

# ISO New England Smart Grid Investment Grant Update

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# Project participants

- Project Transmission Owners (#PMUs)
  - Bangor Hydro (2)
  - Central Maine Power (4)
  - National Grid (6)
  - Northeast Utilities (15)
  - NSTAR (4)
  - United Illuminating (4)
  - Vermont Electric (2)
- Project Lead
  - Eric Wilkinson: 413-540-4686 ([ewilkinson@iso-ne.com](mailto:ewilkinson@iso-ne.com))
- Project Manager
  - KEMA Consulting
- Other Partners
  - Mehta Tech Inc.
  - Rensselaer Polytechnic Institute
  - V&R Energy Systems Research

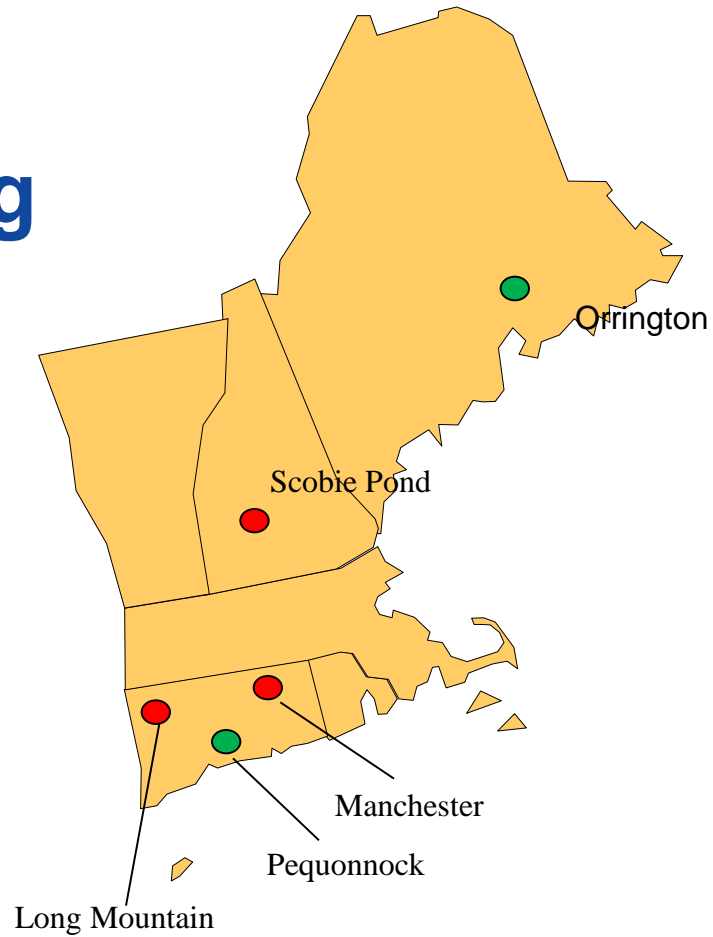
# Project Infrastructure Overview

- PMUs
  - 5 existing
    - Also serve as DDRs per PRC-002-NPCC
  - At least 30 additional PMUs
    - Final sites by 10/31/10
    - Several desirable substations have no rack space for PMU
    - TOs selecting vendors (some TOs have preference)
    - PMUs provide coverage of New England 345 kV system and tie lines
- PDCs
  - FIPS PDC developed by RPI
  - One regional PDC at ISO
  - One PDC at each TO (7)
  - Continue streaming synchrophasor data to TVA SPDC

# PMU Sites

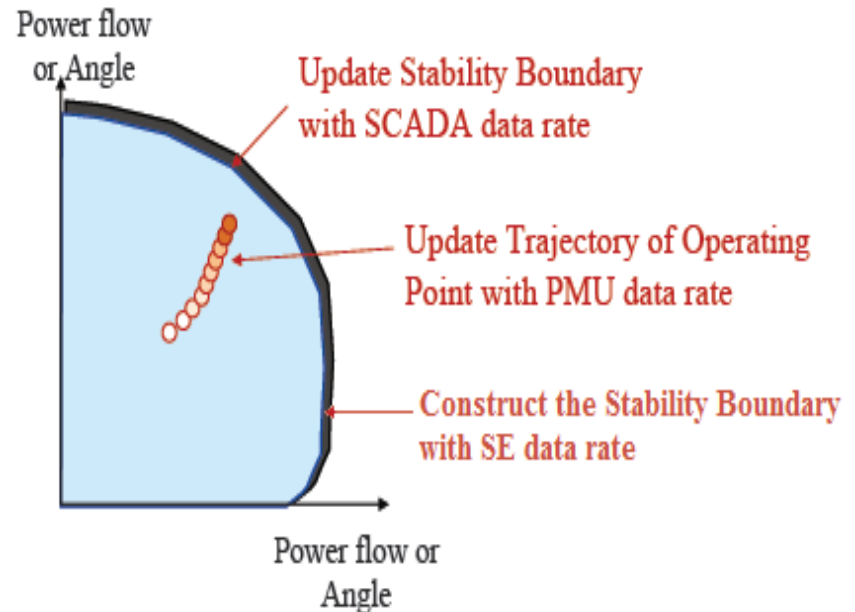
● Streaming

● Non Streaming



# Synchrophasor Applications

- ROSE: uses synchrophasors, SCADA data and SE results for on-line calculation and visualization of the current operating point and its proximity to the stability boundary



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Figure, see <http://ewh.ieee.org/reg/1/809/Litvinov.pdf>.

# Synchrophasor Applications

- Performance tools
  - Data integrity: missing data issue
  - Latency:
    - Compare time of C37.118 packet & PDC receipt
    - Need micro-second time at the PDC
    - ISO-NE has never needed this technology
- Data management:
  - Identification of significant events:
    - Frequency deviation
    - Oscillation
    - Angular separation
  - Disturbance data management
    - Characterize disturbances

# Classification of Events

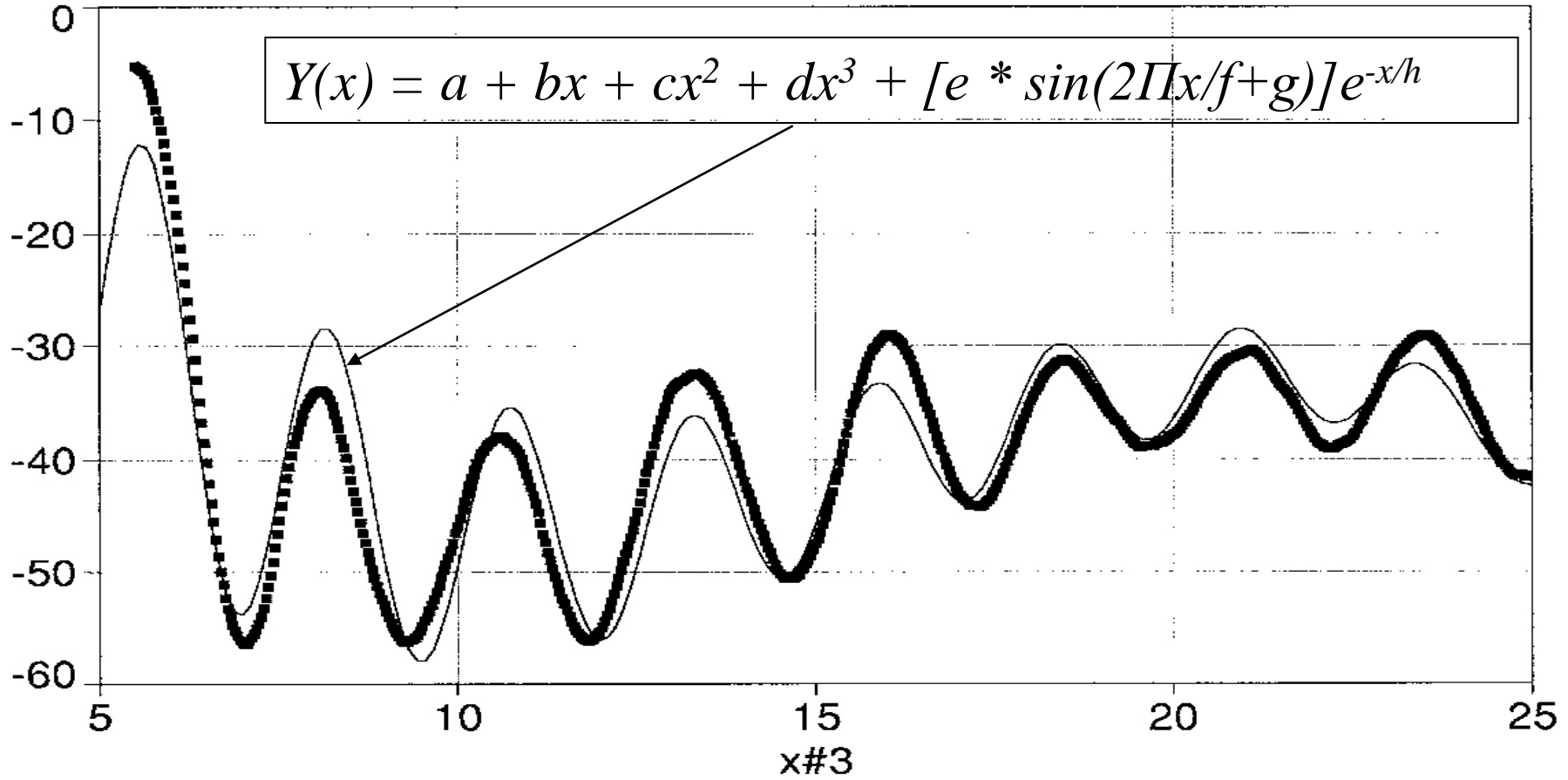
polysin

Rank 1 Eqn 8001 y=polsin.udf()

$r^2=0.878970675$  DF Adj  $r^2=0.877298422$  FitStdErr=3.27127355 Fstat=601.746718

a=39.228678 b=-18.776381 c=1.2906075 d=-0.02665035

e=31.069826 f=2.5481669 g=-18.691612 h=10.498089



# Security Approach

- PMUs deployed by Multiple TOs:
  - Uniform approach to ownership and management of firewalls, routers, encryption, authentication, etc.
- Synchrophasor technology initially not deployed in control room
  - Data archiving - potential for 1+ terabyte per week
  - Cyber security & Redundancy
  - Operators require well developed tools, operating procedures & training



# Other Information

- Project Challenges:
  - Coordinating contract terms with finances
  - Developing statement of work and schedule
- Communications Architecture Challenges
  - Setting clear, achievable objectives and expectations
  - One way, bottom up communication structure
    - PMU to PDC: TCP/IP is sufficient
    - PDC to PDC: start with TCP/IP; explore UDP

# Other Information

- Other useful info to share
  - GPS Clock issues
    - *Micro-second accuracy is critical to synchrophasors*
    - *Interoperability between GPS clock and PMU*
    - *Engineering & maintenance of GPS clock, specifically the connections to IEDs*
  - Important to establish and maintain relationships between project managers, TOs, PMU & PDC vendors
    - Need vendors to provide extensive engineering support
  - Need to monitor & prepare for emerging standards
    - NIST, IEEE PSRC, NERC/NPCC