



# NASPI Working Group Meeting

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Richmond, VA

## NASPInet 2.0 Guidance Document

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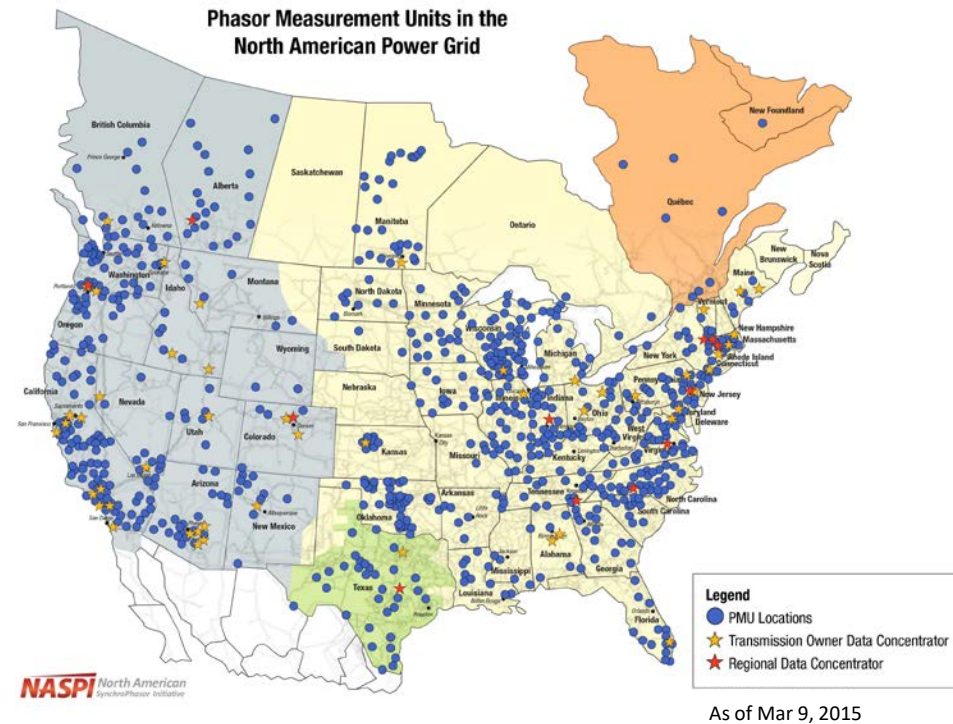
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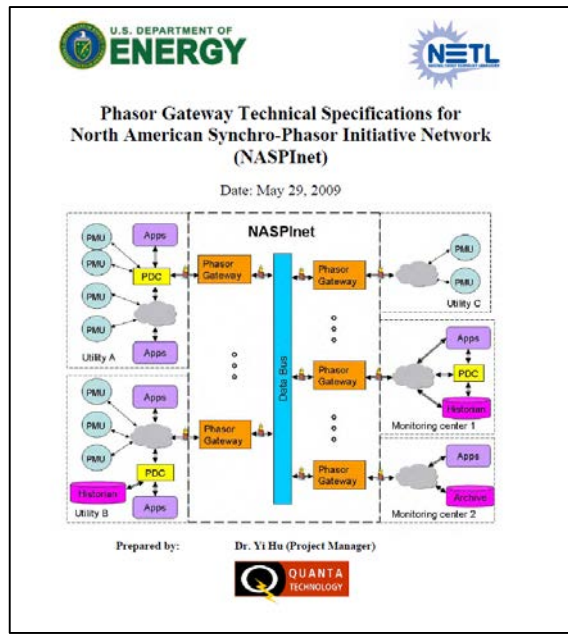
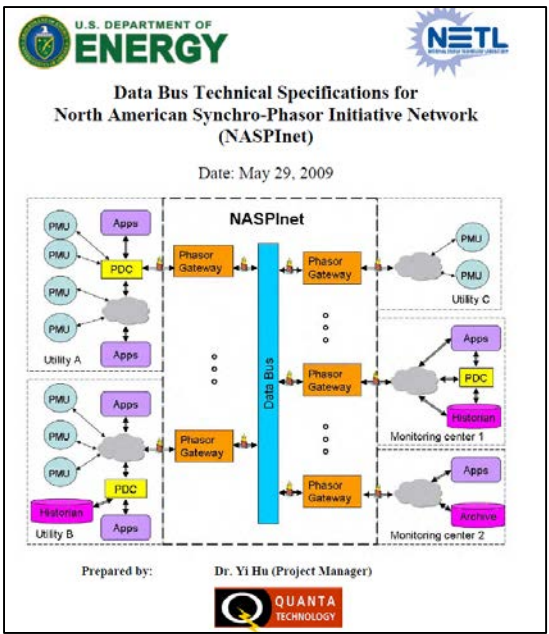
# Objective: Modernize PMU Networking

- The problem: transport, management, and sharing of data from Phasor Measurement Units (PMUs)
  - More than 2,500 transmission level PMUs in the US
  - Emerging technologies & applications
  - New considerations for use at Distribution
  - Original guideline was created in 2007-2009
  - Shortcomings in resilience, security, flexibility
- Purpose: update the Guidelines
  - Considerable practical experience (SGIG) to draw upon since then
  - Use advanced Grid Architecture methods



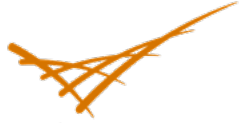
# Background

- Original Guidelines created in 2007-2009



Data bus specification:  
155 specifications  
6 categories  
83 sub-categories

Gateway specification:  
234 specifications  
8 categories  
76 sub-categories



# NASPInet 2.0 Project Tasks

## 1. Assess the state of PMU networking

- Review the existing NASPInet documents from 2007-2009
- Analyze SGIG PMU projects with NASPInet implementations and other implementations
- Identify lessons learned or learnable

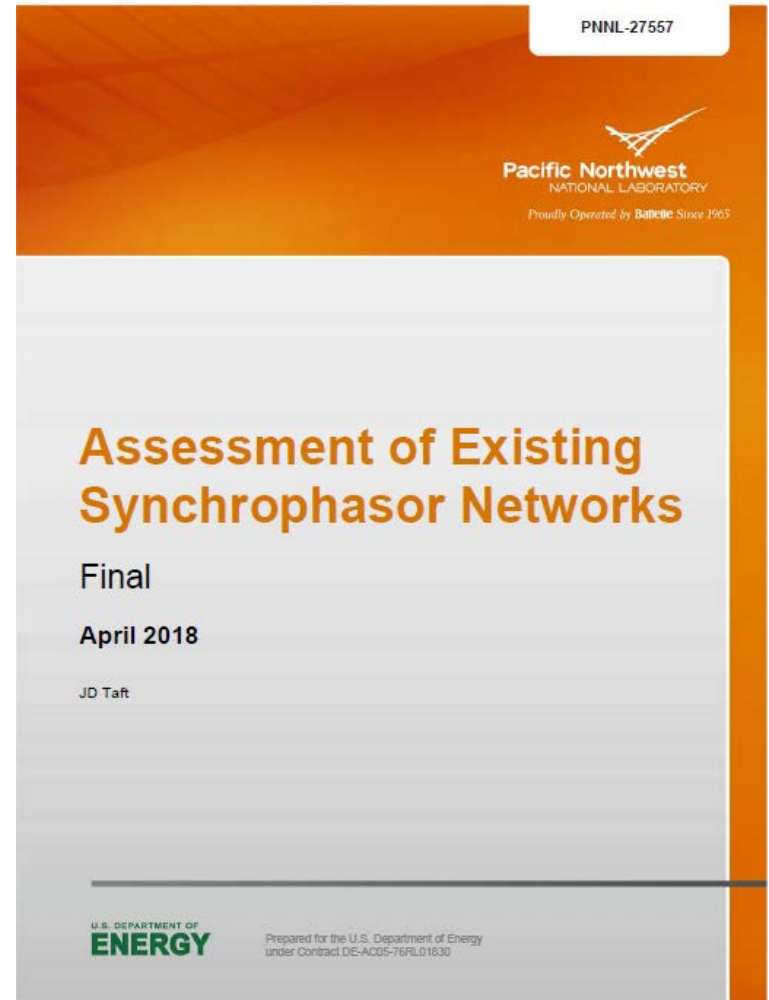
## 2. Create and Validate a new Guidance document (NASPInet 2.0)

- Apply lessons from industry experience
- Apply modern architecture principles & concepts
- Improve flexibility, resilience, cybersecurity
- Address for new technologies and emerging trends



# Task 1: Assessment Report

- Preliminary to creating the new Guidance document
- 8 chapters, 30 pages, 6 figures, 1 appendix, glossary
- Reviewed by DMNTT
- Posted on:
  - NASPI website (<https://www.naspi.org/>)
  - Grid Architecture website (<https://gridarchitecture.pnnl.gov/>)



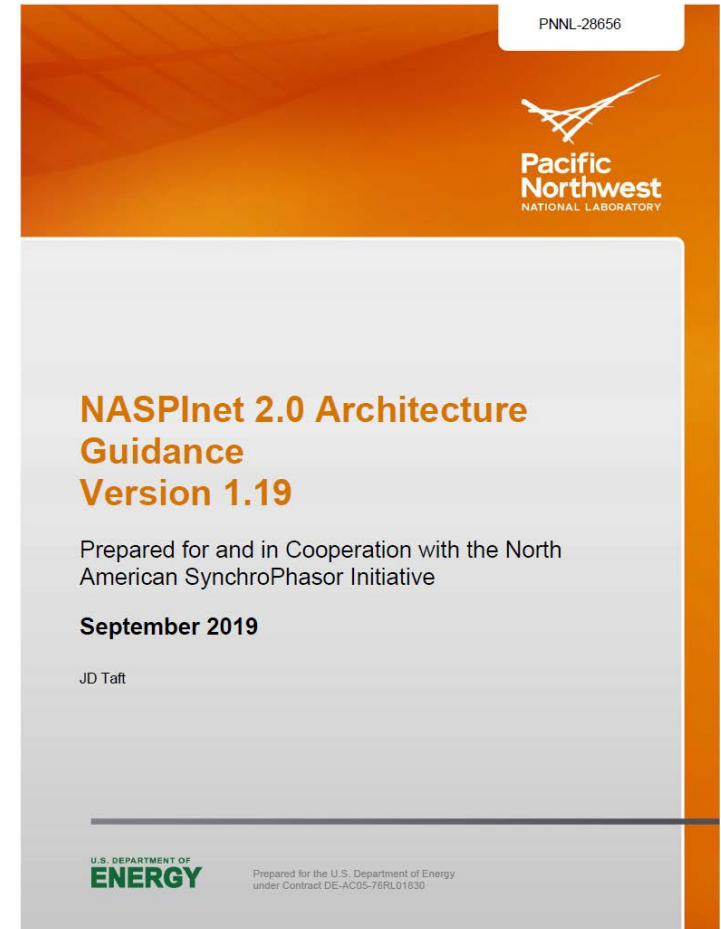
# Primary Assessment Conclusions

- **Considerable creativity & thoughtfulness in the implementations**
- Network design principles and leading practices are not well reflected in the specifications
  - lack of clear guidance about network architecture
  - vague and incomplete security guidance left the issue to individual projects to resolve; **most projects did very little on this**
  - limited recognition of the role of network management in PMU network performance and security
- The data bus paradigm and gateway spec led to PDC stacking and over-the-top networks – severe architectural problems that result in data loss and excessive latency
- Guidance has become obsolete in the 10 years since it was created



# Task 2: New Guidance Document (NASPInet 2.0)

- Based on Grid Architecture principles & methods
- A framework, not an architecture or a design
  - technically a meta-architecture
- 16 chapters, 124 pages, 51 figures, 5 tables, 5 appendices, glossary
- Reviewed by DMNTT
- Posted on:
  - NASPI website  
(<https://www.naspi.org/node/746> )
  - Grid Architecture website  
(<https://gridarchitecture.pnnl.gov/>)



# Paradigm Changes

- Data bus → Distributed observability platform
- PDCs and gateways → Core-edge structure
- GPS timing → Multi-source network timing distribution
- Minimal cyber security → Integrated multi-layer security
- Centralized device registry → Federated signals registry
- PMUs at Transmission only → + Synchronized measurement at Distribution





# Creating and Posting Report is Not Sufficient to Achieve Broad Industry Uptake

- Acceptance and use of this type of material requires a considerable effort to introduce it to the industry stakeholders
- The universe of stakeholders for this work is vast and diverse
- Holding a “big bang” review meeting or workshop is not an effective means to achieve broad uptake
- The Next Steps address the issue of industry uptake
  - Uses model from Grid & Communications Architecture work

# Next Steps: Description

## 1. Industry Rollout

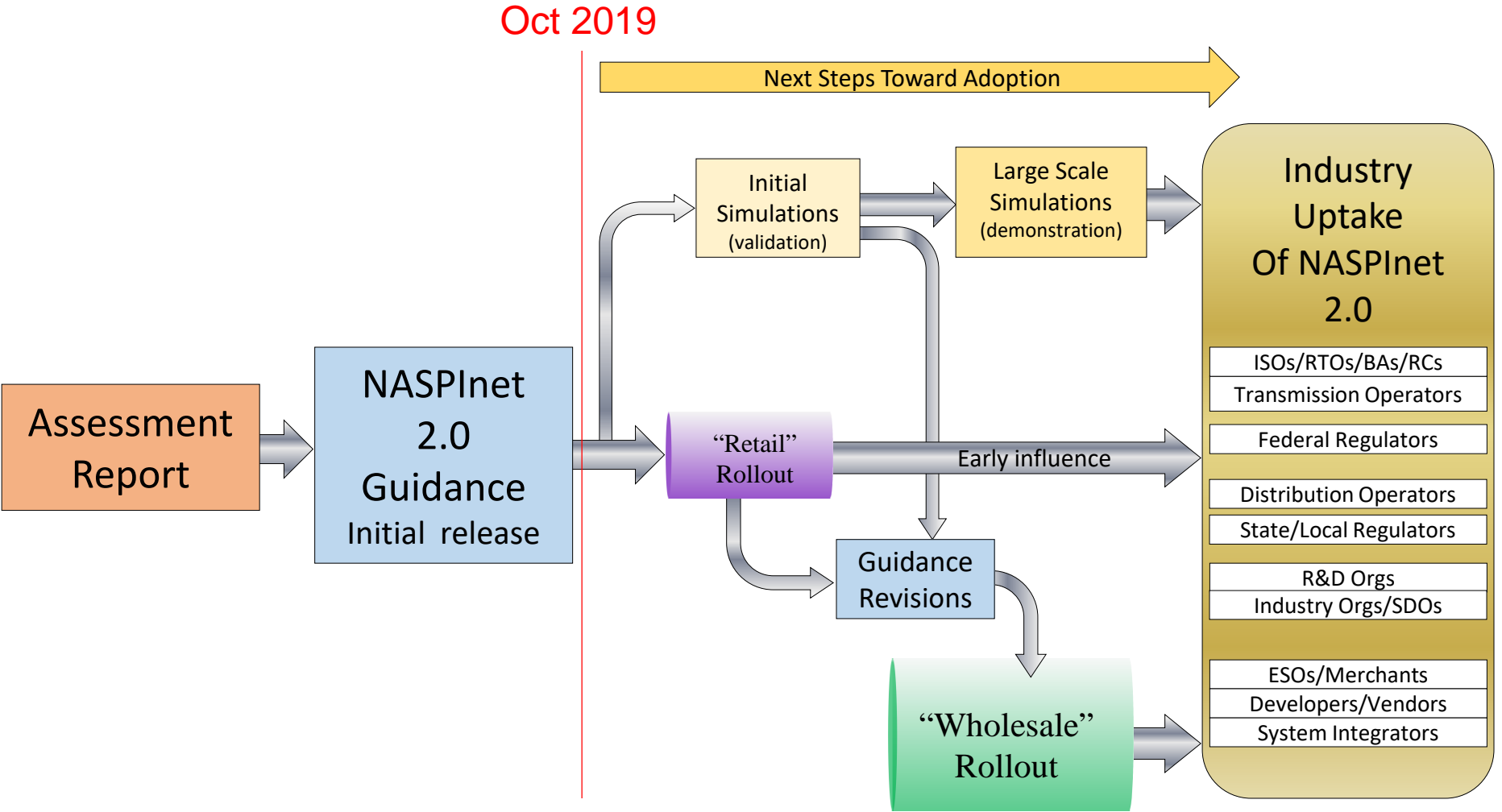
- Multi-stage process
  - “Retail” with key industry figures
  - Update guidance document
  - “Wholesale rollout” via webinars, conferences, workshops

## 2. Validation/Demonstration via Simulation

- Make use of facilities at PNNL
- Start with smaller efforts aimed at validation
  - Simulate key aspects of NASPInet 2.0 vs. corresponding aspects of original NASPInet
  - Incorporate lessons learned into revision of the NASPInet 2.0 guidance document
- Eventually move to larger scale, aimed at demonstration



# Next Steps: Process Flow



Q&A



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