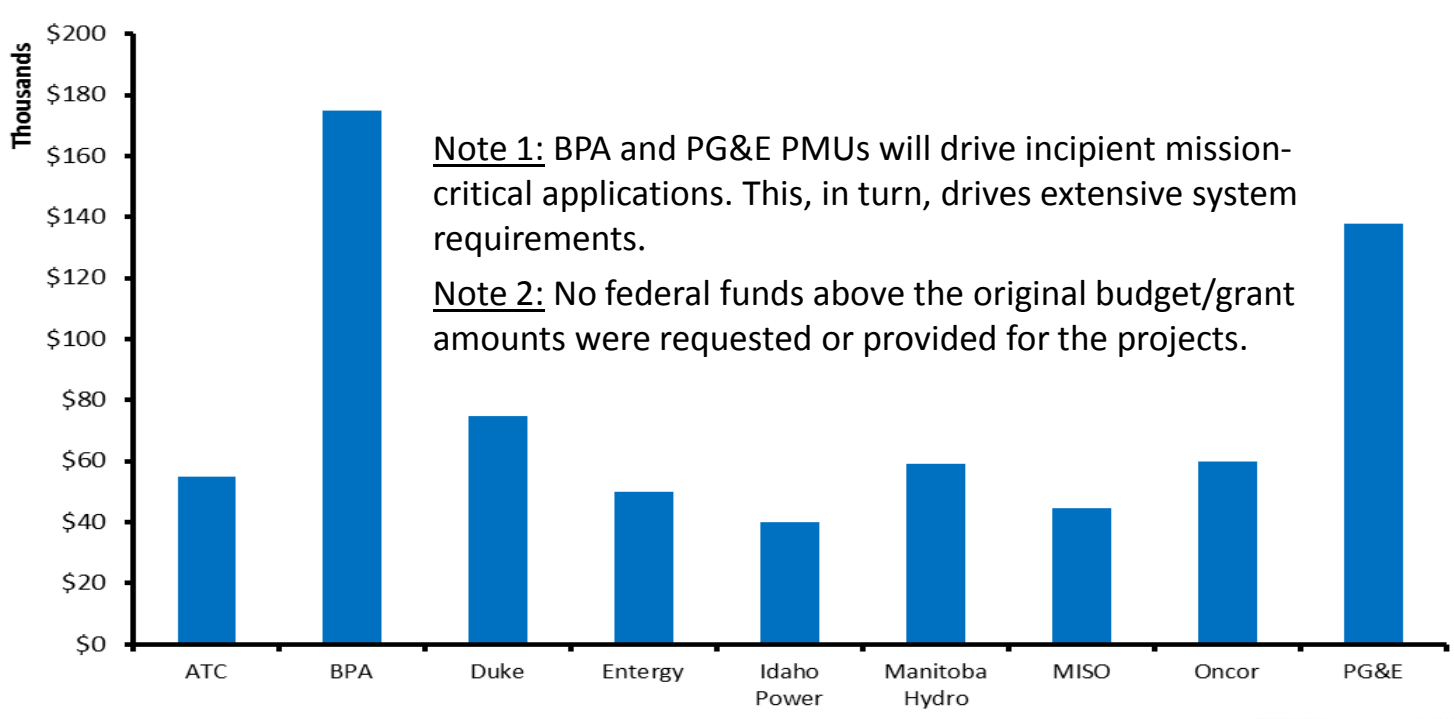
- The study compared the average PMU device cost to the average overall installed cost for each participant.



- The cost of PMU devices was typically less than 10% of the overall cost.
- PMU device cost higher in cases where overall costs were comparitively low.

Average Overall Cost per PMU

The averages include cost of communications, security, labor and other factors that each participant allocated to their PMUs.



The overall costs are primarily driven by the intended use (both present and future) of the synchrophasor system.

Summary

Four key cost drivers emerged

- Communications and security are the factors that drive the largest cost impacts.
- Labor is highest in some cases. Specialized vs. decentralized work crews and size of project's geographic footprint.
- Cost of PMU devices are an extremely small driver of the overall project cost.
  - Some of the study participants activated PMU functionality within existing devices rather than purchase new PMUs.

Each company's plan for synchrophasor use drove their requirements, and thus the costs.

Find the report on: www.smartgrid.gov

https://www.smartgrid.gov/sites/default/files/doc/files/PMU_cost_study_Final_09232014.pdf

click “Access key program results”

click “Synchrophasor Applications in Transmission Systems”