

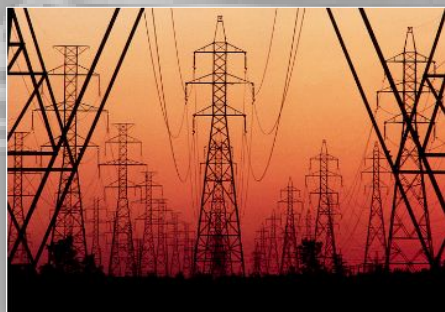
# Pre-Commercial Demonstration of Direct Non-iterative State Estimator (DNSE+)

Project with Quanta, NYPA & EPG

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NASPI Work Group Meeting  
October 15, 2015



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## **Acknowledgement:**

*This material is based upon work supported by the Department of Energy under Award Number DE-OE0000704*

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# Problem Statement & Background

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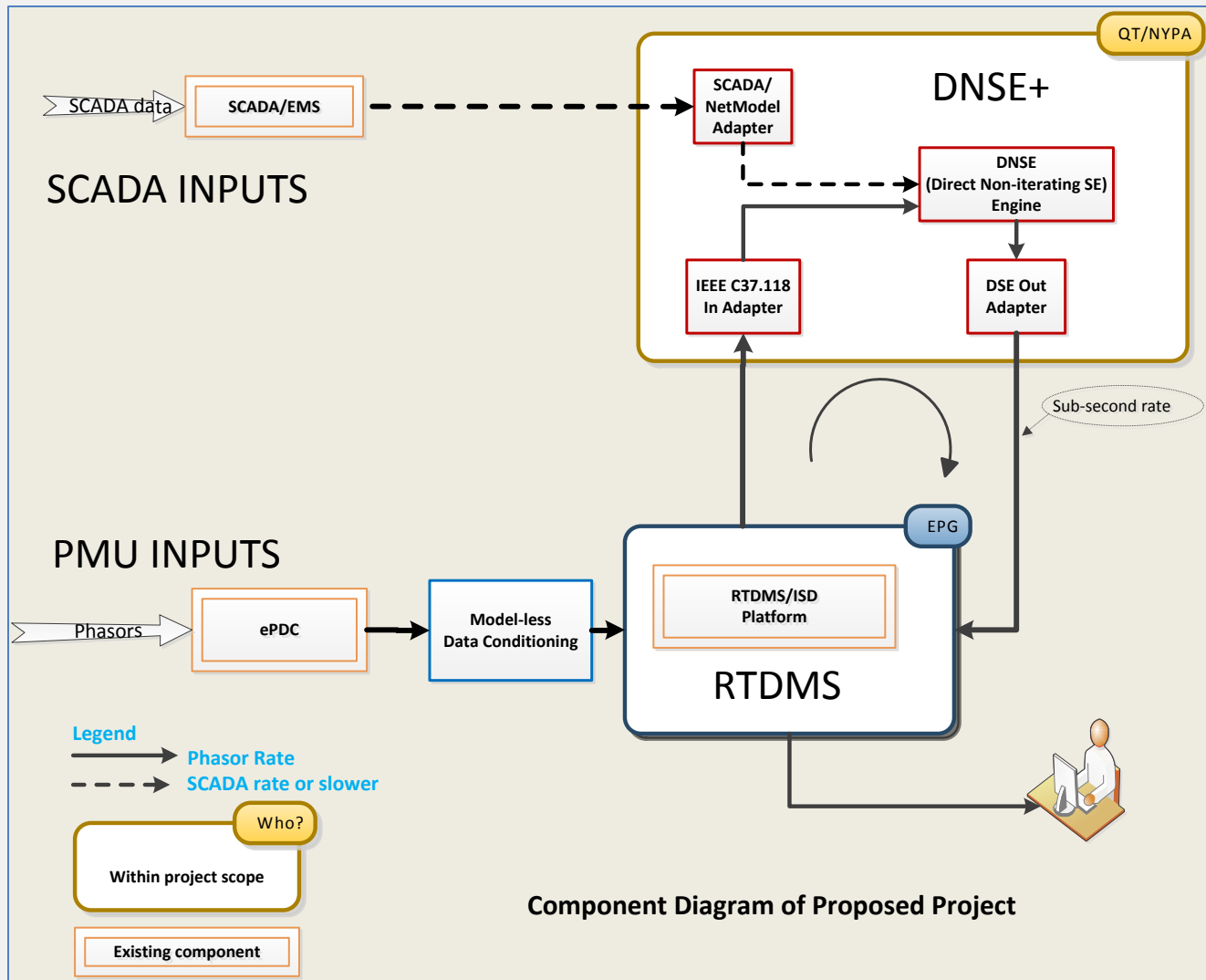
## Project Objective:

Demonstrate functionality and performance of a production-grade Direct Non-iterative State Estimator (DNSE) integrated with NYPA's Energy Management System (EMS) and with an enhanced Real Time Dynamic Monitoring System (RTDMS) synchrophasor platform from Electric Power Group (EPG);

## Background:

- DNSE started as an idea by Bruce Fardanesh at NYPA several years ago; also patented
- It was further researched as PhD thesis by Tony Jiang
- DNSE+ (+ added to designate SE with additional components around the estimation "engine")

# System Architecture – Functional View



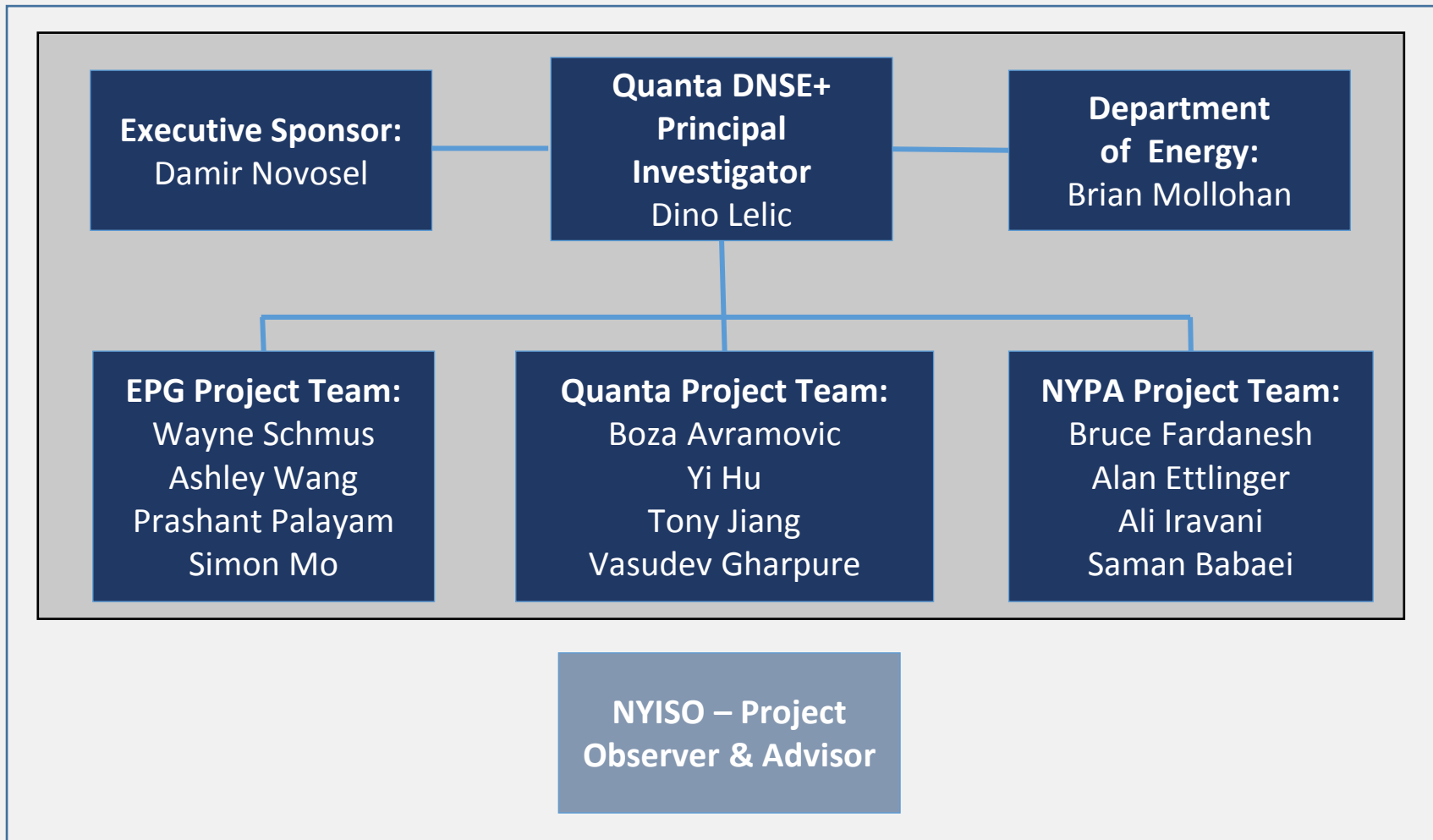
# Anticipated Project End Status



- Successfully demonstrate a DNSE+ at New York Power Authority (NYPA) that will:
  - Use both SCADA and synchrophasor data simultaneously to obtain the complete state of the entire NYPA operating model at rates close to the phasor data rates, and without iterations.
  - Have input/output adapters based on standards (IEC 37.118 for streaming synchrophasor data, IEC 61850 for SCADA exchange and CIM models to export the host utility's EMS source data base)
- Prove that DNSE+ is a commercially viable application by successful integration with commercial products (EMS and RTDMS)
  - RTDMS will be enhanced as part of the project
  - Show DNSE+ is ready for use at other utilities to address a common need for “clean and trustworthy” operational data for synchrophasor applications

# Project Participants

## Key team members



# Project team Roles

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- **Quanta Technology**
  - Overall project management
  - Overall technical lead; overall system design
  - System integration and FAT lead; Site Acceptance Test support
  
- **NYPA**
  - End user of developed system
  - System design support
  - Field installation & SAT test lead
  
- **Electric Power Group**
  - EPG product supplier
  - RTDMS enhancement development
  - System integration & FAT support
  - Field installation & SAT support
  
- **NYISO**
  - Technical advisor and historical PMU data provider



# Performance Target

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Decision point	Performance test environment	Success criteria	
		Minimum	Desired
Mid-point of Task 5 (end of 2015)	A mid-range server at QT	< 2s	< 1s
End of Task 6 (July 2016)	NYPA acquired DNSE+ server	< 1s	< 0.1s



# Project Tasks & Progress

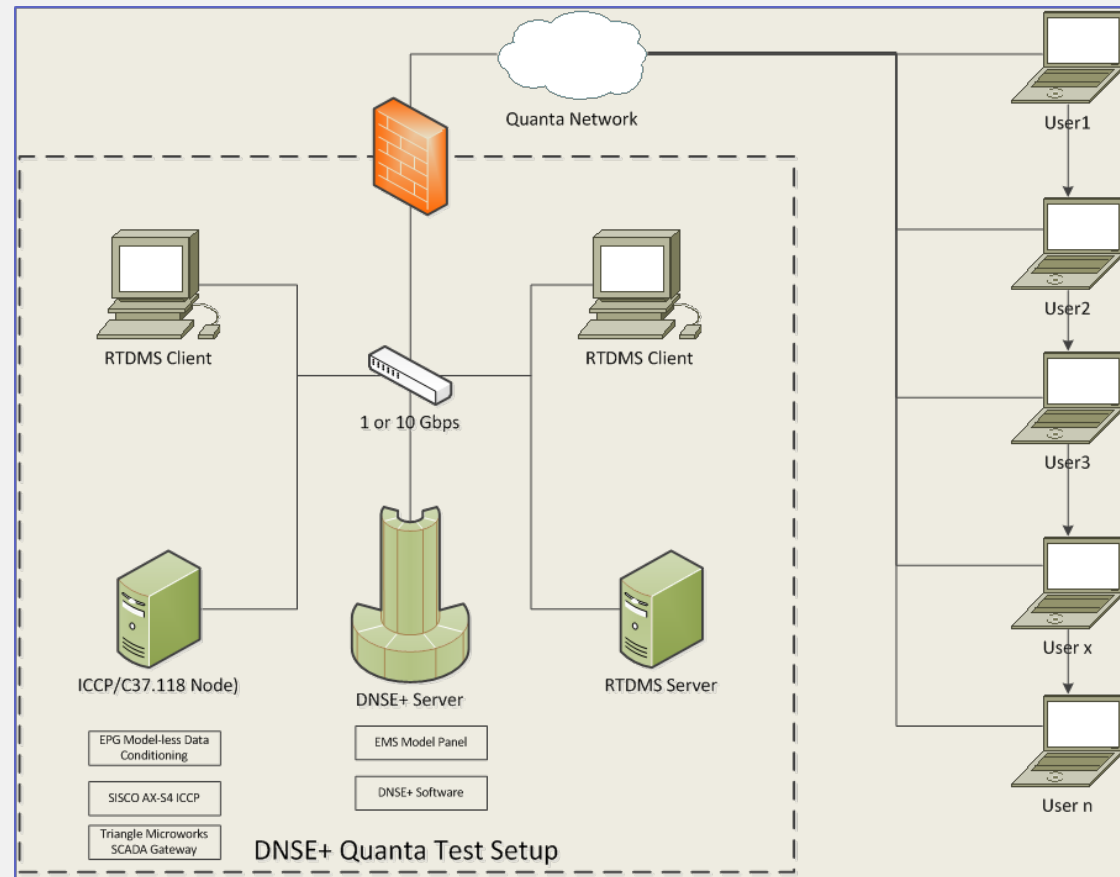
Milestone #	Milestone Name	Completion Date
1	Project Management Planning	Aug 30, 2014
2	System Design Completion	Jan 30, 2015
3	DNSE+ implemented*	Jul 30, 2015
4	RTDMS Platform Enhancement completed**	Jul 30, 2015
5	Integration and FAT completion	Dec 30, 2015
6	Field Installation, User training, and SAT completion	Jun 30, 2016
7	Project completion	Jul 29, 2016

\*It has been tested on a small scale system

\*\*Needs to be tested together with DNSE, using data exchange

# Current Status of the Project

- Integration of DNSE+ with enhanced RTDMS under way
- Interface for transfer of EMS SCADA data is being developed at NYPA
- PMU data (historical) to be received from NYISO for purpose of testing



# References

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1. B. Fardanesh, “Methods and systems for power systems analysis: a non-iterative state solver/estimator for power system operation and control”, US patent no. US 8,108,184. Jan. 2012
2. X. T. Jiang, “Non-iterative Method for Power System State Estimation and a PMU-Based Method for Assessing Generator Damping Contributions”, Ph.D. Dissertation, Rensselaer Polytechnic Institute, May 2014.
3. Real Time Dynamics Monitoring System® (RTDMS®): Built upon GRID-3P® platform. US Patent 7,233,843, US Patent 8,060,259, and US Patent 8,401,710. ©2014 Electric Power Group

# Questions

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