

Navigating A Sample Installation

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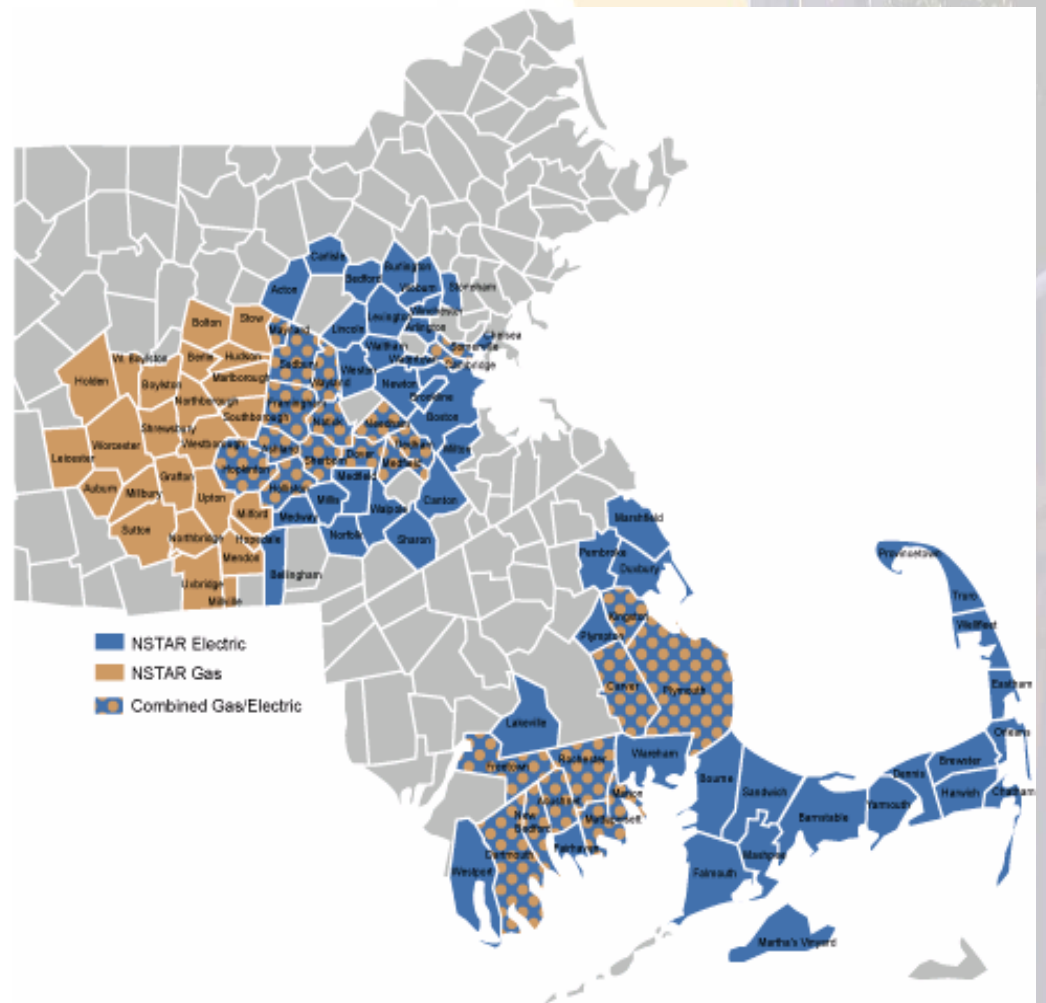
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NSTAR: Quick Summary

- An energy delivery company headquartered in Boston, MA
- Constructive regulatory environment (this minute)
- Customer base
 - 1.1 million electric customers in 81 communities in eastern Mass.
 - 300,000 natural gas distribution customers in 51 communities in Massachusetts
- 2006 Summer Peak: 4959 MW
- Regulated utility operations account for 96% of overall business



Navigate

nav-i-gate (n v -g t)

v. nav-i-gat-ed, nav-i-gat-ing, nav-i-gates

v.tr.

1. **To plan, record, and control the course and position of (a ship or aircraft).**

2. **To follow a planned course on, across, or through: navigate a stream.**

v.intr.

1. To control the course of a ship or aircraft.

2. To voyage over water in a boat or ship; sail.

3. **To make one's way: navigated with difficulty through a storm.**



Background

- **For a 2005 rate case, load research not available for the test year**
- **2000-2002 sample installations were not installed or maintained properly**
 - Merger activities, management changes
 - Alpha technology; technology failures - new systems caused significant loss of data
 - poor communication installation procedures
 - Installations never completed; “300 ordered meters just disappeared?”
 - Operational Perception: Load research meters not really needed, they are just research meters
 - System-wide AMR deployment – additional 200 Load Research meters replaced and thrown away
- **Load Research Program Assessment**
 - Age of the Samples - Over 9 Years Old
 - Significant Data Loss – 47% for BECO
 - Sample Sizes All Less than 30 Per Stratum
 - Sample Bias Caused By Installation Procedures
 - Over 50% Indoor Meters
 - “Don’t Really Need THOSE Meters”
 - Relative Precisions Averaged from 20-30%
- **Determined samples had to be redesigned and replaced**

Interval Data Meter Project

- **Joint Team Effort**

- Meter Operations
- Data Acquisition
- Information Services
- Load Research

- **Short-Term Objectives**

- Mitigate 2005 EPA Act Daylight Saving Time (DST) change Impact
- **Update load research samples for regulatory compliance**
- Mitigate risks related to older ISO interchange meters with expiring 20 yr. DST programs
- Replace older TOU meters with AMI

- **Long-Term Objectives**

- Have the ability to remotely interrogate daily interval data
- Minimize data, loss billing lags, and field visits with reliable, proven metering and communication technologies



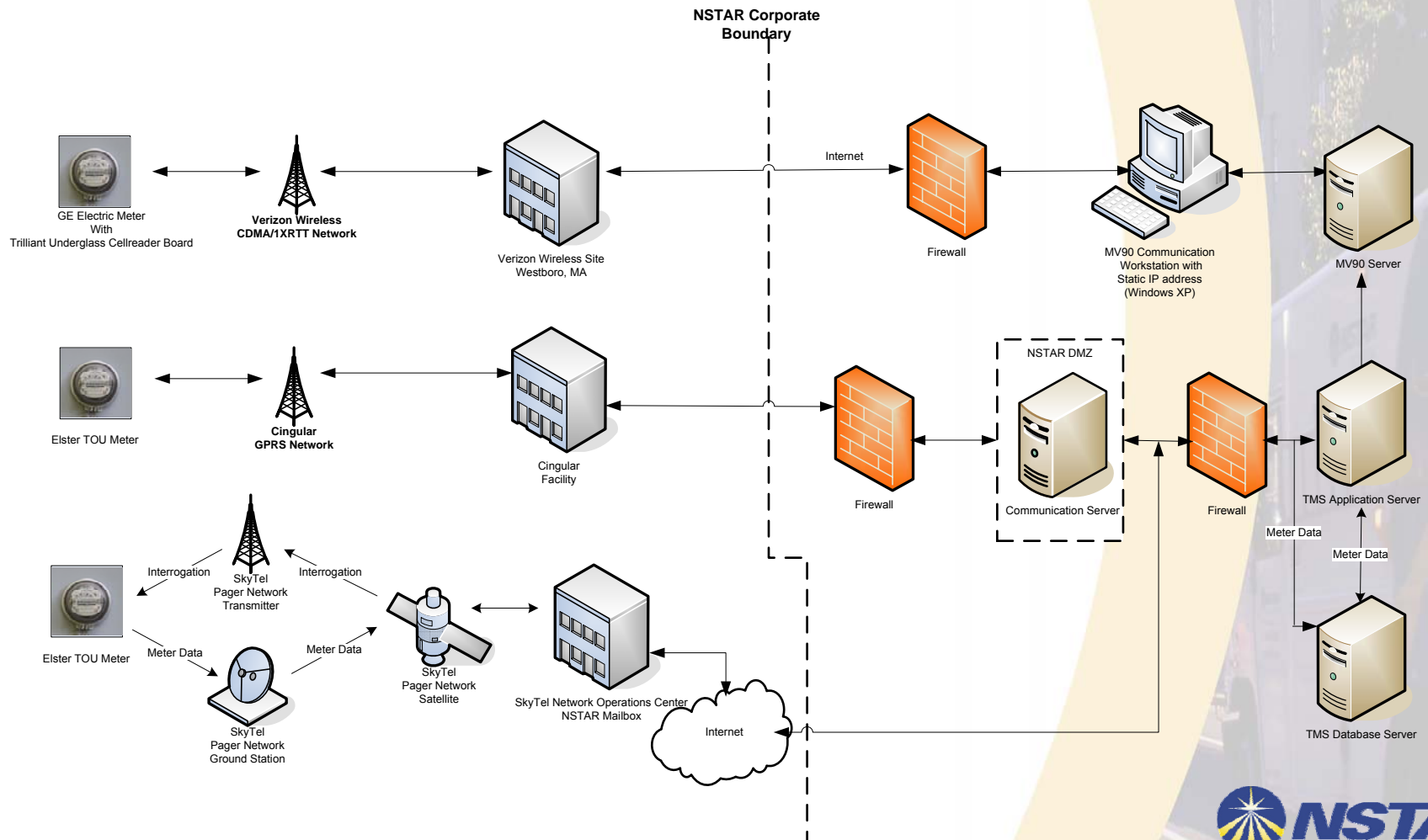
Key RFI Requirements

- **90 days of 15-min. kWh interval data at the meter with status flags**
- **Meter platform and metrology must perform remote updates and self diagnostics**
- **Midnight self meter reads forward at a predetermined schedule**
- **Security from tampering over communication channels to the data collection server and over public networks**
- **Two-way communication**
- **Ability to export data in groups automatically in any common MV-90 format**

Wireless Meter Reading Technologies

Selected two major 2nd generation wireless (under-the-class technologies

1. GPRS (General Packet Radio Service) – Cingular **SmartSynch/Elster**
2. 1xRTT (Radio Transmission Technology) – Verizon **Trilliant/GE**



*Both solutions did not require the implementation of an additional software system

The Pilot

“to act as a guide to: lead or conduct over an usually difficult course”

- Merriam-Webster Dictionary

Objectives

- Assess metering and communication technologies for remote interrogation of interval meters and for a long term meter strategy
- Test & install the technologies and identify potential implementation problems and issues
- Recommend metering and communication technologies to implement for NSTAR’s overall interval meter population
- Map out set-up processes and train resources for full scale deployment



Pilot Frame Specifications

Sample	Sample Size	Population Size
Cambridge Electric R-2 (Supplemental Income Rate)	81	1703
Boston Edison Electric R-2 (Supplemental Income Rate)	82	33,165

- **Low risk samples from a perspective of overall impact to population estimates**
- **Alternate lists were selected randomly to ensure high % of installations, when the installation of a primary site was not possible**

The Pilot – Evaluation Criteria

Business

- **Customer Access** – review process of requesting customer access
- **Data Retrieval Rate > 95%**
- **Cost of Data Acquisition** – Carrier costs

Technical

- **Meter Accuracy** – per meter standards (ANSI/ASQC);
- **Ease of Meter Installation**
 - Technical aspect of installation (preprogramming the meter, etc,)
 - Technicians have the right tools & equipment
- **Establishing a Communication Link** – need to be seamless
- **Strength of Communication Signal** – Use test devices determine strength
- **Security**
 - Secured from physical tampering; Data Encrypted
 - Secured communication channels to the data acquisition server
- **Remote Access** – Can “put” data daily; perform diagnostics; call home



Pilot Findings

Observation	Mitigation
Antennas Not Strong Enough	Returned all meter inventory to SmartSynch retrofit to the new firmware and antennae - 17 times stronger
Provision of meters difficult in field	Worked with vendor to improve provisioning
Need coordinated process to get access to customer sites for installation >50% Indoor meters	Establish formal communication protocols to set-up times
Meter set-up required more time causing backlog	Additional staff employed
Initial cost of communication high required several rounds of negotiations	Negotiated lower rates

Full Sample Deployment

- **13 new samples for a total of 2066 points**
- **Sampling Methodology**
 - Dalenious-Hodges methodology
 - Neyman Allocation for the determination of optimal sample sizes
- **Installations began in May '06 and will continue till the end of '07**
- **Applied 10%-20% data loss factors to sample sizes**
- **No certainty stratum in sample designs**

Sample Installation Rules

- Use remote technology wherever feasible
- Every effort must be made to install the primary sites selected
- Load Research will provide an alternate list only after all reasonable attempts to install at primary sites have been exhausted
- Load Research had the final decision on rejections, removals, and replacements
- No load research samples used as the population for special EE programs and/or programs that could potentially influence energy usage patterns not representative of the target populations.

Measuring Success

- **Sample Installation Rate Target > 95%**
 - Calculation assumed that sample installations span 6 month period
 - Measure good in theory but not in practice
 - Installation timeframes for each sample closer to a year
- **Project Delays**
 - @1 month delay - delay in meter deliveries
 - @2 month delay - longer meter set-up time and backlog
 - @2 month delay - meters returned and retrofitted with stronger antennas
 - @2 month delay - data acquisition systems upgrades
- **The Failure Date**
 - If samples are not installed by date, redesign would be reconsidered
 - 2 samples are being validated with updated population information
- **Late Read Reports (34-45 and >45 days)**
 - More useful measurement – showed over 20% of meters were not transferring data to Load Research

Sample Installation Status

	Design	# of Strata	Installed	Not Installed	No Data	Data Current	Pre-SWAT Data > 34 Days	SWAT Data > 34 Days	Pre-SWAT Data > 45 Days	SWAT Data > 45 Days	Install Date
BECO R1	220	4	220	0	0	183	6	4	40	33	√
BECO R2	82	2	82	0	0	75	4	3	3	4	√
BECO R3	161	4	160	1	0	108	9	9	45	43	√
BECO G1	200	5	77	123	65	0	0	12	0	0	Aug-07
BECO G2	160	4	0	160	0	0	0	0	0	0	Aug-07
CAMB R1	160	4	134	4	43	83	17	8	6	0	Jul-07
CAMB R2	81	2	81	0	0	75	9	0	1	6	√
CAMB R3	165	3	164	1	9	119	0	1	74	35	Jul-07
CAMB G1	198	5	1	197	0	0	1	0	0	1	Aug-07
COMM R1	176	4	109	66	31	78	5	0	1	0	Dec-07
COMM R2	88	2	0	88	0	0	0	0	0	0	Dec-07
COMM R3	165	3	0	165	0	0	0	0	0	0	Dec-07
COMM G1	210	5	0	210	0	0	0	0	0	0	Dec-07
	2066		1028	1015	148	721	51	37	170	122	

Next Steps: SWAT Team

- **Established SWAT Team to address 221 of the 1028 installed meters not transferring data to Load Research**
- **SWAT Team Findings**
 - All issues were due to set up process and **NOT TECHNOLOGY**
 - Significant Backlog in Set Ups
 - Transfer switches off
 - Defined in wrong grouping
 - Provisioning not done correctly
- **After 2 Weeks**
 - 34-45 Days Late Reads reduced from 51 to 37
 - > 45 Days Late Reads reduced from 170 to 122
 - Most issues due to the set up process – Created a “Just in Time” Process to eliminate backlog
- **“No Meter Left Behind”**
- **“We have met the enemy and he is us.”**

Walt Kelly

