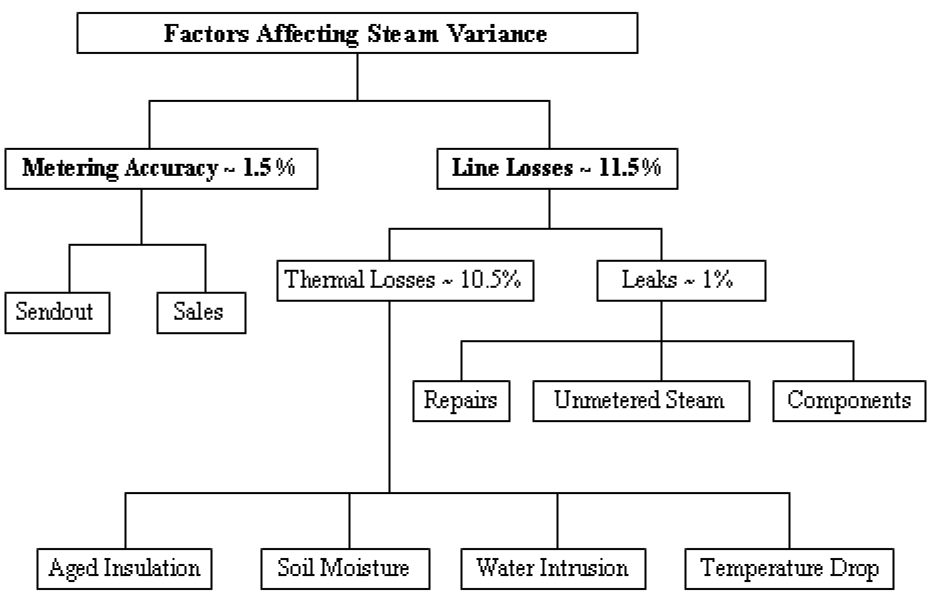
ASSESSMENT DOCUMENT: STEAM VARIANCE

1.1 OVERVIEW

Steam Operations continues to track and monitor its Steam Variance on a monthly basis. Steam Variance is difference between metered steam sendout from the generating stations and the registered customer sales. Steam Variance has been reduced over the last few years and Steam Operations continues to look for ways to continue this trend. A recent collaborative effort was recently conducted is elaborated on further in the next section. Steam Variance can be broken down by the following figure:



1.2 REVIEW, ASSESSMENT, AND ACTION PLAN

<u>Background</u>

Pursuant to the Commission's Order in Case 07-S-1315, the Company, in collaboration with the Active Parties, retained an independent consultant, ABS Consulting (The "Consultant"), to review and summarize the findings of the Company's previous Steam Variance studies conducted from 1991 to 2002 as well as provide a recommended action plan, which the Company could implement to reduce the Steam Variance. Steam Variance is defined as the difference between metered steam sent out from the generating stations and metered steam customer sales.

The Consultant performed a review and summary of the findings of previous Steam Variance studies and provided a recommended action plan (*Thermal Efficiency and Losses: Review and Action Plan*), in May, 2009. The Consultant's review of previous reports concluded that there are two factors affecting the Steam Variance, namely, Metering Accuracy and Line Losses. Metering issues were addressed by the installation of Vortex meters over the last several years. Line Losses are made up leaks and thermal losses. Losses due to leaks are considered small. Therefore, the primary opportunity to reduce Steam Variance is through the reduction of thermal losses. The Consultant's action plan concluded that the Company should investigate increasing the amount of superheat in its steam and the use of pumpable insulation to determine if there are any economic benefits relative to reducing thermal losses.

Consultant's Action Plan

1. Investigate whether slightly increasing steam sendout temperature, while still maintaining a temperature below the maximum system design temperature limits for the transmission and distribution system will bring about an increase in the amount of superheat (superheated steam is dry steam with a temperature above saturation). In theory increasing the amount of superheat in the steam, increases the distance that the steam can travel before a portion of this steam becomes condensate. The expected result is a decrease in the amount of thermal losses.

2. Investigate whether reducing Steam System operating pressure, while still maintaining adequate steam pressure to customers, which would result in an increase in superheat, would reduce thermal losses and whether any such reduction is cost effective.

3. Examine the use of pumpable insulation for re-insulating the Company's High Priority Location List for water intrusion to determine the reduction in thermal losses and determine if such actions are cost effective.

<u>Con Edison's Response to the Consultant's Action Plan</u>

Action Plan Item #1 – Increase Superheat

The Company acknowledges that, in general, raising steam sendout temperature so as to increase the amount of superheat does have the potential for increasing superheat thus lowering thermal line losses. As such, the Company has performed an internal assessment of increasing superheat in its steam sendout mains. The Company's assessment concluded that there is very little margin for increasing the amount of superheat in the steam mains. All of Con Edison's Package Boilers, the Boilers at the Ravenswood Steam Plant, and Hudson Avenue Boiler 82, all of which account for more than 25% of installed steam capacity, do not have superheat capabilities. Con Edison has a distribution piping design temperature limit of 413 ^{o}F and an operating temperature limit of 410 ^{o}F, as well as a transmission piping design limit and operating limit of 25 ^{o}F of superheat.

Actual steam distribution temperatures are within approximately 5 ^{o}F or less of the 410 ^{o}F operating limit. Steam Temperature probes, which are used to measure steam temperature, have an instrument error of 1 ^{o}F to 2 ^{o}F. The combination of the actual steam distribution temperature and instrument error leaves little margin for increasing the superheat temperature. Similarly, the actual transmission steam temperatures are close to the superheat design limit and operating limit of 25 ^{o}F. Furthermore, increasing the transmission superheat temperature will ultimately increase the downstream distribution temperatures, which are already very close to the 410 ^{o}F operating limit. It should also be noted that generally increasing the operating steam temperature has a high potential for increased heat loss to the outside environment. For more detail, please refer to the *Increased Superheat Temperature Assessment* in the following section.

Action Plan Item #2 – Reduced System Operating Pressure

The Company acknowledges that lowering Steam System operating pressure does have the potential for increasing superheat thus lowering thermal line losses. The Company will commence a review of the risks, benefits, and costs of taking such action and estimates that this review could be completed by the end of 2010. The Company estimates that this undertaking will cost approximately $50,000 in engineering consultant costs and will look to recover the actual incurred costs under the FAC, with Staff's approval, as was done for the ABS Consulting *Thermal Efficiency and Losses: Review and Action Plan*. The $50,000 estimate is based on 500 hours of consulting engineer labor at a rate of $100/hour. Not included in this estimate are in-house Company engineering labor, steam technical support labor, and other resources, which are already in rates.

The Steam System has limited operating flexibility to maintain a lower system operating pressure while still delivering adequate pressure to customers under certain operating conditions and contingencies. As such it is expected that a small decrease in operating pressure could be considered. The potential for the reduction of heat loss is considered limited. The impact on customer service and operations needs to be explored. The Company will use various computer models to investigate the operation of the Steam System at a reduced pressure and publish the results by the end of December, 2010. The analysis will also include any potential savings so that any economic benefits are demonstrated.

Action Plan Item #3 – Re-Insulation

The Company conducted a technical and economic review of all the High Priority Locations listed in the Consultant's review and action plan. The High Priority Location List was provided by the Consultant and reconciled with the official list maintained by Steam Distribution. As of March 18, 2010, the Company also evaluated any new High Priority Locations that were identified after the Consultant's review and action plan was issued in May, 2009. The Consultant's recommendation was to utilize recent Infrared ("IR") Scans of each of these locations to obtain a street surface temperature and then compare the street surface temperature to temperature curves developed by the Consultant. A street surface temperature that was greater than the Consultant's curve temperature would indicate an area that required further investigation and possibly be a potential "Hot Spot." Manholes and service boxes, which show up as higher temperature locations on the IR Scans, were excluded from the analysis, since there is no overlying backfill to help reduce thermal losses. A computer software model was used to evaluate the heat loss from the High Priority Locations. The High Priority Locations covered about six miles in total. Heat losses were calculated for each location on the High Priority Location List as well as any new locations that were added to the list after the Consultant issued the review and action plan. Calculations were performed to estimate the amount of steam lost per year for each location. The steam losses were then converted into dollars. The Consultant's review and action plan estimated a re-insulation cost per foot to re-insulate with pumpable insulation. The savings from using the pumpable insulation, expressed as btu/yr and Mlb/yr, were determined and converted into dollars per the method recommended in the Consultant's review and action plan and then compared with the re-insulation cost estimate. A simple payback calculation was performed. The shortest simple payback for any one of these locations was seven years. Several of the locations had payback periods of well over 20 years. Based on the Company's payback analysis, this recommendation was considered uneconomic and unacceptable. Our assessment determined that if all of the High Priority Locations were re-insulated with pumpable insulation, the total cost would be about $31.2 million. The total reduction in Steam Variance would be about 182 MMlb, which is small relative to a typical annual Steam Variance of say 4,095 MMlb. This 182 MMlb reduction equates to an annual savings estimate of about a $2.2 million and is comparable to an annual cost of about $6 million for carrying charges and property taxes, assuming the $31.2 million is capitalized. As such, this recommendation cannot be supported based solely on thermal savings. Based on this assessment, the Company decided that it would not be cost effective to continue to review the remaining IR Scans for the remaining 99 miles of Steam Pipe.

<u>Conclusion:</u>

The Company has addressed action items identified in the *Thermal Efficiency and Losses: Review and Action Plan*, performed by ABS Consulting in May, 2009. Action Plan Items #1 and #3 have been examined from a technical and economic standpoint and have been determined to not require any further action. Action Plan Item # 2 - Reduce System Operating Pressure, requires further analysis, which will be performed by the Company and reported on by the end of December, 2010.

1.3 INCREASED SUPERHEAT TEMPERATURE ASSESSMENT

For Consideration to Reduce Steam Variance

The average steam temperatures, pressures and degrees of superheat from the steam mains connected to its Generating Stations for 2008 were reviewed.

All of the Package Boilers can only generate saturated steam and do not have superheat capability. The Package Boilers consist of:

74th Street - Boilers 1-6
59th Street - Boilers 116-118
60th Street - Boilers 1-6

East River SSS - Boilers 115-119

The Boilers at the Ravenswood Steam Plant, Boilers 1-4, and Hudson Avenue Boiler 82, can only generate saturated steam and do not have superheat capability.

We shall call these units Non-Superheat Units (NSH).

The Steam Units that can produce Superheat are:
74th Street – Boilers 120-122
59th Street – Boilers 114-115 (Annex Boilers)
East River – Boilers 60 and 70
East River – HRSGs 10 and 20
Hudson Avenue – Boilers 71, 72, and 81
BNYCP – Units 1 and 2

We shall call these units Superheat Units (SH).

The Steam System has thermal constraints with the purpose of delivering dry saturated steam to each customer.

The thermal constraints are:

1. Distribution piping has a Design Pressure Limit of 200 PSIG and a Design Temperature Limit of 413 ^{o}F. The Sendout Temperature Guideline (Operating Limit) is 410 ^{o}F.

2. Transmission piping has a Design Pressure Limit of 400 PSIG and a Design Temperature Limit and Sendout Temperature Guideline (Design Limit and Operating Limit respectively) of 25 ^{o}F degrees of Superheat.

59th Street Generating Station

59th Street's steam piping configuration allows the mixing of steam from Boilers 114-115 (SH) with steam from the Package Boilers – Boilers 116-118 (NSH). The Station's steam piping exits into distribution piping with the temperature of the Annex Boilers at 417 ^{o}F and the weighted average Steam temperature is 406 ^{o}F.

The Station has a Sendout Temperature Guideline of 410 ^{o}F. This leaves a 4 ^{o}F margin for safe operation and a 7 ^{o}F margin for the Design Temperature Limit. The margins of 4 ^{o}F and 7 ^{o}F do not leave any available room to increase Superheat with system temperature fluctuations while maintaining the Steam Temperature below the Design Temperature Limit.

Hudson Avenue Generating Station

Hudson Avenue steam piping configuration allows the mixing of steam from Boilers 71, 72, 81 (SH) and 82 (NSH) before exiting into the Mains.

The steam piping enters the mains with an average of 24 ^{o}F superheat and a Superheat Design Temperature Limit and Sendout Temperature Guideline of 25 ^{o}F. This leaves a 1 ^{o}F margin for the Superheat Design Temperature Limit and Sendout Temperature Guideline. The margin of 1 ^{o}F does not leave any available room to increase Superheat with system temperature fluctuations while maintaining the Steam Temperature below the Superheat Design Temperature Limit.

74th Street Generating Station

74th Street steam piping configuration allows the mixing of steam from Boilers 120-122 (SH) with steam from the Package Boilers – Boilers 1-6 (NSH) into all of its exiting headers.

For the Main, the average degrees of Superheat available is 12.4 ^{o}F.
The Main was the only steam main that had any appreciable margin for increasing the Superheat temperature. However if we consider keeping a safe margin for temperature excursions, instrument error, and variation in steam flow, the amount of reduction on Steam Variance is deemed insignificant.

Main – 406 ^{o}F average temperature with a Sendout Temperature Guideline of 410 ^{o}F. This leaves a 4 ^{o}F margin for safe operation and a 7 ^{o}F margin for the Design Temperature Limit. The margins of 4 ^{o}F and 7 ^{o}F do not leave any available room to increase Superheat with system temperature fluctuations while maintaining the Steam Temperature below the Design Temperature Limit.

Main – 405 ^{o}F average temperature with a Sendout Temperature Guideline of 410 ^{o}F. This leaves a 5 ^{o}F margin for safe operation and an 8 ^{o}F margin for the Design Temperature Limit. The margins of 5 ^{o}F and 8 ^{o}F do not leave any available room to increase Superheat with system temperature fluctuations while maintaining the Steam Temperature below the Design Temperature Limit.

East River Generating Station

East River steam piping configuration allows the mixing of steam from HRSGs 10 and 20 and Boilers 60 and 70 (SH) with steam from the South Steam Station – Boilers 115-119 (NSH) into all of its exiting headers except the one exiting into the Main, which does not mix with the Package Boilers.

A – Already meets Superheat Guideline of 25 ^{o}F.

B – 407 ^{o}F average temperature with a Sendout Temperature Guideline of 410 ^{o}F. This leaves a 3 ^{o}F margin for safe operation and a 6 ^{o}F margin for the Design Temperature Limit. The margins of 3 ^{o}F and 6 ^{o}F do not leave any available room to increase Superheat with system temperature fluctuations while maintaining the Steam Temperature below the Design Temperature Limit.

C – 404 ^{o}F average temperature with a Sendout Temperature Guideline of 410 ^{0}F. This leaves a 6 ^{o}F margin for safe operation and a 9 ^{o}F margin for the Design Temperature Limit. The margins of 6 ^{o}F and 9 ^{o}F do not leave any available room to increase Superheat with system temperature fluctuations while maintaining the Steam Temperature below the Design Temperature Limit.

D – Has a Superheat Sendout Temperature Guideline and Superheat Design Temperature Limit of 25 ^{o}F. The average temperature was not available at the time of the assessment.

E – 24 ^{o}F average superheat with a Superheat Sendout Temperature Guideline and Superheat Design Temperature Limit of 25 ^{o}F. This leaves a 1 ^{o}F margin for the Sendout Temperature Guideline and Superheat Design Temperature Limit. The margin of 1 ^{o}F does not leave any available room to increase Superheat with system temperature fluctuations while maintaining the Steam Temperature below the Design Temperature Limit.

System receives steam from East River, which leaves the Station with 25 ^{o}F Superheat, but reduces to 20 ^{o}F Superheat. Superheat cannot be increased at East River Station in order to increase Superheat of the steam it will exceed the Design Temperature Limit as it leaves the Station.

BNYCP

BNYCP steam mixes with Hudson Avenue Generating Station steam before entering into the Mains. The mixing of steam from these two Stations results in steam with an average of 23 ^{o}F superheat for the Main and 20 ^{o}F superheat for the Main and a Superheat Sendout Temperature Guideline and Superheat Design Temperature Limit of 25 ^{o}F. This leaves a 2 ^{o}F margin for one and a 5 ^{o}F margin for another, which does not leave any available room to increase Superheat with system temperature fluctuations while maintaining the Steam Temperature below the Design Temperature Limit.

Con Edison does not control the temperature of the steam output from BNYCP and the metered steam from BNYCP is located on the Hudson Avenue premises, so the line losses from the BNYCP Units to the steam meter is not part of the Steam Variance.

Based on the foregoing, raising superheat at BNYCP will insignificantly impact Steam Variance.

Ravenswood Steam Station

Ravenswood's steam piping configuration allows the mixing of steam from Boilers 1-4 (NSH) before entering the system. The steam exiting the station is saturated and superheat is not available.

60th Street Generating Station

60th Street's steam piping configuration allows the mixing of steam from Boilers 1-6 (NSH) before exiting into the distribution mains. The steam exiting the station is saturated and superheat is not available.

ASSESSMENT DOCUMENT: PEAK FORECAST METHODOLOGY

1.1 STEAM PEAK DEMAND FORECAST METHODOLOGY

Energy Management provides Steam Operations with its base, low, and high peak demand forecast. This document highlights the key elements of this methodology and examines the next 20 years.

CECONY 2010 Winter Experience & 2011-2020 Steam Peak Demand Forecast

Energy Management

March 2010

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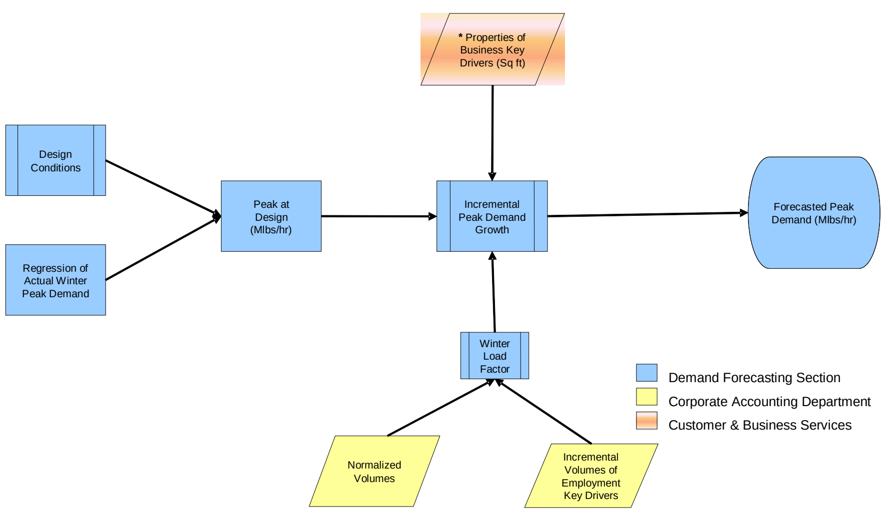
Outline

- **Winter 2010 Experience**
- **Peak Demand Growth**
  - o **2009 to 2010 Demand Growth**
- **2011 – 2020 Long-Term Forecasts**
- **Incremental Growth Forecast Methodology**
  - o **Key drivers of Peak Demand Adjustment**

CECONY- Peak Demand Forecasting Process



* New – mlbs/hr per 1,000 sq/ft. 15.5 for Commercial, 10.6 for Residential

Winter 2010 Experience

Winter 2010 weather was warm when compared to weather from the past 30 years.

TV

• 15.1°F TV (60% of current hour + 40% of prior 24 hr average) observed on Saturday, January 30, 2010 is the twenty-fifth coldest day in the past 30 years

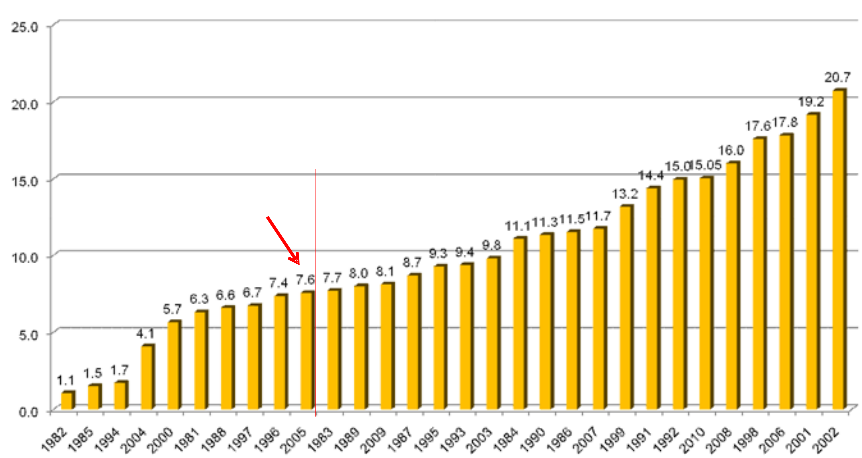
Actual demand

• The daily peak demand of 7,985 Mlbs/hr was reached on Monday, January 4th, 2010 (at 20.7°F TV)

Updated Design Temperature Variable

Changed from 6°F TV to 7°F TV to satisfy 1-in-3 condition

1 in 3 Lowest annual TV 1981-2010



** Changed from 5°F TV to 6°F TV Design Condition in Winter of 2002/2003

* See Appendix for a comparison of the older 70/30 % TV calculation on a 7° TV

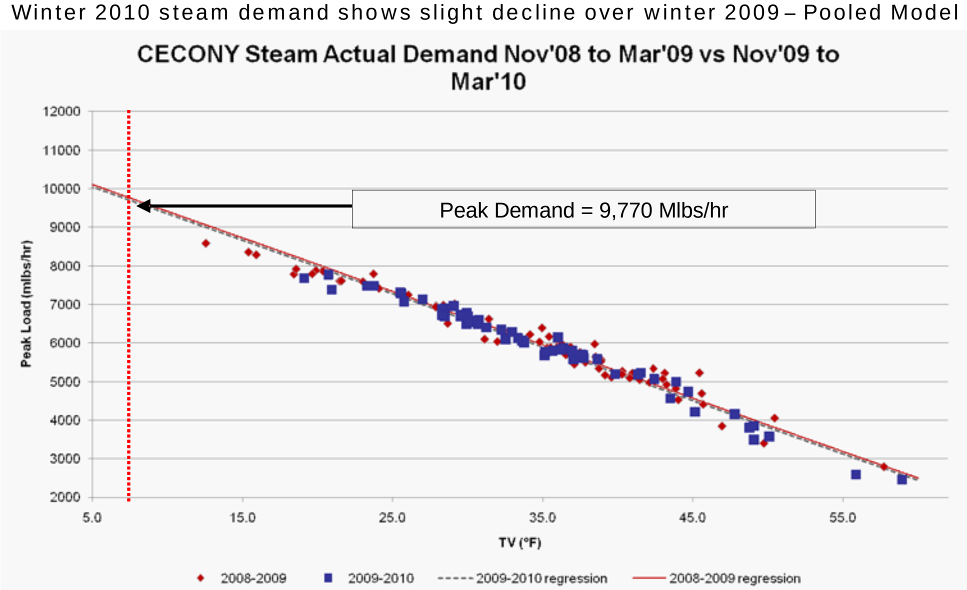
CECONY-Year over Year Steam Demand Comparison

New Model versus Old Model

- New model is a pooled regression that includes data from multiple years
- The previous approach compared models developed independently using single seasons
  - Single season regression models are more sensitive to outliers
  - Comparing single season regression models is more challenging and does not adjust for weather variability across seasons
- Pooled regression leverages multiple years of information
  - One unified model is designed
  - Binary variables identify different seasons
  - Year-over-year growth is identified using the coefficients of the binary variables

CECONY-Year over Year Steam Demand Comparison

Winter 2010 steam demand shows slight decline over winter 2009 – Pooled Model



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CECONY- Peak demand growth 2008/09 – 2009/10

Weather Adjusted demand shows -0.6% growth over prior winter

	Adjusted Peak	Forecast
Winter 2008/2009	*9,830 Mlbs/hr	
Winter 2009/2010	9,770 Mlbs/hr	9,770 Mlbs/hr
Estimate Growth (Mlbs/hr)	*-60 Mlbs/hr*	*0 Mlbs/hr*
Estimate Growth (%)	*-0.6%*	*0.0%*

*** New Value after correcting for outliers and adjusted to a 7°F 1 in 3 design condition**

CECONY- Incremental Growth Forecast Methodology

- The peak demand is adjusted by several key forecasted drivers:
  - New business from commercial or residential sectors
  - Lost business from on-site generation and demolition losses.
  - Employment outlook
- Business drivers are determined through square footage to demand conversion, while employment uses winter load factor (WLF) for its impact on demand
- WLF is calculated by = winter normalized sales/number of hours in winter/ Normalized peak
- Employment changes, multiplied by WLF, provides the incremental value to add/subtract from the normalized peak to develop the peak load forecast

CECONY- Peak load forecast for winter 2010/2011

Increase of 0.05% predicted for this winter

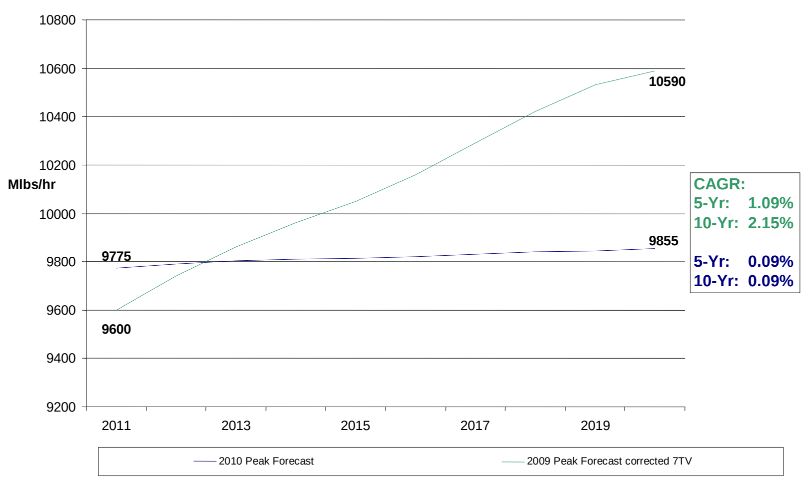
2009/2010 Adjusted Demand	**9,770**
Incremental Growth/Decline:	
Employment	**(5)**
New Business	**40**
Lost business*	**(30)**
Total Growth:	**5**
2010/2011 Winter forecast:	**9,775**

**** On-site generation and demolition losses**

2010 Updated Service Area Long-Term Forecast

Current 10-Yr Forecast lower than previous forecast by 735 Mlbs/hr

Ten-Year Steam System Peak Load Forecast (2011-2020)



Summary

- 2009-10 CECONY weather-adjusted winter peak demand is in line with our predictions
- For the winter of 2010/2011 the 0.05% demand increase is due to forecasted employment growth and known New Business projects
- Long term forecast - 80 m/lbs over the next 10 winters
  - Years 2011-2015 - 20% new employment + New Business
  - Years 2016-2020 - 100% new employment

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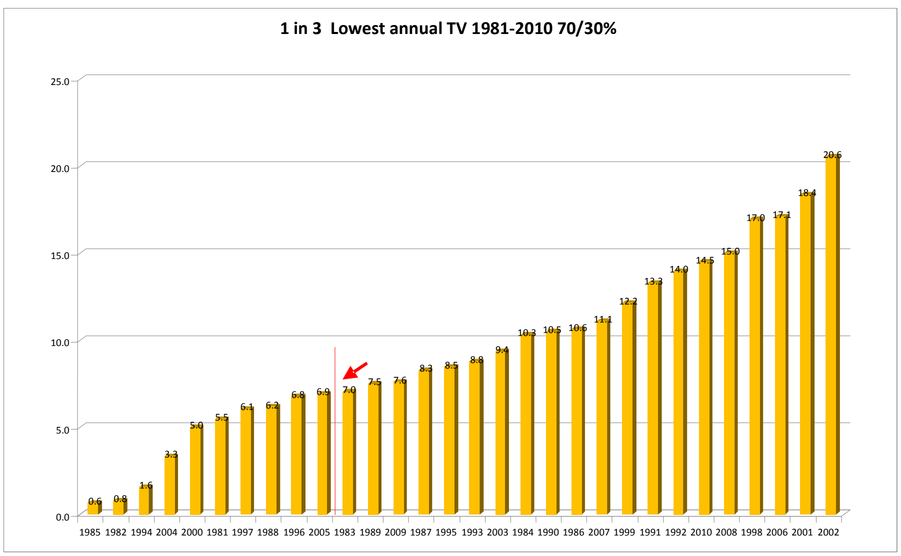
Appendix A



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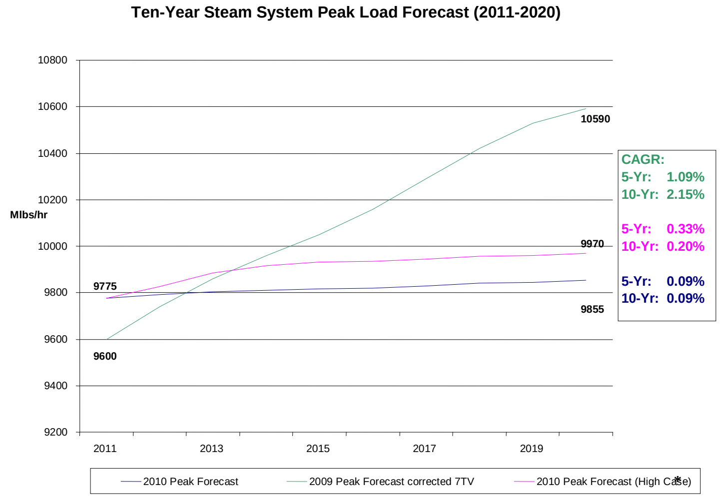
Appendix B

2010 Updated Service Area Long-Term Forecast

Current 10-Yr Forecast lower than previous forecast by 730 Mlbs/hr



*Assumes 100% of the New Business, whereas the 2010 peak forecast assumes only the "definite" New Business

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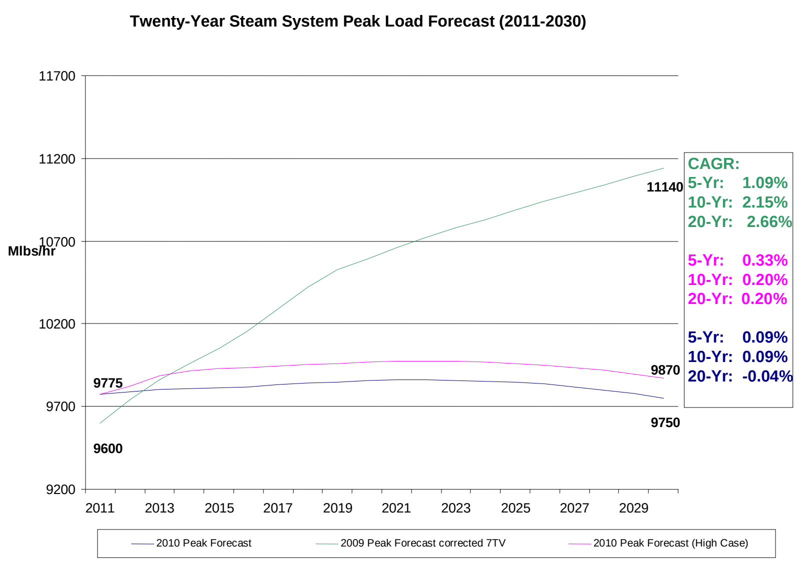
Appendix C



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Appendix D

CECONY- Peak load forecast 1 Year vs. 5 Year

2009/2010 Adjusted Demand: 9,770 (Mlbs/hr)

	2010/2011	2014/2015 (Cumulative)
Incremental Growth/Decline:		
Employment	**(5)**	**80**
New Business*	**40**	**140**
Lost business**	**(30)**	**(175)**
Total Growth:	**5**	**45**
2010/2011 Winter forecast:	**9,775**	**9,815**

*** New Business high case doesn't show any change for Winter 2010/2011. Over the next five years the high case for New Business adds 115 mlbs to the peak bringing the forecast to 9,930**

**** On-site generation and demolition losses**

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ASSESSMENT DOCUMENT: STONER HYDRAULIC MODELING

STONER – HYRDRAULIC MODELING STEAM OPERATIONS

This document contains the backup detailed analysis summary of the pressures and flows associated with the scenarios discussed in Chapter 3 of the Plan. The STONER Model and Contingency Model were utilized to examine various scenarios under various conditions to understand the hydraulic performance of the Steam Transmission and Distribution System under varying conditions.

Multi-area Reliability Simulation (MARS)

March 2010

MARS Overview

- MARS is one of the three tools used by Con Edison to evaluate steam system reliability:
  - Reserve Margin Forecast (CL&R table)
  - MARS (probabilistic)
  - STONER (deterministic)
- MARS is a simulation that steps through a year chronologically and performs up to 9,999 iterations taking into account the random nature of forced outages
- The results for each iteration are averaged to determine the results of the study.
- MARS is the same platform used by NYISO to determine electric reliability.

Capacity, Load & Reserve

Station/Unit	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
East River 10	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600
East River 20	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600
East River 60	980	980	980	980	980	980	980	980	980	980
East River 70	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200
BNYCP	971	971	971	971	971	971	971	971	971	971
East River SSS	650	650	650	650	650	650	650	650	650	650
74th High Pressure	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300
74th Package	708	708	708	708	708	708	708	708	708	708
60th Package	696	696	696	696	696	696	696	696	696	696
59th High Pressure	986	986	986	986	986	986	986	986	986	986
59th Package	381	381	381	381	381	381	381	381	381	381
Ravenswood 'A' House	750	750	750	750	750	750	480	480	480	480
Hudson Ave	1,600	1,600	1,600	1,600	0	0	0	0	0	0
Projected Capacity	**13,422**	**13,422**	**13,422**	**13,422**	**11,822**	**11,822**	**11,552**	**11,552**	**11,552**	**11,552**
Base Forecast	**9,840**	**9,770**	**9,740**	**9,610**	**9,500**	**9,400**	**9,380**	**9,375**	**9,390**	**9,405**
Reserve Requirement	**1,600**	**1,600**	**1,600**	**1,600**	**1,600**	**1,600**	**1,600**	**1,600**	**1,600**	**1,600**
Surplus / Deficiency	**1,982**	**2,052**	**2,082**	**2,212**	**722**	**822**	**572**	**577**	**562**	**547**

Inputs

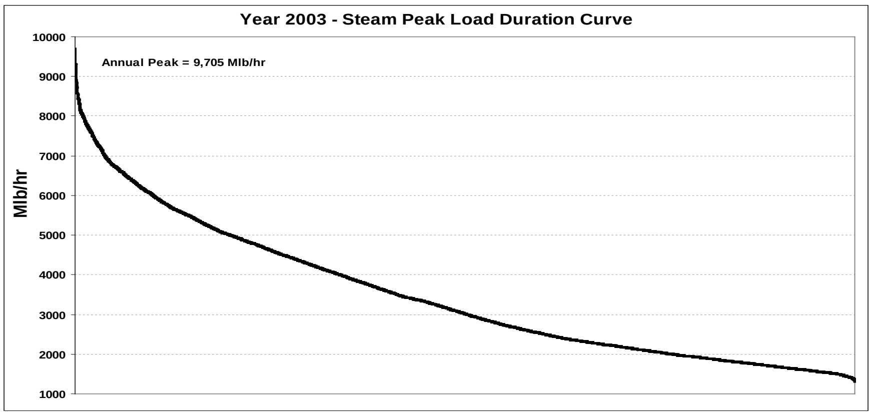
- System Topography
- Unit Capacities
- Unit Forced Outage Rates (EFORs)
- Planned Maintenance Schedules
- Peak Load and Load Shape
- Reserve

Capacities and Forced Outage Rates

		Capacity *	2007	2008	2009	3 Year Wgt'd Avg
		weighting factor =	**20%**	**30%**	**50%**	
East River	ER 10	1,600	5.9	0.7	8.1	**5.4**
	ER 20	1,600	0.6	0.2	6.3	**3.3**
	ER 60	830	9.8	2.4	3.5	**4.4**
	ER 70	1,186	11.7	6.7	5.6	**7.2**
	ER So B-115	130	19.6	2.6	1.9	**5.7**
	ER So B-116	130	40.7	9.4	13.4	**17.7**
	ER So B-117	130	0.7	9.7	1.4	**3.8**
	ER So B-118	130	0.8	2.6	2.0	**1.9**
	ER So B-119	130	3.6	2.5	3.9	**3.4**
74th Street	B - 120	434	0.3	0.5	19.6	**10.0**
	B - 121	433	0.8	0.0	2.3	**1.3**
	B - 122	433	2.0	0.0	2.3	**1.6**
	B - 001	118	0.1	11.1	42.1	**24.4**
	B - 002	118	0.2	3.9	30.9	**16.7**
	B - 003	118	0.9	3.3	27.2	**14.8**
	B - 004	118	0.0	4.3	34.3	**18.4**
	B - 005	118	0.0	6.8	26.6	**15.3**
	B - 006	118	0.0	3.5	23.9	**13.0**
60th Street	B - 001	116	0.6	2.5	0.4	**1.1**
	B - 002	116	0.6	14.3	0.3	**4.6**
	B - 003	116	0.6	2.7	0.4	**1.1**
	B - 004	116	0.0	2.8	0.4	**1.0**
	B - 005	116	0.0	2.6	0.4	**1.0**
	B - 006	116	0.0	3.4	0.3	**1.2**
Ravenswood	B - 001	154	6.0	1.3	8.4	**5.8**
	B - 002	188	10.8	12.4	14.4	**13.1**
	B - 003	220	9.4	11.4	8.5	**9.6**
	B - 004	188	5.0	8.5	2.6	**4.9**
Hudson Ave	B - 071	400	0.0	7.9	1.9	**3.3**
	B - 072	400	1.2	3.1	14.2	**8.3**
	B - 081	400	0.4	1.9	3.1	**2.2**
	B - 082	400	1.9	8.0	0.0	**2.8**
59th Street	B -114	475	1.2	1.8	1.5	**1.5**
	B -115	475	1.9	9.7	4.7	**5.6**
	B -116	127	0.2	1.0	3.4	**2.0**
	B -117	127	0.0	1.0	4.0	**2.3**
	B -118	127	0.0	1.1	2.6	**1.6**
BNYCP	B - 001	485	4.8	11.7	2.7	**5.8**
	B - 002	486	4.8	11.7	2.7	**5.8**
	** updated 1/1/10*	**13,222**				**5.4**

Peak Load & Shape

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Year 2003		9,705	8,448	8,574	6,911	3,699	5,935	6,238	6,114	5,046	5,149	5,909	8,044
ratio to peak		1.000	0.870	0.884	0.712	0.381	0.612	0.643	0.630	0.520	0.531	0.609	0.829
Forecast													
Winter Peak	**9,500**	**9,500**	**8,270**	**8,393**	**6,766**	**3,621**					**5,041**	**5,784**	**7,874**
Summer Peak	**5,350**						**5,350**	**5,350**	**5,350**	**5,350**			



Reserve Requirements

MARS Area Location	Reserve Mlb/hr
ER 6,7	**400**
ERRP 1,2	**1,182**
HUDSON AVE	**<u>118</u>**
	1,700

Program Output

- **Loss of Load Expectation (LOLE)** The LOLE is determined by calculating the peak hour in each area. If at least one area has a loss of load at the peak hour, then the steam system is determined to have a loss of load of one day. The results for each iteration are averaged to determine the results of the study
- **Alerts** - the number of days per year that the system called upon reserve to meet demand.

Plan Scenario Results

Peak Load 9,500 Mlb/hr

	Capacity with seasonal outages & deratings	Maintenance scheduled mtce at time (week) of peak		Peak	Reserve less seasonal & mtce & peak	Reserve (less HA) 1600	LOLE
	Mlb/hr						days per year
		(using 2003 historic load shapes)				w/o HA & Rav @ 750	
Jan	13,222	0		9,500	3,722	2,122	0.115
Feb	13,222	0		8,270	4,952	3,352	0.018
Mar	13,222	0	*wk 1*	8,393	4,829	3,229	0.048
Apr	13,001	3,784	*wk 2*	6,766	2,451	851	0.311
May	11,815	2,654	*wk 5*	3,621	5,540	3,940	0.003
Jun	9,377	0		5,350	4,027	2,427	0.013
Jul	9,377	0		5,350	4,027	2,427	0.016
Aug	9,377	0		5,350	4,027	2,427	0.025
Sep	11,615	2,384	*wk 2*	5,350	3,881	2,281	0.006
Oct	13,001	5,465	*wk 3*	5,041	2,495	895	0.139
Nov	13,001	3,662	*wk 2*	5,784	3,555	1,955	0.023
Dec	13,222	0		7,874	5,348	3,748	0.003
						Annual LOLE	**0.720**
						Annual Alerts	**21.878**

Plan Scenario Results

Peak Load 9,800 Mlb/hr

Reliability Analysis (without Hudson Avenue)

	Capacity	Maintenance		Peak	Reserve	Reserve (less HA)	LOLE
	with seasonal outages & deratings	scheduled mtce at time (week) of peak		**9,800 Mlb/hr**	less seasonal & mtce & peak	1600	
	Mlb/hr						days per year
				(using 2003 historic peak ratios)		w/o HA & Rav @ 750	
Jan	13,272	0		9,800	3,472	1,872	0.195
Feb	13,272	0		8,531	4,741	3,141	0.028
Mar	13,272	0	*wk 1*	8,658	4,614	3,014	0.062
Apr	13,051	3,798	*wk 2*	6,979	2,274	674	0.395
May	11,851	2,668	*wk 5*	3,735	5,448	3,848	0.005
Jun	9,413	0		5,350	4,063	2,463	0.012
Jul	9,413	0		5,350	4,063	2,463	0.014
Aug	9,413	0		5,350	4,063	2,463	0.027
Sep	11,651	2,398	*wk 2*	5,350	3,903	2,303	0.007
Oct	13,051	5,479	*wk 3*	5,200	2,372	772	0.146
Nov	13,051	3,712	*wk 2*	5,967	3,372	1,772	0.048
Dec	13,272	0		8,123	5,149	3,549	0.004
						Annual LOLE (1)	**0.943**
						Annual Alerts (2)	**25.543**

(1) Annual LOLE assuming use of 1,700 Mlb/hr of reserve

(2) Annual Alerts = LOLE if 1,700 Mlb/hr of reserve were not available