AKRF
Environmental and Planning Consultants

440 Park Avenue South
New York, NY 10016
tel: 800 899-AKRF
fax: 212 213-3191
www.akrf.com

December 3, 2010

Mr. Nicholas Audi
NYCDEP
58-17 Junction Boulevard, 9th Floor
Corona, NY 11368

Re: NYCDOC Rikers Island Cogeneration-
Revised NYCDEP Air Permit Application Package (By hand delivery)

Dear Mr. Audi:

Pursuant to our October 7th meeting at the NYCDEP offices, we are hereby submitting the revised permit applications and additional information requested by NYCDEP for the proposed new gas turbine cogeneration facility at Rikers Island. In addition, a separate new permit application is submitted for a new 2 MW black start emergency engine generator, which is included in this submittal.

Your prompt review of the applications is sincerely appreciated. Please feel free to contact me at 646-388-9724 if you have any questions or need additional information.

Sincerely,
AKRF, Inc.

Ramon Li, P.E.
Technical Director

Enclosures

Cc: Ramen Nandi, NYCDEP (w/o copy)
Randall Solomon, NYPA
Michael Gillespie, AECOM
Jennifer Franco, AKRF

New York City Department of Environmental Protection

THE CITY OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Bureau of Environmental Compliance
59-17 Junction Boulevard, 9th Floor, Flushing, New York 11373-5108
Records Control (718) 595-3855

Date: December 2 2010

Installation #: _____

Reference: Rikers Island, 17-25 Hazen Street (*Premise's Address*) East Elmhurst (*City*) NY (*State*) 11370 (*Zip*) Queens (*Borough*)

PROFESSIONAL CERTIFICATION

Being duly mindful of my responsibilities as a licensed Professional Engineer / Registered Architect in the State of New York and acting as designated agent for the applicant, I hereby certify that the application, plans, and all supplementary documents submitted in connection with this filing are complete and fully comply with all applicable laws, codes, rules, regulations, and directives of the Department of Environmental Protection, Bureau of Environmental Compliance of the City of New York in effect at the time filed.

N.Y.S. P.E. or R. A. Seal:

N.Y.S. P.E. or R. A. Signature:

N.Y.S. P.E. or R. A. Name: Ramon Li, P.E.

N.Y.S. P.E. or R. A. License Number: 060857

INSTRUCTIONS: Pursuant to Engineering Directive Number 1-78, this certification must be submitted in triplicate with all APC 5-0, APC 5-R, and APC 5-PA applications and does not preclude the necessity to sign and seal the certification now contained on the application forms.

New York City Department of Environmental Protection

PC Rev 02/09

THE CITY OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Bureau of Environmental Compliance
59-17 Junction Boulevard, 9th Floor, Flushing, New York 11373-5108
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N.Y.S. P.E. or R. A. Seal: STATE OF NEW YORK RAMON LI No. 060857 LICENSED PROFESSIONAL ENGINEER

N.Y.S. P.E. or R. A. Signature: _____

N.Y.S. P.E. or R. A. Name: Ramon Li, P.E.

N.Y.S. P.E. or R. A. License Number: 060857

INSTRUCTIONS: Pursuant to Engineering Directive Number 1-78, this certification must be submitted in triplicate with all APC 5-0, APC 5-R, and APC 5-PA applications and does not preclude the necessity to sign and seal the certification now contained on the application forms.

New York City Department of Environmental Protection

THE CITY OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Bureau of Environmental Compliance
59-17 Junction Boulevard, 9th Floor, Flushing, New York 11373-5108
Records Control (718) 595-3855

Date: December 2 2010

Installation #: _____

Reference: Rikers Island, 17-25 Hazen Street (*Premise's Address*) East Elmhurst (*City*) NY (*State*) 11370 (*Zip*) Queens (*Borough*)

PROFESSIONAL CERTIFICATION

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N.Y.S. P.E. or R. A. Seal: STATE OF NEW YORK RAMON LI No. 060857 LICENSED PROFESSIONAL ENGINEER

N.Y.S. P.E. or R. A. Signature: Ramon Li

N.Y.S. P.E. or R. A. Name: Ramon Li, P.E.

N.Y.S. P.E. or R. A. License Number: 060857

INSTRUCTIONS: Pursuant to Engineering Directive Number 1-78, this certification must be submitted in triplicate with all APC 5-0, APC 5-R, and APC 5-PA applications and does not preclude the necessity to sign and seal the certification now contained on the application forms.

THE CITY OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Bureau of Environmental Compliance
59-17 Junction Boulevard, 9th Floor, Flushing, New York 11373-5107
Records Control (718) 595-3855

INDUSTRIAL PROCESSES DIVISION
ENVIRONMENTAL RATING REPORT
SUMMARY OF POINTS OF EMISSION
(FORM APC 3PA)

EN NUMBER: _____

PREMISE IDENTIFICATION NUMBER:

1. COMPANY NAME: NYC Department of Correction

2. PREMISE ADDRESS: NYC-DOC-Rikers Island, 17-25 Hazen St., East Elmhurst, NY ZIP CODE: 11370

3. MAILING ADDRESS: 17-25 Hazen Street, East Elmhurst, NY ZIP CODE: 11370

TELEPHONE NUMBER: 718-546-1488

4. NAME OF PERSON PREPARING REPORT: Ramon Li, P.E.

5. ADDRESS: AKRF, Inc. 440 Park Avenue South, 7th Floor, New York, NY ZIP CODE: 10016

6. TELEPHONE NUMBER: 616-388-9724

7. SEC.	LOT	BLOCK
4	40	2605

8. EMISSION POINT NUMBER	9. OPERATION PRODUCING EMISSION	10. ENVIRONMENTAL RATING PROPOSED	ASSIGNED BY BEC
U0033	Emergency black start engine	D	

THIS REPORT IS: ☑ NEW ☐ REVISION ☐ ADDENDUM

11. SIGNATURE: _____ TITLE: Technical Director DATE: December 2, 2010

STATE OF NEW YORK
RAMON LI
No. 060357
LICENSED PROFESSIONAL ENGINEER

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

COPIES
WHITE - ORIGINAL
GREEN - DIVISION OF AIR
WHITE - REGIONAL OFFICE
WHITE - FIELD REP
YELLOW - APPLICANT

REGION | LOCATION | FACILITY | EMISSION POINT

ADD / CHANGE / DELETE

READ INSTRUCTIONS CONTAINED IN FORM 75-10-2 BEFORE ANSWERING ANY QUESTION

PROCESS, EXHAUST OR VENTILATION SYSTEM

APPLICATION FOR PERMIT TO CONSTRUCT OR CERTIFICATE TO OPERATE

SECTION A

1. NAME OF OWNER / FIRM: NYC Department of Correction
2. NUMBER AND STREET ADDRESS: 60 Hudson Street, Room 719
3. CITY / TOWN / VILLAGE: New York
4. STATE: NY
5. ZIP: 10013
6. OWNER CLASSIFICATION: A [ ] COMMERCIAL [ ] STATE [ ] MUNICIPAL; B [ ] INDUSTRIAL [ ] FEDERAL [X] OTHER
7. NAME, TITLE OF OWNER'S REPRESENTATIVE: Gregory McLaughlin, Warden/Support Services Division
8. TELEPHONE: 718-546-1429
9. NAME OF ARCHITECT / ENGINEER: AKRF, Inc.
10. TELEPHONE: 212-696-0670
11. NUMBER AND STREET ADDRESS: 440 Park Avenue South, 7th Floor
12. CITY / TOWN / VILLAGE: New York
13. STATE: NY
14. ZIP: 10016
15. NYS LIC. ARCHITECT / ENGINEER LICENSE NO.: 060857
16. TELEPHONE: 646-388-9724
17. NAME OF ARCHITECT / ENGINEER: Ramon Li, P.E.
18. SIGNATURE OF ARCHITECT / ENGINEER: Ramon Li
19. FACILITY NAME IF DIFFERENT FROM OWNER'S FIRM: NYC-DOC-Rikers Island
20. FACILITY LOCATION (NUMBER AND STREET ADDRESS): 17-25 Hazen Street
21. CITY / TOWN / VILLAGE: East Elmhurst, NY
22. ZIP: 11370
23. BUILDING NAME OR NUMBER: Outside
24. FLOOR NAME OR NUMBER: NA
25. START UP DATE: 07 / 2012 (MO / YR)
26. DRAWING NUMBERS OF PLANS SUBMITTED: Figure 1
27. PERMIT TO CONSTRUCT: A [X] NEW EQUIPMENT; B [ ] MODIFICATION
28. CERTIFICATE TO OPERATE: A [ ] NEW EQUIPMENT; B [ ] MODIFICATION; C [ ] EXISTING EQUIPMENT

STATE OF NEW YORK — RAMON LI — No. 060857 — LICENSED PROFESSIONAL ENGINEER

SECTION B

EMISSION POINT	STACK HEIGHT (FT)	STACK DIAMETER (FT)	EXIT VELOCITY (FPS)	EXIT TEMP (°F)	EXIT FLOW (ACFM)	EXIT FLOW (DSCFM)	EXIT MOISTURE (%)
U 0 0 3 3	15.5	0	13.5	18	896	152	16,103

SOURCE CODE: 1
SIC CODE: 12 2 5 2 5 2 5 2 5

DESCRIBE PROCESS: One 2 MW black start emergency generator to be operated only during emergencies. The generator will be tested for 1 hour each month to ensure reliability. The generator will be an MTU model 16V 4000 G43 (T1638A36) diesel unit or equivalent unit.

SECTION C

CONTAMINANT NAME	CAS NUMBER	RATE (LB/HR) ACTUAL	EMISSIONS UOM	EMISSIONS BASIS	HOURLY EMISSIONS (LB/HR) ACTUAL	HOURLY EMISSIONS (LB/HR) ALLOWABLE	ANNUAL EMISSIONS (TONS/YR) ACTUAL	ANNUAL EMISSIONS (TONS/YR) ALLOWABLE
Total Particulates	NY75-00-0	0.88	01	4	0.88	0.88	11	0
Sulfur Dioxide	7446_09_5	0.03	01	4	0.03	0.03	0.39	0
Nitrogen Oxides	NY210_00_0	26.01	01	4	26.01	28.22	312	0
Carbon Monoxide	630 08 0	8.38	01	4	8.38	15.43	101	0
Volatile Organic Compounds	NY998 00 0	1.72	01	4	1.72	1.72	21	0

DISPOSAL METHOD: None

See attached emissions calculation sheet.

SECTION D

STACK TEST DATE	DURATION OF TEST	APPLICABLE RULE	APPLICANT TITLE
40	1,768	15 ppm	

PERMIT TO CONSTRUCT

DATE ISSUED	EXPIRATION DATE	SIGNATURE OF APPROVAL	FEE
/ /	/ /		

1. DEVIATION FROM APPROVED APPLICATION SHALL VOID THIS PERMIT
2. THIS IS NOT A CERTIFICATE TO OPERATE
3. TESTS AND/OR ADDITIONAL EMISSION CONTROL EQUIPMENT MAY BE REQUIRED PRIOR TO THE ISSUANCE OF A CERTIFICATE TO OPERATE

CERTIFICATE TO OPERATE

DATE ISSUED	EXPIRATION DATE	SIGNATURE OF APPROVAL	FEE
/ /	/ /		

1. [ ] INSPECTED BY _____ DATE _____
2. [ ] INSPECTION DISCLOSED DIFFERENCES AS BUILT VS. PERMIT, CHANGES INDICATED ON FORM
3. [ ] ISSUE CERTIFICATE TO OPERATE FOR SOURCE AS BUILT
4. [ ] APPLICATION FOR C.O. DENIED _____ DATE _____ INITIALED

SPECIAL CONDITIONS

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

COPIES
WHITE - ORIGINAL
GREEN - DIVISION OF AIR
WHITE - REGIONAL OFFICE
WHITE - FIELD RTF
YELLOW - APPLICANT

PROCESS, EXHAUST OR VENTILATION SYSTEM

APPLICATION FOR PERMIT TO CONSTRUCT OR CERTIFICATE TO OPERATE

OP | LOCATION | FACILITY | EMISSION POINT

A ADD
C CHANGE
D DELETE

READ INSTRUCTIONS CONTAINED IN FORM 3-10 BEFORE ANSWERING ANY QUESTION

SECTION A

1. NAME OF OWNER / FIRM
NYC Department of Correction

2. NUMBER AND STREET ADDRESS
60 Hudson Street, Room 719

3. CITY - TOWN - VILLAGE | 4. STATE | 5. ZIP
New York | NY | 10013

6. OWNER CLASSIFICATION
A ☐ COMMERCIAL B ☐ INDUSTRIAL C ☐ PUBLIC UTILITY D ☐ FEDERAL E ☐ STATE F ☐ MUNICIPAL G ☐ PUBLIC AUTH. H ☐ RESIDENTIAL X ☐ OTHER

7. NAME & TITLE OF OWNER'S PERSONNEL CONTACT
Gregory McLaughlin,
Warden/Support Services Division

8. TELEPHONE
718-546-1429

9. NAME OF AUTHORIZED AGENT
AKRF, Inc.

10. TELEPHONE
212-696-0670

11. NUMBER AND STREET ADDRESS
440 Park Avenue South, 7th Floor

12. CITY - TOWN - VILLAGE | 13. STATE | 14. ZIP
New York | | 10016

15. TELEPHONE
646-388-9724

16. NAME & TITLE OF AUTHORIZED AGENT'S PERSONNEL CONTACT
Ramon Li, P.E.

17. SIGNATURE OF AUTHORIZED AGENT WHEN SUBMITTED FOR CONSTRUCTION

STATE OF NEW YORK
RAMON LI
No. 060857
LICENSED PROFESSIONAL ENGINEER

18. FACILITY NAME IF DIFFERENT FROM OWNER'S NAME
NYC-DOC-Rikers Island

20. FACILITY LOCATION (NUMBER AND STREET ADDRESS)
17-25 Hazen Street

21. CITY - TOWN - VILLAGE | 22. ZIP
East Elmhurst, NY | 11370

23. BUILDING NAME OR NUMBER
Outside

24. FLOOR NAME OR NUMBER
NA

25. START OF DATE (MO / YR)
07 / 2012

26. DRAWING NUMBER OF PLANS SUBMITTED
Figure 1

27. PERMIT TO CONSTRUCT
A [X] NEW SOURCE B ☐ MODIFICATION

28. CERTIFICATE TO OPERATE
A ☐ NEW SOURCE B ☐ MODIFICATION C ☐ RENEWAL D ☐ TEMP. ACTIVITY

SECTION B

29. EMISSION POINT	30. EXHAUST ELEVATION	31. EXHAUST DIAMETER	32. EXHAUST VELOCITY	33. EXHAUST TEMPERATURE	34. EXHAUST FLOW (ACTUAL CFM)	35. EXHAUST FLOW (STANDARD CFM)
U 0 0 3 3	15.5	0	13.5	18	896	152	16,103

36. SOURCE CODE: 1

37. EMISSION UNIT: 12

38. EMISSION POINT: 2 5 2 5

39. EMISSION PROCESS: 2 5

40. EMISSION CONTROL: 2 5

41. DESCRIPTION

One 2 MW black start emergency generator to be operated only during emergencies. The generator will be tested for 1 hour each month to ensure reliability. The generator will be an MTU model 16V 4000 G43 (T1638A36) diesel unit or equivalent unit.

SECTION C

42. EMISSION CONTROL(S) (NAME & TYPE)
None

43. MANUFACTURER | 44. MODEL NO. | 45. TYPE OF SERVICE | 46. DATE | 47. DISPOSAL FEE (USD) | 48. DATE INSTALLED (MONTH/YEAR) | 49. USEFUL LIFE

SECTION D

50. REMARKS

See attached emissions calculation sheet.

SECTION E

51. CONTAMINANT NAME	52. CAS NUMBER	53. EMISSION FACTOR	54. BASIS FOR CALCULATION	55. UNCONTROLLED POTENTIAL EMISSIONS (PTE)	56. CONTROLLED PTE	57. ALLOWABLE EMISSIONS	58. PERMIT BASIS
Total Particulates	NY75-00-0	0.88	01 4	0.88	0.88	11	0
Sulfur Dioxide	7446_09_5	0.03	01 4	0.03	0.03	0.39	0
Nitrogen Oxides	NY210 00 0	26.01	01 4	26.01	28.22	312	0
Carbon Monoxide	630 08 0	8.38	01 4	8.38	15.43	101	0
Volatile Organic Compounds	NY998 00 0	1.72	01 4	1.72	1.72	21	0

SECTION G

59. EXHAUST GAS TEMPERATURE | 60. EXHAUST GAS VOLUME | 61. EXHAUST GAS MOISTURE CONTENT
40 | 1,768 | 15 ppm

62. ALLOWABLE FUEL | 63. APPLICANT FUEL

64. I CERTIFY THAT THE INFORMATION SUBMITTED HEREIN IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF AND THAT I AM AUTHORIZED TO SUBMIT THIS APPLICATION ON BEHALF OF THE APPLICANT NAMED IN ITEM 1. I UNDERSTAND THAT ANY FALSE STATEMENT MAY BE PUNISHABLE AS A CLASS A MISDEMEANOR PURSUANT TO SECTION 210.45 OF THE PENAL LAW.

AGENCY USE ONLY

65. DEC ACCEPTANCE DATE | 66. FACILITY ID NO. | 67. U.T.M. (E) | 68. U.T.M. (N) | 69. SIC NUMBER | 70. DATE APPL. RECEIVED | 71. DATE APPL. RETURNED | 72. REVIEWED BY

PERMIT TO CONSTRUCT

73. DATE ISSUED | 74. EXPIRATION DATE | 75. SIGNATURE OF APPROVAL | 76. FEE

77. 1. DEVIATION FROM APPROVED APPLICATION SHALL VOID THIS PERMIT.
2. THIS IS NOT A CERTIFICATE TO OPERATE.
3. TESTS AND/OR ADDITIONAL DATA ON CONTROL EQUIPMENT MAY BE REQUIRED PRIOR TO THE ISSUANCE OF A CERTIFICATE TO OPERATE.

CERTIFICATE TO OPERATE

78. DATE ISSUED | 79. EXPIRATION DATE | 80. SIGNATURE OF APPROVAL | 81. FEE

82. 1. ☐ INSPECTED BY _____ DATE _____
2. ☐ INSPECTION DISCLOSED DIFFERENCES AS BUILT VS. PERMIT. CHANGES INDICATED ON FORM
3. ☐ ISSUE CERTIFICATE TO OPERATE FOR SOURCE AS BUILT
4. ☐ APPLICATION FOR C.O. DENIED _____ DATE _____ INITIALED

83. SPECIAL CONDITIONS

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

COPIES
WHITE - ORIGINAL
GREEN - DIVISION OF AIR
WHITE - REGIONAL OFFICE
WHITE - FIELD REP
YELLOW - APPLICANT

OP | LOCATION | FACILITY | EMISS ON POINT

A ADD
C CHANGE
D DELETE

READ INSTRUCTIONS CONTAINED IN FORM 75-1-12 BEFORE ANSWERING ANY QUESTION

PROCESS, EXHAUST OR VENTILATION SYSTEM

APPLICATION FOR PERMIT TO CONSTRUCT OR CERTIFICATE TO OPERATE

SECTION A

1. NAME OF OWNER / FIRM: NYC Department of Correction
2. NUMBER AND STREET ADDRESS: 60 Hudson Street, Room 719
3. CITY - TOWN - VILLAGE: New York
4. STATE: NY
5. ZIP: 10013
6. OWNER'S CLASSIFICATION: A. COMMERCIAL B. INDUSTRIAL C. STATE D. UTILITY E. FEDERAL F. MUNICIPAL G. PRIVATE / NOT-FOR-PROFIT H. HOSPITAL I. RESIDENTIAL X. OTHER
7. NAME & TITLE OF OWNER'S REPRESENTATIVE: Gregory McLaughlin, Warden/Support Services Division
8. TELEPHONE: 718-546-1429
9. NAME OF AUTHORIZED AGENT: AKRF, Inc.
10. TELEPHONE: 212-696-0670
11. NUMBER AND STREET: 440 Park Avenue South, 7th Floor
12. CITY - TOWN - VILLAGE: New York
13. STATE: NY
14. ZIP: 10016
15. TELEPHONE: 646-388-9724
16. NAME & TITLE OF AUTHORIZED REPRESENTATIVE: Ramon Li, P.E.
17. SIGNATURE: 060857
18. DATE SIGNED: 07 / 2012
19. FACILITY NAME (IF DIFFERENT FROM OWNER / FIRM): NYC-DOC-Rikers Island
20. FACILITY LOCATION (NUMBER AND STREET ADDRESS): 17-25 Hazen Street
21. CITY - TOWN - VILLAGE: East Elmhurst, NY
22. ZIP: 11370
23. BUILDING NAME OR NUMBER: Outside
24. FLOOR LEVEL OR NUMBER: NA
25. START UP DATE: 07 / 2012
26. DRAWING NUMBERS OF PLANS SUBMITTED: Figure 1
27. PERMIT TO CONSTRUCT: A. [X] NEW SOURCE B. [ ] MODIFICATION
28. CERTIFICATE TO OPERATE: A. [ ] NEW SOURCE B. [ ] MODIFICATION C. [ ] EXISTING SOURCE

STATE OF NEW YORK
RAMON LI
No. 060857
LICENSED PROFESSIONAL ENGINEER

SECTION B

29. EMISSION POINT	30. UNIFORM ELEVATION	31. HORIZONTAL AREA	32. HEIGHT	33. DIAMETER	34. TEMP.	35. EXIT VELOCITY	36. EXIT FLOW RATE (ACFM)
U 0 0 3 3	15.5	0	13.5	18	896	152	16,103

37. SOURCE CODE: 1
38. HOURS/DAY: 12
39. DAYS/WEEK: 2
40. WEEKS/YEAR: 52
41. % OPERATION BY SEASON: WINTER 25, SPRING 25, SUMMER 25, FALL 25

SECTION C

42. DESCRIBE PROPOSED OPERATION:

One 2 MW black start emergency generator to be operated only during emergencies. The generator will be tested for 1 hour each month to ensure reliability. The generator will be an MTU model 16V 4000 G43 (T1638A36) diesel unit or equivalent unit.

SECTION D

43. EMISSION CONTROL EQUIPMENT	44. MANUFACTURER NAME AND MODEL NUMBER	45. DISPOSAL METHOD	46. DATE INSTALLED MONTH / YEAR	47. USEFUL LIFE
None				

SECTION E

48. CALCULATIONS:

See attached emissions calculation sheet.

SECTION F

49. CONTAMINANT NAME	50. CAS NUMBER	51. APPORTIONMENT	52. UNIT	53. RW RATING	54. EMISSIONS ACTUAL	55. UNIT	56. EF	57. REMARKS	58. EMISSIONS PER C.O.	59. HOURLY EMISSIONS LBS/HR UNIT	60. HOURLY EMISSIONS LBS/HR ACTUAL	61. ANNUAL EMISSIONS LBS/YR ACTUAL	62. ANNUAL EMISSIONS LBS/YR PERMISSIBLE
Total Particulates	NY75-00-0				0.88	01	4		0.88	0.88	0.88	11	0
Sulfur Dioxide	7446_09_5				0.03	01	4		0.03	0.03	0.03	0.39	0
Nitrogen Oxides	NY210_00_0				26.01	01	4		26.01	28.22	28.22	312	0
Carbon Monoxide	630_08_0				8.38	01	4		8.38	15.43	15.43	101	0
Volatile Organic Compounds	NY998_00_0				1.72	01	4		1.72	1.72	1.72	21	0

SECTION G

63. SOLID FUEL TYPE	64. SOLID FUEL THOUSANDS OF GALLONS/YR	65. SOLID FUEL % SULFUR	66. SOLID FUEL % ASH	67. GAS THOUSANDS OF CU FT/YR	68. APPLICABLE RULE	69. APPLICABLE RULE
	40	1,768	15 ppm			

Upon completion of construction sign the statement listed below and forward to the appropriate Department office.

THE PROCESS, EXHAUST OR VENTILATION SYSTEM HAS BEEN CONSTRUCTED AND WILL BE OPERATED IN ACCORDANCE WITH THE STATED SPECIFICATIONS AND IN COMPLIANCE WITH ALL PROVISIONS OF 6 NYCRR REGULATIONS.

70A. SIGNATURE OF AUTHORIZED REPRESENTATIVE | DATE

AGENCY USE ONLY

156. LOCATION CODE | 157. FACILITY ID. NO. | 158. U.T.M. (E) | 159. U.T.M. (N) | 160. SIC NUMBER | 161. DATE APPL. RECEIVED | 162. DATE APPL. REVIEWED | 163. REVIEWED BY

PERMIT TO CONSTRUCT

164. DATE ISSUED	165. EXPIRATION DATE	166. SIGNATURE OF APPROVAL	167. FEE
/ /	/ /		

166.
1. DEVIATION FROM APPROVED APPLICATION SHALL VOID THIS PERMIT.
2. THIS IS NOT A CERTIFICATE TO OPERATE.
3. TESTS AND/OR ADDITIONAL EMISSION CONTROL EQUIPMENT MAY BE REQUIRED PRIOR TO THE ISSUANCE OF A CERTIFICATE TO OPERATE.

CERTIFICATE TO OPERATE

169. DATE ISSUED	170. EXPIRATION DATE	171. SIGNATURE OF APPROVAL	172. FEE
/ /	/ /		

173.
1. [ ] INSPECTED BY _____ DATE _____
2. [ ] INSPECTION DISCLOSED DIFFERENCES AS BUILT VS. PERMIT. CHANGES INDICATED ON FORM
3. [ ] ISSUE CERTIFICATE TO OPERATE FOR SOURCE AS BUILT
4. [ ] APPLICATION FOR C.O. DENIED _____ DATE _____ INITIALED

174. SPECIAL CONDITIONS:

1. | 2.
3. | 4.
5. | 6.
7. | 8.

TABLE 1
NYC-DOC-Rikers Island
Emergency Blackstart Engine Emission Rates

Capacity	2000	kW
Operating Hours	12	hours/yr
Max. Fuel Flow	147	gals/hr
Max. Fuel Flow	1768	gals/yr

Pollutant	Emission Factor	Units	Emissions (lbs/hr)	Emissions (tons/yr)	Emissions (lbs/yr)
NOx + NMHC[1]	5.9	g/kW-hr	26.01	0.16	312
CO	1.9	g/kW-hr	8.38	0.050	101
VOC[2]	0.00064	lb/hp-hr	1.72	0.010	21
PM10/PM2.5	0.2	g/kW-hr	0.88	0.0053	11
SO2[3]	0.000012	lb/hp-hr	0.03	0.00020	0.39

Notes:

1. Emission factors for NOx + NMHC, CO, and PM are from manufacturer data. PM10/PM2.5 are assumed equal to PM emissions.
2. From AP-42. TOC is by weight 9% methane and 91% nonmethane.
3. Assumes a sulfur in fuel contect of 15 ppm.

NORTH

PREVAILING WIND DIRECTION

EAST RIVER

REVISED ROAD

EXISTING ROAD

EXISTING DONUT BUILDING

EXISTING GUARD RAIL

REVISE EXISTING ROAD

U0033
AMSL = 29'-0"
AG = 13'-6"

PORTABLE EMERGENCY DIESEL GENERATOR 2000KW

OUTDOOR SWITCHGEAR

TRANSFORMERS TWO (2)

U0030
AMSL = 115'-6"
AG = 100'-0"

RAMP

RAMP

MULTI-OURPOSE ROOM ROOF

MECHANICAL AREA/ STORAGE AREA ROOF

CHEMICAL INJECTION EQUIPMET/STORAGE AREA ROOF

GRADE EL 15'-6"

ROOF FAN

ELECTRICAL/CONTROL ROOM ROOF

GAS TURBINE ROOF

GT INLET FILTER W/INLET COOLING (TYP)

BYPASS DUCT

LUBE OIL AIR COOLERS

STACK

70'-9"

94'-9"

71'-0"

95'-0"

24'-0"

17'-0"

16'-0"

59'-6"

U0029
AMSL = 165'-6"
AG = 150'-0"

U0031
AMSL = 165'-6"
AG = 150'-0"

PIPE RACK

UNLOADING DOCK

U0032
AMSL = 115'-6"
AG = 100'-0"

EXISTING TRAILER

EXISTING PIPE FITTERS BUILDING

UNLOADING DOCK

REVISE EXIST ROAD 14'-0" WIDE

EXISTING ROAD

EXISTING BURIED SIX (6) OIL TANKS

EXISTING ROAD

EXISTING FOUR (4) TANKS TK NO 7

GAS COMPRESSORS THREE (3) 50%

℄ BOILER No 9

℄ BOILER No 8

EXISTING BOILER BUILDING

℄ BOILER No 7

℄ BOILER No 6

EXISTING BOILER BUILDING

U0001
AMSL = 200'-0"
AG = 182'-0"
BOILERS 6, 7, 8, & 9

℄ STACK EXIST

EXISTING GAS METER AREA

EXISTING BURIED TWO (2) FIBERGLASS DIESEL OIL TKS (ABANDON IN PLACE AND CLEANED)

℄ BOILER No 5

U0003
AMSL = 188'-0"
AG = 170'-0"
BOILERS 4 & 5

℄ STACK EXIST

℄ BOILER No 4

GRADE EL 18'-0"±

U0002
AMSL = 203'-0"
AG = 185'-0"
BOILERS 2 & 3

EXISTING ENGINE ROOM

℄ STACK EXIST

℄ BOILER No 3

℄ BOILER No 2

GRADE

EXISTING ELECTRICAL TRAILERS AREA

0' 20' 40' 60'

GRAPHIC SCALE

STATE OF NEW YORK
RAMON LI
No. 060057
LICENSED PROFESSIONAL ENGINEER

NOTES:
THERE ARE NO BUILDING AT OR BEYOND THE PROPERTY LINE

LEGEND:
EMISSION POINTS IN BLUE ARE PROPOSED
EMISSION POINTS IN RED ARE EXISTING
AMSL = ABOVE MEAN SEA LEVEL
AG = ABOVE GRADE

New York Power Authority

AECOM

20 Exchange Place, New York NY 10005

NEW YORK CITY DEPARTMENT OF CORRECTION

REVISIONS

NO.	DATE	DESCRIPTION	BY	APPD.
A	12-01-09	60% SUBMITTAL		
B	10-20-10	90% SUBMITTAL		

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KEY PLAN

RIKERS ISLAND

17-25 HAZEN STREET
E. ELMHURST N.Y. 11370

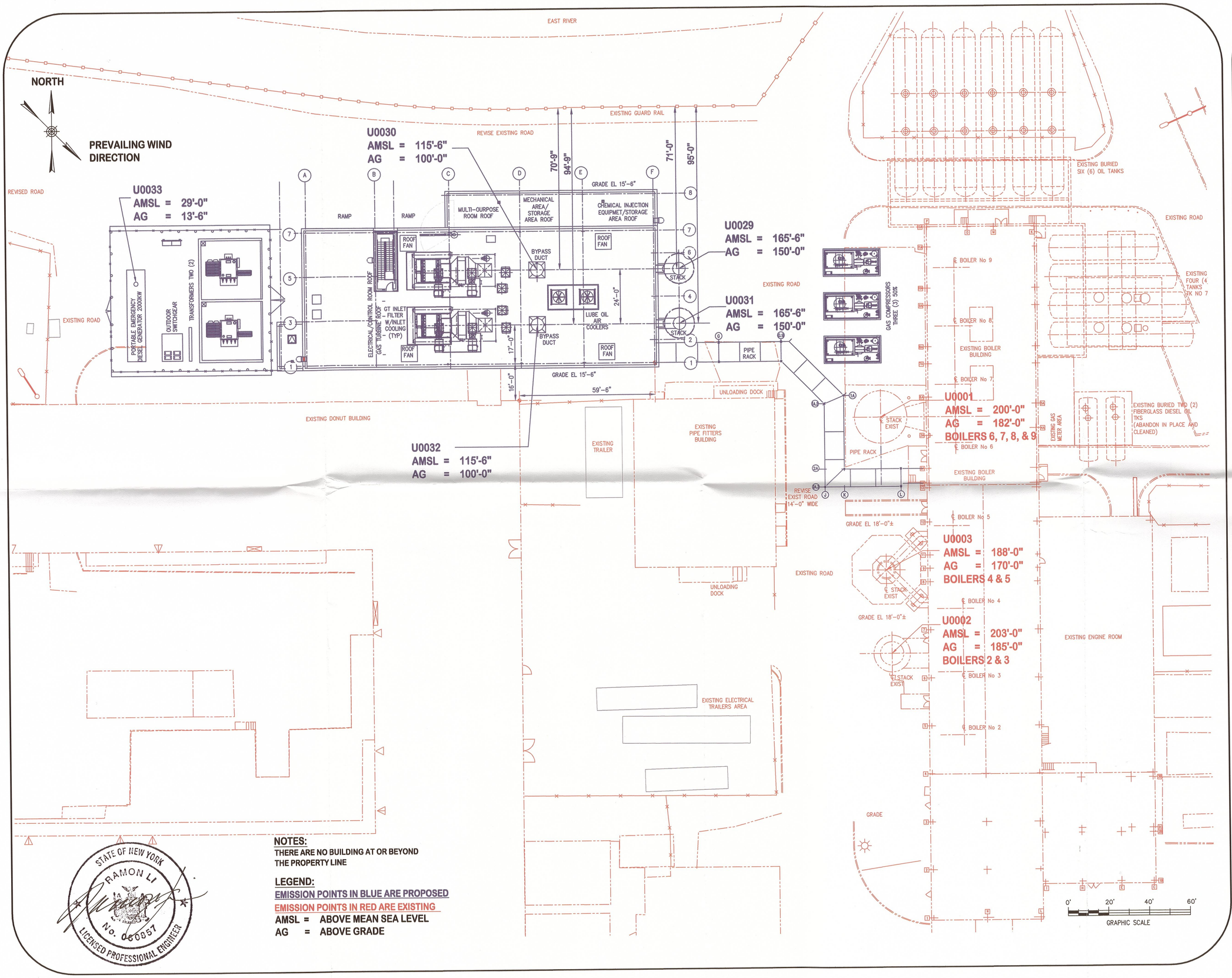
COGENERATION PLANT

MECHANICAL

ENLARGED PLOT PLAN
NORTH SIDE

PROJECT MANAGER: M.GILLESPIE	SCALE: 1"=20'
DESIGNED BY:	DATE: 09-25-2009
DRAWN BY: JS ZAFFOS	AECOM PROJECT NO. 60020717
CHECKED BY: P YALLOURIS	
FILE LOCATION:	
DRAWING NO.	

FIGURE 1



STATE OF NEW YORK
RAMON LI
No. 060857
LICENSED PROFESSIONAL ENGINEER

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20 Exchange Place, New York NY 10005

NEW YORK CITY DEPARTMENT OF CORRECTION

REVISIONS

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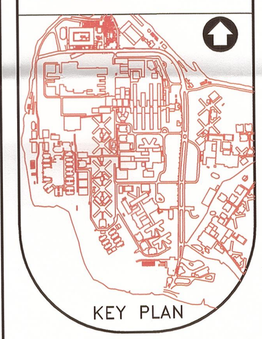

RIKERS ISLAND
17-25 HAZEN STREET
E. ELMHURST N.Y. 11370

COGENERATION PLANT

MECHANICAL

ENLARGED PLOT PLAN
NORTH SIDE

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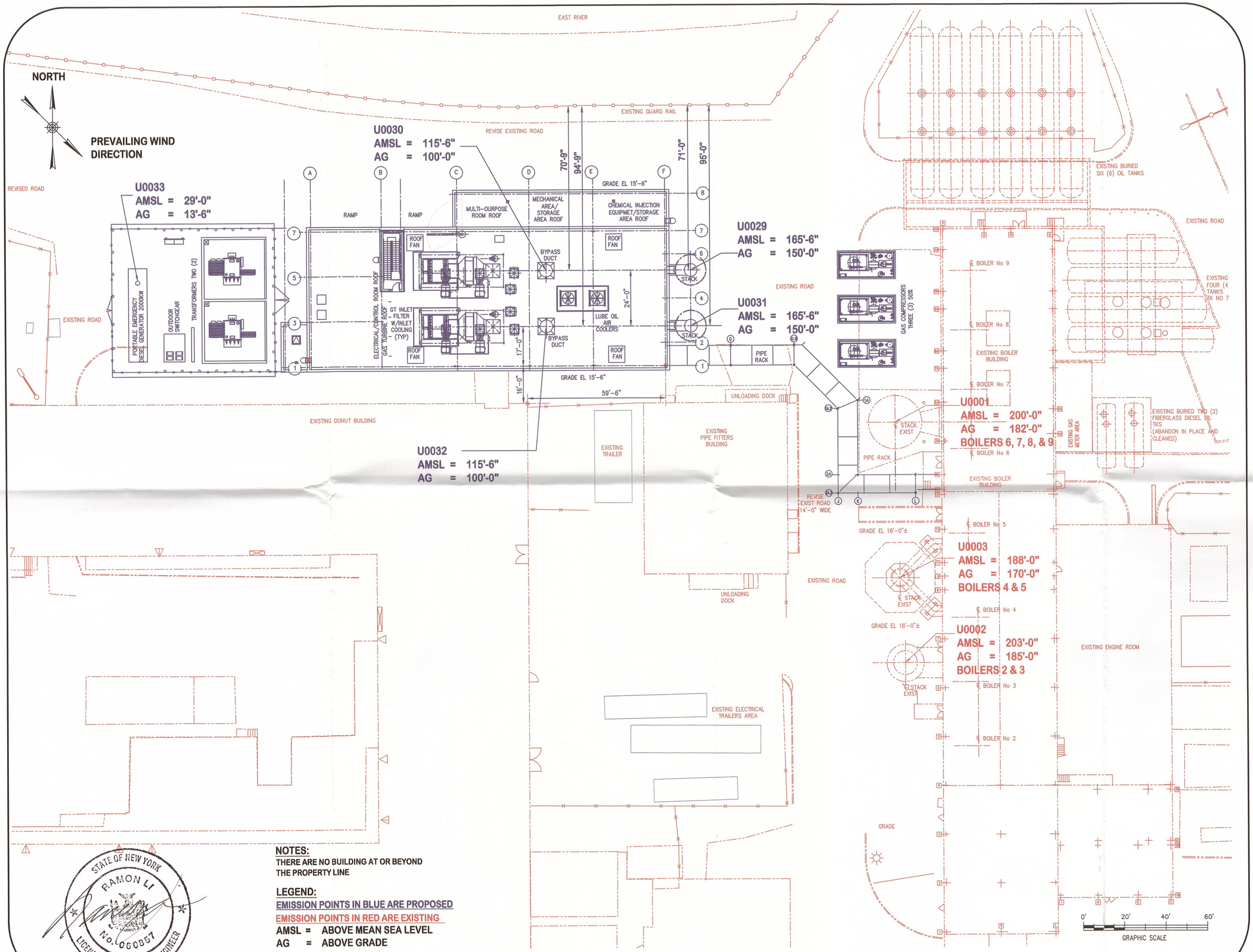
FIGURE 1



STATE OF NEW YORK
RAMON LI
No. 060957
LICENSED PROFESSIONAL ENGINEER

NOTES:
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LEGEND:
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20 Exchange Place, New York NY 10005

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REVISIONS

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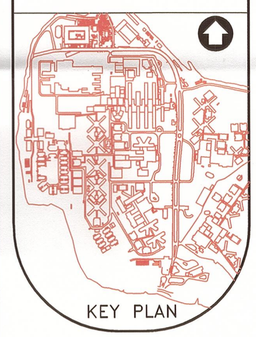

RIKERS ISLAND
17-25 HAZEN STREET
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COGENERATION PLANT

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DESIGNED BY:	DATE: 09-25-2009
DRAWN BY: JS ZAFFOS	AECOM PROJECT NO. 60020717
CHECKED BY: P YALLOURIS	
FILE LOCATION:	
DRAWING NO.	

FIGURE 1

DIESEL ENGINE-GENERATOR SET 2000-XC6DT2

2000 kWe / 60 Hz / Standby
1800 kWe / 60 Hz / Prime
480 - 13.8kV

SYSTEM RATINGS

Standby

Voltage (L-L)	480V**	600V	4160V	12470V	13200V	13800V
Phase	3	3	3	3	3	3
PF	0.8	0.8	0.8	0.8	0.8	0.8
Hz	60	60	60	60	60	60
kW	2000	2000	2000	2000	2000	2000
kVA	2500	2500	2500	2500	2500	2500
AMPS	3007	2406	347	116	109	105
skVA@30% Voltage Dip	5800	3600	5100	C/F	C/F	C/F
Generator Model*	744RSL4054	744RSS4292	744FSM4374	1020FDH5582	1020FDH5582	1020FDH5582
Temp Rise	130°C/27°C	125°C/40°C	130°C/27°C	130°C/27°C	130°C/27°C	130°C/27°C
Connection	4 BAR WYE	4 BAR WYE	4 BAR WYE	4 BAR WYE	4 BAR WYE	4 BAR WYE

Prime

Voltage (L-L)	480V	600V	4160V	12470V	13200V	13800V
Phase	3	3	3	3	3	3
PF	0.8	0.8	0.8	0.8	0.8	0.8
Hz	60	60	60	60	60	60
kW	1800	1800	1800	1800	1800	1800
kVA	2250	2250	2250	2250	2250	2250
AMPS	2710	2168	312	104	99	94
skVA@30% Voltage Dip	5800	3600	5100	C/F	C/F	C/F
Generator Model*	744RSL4054	744RSS4292	744FSM4374	1020FDH5582	1020FDH5582	1020FDH5582
Temp Rise	105°C/40°C	105°C/40°C	105°C/40°C	105°C/40°C	105°C/40°C	105°C/40°C
Connection	4 BAR WYE	4 BAR WYE	4 BAR WYE	4 BAR WYE	4 BAR WYE	4 BAR WYE

* The Generator Model Number identified in the table is for standard C Series Configuration. Consult the factory for alternate configuration.
** UL2200 Offered

STANDARD FEATURES

// EPA Tier 2 Certified
// Engine-Generator Set Tested to ISO 8528-5 for Transient Response
// UL2200 Listed, CSA Certified – Offered
// Accepts Rated Load in One Step Per NFPA 110
// All engine-generator sets are prototype and factory tested
// MTU Onsite Energy is a single source supplier
// Global Product Support
// 2 Year Standard Warranty
// 16V 4000 Diesel Engine
- 76.3 Liter Displacement
- Common Rail Fuel Injection
- 4-Cycle
// Complete Range of Accessories
// Generator
- Brushless, Rotating Field Generator
- PMG (Permanent Magnet Generator) supply to regulator
- 300% Short Circuit Capability
- 2/3 Pitch Windings
- Standard for 570 frame and larger
- Optional for 430 frame and smaller
// Digital Control Panel(s)
- UL Recognized, CSA Certified, NFPA 110
- Complete System Metering
- LCD Display
// Cooling System
- Integral Set-Mounted
- Engine Driven Fan

STANDARD EQUIPMENT

// Engine

Air Cleaner
Oil Pump
Full Flow Oil Filter
Closed Crankcase Ventilation
Jacket Water Pump
Inter Cooler Water Pump
Thermostats
Exhaust Manifold – Dry
Blower Fan & Fan Drive
Radiator - Unit Mounted
Electric Starting Motor - 24V
Governor – Electronic Isochronous
Base - Structural Steel
SAE Flywheel & Bell Housing
Charging Alternator - 24V
Battery Box & Cables
Flexible Fuel Connectors
Flexible Exhaust Connection
EPA Certified Engine

// Generator

NEMA MG1, IEEE and ANSI standards compliance for temperature rise and motor starting
Sustained short circuit current of up to 300% of the rated current for up to 10 seconds
Self-Ventilated and Drip-Proof
Superior Voltage Waveform
Digital, Solid State, Volts-per-Hertz Regulator
No Load to Full Load Regulation
Brushless Alternator with Brushless Pilot Exciter
4 Pole, Rotating Field
130 °C Maximum Standby Temperature Rise
1 Bearing, Sealed
Flexible Coupling
Full Amortisseur Windings
125% Rotor Balancing
3-Phase Voltage Sensing
±0.25% Voltage Regulation
100% of Rated Load - One Step
3% Maximum Harmonic Content

// Digital Control Panel(s)

Digital Metering
Engine Parameters
Generator Protection Functions
Engine Protection
SAE J1939 Engine ECU Communications
Windows-Based Software
Multilingual Capability
Remote Communications to our RDP-110 Remote Annunciator
16 Programmable Contact Inputs
Up to 11 Contact Outputs
UL Recognized, CSA Certified, CE Approved
Event Recording
IP 54 Front Panel Rating with Integrated Gasket
NFPA110 Compatible

APPLICATION DATA

// Engine

Manufacturer	MTU
Model	16V 4000 G43 (T1638A36)
Type	4-Cycle
Arrangement	16-V
Displacement: L (in³)	76.3 (4,656)
Bore: cm (in)	17 (6.69)
Stroke: cm (in)	21 (8.27)
Compression Ratio	16.5:1
Rated RPM	1,800
Engine Governor	Electronic Isochronous (ADEC)
Maximum Power: Standby: kWm (bhp)	2,280 (3,058)
Maximum Power: Prime: kWm (bhp)	2,020 (2,709)
Speed Regulation	±0.25%
Air Cleaner	Dry

// Liquid Capacity (Lubrication)

Total Oil System: L (gal)	300 (79.3)
Engine Jacket Water Capacity: L (gal)	175 (46.2)
After Cooler Water Capacity: L (gal)	50 (13.2)
System Coolant Capacity: L (gal)	651 (172)

// Electrical

Electric Volts DC	24
Cold Cranking Amps Under -17.8°C (0°F)	2,600

// Fuel System

Fuel Supply Connection Size	1" NPT
Fuel Return Connection Size	3/4" NPT
Maximum Fuel Lift: m (ft)	1 (3)
Recommended Fuel	Diesel #2
Total Fuel Flow: L/hr (gal/hr)	1,020 (269)

// Fuel Consumption

	STANDBY	PRIME
At 100% of Power Rating: L/hr (gal/hr)	558 (147.3)	487 (128.6)
At 75% of Power Rating: L/hr (gal/hr)	426 (112.6)	381 (100.7)
At 50% of Power Rating: L/hr (gal/hr)	299 (78.9)	265 (69.9)

// Cooling - Radiator System

	STANDBY	PRIME
Ambient Capacity of Radiator: °C (°F)	40 (104)	40 (104)
Maximum Restriction of Cooling Air, Intake, and Discharge Side of Rad.: kPa (in. H_2O)	0.12 (0.5)	0.12 (0.5)
Water Pump Capacity: L/min (gpm)	1,350 (357)	1,350 (357)
After Cooler Pump Capacity: L/min (gpm)	583 (154)	583 (154)
Heat Rejection to Coolant: kW (BTUM)	874 (49,704)	770 (43,790)
Heat Rejection to After Cooler: kW (BTUM)	671 (38,160)	572 (32,530)
Heat Radiated to Ambient: kW (BTUM)	184 (10,478)	173.6 (9,871)

// Air Requirements

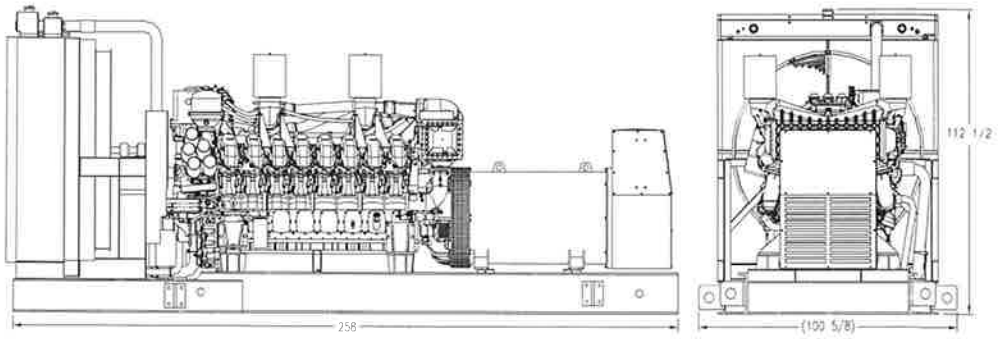
	STANDBY	PRIME
Aspirating: *m³/min (SCFM)	186 (6,569)	180 (6,357)
Air Flow Required for Rad. Cooled Unit: *m³/min (SCFM)	2,270 (80,160)	2,270 (80,160)
Air Flow Required for Heat Exchanger/Remote Rad. based on 25°F Rise: *m³/min (SCFM)	673 (23,631)	634 (22,262)

* Air density = 1.184 kg/m³ (0.0739 lbm/ft³)

// Exhaust System

	STANDBY	PRIME
Gas Temp. (Stack): °C (°F)	480 (896)	435 (815)
Gas Volume at Stack Temp: m³/min (CFM)	456 (16,103)	426 (15,044)
Maximum Allowable Back Pressure: kPa (in. H_2O)	8.5 (34.1)	8.5 (34.1)

WEIGHTS AND DIMENSIONS



Drawing above for illustration purposes only, based on standard open power 480 volt engine-generator set. Lengths may vary with other voltages. Do not use for installation design. See website for unit specific template drawings.

System	Dimensions (L x W x H)	Weight (less tank)
OPU	6,550 x 2,560 x 2,860 mm (258 x 100.6 x 112.5 in)	16,477 kg (36,326 lb)

Weights and dimensions are based on open power units and are estimates only. Consult the factory for accurate weights and dimensions for your specific engine-generator set.

SOUND DATA

Unit Type	Standby Full Load	Prime Full Load
Level 0: Open Power Unit (dBA)	104	102.5

Sound data is provided at 7 m (23 ft). Engine-generator set tested in accordance with ISO 8528-10 and with infinite exhaust.

EMISSIONS DATA

NO$_x$ + NMHC	CO	PM
C/F	C/F	C/F

All units are in g/hp-hr and are EPA D2 cycle values.
Emission levels of the engine may vary as a function of ambient temperature, barometric pressure, humidity, fuel type and quality, installation parameters, measuring instrumentation, etc. The data provided are laboratory results from one engine representing this rating. The data was obtained under controlled environmental conditions with calibrated instrumentation traceable to the United States National Bureau of Standards and in compliance with US EPA regulations found within 40 CFR Part 89. The weighted cycle value from each engine is guaranteed to be below the US EPA Standards at the US EPA defined conditions.

RATING DEFINITIONS AND CONDITIONS

- Standby ratings apply to installations served by a reliable utility source. The standby rating is applicable to varying loads for the duration of a power outage. No overload capability for this rating. Ratings are in accordance with ISO-8528-1, ISO-3046-1, BS 5514, AS 2789, and DIN 6271. Permissible average power output during 24 hours of operation is approved up to 85%.
- Prime power ratings apply to installations where utility power is unavailable or unreliable. At varying load, the number of generator set operating hours is unlimited. A 10% overload capacity is available for one hour in twelve. Ratings are in accordance with ISO-8528-1, ISO-3046-1, BS 5514, AS 2789, and DIN 6271. Permissible average power output during 24 hours of operation is approved up to 75%.
- Deration Factor:
  Altitude: Consult your local MTU Onsite Energy Power Generation Distributor for altitude derations.
  Temperature: Consult your local MTU Onsite Energy Power Generation Distributor for temperature derations.

Materials and specifications subject to change without notice.
C/F = Consult Factory/MTU Onsite Energy Distributor

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// **Tognum Group Companies: Europe / Middle East / Africa / Latin America** / MTU Onsite Energy / 88040 Friedrichshafen / Germany / Phone + 49 7541 90 7060 / Fax +49 7541 90 7084 / powergenregion1@mtu-online.com // **Asia / Australia / Pacific** / MTU Onsite Energy / 1, Benoi Place / Singapore 629923 / Republic of Singapore / Phone + 65 6861 5922 / Fax + 65 6861 3615 / powergenregion2@mtu-online.com // **USA / Canada / Mexico** / MTU Onsite Energy Corporation / 100 Power Drive / Mankato, Minnesota 56001 / USA / Phone + 1 507 625 7973 / Fax + 1 507 625 2968 / powergenregion3@mtu-online.com // **Worldwide for HotModule** / MTU Onsite Energy / 81663 Munich / Germany / Phone + 49 89 203042 800 / Fax +49 89 203042 900 / info@mtu-online.com //www.mtu-online.com

California Environmental Protection Agency AIR RESOURCES BOARD	MTU DETROIT DIESEL, INC.	EXECUTIVE ORDER U-R-052-0014 New Off-Road Compression-Ignition Engines

Pursuant to the authority vested in the Air Resources Board by Sections 43013, 43018, 43101, 43102, 43104 and 43105 of the Health and Safety Code; and

Pursuant to the authority vested in the undersigned by Sections 39515 and 39516 of the Health and Safety Code and Executive Order G-02-003;

IT IS ORDERED AND RESOLVED: That the following compression-ignition engines and emission control systems produced by the manufacturer are certified as described below for use in off-road equipment. Production engines shall be in all material respects the same as those for which certification is granted.

MODEL YEAR	ENGINE FAMILY	DISPLACEMENT (liters)	FUEL TYPE	USEFUL LIFE (hours)
2010	AMDDL95.4XTR	57.2, 76.3, 95.4	Diesel	8,000

SPECIAL FEATURES & EMISSION CONTROL SYSTEMS	TYPICAL EQUIPMENT APPLICATION
Electronic Direct Injection, Turbocharger, Charge Air Cooler, Electronic Control Module	Loader, Tractor, Pump, Compressor, Generator Set

The engine models and codes are attached.

The following are the exhaust certification standards (STD) and certification levels (CERT) for hydrocarbon (HC), oxides of nitrogen (NOx), or non-methane hydrocarbon plus oxides of nitrogen (NMHC+NOx), carbon monoxide (CO), and particulate matter (PM) in grams per kilowatt-hour (g/kW-hr), and the opacity-of-smoke certification standards and certification levels in percent (%) during acceleration (Accel), lugging (Lug), and the peak value from either mode (Peak) for this engine family (Title 13, California Code of Regulations, (13 CCR) Section 2423):

RATED POWER CLASS	EMISSION STANDARD CATEGORY		EXHAUST (g/kW-hr)					OPACITY (%)		
			HC	NOx	NMHC+NOx	CO	PM	ACCEL	LUG	PEAK
kW > 560	Tier 2	STD	N/A	N/A	6.4	3.5	0.20	20	15	50
		CERT	--	--	5.9	1.9	0.20	4	2	5

BE IT FURTHER RESOLVED: That for the listed engine models, the manufacturer has submitted the information and materials to demonstrate certification compliance with 13 CCR Section 2424 (emission control labels), and 13 CCR Sections 2425 and 2426 (emission control system warranty).

Engines certified under this Executive Order must conform to all applicable California emission regulations.

This Executive Order is only granted to the engine family and model-year listed above. Engines in this family that are produced for any other model-year are not covered by this Executive Order.

Executed at El Monte, California on this 11 day of February 2010.

Annette Hebert, Chief
Mobile Source Operations Division

Engine Model Summary Template

ATTACHMENT 1 OF 2

U-R-052-0014

2/9/10

Engine Family	1.Engine Code	2.Engine Model	3.BHP@RPM (SAE Gross)	4.Fuel Rate: mm/stroke @ peak HP (for diesel only)	5.Fuel Rate: (lbs/hr) @ peak HP (for diesels only)	6.Torque @ RPM (SEA Gross)	7.Fuel Rate: mm/stroke@peak torque	8.Fuel Rate: (lbs/hr)@peak torque	9.Emission Control Device Per SAE J1930
AMDDL95.4XTR	7000	12V4000G83 3D	2561 @ 1800	733@2561	877@2561	Genset	NA	NA	DFI, TC, CAC, ECM
AMDDL95.4XTR	7001	12V4000G43 3D	2328 @ 1800	655@2328	788@2328	Genset	NA	NA	DFI, TC, CAC, ECM
AMDDL95.4XTR	7002	12V4000G83 3B	2328 @1800	655@2328	788@2328	Genset	NA	NA	DFI, TC, CAC, ECM
AMDDL95.4XTR	7003	12V4000G43 3B	2038 @ 1800	571@2038	687@2038	Genset	NA	NA	DFI, TC, CAC, ECM
AMDDL95.4XTR	7004	16V4000G83 3D	3353@1800	760@3353	1155@3353	Genset	NA	NA	DFI, TC, CAC, ECM
AMDDL95.4XTR	7005	16V4000G43 3D	3057@1800	690@3057	1046@3057	Genset	NA	NA	DFI, TC, CAC, ECM
AMDDL95.4XTR	7006	16V4000G83 3B	3353@1800	690@3057	1046@3057	Genset	NA	NA	DFI, TC, CAC, ECM
AMDDL95.4XTR	7007	16V4000G43 3B	2709 @ 1800	500@2709	912@2709	Genset	NA	NA	DFI, TC, CAC, ECM
AMDDL95.4XTR	7008	20V4000G83L 3D	4680@1800	852@4680	1641@4680	Genset	NA	NA	DFI, TC, CAC, ECM
AMDDL95.4XTR	7009	20V4000G83 3D	4036@1800	704@4036	1468@4036	Genset	NA	NA	DFI, TC, CAC, ECM
AMDDL95.4XTR	7010	20V4000G43 3D	3674@1800	642@3674	1272@3674	Genset	NA	NA	DFI, TC, CAC, ECM
AMDDL95.4XTR	7011	20V4000G83L 3B	4036@1800	704@4036	1468@4036	Genset	NA	NA	DFI, TC, CAC, ECM
AMDDL95.4XTR	7012	20V4000G83 3B	3674@1800	642@3674	1272@3674	Genset	NA	NA	DFI, TC, CAC, ECM
AMDDL95.4XTR	7013	20V4000G43 3B	3339@1800	582@3339	1152@3339	Genset	NA	NA	DFI, TC, CAC, ECM
AMDDL95.4XTR	7014	12V4000C23	2253 @ 1800	667@2253	756@2253	9440@1700	690@9440	748@9440	DFI, TC, CAC, ECM
AMDDL95.4XTR	7015	12V4000C23R	2025 @ 1800	597@2025	679@2025	8480@1700	630@8480	673@8480	DFI, TC, CAC, ECM
AMDDL95.4XTR	7016	12V4000C13L	1911 @ 1800	567@1911	647@1911	9072@1500	665@9072	628@9072	DFI, TC, CAC, ECM
AMDDL95.4XTR	7017	12V4000C13	1801 @ 1800	539@1801	613@1801	8550@1500	630@8550	598@8550	DFI, TC, CAC, ECM
AMDDL95.4XTR	7018	12V4000C13R	1600@1800	438@1600	550@1600	7595@1500	560@7595	534@7595	DFI, TC, CAC, ECM
AMDDL95.4XTR	7019	16V4000C23	3004 @ 1800	701@3004	1022@3004	12583@1700	720@12583	987@12583	DFI, TC, CAC, ECM
AMDDL95.4XTR	7020	16V4000C23R	2699 @ 1800	628@2699	919@2699	11308@1700	648@11308	896@11308	DFI, TC, CAC, ECM
AMDDL95.4XTR	7021	16V4000C13L	2501 @ 1800	589@2501	868@2501	11873@1500	670@11873	827@11873	DFI, TC, CAC, ECM
AMDDL95.4XTR	7022	16V4000C13	2347 @ 1800	555@2347	822@2347	11140@1500	635@11140	780@11140	DFI, TC, CAC, ECM
AMDDL95.4XTR	7023	16V4000C13R	2001 @ 1800	480@2001	701@2001	9550@1500	540@9550	691@9550	DFI, TC, CAC, ECM
AMDDL95.4XTR	7024	20V4000C23L	4023 @ 1800	740@4023	1409@4023	16850@1700	765@16850	1377@16850	DFI, TC, CAC, ECM
AMDDL95.4XTR	7025	20V4000C23	3755 @ 1800	680@3755	1308@3755	15730@1700	705@15730	1265@15730	DFI, TC, CAC, ECM
AMDDL95.4XTR	7026	20V4000C13L	3185 @ 1800	580@3185	1100@3185	15120@1500	640@15120	1037@15120	DFI, TC, CAC, ECM
AMDDL95.4XTR	7027	12V4000S23	1911 @ 1900	649@1911	663@1911	9221@1475	619@9221	613@9221	DFI, TC, CAC, ECM

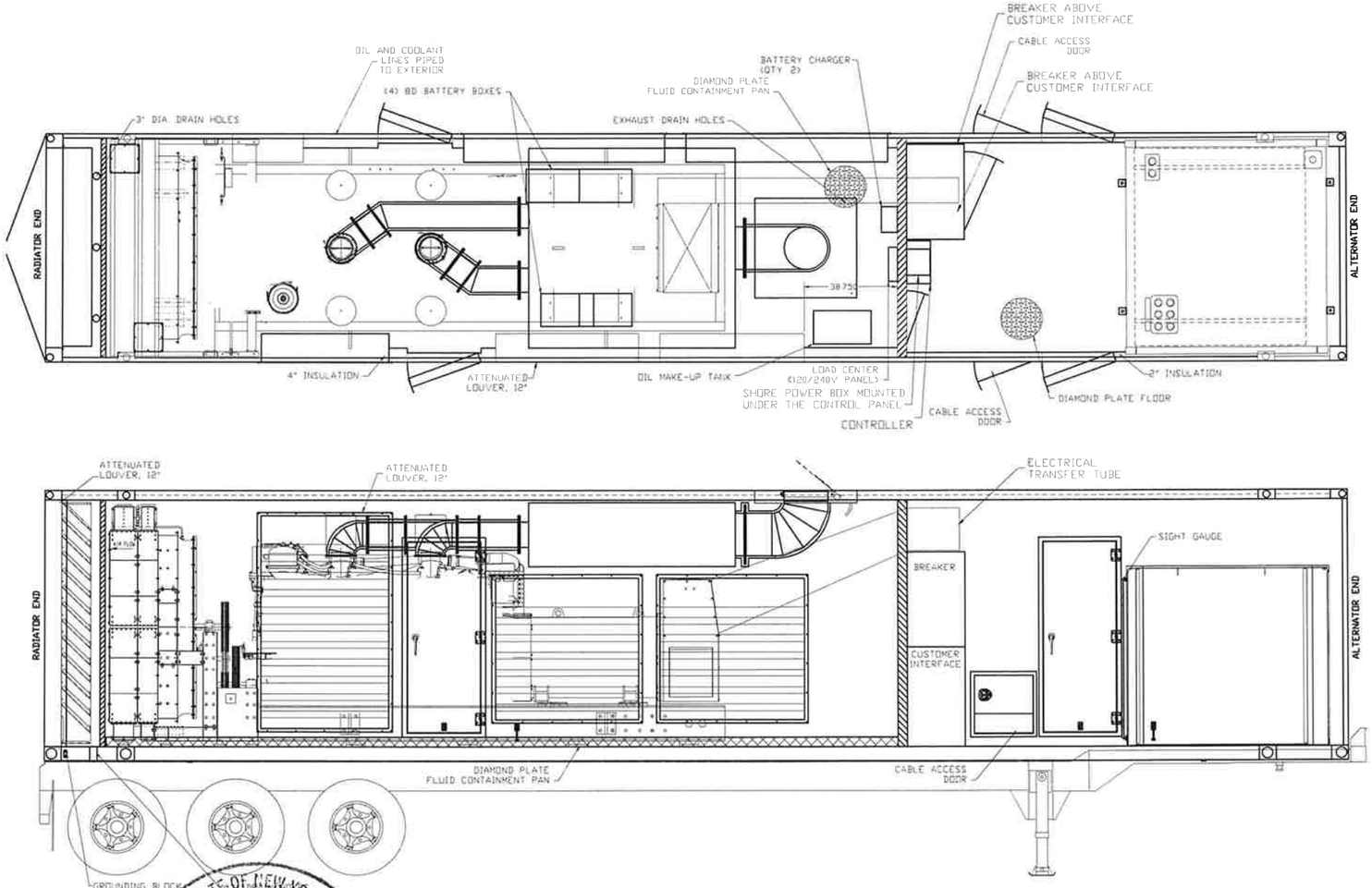
Engine Model Summary Template

ATTACHMENT 2 OF 2

U-R-052-0014

2/9/10

Engine Family	1.Engine Code	2.Engine Model	3.BHP@RPM (SAE Gross)	4.Fuel Rate: mm/stroke @ peak HP (for diesel only)	5.Fuel Rate: (lbs/hr) @ peak HP (for diesels only)	6.Torque @ RPM (SEA Gross)	7.Fuel Rate: mm/stroke@peak torque	8.Fuel Rate: (lbs/hr)@peak torque	9.Emission Control Device Per SAE J1930
AMDDL95.4XTR	7028	12V4000S83	2253 @ 1900	633@2253	807@2253	10014@1600	678@10014	729@10014	DFI, TC, CAC, ECM
AMDDL95.4XTR	7029	12V4000S83L	2501 @ 1900	696@2501	876@2501	10472@1700	740@10472	831@10472	DFI, TC, CAC, ECM
AMDDL95.4XTR	7032	12V4000G73 3A	1167 @ 1200	448@1167	408@1167	Genset	NA	NA	DFI, TC, CAC, ECM
AMDDL95.4XTR	7033	12V4000G73 3B	1482 @ 1200	601@1482	480@1482	Genset	NA	NA	DFI, TC, CAC, ECM
AMDDL95.4XTR	7073	12V4000C23 TB	2253@1900	659@2253	802@2253	8410@1900	696@8410	527@8410	DFI, TC, CAC, ECM
AMDDL95.4XTR	7081	16V4000G73	1529 @ 1200	465@1529	464@1529	Genset	NA	NA	DFI, TC, CAC, ECM
AMDDL95.4XTR	7082	16V4000G73	1864 @ 1200	561@1864	598@1529	Genset	NA	NA	DFI, TC, CAC, ECM
AMDDL95.4XTR	7090	12V4000R33	2250 @ 1800	663@2250	796@2250	6572@1800	663@6572	796@6572	DFI, TC, CAC, ECM
AMDDL95.4XTR	7116	12V4000P83	2478 @ 1800	733@2478	872@2478	Genset	NA	NA	DFI, TC, CAC, ECM
AMDDL95.4XTR	7117	16V4000P83	3304 @ 1800	722@3304	1146@3304	Genset	NA	NA	DFI, TC, CAC, ECM



NOTES:

1. ENCLOSURE USE- GENERATOR: 2000KW XC6DT2
   - GENERATOR WEIGHT: 39,145 LBS.
   - MATERIAL: 45' ISO CONTAINER
   - TYPE: SOUND ATTENUATED, SKIN-TIGHT
   - DOORS: 4 W/ STAINLESS LIFT OFF HINGES
   - DOOR SIZE: 31W X 81H
   - DOOR LATCH TYPE: KEY LOCKABLE
2. AIRFLOW REQUIRED: RADIATOR 79,848 CFM, GENERATOR 32,500 CFM
3. THE ENCLOSURE IS DESIGNED TO REDUCE SOURCE NOISE BY APPROXIMATELY 25db(A) AT 23 FEET BASED ON FREE-FIELD CONDITIONS.
4. INSULATION: 2" MINERAL WOOL ELECTRICAL ROOM
   4" MINERAL WOOL MAIN ROOM
5. LINING: PERFORATED GALVANIZED
6. BASE TYPE: 1,800 GALLON FUEL TANK, CLOSED TOP DIKE 110% CONTAINMENT
7. ESTIMATED SHIPPING WEIGHT: 75,000 LBS.
   ESTIMATED SHIPPING DIMENSIONS: 540L X 101W X 162H
8. ENCLOSURE EXTERIOR COLOR: _____ (REFER TO COLOR CHART)
9. SILENCER (RCE SUPPLIED)
   -MAKE: GT
   -MODEL: 518-10-C2-5110-1-40295
10. ISOLATORS (ATLANTIC DETROIT DIESEL SUPPLIED)
    -MAKE: AMBER-BOOTH
    -MODEL: P-1021, SIZE 88
    -QTY: 16

ELECTRICAL PACKAGE:

RCE SUPPLY	CUSTOMER SUPPLY	
WIRE	X	BATTERY CHARGERS
WIRE	X	WATER JACKET HEATER
WIRE		3000AMP BREAKER W/BUSS CONNECTION
1		100 AMP 120/240V 1Ø

STATE OF NEW YORK
RAMON LI
No. 000057
LICENSED PROFESSIONAL ENGINEER

REV.	REVISION DESCRIPTION	DATE	BY	REV.	REVISION DESCRIPTION	DATE	BY
G	REVISED RADIATOR END PER CUSTOMER'S NEW DRAWING	6/17/08	DM				
F	REVISED RADIATOR END PER CUSTOMER'S NEW DRAWING	4/22/08	AD	C	NEW RADIATOR	2/18/08	DM
E	REMOVED DAMPERS, REVISED BULKHEAD WALL, MOVED OIL MAKE UP TANK	2/28/08	AD	B	UPDATED ELECCTRICAL	2/14/08	DM
D	SHOWED DAMPERS AS ACTUAL SIZE, REMOVED FRAMED OPENING AND ADDED DOOR	2/25/08	AD	A	NEW RADIATOR, TOTAL REDESIGN	1/22/08	DM

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CUSTOMER NAME: ATLANTIC DETROIT DIESEL

PROJECT NAME: ABLE EQUIPMENT

TITLE: ASSEMBLY DRAWING | DWG #: 931-G

RCE QUOTE #: 52137-02 | GENSET DWG #: 2000RXC6DT2

SHEET #: 1 of 6 | DATE: 12/14/07 | DRAWN BY: PR/ | CHECKED BY: DP

APPROVED AS DRAWN ☐
APPROVED AS NOTED ☐
REVISE AS NOTED, RESUBMIT ☐

SIGNATURE _____ DATE _____

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P.O. BOX 5905
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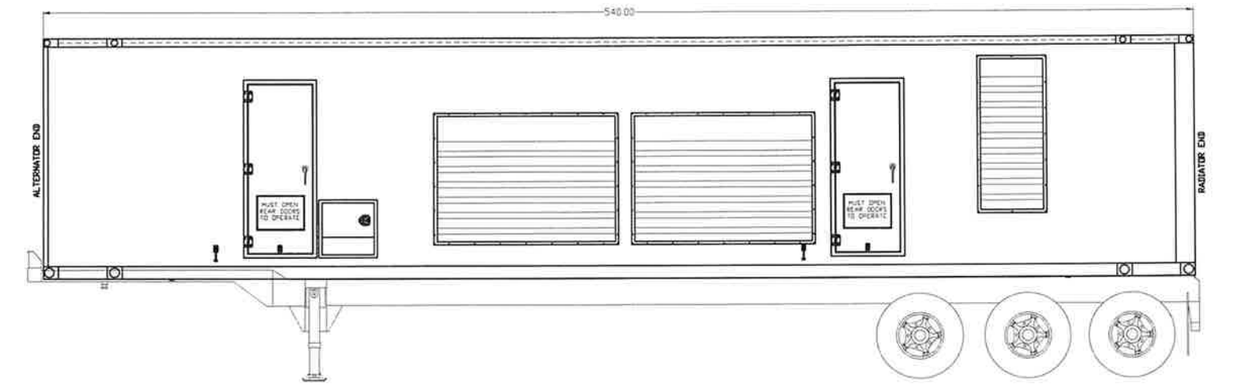

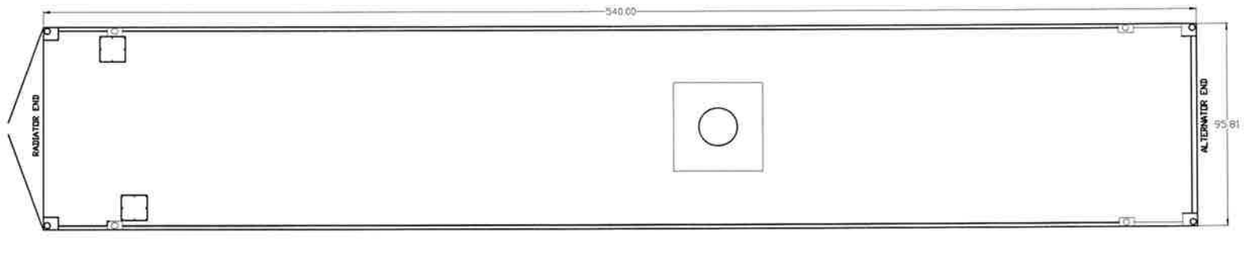

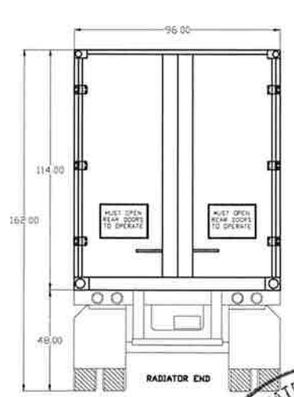

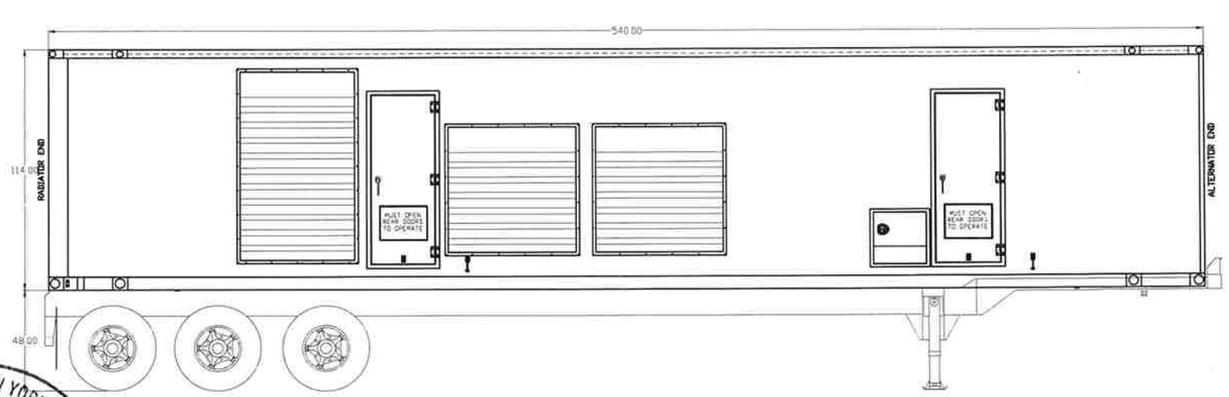

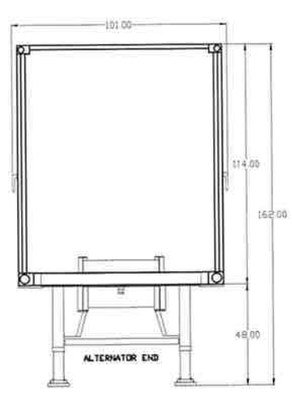

REV.	REVISION DESCRIPTION	DATE	BY
G	REVISED RADIATOR END PER CUSTOMER'S NEW DRAWING	6/17/08	DM
F	REVISED RADIATOR END PER CUSTOMER'S NEW DRAWING	4/22/08	AD
E	REMOVED DAMPERS, REVISED BULKHEAD WALL, MOVED OIL MAKE UP TANK	2/28/08	AD
D	SHOWED DAMPERS AS ACTUAL SIZE, REMOVED FRAMED OPENING AND ADDED DOOR	2/25/08	AD

REV.	REVISION DESCRIPTION	DATE	BY
C	NEW RADIATOR	2/18/08	DM
B	UPDATED ELECCTRICAL	2/14/08	DM
A	NEW RADIATOR, TOTAL REDESIGN	1/22/08	DM

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CUSTOMER NAME: ATLANTIC DETROIT DIESEL

PROJECT NAME: ABLE EQUIPMENT

TITLE: ELEVATION DRAWING | DWG #: 931-G

RCE QUOTE #: 52137-02 | GENSET DWG #: 2000RXC6DT2

SHEET #:	DATE:	DRAWN BY:	CHECKED BY:
2 of 6	12/14/07	PR/	DP

APPROVED AS DRAWN ☐
APPROVED AS NOTED ☐
REVISE AS NOTED, RESUBMIT ☐

SIGNATURE _____ DATE _____

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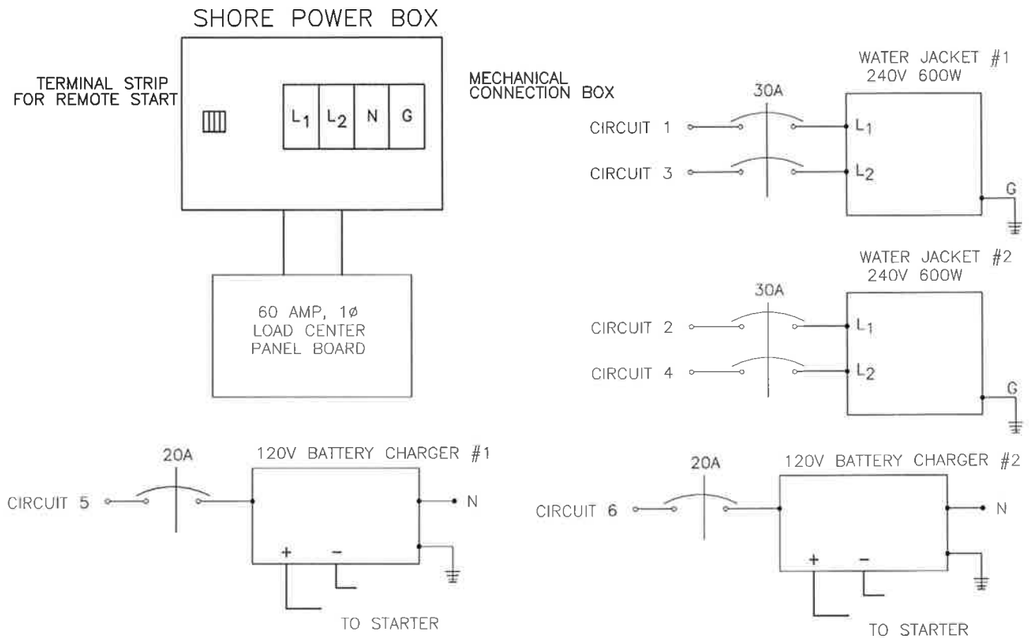

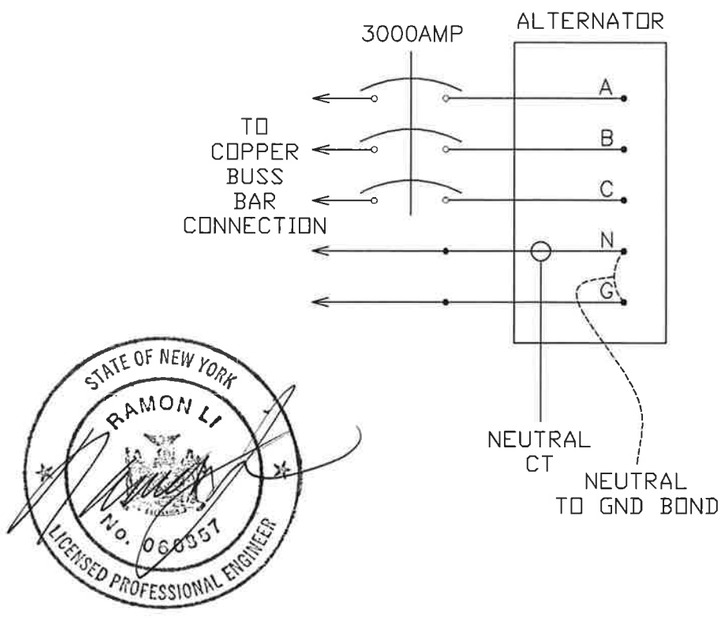

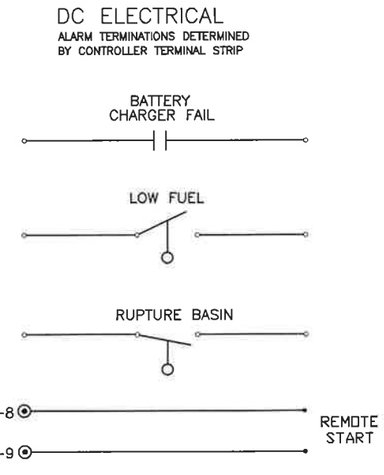

REV.	REVISION DESCRIPTION	DATE	BY	REV.	REVISION DESCRIPTION	DATE	BY
G	REVISED RADIATOR END PER CUSTOMER'S NEW DRAWING	6/17/08	DM				
F	REVISED RADIATOR END PER CUSTOMER'S NEW DRAWING	4/22/08	AD	C	NEW RADIATOR	2/18/08	DM
E	REMOVED DAMPERS, REVISED BULKHEAD WALL, MOVED OIL MAKE UP TANK	2/28/08	AD	B	UPDATED ELECCTRICAL	2/14/08	DM
D	SHOWED DAMPERS AS ACTUAL SIZE, REMOVED FRAMED OPENING AND ADDED DOOR	2/25/08	AD	A	NEW RADIATOR, TOTAL REDESIGN	1/22/08	DM

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CUSTOMER NAME: ATLANTIC DETROIT DIESEL

PROJECT NAME: ABLE EQUIPMENT

TITLE: ELECTRICAL DETAIL | DWG #: 931-G

RCE QUOTE #: 52137-02 | GENSET DWG #: 2000RXC6DT2

SHEET #: 3 of 6 | DATE: 12/14/07 | DRAWN BY: PR/ | CHECKED BY: DP

APPROVED AS DRAWN ☐
APPROVED AS NOTED ☐
REVISE AS NOTED, RESUBMIT ☐

SIGNATURE _____ DATE _____

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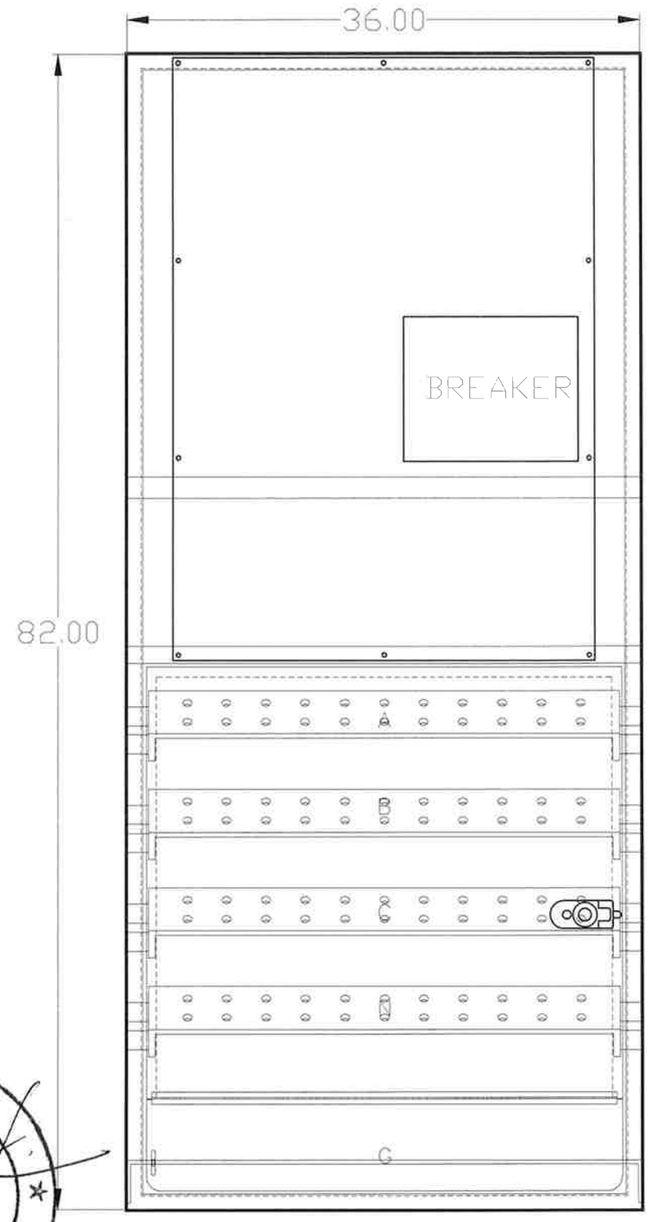

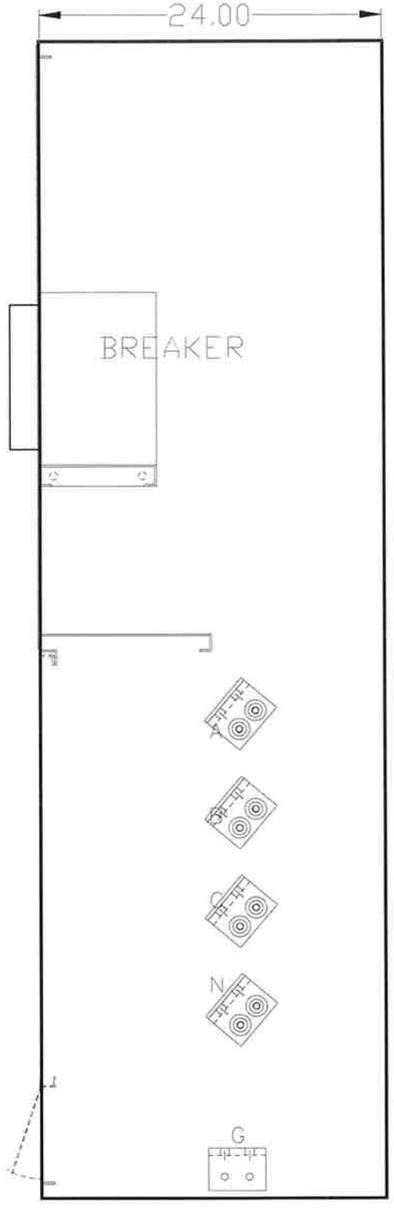

STATE OF NEW YORK
RAMON LI
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LICENSED PROFESSIONAL ENGINEER

REV.	REVISION DESCRIPTION	DATE	BY	REV.	REVISION DESCRIPTION	DATE	BY
G	REVISED RADIATOR END PER CUSTOMER'S NEW DRAWING	6/17/08	DM				
F	REVISED RADIATOR END PER CUSTOMER'S NEW DRAWING	4/22/08	AD	C	NEW RADIATOR	2/18/08	DM
E	REMOVED DAMPERS, REVISED BULKHEAD WALL, MOVED OIL MAKE UP TANK	2/28/08	AD	B	UPDATED ELECCTRICAL	2/14/08	DM
D	SHOWED DAMPERS AS ACTUAL SIZE, REMOVED FRAMED OPENING AND ADDED DOOR	2/25/08	AD	A	NEW RADIATOR, TOTAL REDESIGN	1/22/08	DM

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CUSTOMER NAME: ATLANTIC DETROIT DIESEL

PROJECT NAME: ABLE EQUIPMENT

TITLE: BREAKER/CONNECTION BOX | DWG #: 931-G

RCE QUOTE #: 52137-02 | GENSET DWG #: 2000RXC6DT2

SHEET #: 4 of 6 | DATE: 12/14/07 | DRAWN BY: PR/ | CHECKED BY: DP

APPROVED AS DRAWN ☐
APPROVED AS NOTED ☐
REVISE AS NOTED, RESUBMIT ☐

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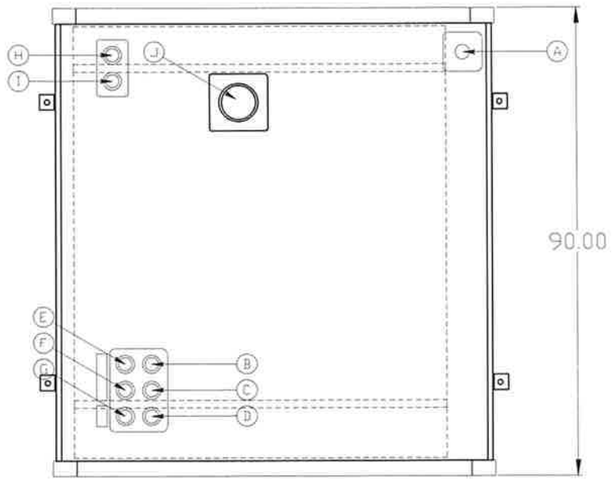
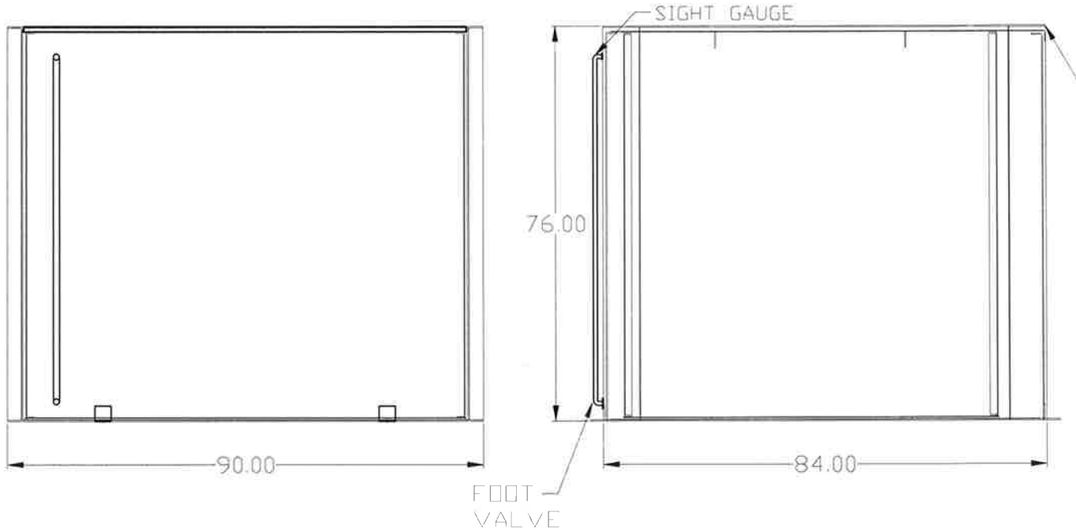
(920) 490-3250 (MAIN)
(920) 617-3308 (FAX)

FUEL TANK: UL 142 LISTED: NO
DIESEL FUEL ONLY
CAPACITY: 1,800 GALLONS
TANK STYLE: CLOSED TOP DIKE
CONTAINMENT: 110%
OUTER WALLS: 1/4" P&O
INNER TANK: 10 GA P&O
TOP: 7 GA P&O

FITTINGS:

A 2" NPT RUPTURE BASIN ALARM
B 2" NPT LOW FUEL ALARM
C 2" NPT FUEL FILL
D 2" NPT FUEL GAUGE
E 2" NPT FITTING (EXTRA)
F 2" NPT FITTING (EXTRA)
G 2" NPT FITTING (EXTRA)
H 2" NPT GENERATOR FUEL SUPPLY W/CHECK VALVE & SHUT-OFF VALVE
I 2" NPT GENERATOR FUEL RETURN W/SHUT-OFF VALVE
J 6" NPT INSPECTION PORT





STATE OF NEW YORK
RAMON LI
No. 060537
LICENSED PROFESSIONAL ENGINEER

REV.	REVISION DESCRIPTION	DATE	BY	REV.	REVISION DESCRIPTION	DATE	BY
G	REVISED RADIATOR END PER CUSTOMER'S NEW DRAWING	6/17/08	DM				
F	REVISED RADIATOR END PER CUSTOMER'S NEW DRAWING	4/22/08	AD	C	NEW RADIATOR	2/18/08	DM
E	REMOVED DAMPERS, REVISED BULKHEAD WALL, MOVED OIL MAKE UP TANK	2/28/08	AD	B	UPDATED ELECCTRICAL	2/14/08	DM
D	SHOWED DAMPERS AS ACTUAL SIZE, REMOVED FRAMED OPENING AND ADDED DOOR	2/25/08	AD	A	NEW RADIATOR, TOTAL REDESIGN	1/22/08	DM

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CUSTOMER NAME: ATLANTIC DETROIT DIESEL
PROJECT NAME: ABLE EQUIPMENT
TITLE: TANK DETAIL
DWG #: 931-G
RCE QUOTE #: 52137-02
GENSET DWG #: 2000RXC6DT2
SHEET #: 5 of 6
DATE: 12/14/07
DRAWN BY: PR/
CHECKED BY: DP

APPROVED AS DRAWN ☐
APPROVED AS NOTED ☐
REVISE AS NOTED, RESUBMIT ☐

SIGNATURE DATE

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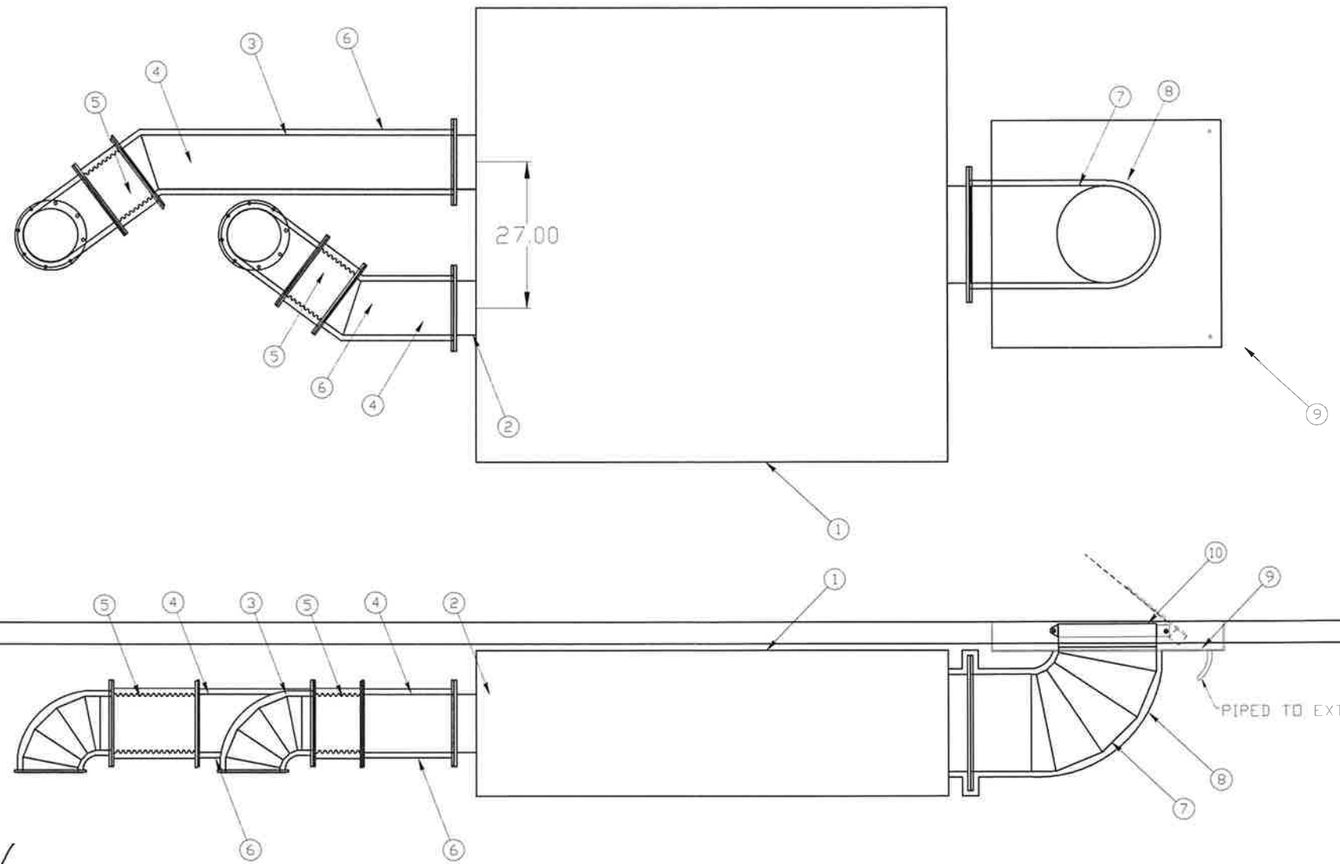
1740 EISENHOWER DRIVE
P.O. BOX 5905
DE PERE, WI 54115-5905
(920) 490-3250 (MAIN)
(920) 617-3308 (FAX)

ITEM #	DESCRIPTION	SUPPLIED BY	QTY
1	SILENCER	ROBINSON CUSTOM ENCLOSURES	1
2	10" MITER PIPE	ROBINSON CUSTOM ENCLOSURES	1
3	10" MITER PIPE	ROBINSON CUSTOM ENCLOSURES	1
4	10" FLEX	ROBINSON CUSTOM ENCLOSURES	2
5	10" 90° ELBOW	ROBINSON CUSTOM ENCLOSURES	2
6	10" WRAP	ROBINSON CUSTOM ENCLOSURES	2
7	18" 90° ELBOW	ROBINSON CUSTOM ENCLOSURES	1
8	18" WRAP	ROBINSON CUSTOM ENCLOSURES	1
9	EXHAUST BOX	ROBINSON CUSTOM ENCLOSURES	1
10	18" RAIN CAP	ROBINSON CUSTOM ENCLOSURES	1



STATE OF NEW YORK
RAMON LI
No. 066057
LICENSED PROFESSIONAL ENGINEER

REV.	REVISION DESCRIPTION	DATE	BY
G	REVISED RADIATOR END PER CUSTOMER'S NEW DRAWING	6/17/08	DM
F	REVISED RADIATOR END PER CUSTOMER'S NEW DRAWING	4/22/08	AD
E	REMOVED DAMPERS, REVISED BULKHEAD WALL, MOVED OIL MAKE UP TANK	2/28/08	AD
D	SHOWED DAMPERS AS ACTUAL SIZE, REMOVED FRAMED OPENING AND ADDED DOOR	2/25/08	AD

REV.	REVISION DESCRIPTION	DATE	BY
C	NEW RADIATOR	2/18/08	DM
B	UPDATED ELECCTRICAL	2/14/08	DM
A	NEW RADIATOR, TOTAL REDESIGN	1/22/08	DM

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CUSTOMER NAME: ATLANTIC DETROIT DIESEL

PROJECT NAME: ABLE EQUIPMENT

TITLE: EXHAUST DRAWING | DWG #: 931-G

RCE QUOTE #: 52137-02 | GENSET DWG #: 2000RXC6DT2

SHEET #: 6 of 6 | DATE: 12/14/07 | DRAWN BY: PR/ | CHECKED BY: DP

APPROVED AS DRAWN ☐
APPROVED AS NOTED ☐
REVISE AS NOTED, RESUBMIT ☐

SIGNATURE _____ DATE _____

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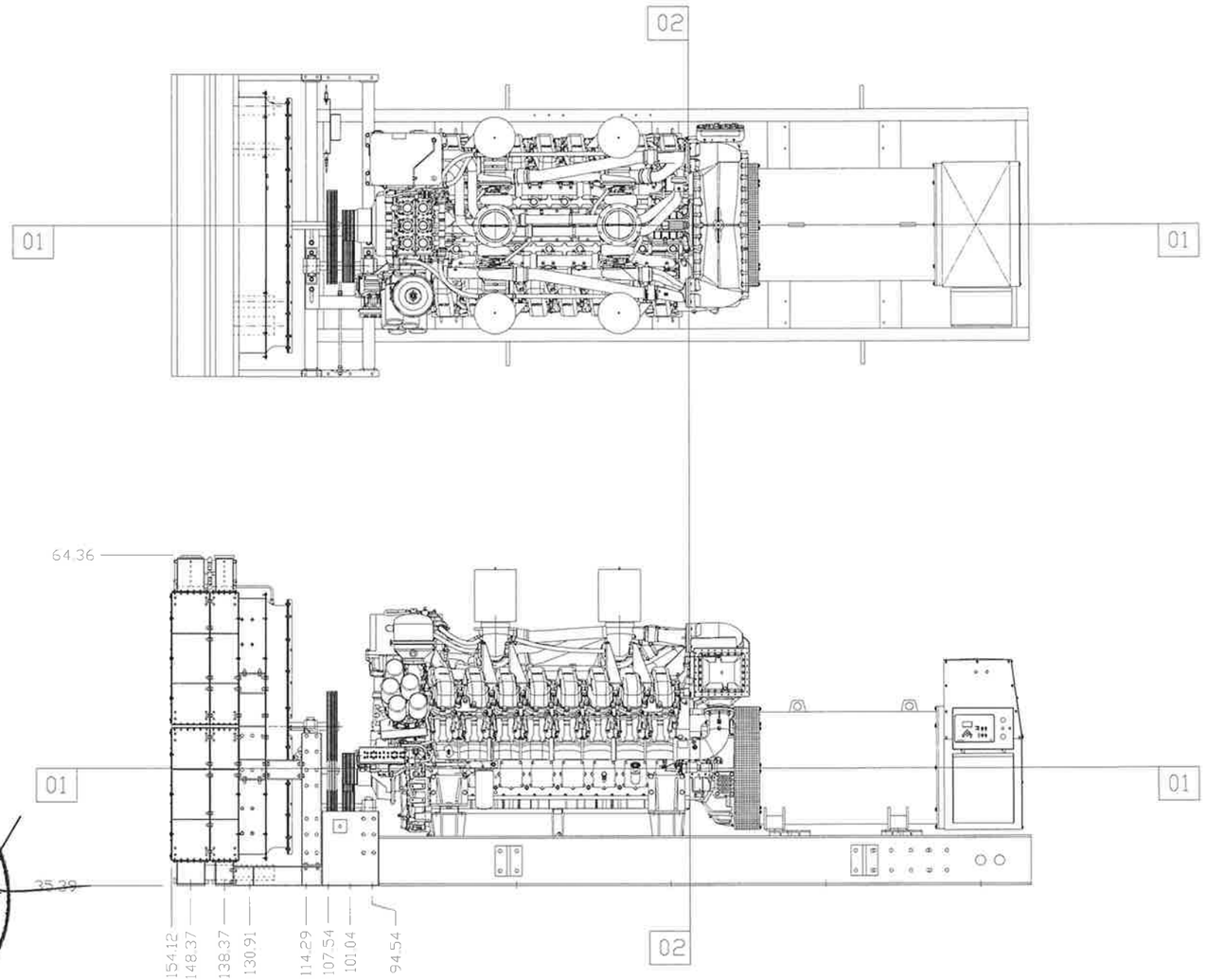

01 CENTERLINE OF CRANKSHAFT

02 REAR FACE OF CYLINDER BLOCK

DETROIT GENSET 2000RXC6DT2

DETROIT 16V4000/EC046S299 ***

CHANGE #	REV.	CHECKED	DATE	MATERIAL
				SEE PARTS LIST

NAME: ENGINE/RADIATOR LAYOUT W/AUXILIARY DRIVE

DATE: 6-5-08 | PART NUMBER: 16V4000-46

DRAWN BY: GD

CHECKED: PB

SCALE: 1:36

TOLERANCES UNLESS OTHERWISE SPECIFIED

1 PLACE (XX) ± 1
2 PLACE (.XX) ± .06
3 PLACE (.XXX) ± .015
ANGULAR ±1 DEG

TOLERANCES ARE NON-CUMULATIVE & DO NOT APPLY TO MATERIAL GAGES OR COMMERCIAL FEATURES

IEA. KENOSHA, WISCONSIN

PROPERTY OF IEA, INC
CONFIDENTIAL PROPRIETARY INFORMATION

STATE OF NEW YORK
RAMON LI
No. 060957
LICENSED PROFESSIONAL ENGINEER

REV.	REVISION DESCRIPTION	DATE	BY	REV.	REVISION DESCRIPTION	DATE	BY
G	REVISED RADIATOR END PER CUSTOMER'S NEW DRAWING	6/17/08	DM				
F	REVISED RADIATOR END PER CUSTOMER'S NEW DRAWING	4/22/08	AD	C	NEW RADIATOR	2/18/08	DM
E	REMOVED DAMPERS, REVISED BULKHEAD WALL, MOVED OIL MAKE UP TANK	2/28/08	AD	B	UPDATED ELECCTRICAL	2/14/08	DM
D	SHOWED DAMPERS AS ACTUAL SIZE, REMOVED FRAMED OPENING AND ADDED DOOR	2/25/08	AD	A	NEW RADIATOR, TOTAL REDESIGN	1/22/08	DM

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CUSTOMER NAME: ATLANTIC DETROIT DIESEL

PROJECT NAME: ABLE EQUIPMENT

TITLE: GENSET DRAWING | DWG #: 931-G

RCE QUOTE #: 52137-02 | GENSET DWG #: 2000RXC6DT2

SHEET #: 1 of 1 | DATE: 12/14/07 | DRAWN BY: PR/ | CHECKED BY: DP

APPROVED AS DRAWN ☐
APPROVED AS NOTED ☐
REVISE AS NOTED, RESUBMIT ☐

SIGNATURE _____ DATE _____

ROBINSON CUSTOM ENCLOSURES
1740 EISENHOWER DRIVE
P.O. BOX 5905
DE PERE, WI 54115-5905
(920) 490-3250 (MAIN)
(920) 617-3308 (FAX)

F 355

CITY OF NEW YORK DEPARTMENT OF ENVIRONMENTAL PROTECTION

BUREAU OF AIR, NOISE & HAZARDOUS MATERIALS
59 -17 JUNCTION BOULEVARD,CORONA, NEW YORK 11368
AIR PERMITTING, 9TH FLOOR

AMENDMENT
(TO BE TYPED OR PRINTED)

INSTALLATION: PB008210X

DATE: December 2, 2010

PREMISE ADDRESS: NYC-DOC-Rikers Island, 17-25 Hazen Street, East Elmhurst, NY 11370 Queens
(BORO)

ANSWERS TO THE DISAPPROVAL SHOULD BE MADE BELOW. THIS AMENDMENT IS TO BE MADE PART OF THE ORIGINAL PLANS AND IS SUBJECT TO ALL THE CONDITIONS, AGREEMENTS AND STATEMENTS CONTAINED THEREIN. RETURN THIS COMPLETED FORM TO THE BUREAU OF AIR NOISE & HAZARDOUS MATERIALS AT THE ADDRESS ABOVE.

IF MORE SPACE IS NEEDED ADDITIONAL SHEETS MUST BE USED. NO ITEM CAN BE CONTINUED OVER TO ANOTHER SHEET; EACH ITEM MUST BE COMPLETE ON THE SHEET ON WHICH IT APPEARS. ONLY THOSE ITEMS THAT APPEAR ABOVE THE ENDORSEMENT AT THE BOTTOM OF THE PAGE CAN BE CONSIDERED.

1. The contractor's statement form is attached, indicating the installer will be determined at a later date.
2. A letter of authorization from DOC to AKRF, Inc. is attached.
3. A facility description is attached describing the stack emission point numbers. The emission points for the main stacks and the bypass stacks have been updated. For train 1, the emission point numbers for the main stack and the bypass stack are U0029 and U0030. For train 2, the emission point numbers for the main stack and the bypass stack are U0031 and U0032.
4. Figure 1 is attached and has been updated to reflect the latest design (90% complete) and includes the number of existing boilers attached to each stack. Figure 1 is submitted in triplicate on 17" x 22" paper.
5. Manufacturer information for the four building roof fans is attached to this amendment.

P.E. OR R.A. Ramon Li, P.E.		
NAME AKRF, Inc.		
STREET ADDRESS 440 Park Avenue South, 7th Floor		
CITY New York,	STATE NY	ZIP CODE 10016

P.E. OR R.A. SEAL & SIGNATURE

FOR DEPARTMENT USE ONLY

FEE ENCLOSED: $_____ ON_____
DATE

AMENDMENT ☐ APPROVED

☐ DISAPPROVED BY:_____

r 355

CITY OF NEW YORK DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF AIR, NOISE & HAZARDOUS MATERIALS
59 -17 JUNCTION BOULEVARD,CORONA, NEW YORK 11368
AIR PERMITTING, 9TH FLOOR

AMENDMENT
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6. Figure 3 is attached and has been updated to reflect the latest design (90% complete) and includes the bypass stack sampling ports. Figure 3 is submitted in triplicate on 17" x 22" paper.

7. Information on the duct burner and the waste heat recovery boilers is attached.

8. The transformer oil in the retention pit is vegetable-based oil. Rupture/leakage will be captured in a sump pit (containment) and pumped manually to an appropriate receptacle for transportation to a disposal facility. The oil is not considered hazardous material.

9. A copy of the New York State Department of Environmental Conservation (NYSDEC) Title V permit modification is enclosed.

10. A copy of the New York State's Environmental Quality Review Act (SEQRA) analysis is enclosed.

11. Back-up emission factors from Solar (the turbine manufacturer) and Rentech (the duct burner manufacturer) are enclosed with a revised emissions table (Table 1).

P.E. OR R.A.		
Ramon Li, P.E.		
NAME		
AKRF, Inc.		
STREET ADDRESS		
440 Park Avenue South, 7th Floor		
CITY	STATE	ZIP CODE
New York,	NY	10016

P.E. OR R.A. SEAL & SIGNATURE
STATE OF NEW YORK
RAMON LI
NO. 060357
LICENSED PROFESSIONAL ENGINEER

FOR DEPARTMENT USE ONLY

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AMENDMENT ☐ APPROVED

☐ DISAPPROVED BY: _____

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CITY OF NEW YORK DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF AIR, NOISE & HAZARDOUS MATERIALS
59 -17 JUNCTION BOULEVARD,CORONA, NEW YORK 11368
AIR PERMITTING, 9TH FLOOR

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12. Main Stacks: Box 29: The Emission Point ID No. is updated to U0029 for Train 1 and U0031 for Train 2.
13. Main Stacks: Box 30: Ground elevation (ft): Updated to 15.5 ft.
14. Main Stacks: Boxes 32, 36, 38, and 39 have been verified and remain unchanged.
15. Main Stacks: Box 40: % Operating season: Updated to indicate 32% in the winter, 28% in the spring, 16% in the summer, and 24% in the fall.
16. Main Stacks: Box 151: Gas Thousands of CF/YR: Updated to 1,059,280. Difference was due to rounding.
17. Main Stacks: Box 152 has been verified and remains unchanged.
18. Bypass Stacks: Box 29: The Emission Point ID No. is updated to U0030 for Train 1 and U0032 for Train 2.
19. Bypass Stacks: Box 30: Ground elevation (ft): Updated to 15.5 ft.
20. Bypass Stacks: Box 34: Exit Temperature (F): Updated to 955 F.
21. Bypass Stacks: Box 35: Exit Velocity (ft/sec): Updated to 108.3.

P.E. OR R.A.		
Ramon Li, P.E.		
NAME		
AKRF, Inc.		
STREET ADDRESS		
440 Park Avenue South, 7th Floor		
CITY	STATE	ZIP CODE
New York,	NY	10016

FOR DEPARTMENT USE ONLY

FEE ENCLOSED: $_____ ON _____ DATE

AMENDMENT ☐ APPROVED

☐ DISAPPROVED BY: _____

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BUREAU OF AIR, NOISE & HAZARDOUS MATERIALS
59 -17 JUNCTION BOULEVARD,CORONA, NEW YORK 11368
AIR PERMITTING, 9TH FLOOR

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22. Bypass Stacks: Box 36: Exit Flow Rate (acfm): Updated to 127,616. Difference was due to rounding.

23. Bypass Stacks: Boxes 32, 38, 39, and 40 have been verified and remain unchanged.

24. Bypass Stacks: Box 151: Gas Thousands of CF/YR: Updated to 734,394. Difference was due to rounding.

25. Bypass Stacks: Box 152 has been verified and remains unchanged.

26. The basis of design report is enclosed.

27. DOC is investigating the status of the existing plant's permits with the DEP. It is our understanding that whether the existing plant has DEP permits or not, this should not affect the status and approval of the new cogeneration plant. DOC will take this matter up with the DEP under separate filing.

28. Per the 10/7/2010 meeting, the roof fans, the cooling for the electric generator, the gas turbine chiller, the enclosure cooler, the lube oil cooler, and the future air chiller are not required to have DEP permits or registrations.

P.E. OR R.A.		
Ramon Li, P.E.		
NAME		
AKRF, Inc.		
STREET ADDRESS		
440 Park Avenue South, 7th Floor		
CITY	STATE	ZIP CODE
New York,	NY	10016

P.E. OR R.A. SEAL & SIGNATURE

STATE OF NEW YORK
RAMON LI
No. 060057
LICENSED PROFESSIONAL ENGINEER

FOR DEPARTMENT USE ONLY

FEE ENCLOSED: $_____ ON _____
DATE

AMENDMENT ☐ APPROVED

☐ DISAPPROVED BY: _____

.r 355

CITY OF NEW YORK DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF AIR, NOISE & HAZARDOUS MATERIALS
59 -17 JUNCTION BOULEVARD,CORONA, NEW YORK 11368
AIR PERMITTING, 9TH FLOOR

AMENDMENT
(TO BE TYPED OR PRINTED)

INSTALLATION: PB008210X

DATE: December 2, 2010

PREMISE ADDRESS: NYC-DOC-Rikers Island, 17-25 Hazen Street, East Elmhurst, NY 11370 Queens (BORO)

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29. Per the 10/7/2010 meeting, the project is not required to have a public hearing. There will be an opportunity for the public to comment on the Title V application and the NYSDEC will decide if a public hearing in necessary. A public participation plan is also being developed for the NYSDEC per the Title V permit and the Environmental Justice requirements in the EAS.

30. Per the 10/7/2010 meeting, any continuous emission monitoring equipment for the main and bypass stacks will be at the discretion of the NYSDEC.

P.E. OR R.A. Ramon Li, P.E.		
NAME AKRF, Inc.		
STREET ADDRESS 440 Park Avenue South, 7th Floor		
CITY New York,	STATE NY	ZIP CODE 10016

P.E. OR R.A. SEAL & SIGNATURE
STATE OF NEW YORK
RAMON LI
No. 080357
LICENSED PROFESSIONAL ENGINEER

FOR DEPARTMENT USE ONLY

FEE ENCLOSED: $_____ ON _____ DATE

AMENDMENT ☐ APPROVED

☐ DISAPPROVED BY: _____

CONTRACTOR'S STATEMENT

CONTRACTOR STATEMENT

I CERTIFY THAT I WILL MAKE THE INSTALLATION OF THE EQUIPMENT AT THE PREMISES:

(LOCATION): NYC-DOC-Rikers Island, 17-25 Hazen Street, East Elmhurst Queens
(BORO)

AS SPECIFIED IN THE APPLICATION AND IN ACCORDANCE WITH THE PLANS FILED AND APPROVED BY THE COMMISSIONER OF THE NYC DEPARTMENT of ENVIRONMENTAL PROTECTION.

INSTALLER NAME (INDIVIDUAL): To Be Determined at a Later Date

INSTALLER SIGNATURE: _____

COMPANY NAME: To be Determined at a Later Date

INSTALLER ADDRESS: _____

COMPANY NUMBER AND CLASS FOR FUEL BURNING EQUIPMENT OR PLUMBER LICENSE NUMBER: _____

(A VALID CERTIFICATE OF WORKMAN'S COMPENSATION MUST BE ON FILE WITH THE NYC DEPARTMENT of ENVIRONMENTAL PROTECTION)

PLEASE RETURN THIS FORM (ORIGINAL) TO:

NYC DEPARTMENT of ENVIRONMENTAL PROTECTION
Bureau of Air Noise & Hazardous Materials
59-17 Junction Boulevard 9th Fl. (RECORDS CONTROL)
Corona, NY 11368

LETTER OF AUTHORIZATION

EPA #18

THE CITY OF NEW YORK
ENVIRONMENTAL PROTECTION

NYC Dept. of Environmental Protection
Bureau of Environmental Compliance
59-17 Junction Boulevard
9th Floor
Flushing, NY 11373-5108

LETTER OF AUTHORIZATION

Date October 12, 2010

Gentlemen:

Reference: Premises New York City Department of Correction, NYC-DOC-Rikers Island, 17-25 Hazen Street
Street Address

East Elmhurst, Queens
City Borough

Lot No. _____ Block No. _____

I have authorized Ramon Li, P.E. of AKRF, Inc. P.E./R.A./Agent
Name

440 Park Avenue South, 7th Floor, New York, NY 10016
Full Address

to file plans and specifications to install a new cogeneration system consisting of two 7.5 MW (total of 15 MW)
Specify Equipment

imple cycle natural gas fired turbines with heat recovery duct firing

at the above premises.

Warden M. Laylli
Signature of Owner
If Corp., State Title of Officer Signing
Address

New York City Department of Correction
60 Hudson Street, Room 719
New York, NY 10013-3001

The signature of the owner constitutes an agreement that the owner assumes responsibility for the installation, alteration and use of the equipment or control apparatus concerned in accordance with the requirements of the New York City Air Pollution Control Code.

FACILITY DESCRIPTION

NYC-DOC-Rikers Island

DEP Permit Applications

Facility Description

Existing Facility

Rikers Island has an existing powerhouse which houses eight boilers with a capacity of 96 mmbtu/hr each, firing natural gas or distillate oil as back up. The eight boilers are retrofitted with low NOx burners, utilizing natural gas as the primary fuel and #2 fuel oil as back up. The eight boilers exhaust through **Emission Points U00001, U00002, and U00003** and are permitted under **Emission Units U-00001, U-00002, and U-00003, respectively**.

Emission Point U00001 includes four existing boilers; **Emission Sources: 00001, 00002, 00003, and 00004**. These are boiler number 6, 7, 8, and 9 at the plant.

Emission Point U00002 includes two existing boilers; **Emission Sources: 00005 and 00006.** These are boiler numbers 2 and 3 at the plant.

Emission Point U00003 includes two existing boilers; **Emission Sources: 00007 and 00008.** These are boiler numbers 4 and 5 at the plant.

The facility also operates a spray paint booth, under **Emission Unit U-00009** and is **Emission Source 0000P** exhausting through **Emission Point 00009**, which is located in the garage where the vehicles are served. The spray booth is used for painting repaired parts of buses and vehicles for the Department of Correction (DOC).

The facility also operates nineteen (19) internal combustion engines in a Peak Load Management (PLM) program with Con Edison, the local utility. These nineteen engines are permitted under **Emission Unit U-00010** and exhaust through **Emission Points 00010, 00011, 00012, 00013, 00014, 00015, 00016, 00017, 00018, 00019, 00020, 00021, 00022, 00023, 00024, 00025, 00026, 00027, and 00028**. Fifteen of the nineteen engines are permitted to operate under NOx RACT variance emission limits.

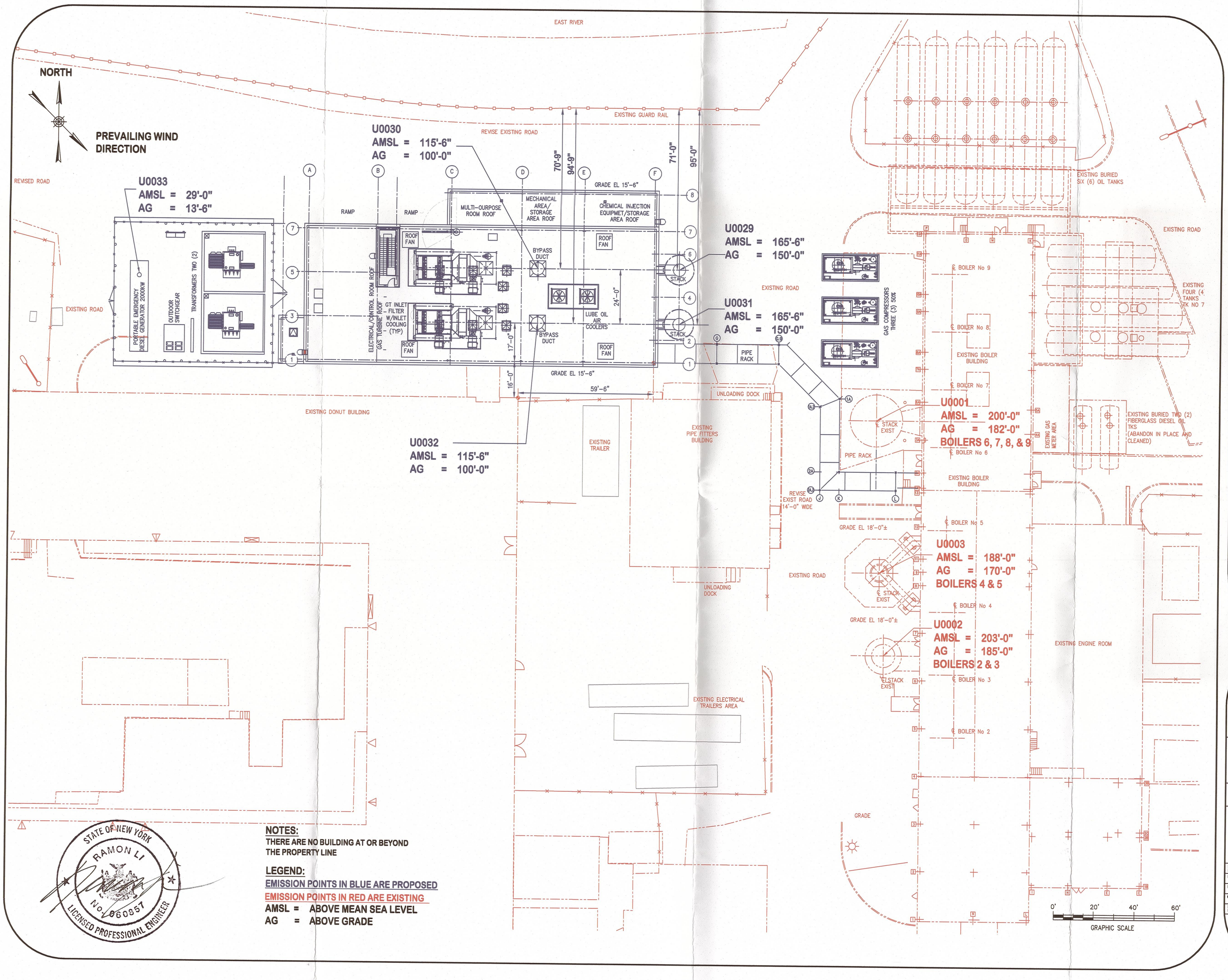
There is no Emission Unit U-00004, U-00005, U-00006, U-00007, or U-00008. There is also no Emission Point 00004, 00005, 00006, 00007, or 00008.

New Cogeneration Plant

For the NYSDEC Title V modification, the new cogeneration system is being permitted under **Emission Unit U-00011** as **Emission Sources 00029, 00030, 00031, and 00032** and exhausting through **Emission Points U0029, U0030, U0031, and U0032**.

For consistency, for the DEP permit applications, the new cogeneration system is being permitted as **Emission Point Numbers U0029, U0030, U0031, and U0032. U0029 is the main stack for Train 1. U0030 is the bypass stack for Train 1. U0031 is the main stack for Train 2. U0032 is the bypass stack for Train 2.**

FIGURE 1 (TRIPLICATE)



STATE OF NEW YORK
RAMON LI
No. 060957
LICENSED PROFESSIONAL ENGINEER

NOTES:
THERE ARE NO BUILDING AT OR BEYOND THE PROPERTY LINE

LEGEND:
EMISSION POINTS IN BLUE ARE PROPOSED
EMISSION POINTS IN RED ARE EXISTING
AMSL = ABOVE MEAN SEA LEVEL
AG = ABOVE GRADE

New York Power Authority

AECOM
20 Exchange Place, New York NY 10005

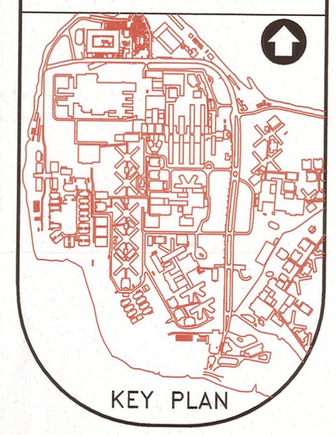
NEW YORK CITY DEPARTMENT OF CORRECTION

REVISIONS

NO.	DATE	DESCRIPTION	BY	APPD.
A	12-01-09	60% SUBMITTAL		
B	10-20-10	90% SUBMITTAL		

THESE PLANS ARE A SERVICE PROVIDED EXCLUSIVELY TO THE OWNER, AND ARE THE SOLE PROPERTY OF THE ENGINEER. ANY UNAUTHORIZED RE-USE OF THIS WORK WITHOUT THE ENGINEER'S WRITTEN PERMISSION WILL BE CONSIDERED AN INFRINGEMENT OF THE ENGINEERS WORK.

"IT IS A VIOLATION OF THE PROFESSIONAL LICENSE LAW FOR ANY PERSON TO ALTER THIS DRAWING IN ANY WAY, UNLESS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER/ARCHITECT AS APPLICABLE. THE ALTERING ENGINEER/ARCHITECT SHALL AFFIX HIS/HER SEAL AND THE NOTATION "ALTERED BY" FOLLOWED BY HIS/HER SIGNATURE AND DATE OF ALTERATION."



RIKERS ISLAND
17-25 HAZEN STREET
E. ELMHURST N.Y. 11370

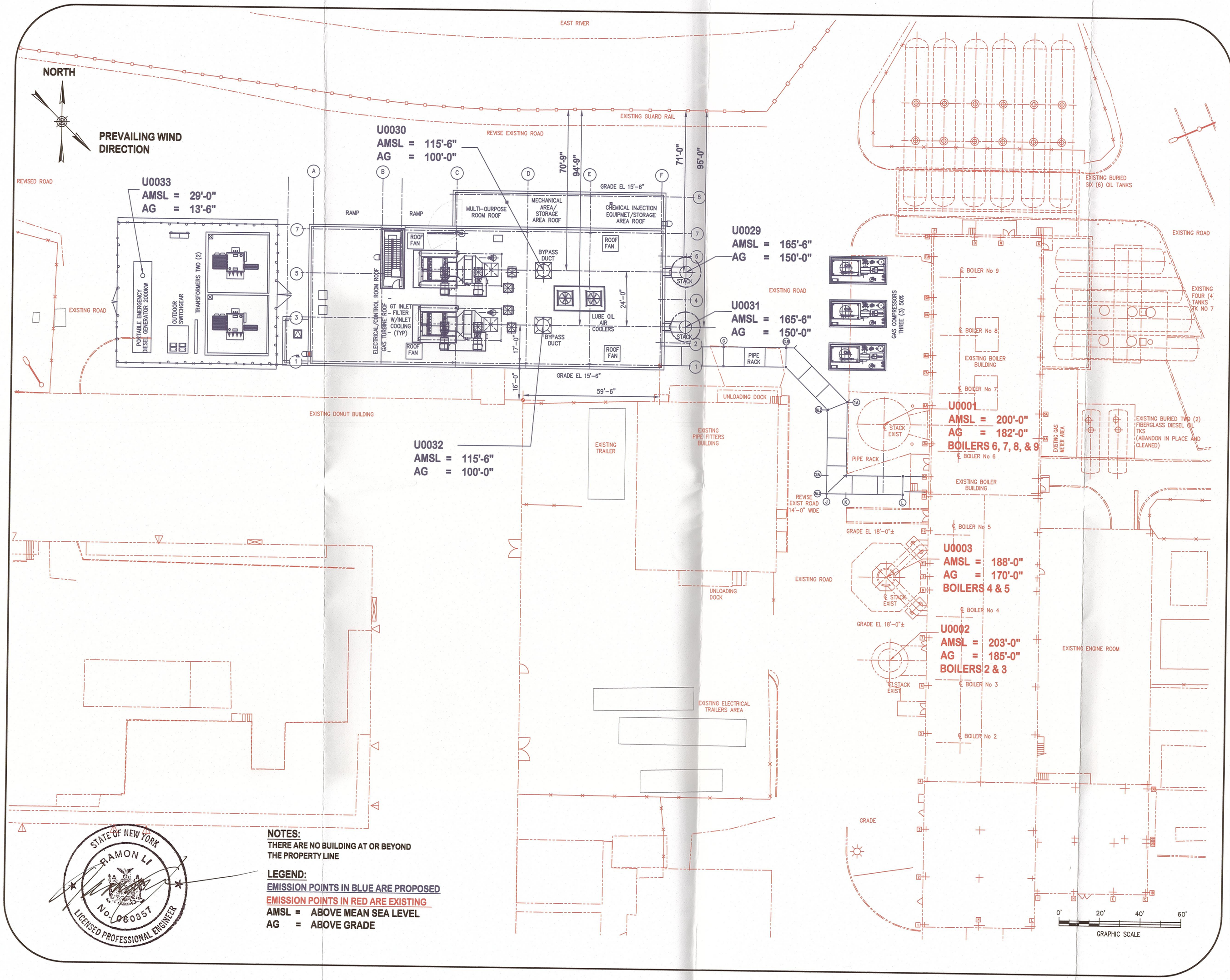
COGENERATION PLANT

MECHANICAL

ENLARGED PLOT PLAN
NORTH SIDE

PROJECT MANAGER: M.GILLESPIE	SCALE: 1"=20'
DESIGNED BY:	DATE: 09-25-2009
DRAWN BY: JS ZAFFOS	AECOM PROJECT NO. 60020717
CHECKED BY: P YALLOURIS	
FILE LOCATION:	
DRAWING NO.	

FIGURE 1



STATE OF NEW YORK
RAMON LI
No. 060057
LICENSED PROFESSIONAL ENGINEER

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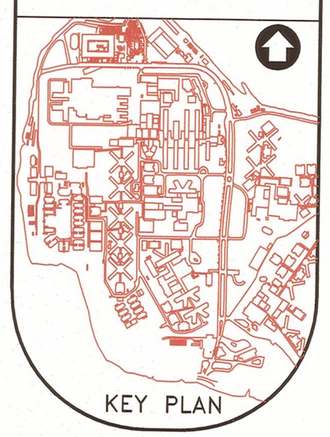


RIKERS ISLAND
17-25 HAZEN STREET
E. ELMHURST N.Y. 11370

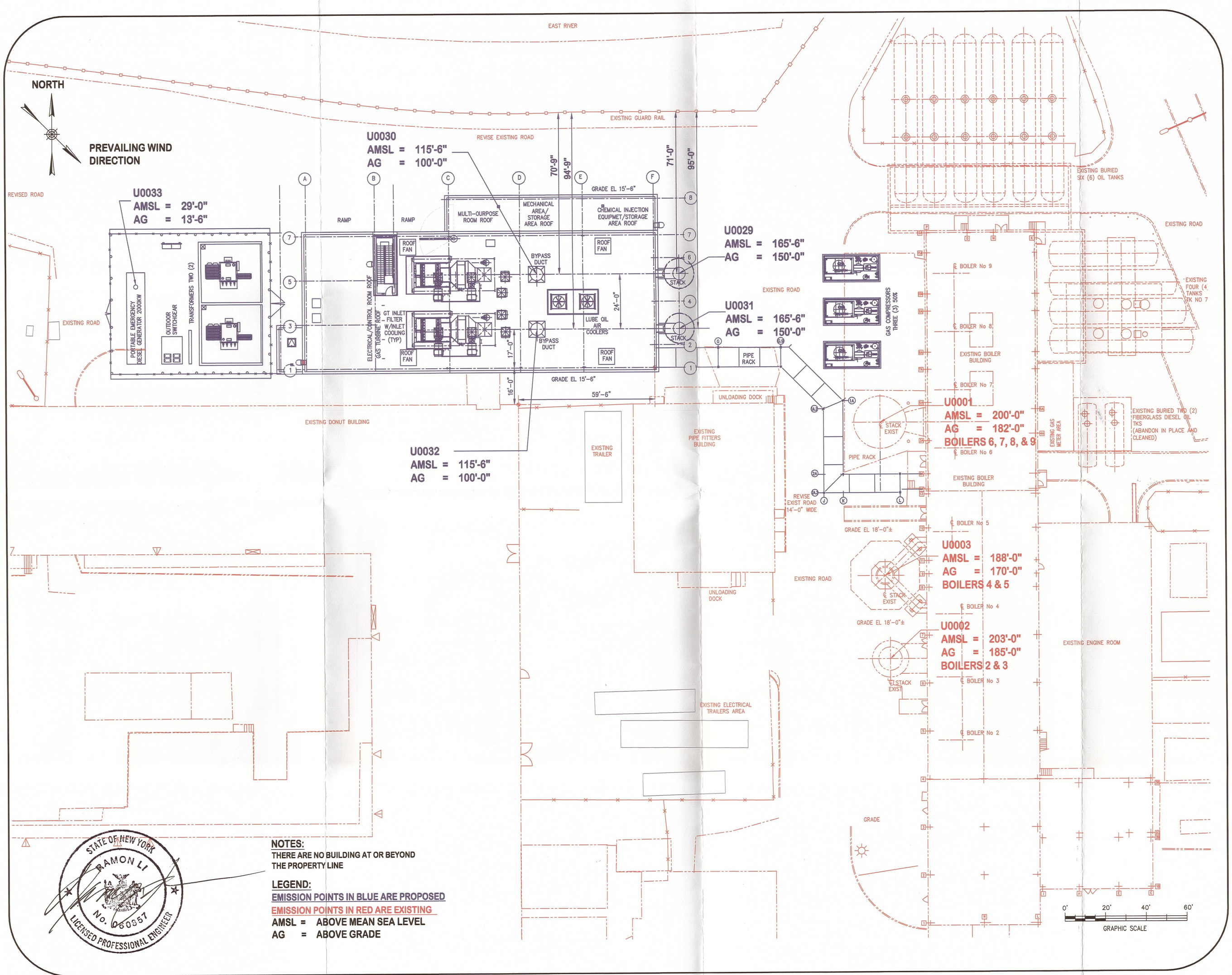
COGENERATION PLANT

MECHANICAL

ENLARGED PLOT PLAN
NORTH SIDE

PROJECT MANAGER: M.GILLESPIE	SCALE: 1"=20'
DESIGNED BY:	DATE: 09-25-2009
DRAWN BY: JS ZAFFOS	AECOM PROJECT NO. 60020717
CHECKED BY: P YALLOURIS	
FILE LOCATION:	
DRAWING NO.	

FIGURE 1



STATE OF NEW YORK
RAMON LI
No. 060357
LICENSED PROFESSIONAL ENGINEER

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NEW YORK CITY DEPARTMENT OF CORRECTION

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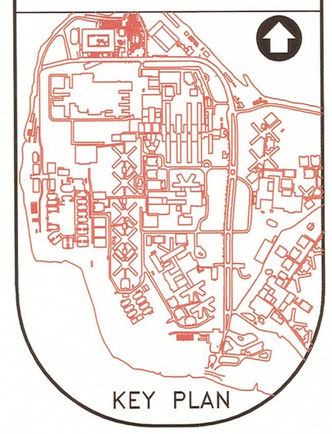


RIKERS ISLAND

17-25 HAZEN STREET
E. ELMHURST N.Y. 11370

COGENERATION PLANT

MECHANICAL

ENLARGED PLOT PLAN
NORTH SIDE

PROJECT MANAGER: M.GILLESPIE	SCALE: 1"=20'
DESIGNED BY:	DATE: 09-25-2009
DRAWN BY: JS ZAFFOS	AECOM PROJECT NO. 60020717
CHECKED BY: P YALLOURIS	
FILE LOCATION:	
DRAWING NO.	

FIGURE 1

ROOF FAN
MANUFACTURER INFORMATION

GREENHECK
Building Value in Air.

Printed Date: 9/27/2010
Job: Rikers Island
Product Type: Centrifugal
Mark: EF-1,2,3,4

QEI Mixed Flow Fan

ENGINEERING DATA

Approx. Fan Weight (lb)	Class	Max. T Motor Frame Size	WR2 (lb-ft2)
3,400	I	365	1,630

**Weight does NOT include motor, drives, or accessories.

Motor Location	Drive Type
N/A	Constant

CONFIGURATION

Arrangement	Discharge Position	Material Type
9	Vertical	Steel

INSTALLATION

Inlet Conditions	Outlet Conditions
Standard	Free Discharge

MOTOR SPECS

Size (hp)	RPM	V/C/P	Enclosure	Motor Frame Size
50	1725	460/60/3	ODP	326

TAGS

EF-1 EF-3
EF-2 EF-4

STANDARD CONSTRUCTION FEATURES

HOUSING: Continuously welded steel housing • Welded steel air straightening vanes • Lifting lugs • Slip-fit inlet and outlet collars• Heavy duty, steel motor supports with adjustment screws for belt tensioning • Structural parts are phosphatized and coated with Permatector
BEARINGS, SHAFT: Heavy duty, self-aligning ball or roller face mounted bearings with extended lubrication lines
WHEEL: Welded construction • Single thickness cambered blades

SELECTED OPTIONS & ACCESSORIES

Outdoor Intended Application (informational purposes only)
Mounting Support - Base
Access Door - Quick Opening, Flush
Bearings, L(10) 80k hrs = L(50) 400,000 hrs
Extended Lube Line - Copper
Guard - Inlet
Permatector Coating on Steel Components
Class B Motor Insulation or Greater
Drive Service Factor of 1.5 - Standard
UL/cUL-705 - "Power Ventilators"
Belt Tube
Aluminum Butterfly Dampers
Motor Cover
Spare Set of Belts
Guard - Outlet Debris
Roof Curb - GP Std, Aluminum Construction, 18 Inch Height
Magnetic Bumper Latches
Premium Efficient Motor Exceeds EPACT and NEMA 12.10

STATE OF NEW YORK
RAMON LI
No. 060057
LICENSED PROFESSIONAL ENGINEER

PERFORMANCE (Elevation ft = 0, Airstream Temperature F = 70, Standard Temperature F = 70) Drive Loss (%) 3

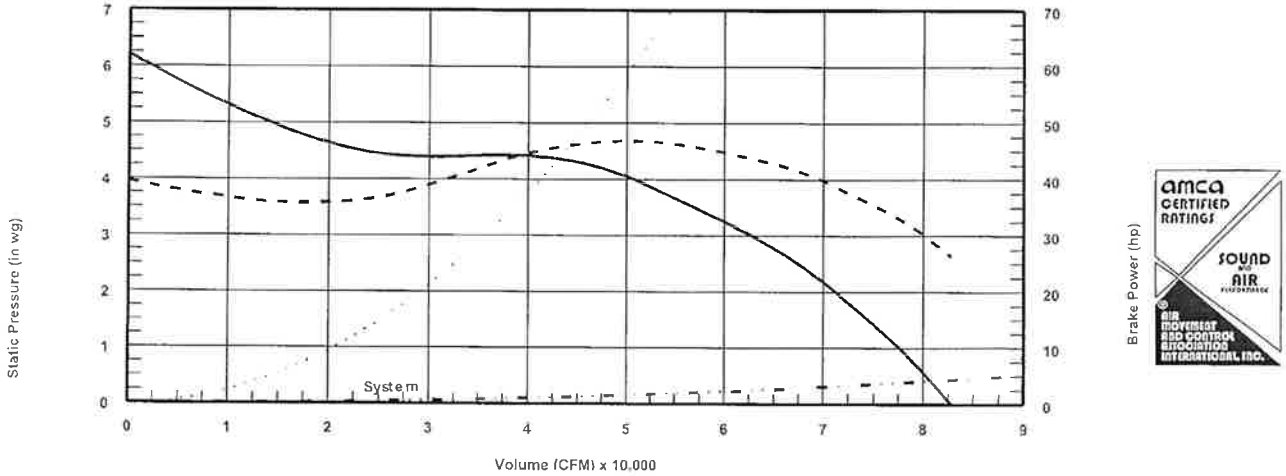
Qty	Model	Volume (CFM)	SP (in wg)	Fan RPM	Tip Speed (ft/min)	FRPM	Max Class FRPM	Operating Power (hp)	SE %
4	QEI-54-I	76,855	0.375	12,164	2,523	704	752	33.82	14

SOUND

Inlet / Outlet Sound Power by Octave Band								LwA	dBA
63	125	250	500	1000	2000	4000	8000		
99 / 97	99 / 99	95 / 100	93 / 97	90 / 93	88 / 90	79 / 81	68 / 71	95 / 98	84 / 87

LwA - A weighted sound power level, based on ANSI S1.4.
dBA - A weighted sound pressure level, based on 11.5 dB attenuation per octave band at 5.0 ft.

dBA levels are not licensed by AMCA International.



amca CERTIFIED RATINGS
SOUND AIR
AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL, INC.

Size: 54
Arrangement: 9
Class: I

QEI Mixed Flow Fan

NOTES: All dimensions shown are in units of inches.
Drawings are not to scale. Drawings are of standard unit and do not include dimensions for accessories or design modifications.

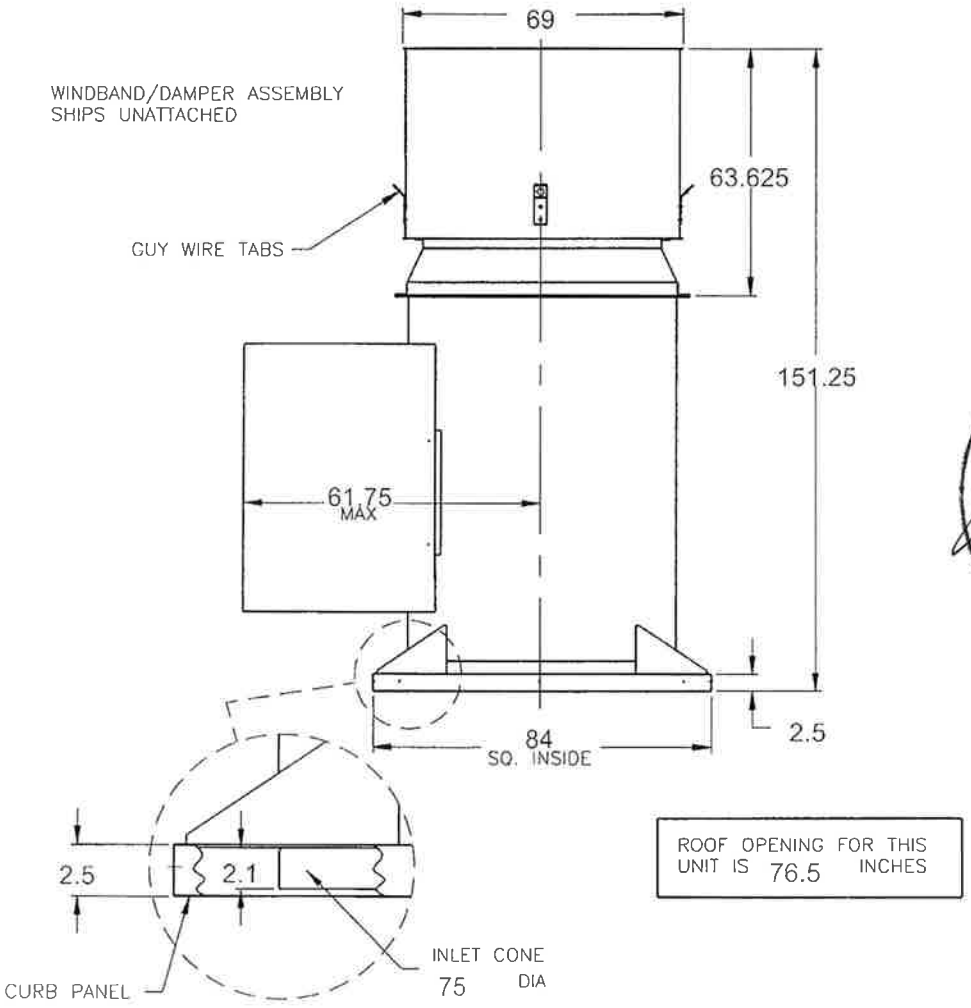
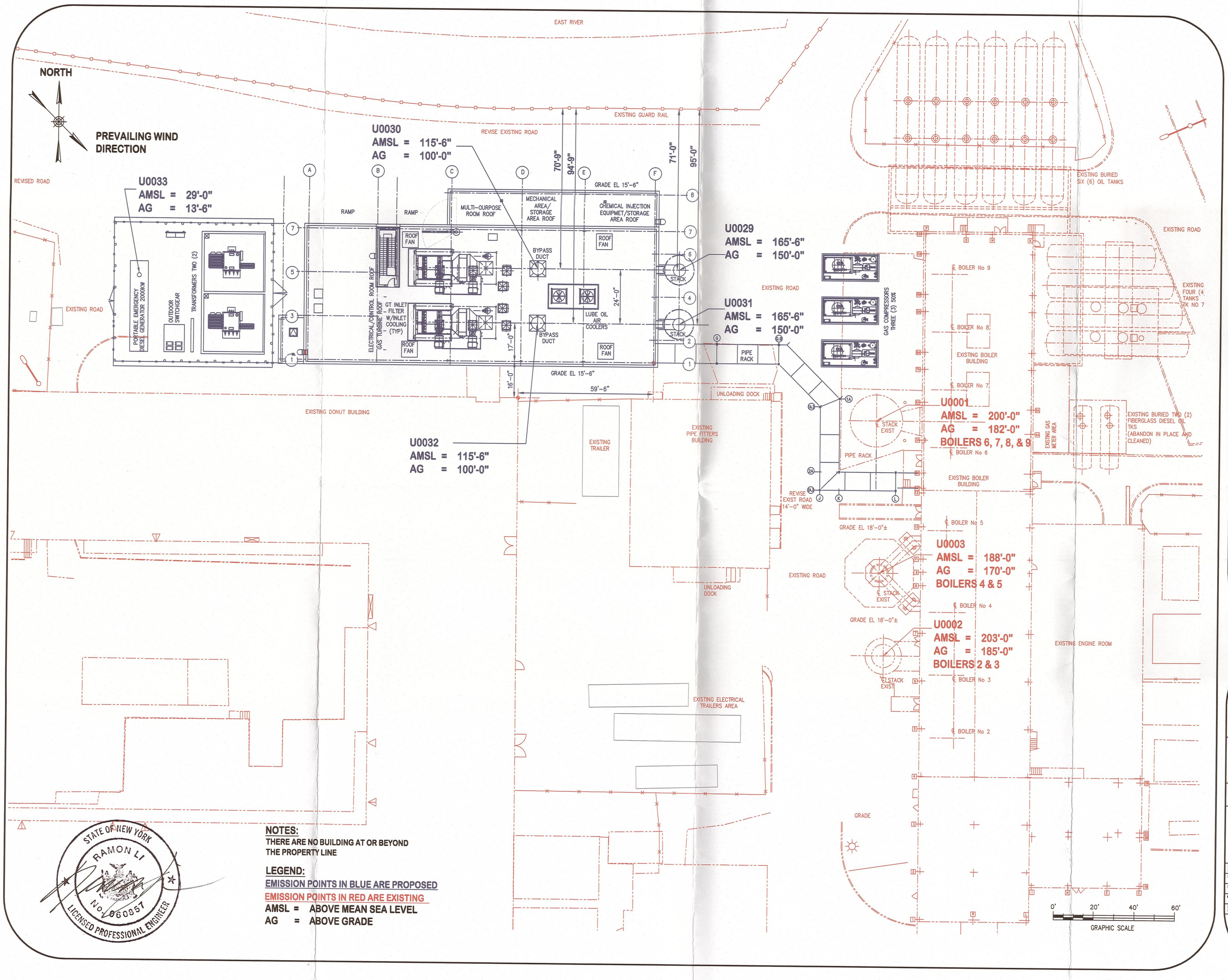


FIGURE 3 (TRIPLICATE)



STATE OF NEW YORK
RAMON LI
No. 060957
LICENSED PROFESSIONAL ENGINEER

NOTES:
THERE ARE NO BUILDING AT OR BEYOND THE PROPERTY LINE

LEGEND:
EMISSION POINTS IN BLUE ARE PROPOSED
EMISSION POINTS IN RED ARE EXISTING
AMSL = ABOVE MEAN SEA LEVEL
AG = ABOVE GRADE

New York Power Authority

AECOM
20 Exchange Place, New York NY 10005

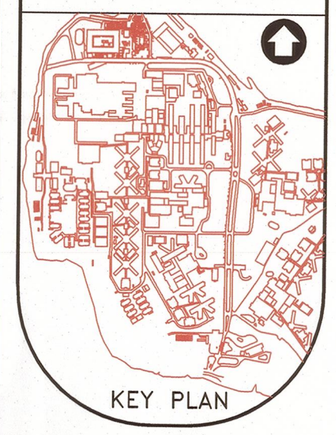
NEW YORK CITY DEPARTMENT OF CORRECTION

REVISIONS

NO.	DATE	DESCRIPTION	BY	APPD.
A	12-01-09	60% SUBMITTAL		
B	10-20-10	90% SUBMITTAL		

THESE PLANS ARE A SERVICE PROVIDED EXCLUSIVELY TO THE OWNER, AND ARE THE SOLE PROPERTY OF THE ENGINEER. ANY UNAUTHORIZED RE-USE OF THIS WORK WITHOUT THE ENGINEER'S WRITTEN PERMISSION WILL BE CONSIDERED AN INFRINGEMENT OF THE ENGINEERS WORK.

"IT IS A VIOLATION OF THE PROFESSIONAL LICENSE LAW FOR ANY PERSON TO ALTER THIS DRAWING IN ANY WAY, UNLESS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER/ARCHITECT AS APPLICABLE. THE ALTERING ENGINEER/ARCHITECT SHALL AFFIX HIS/HER SEAL AND THE NOTATION "ALTERED BY" FOLLOWED BY HIS/HER SIGNATURE AND DATE OF ALTERATION."



RIKERS ISLAND
17-25 HAZEN STREET
E. ELMHURST N.Y. 11370

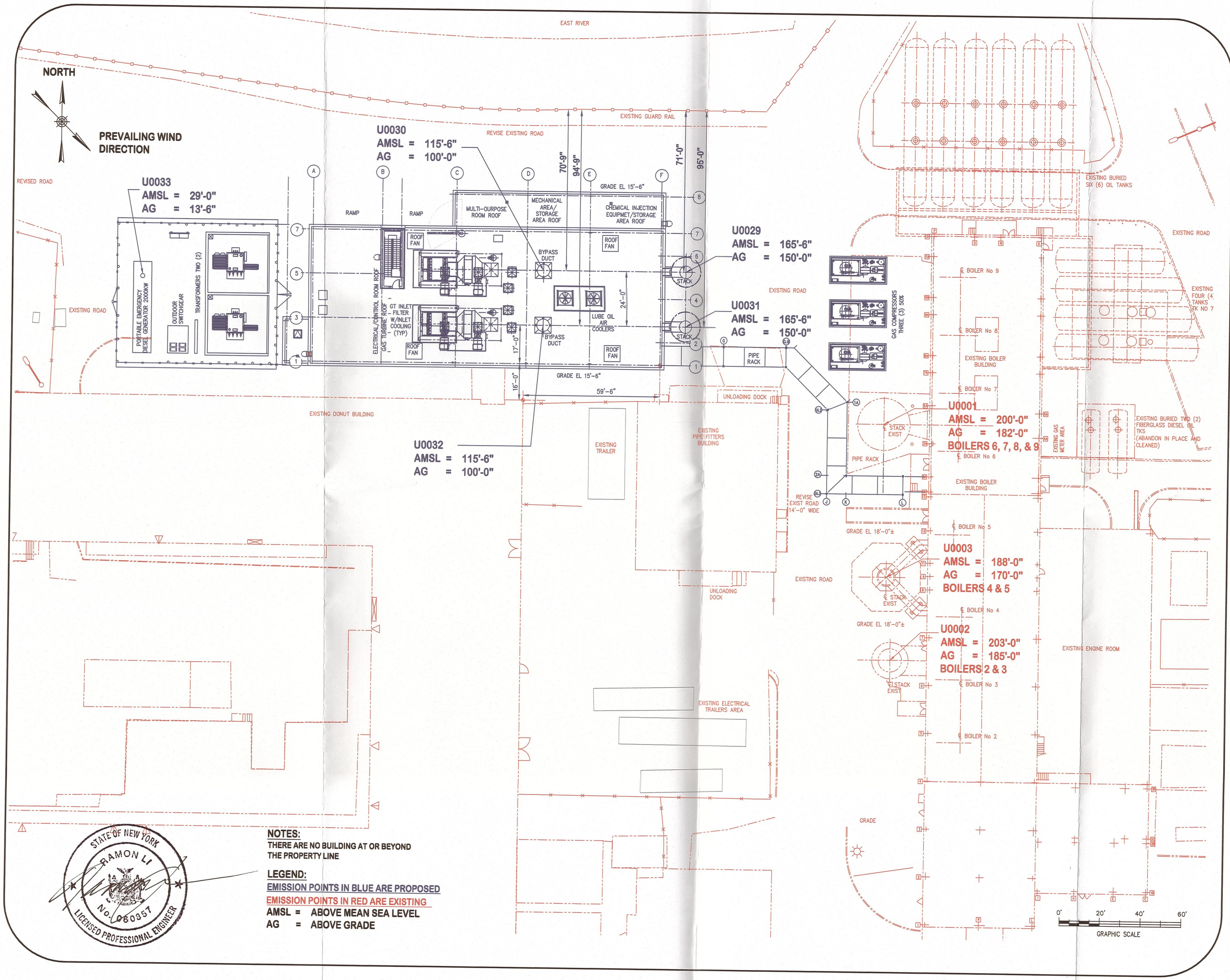
COGENERATION PLANT

MECHANICAL

ENLARGED PLOT PLAN
NORTH SIDE

PROJECT MANAGER: M.GILLESPIE	SCALE: 1"=20'
DESIGNED BY:	DATE: 09-25-2009
DRAWN BY: JS ZAFFOS	AECOM PROJECT NO. 60020717
CHECKED BY: P YALLOURIS	
FILE LOCATION:	
DRAWING NO.	

FIGURE 1



STATE OF NEW YORK
RAMON LI
No. 060057
LICENSED PROFESSIONAL ENGINEER

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New York Power Authority

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NEW YORK CITY DEPARTMENT OF CORRECTION

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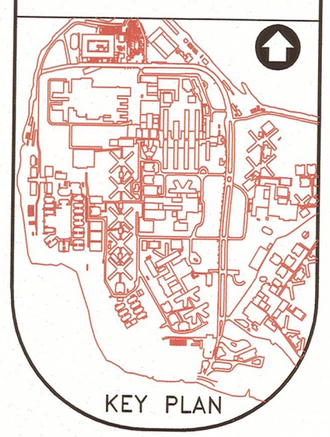

RIKERS ISLAND
17-25 HAZEN STREET
E. ELMHURST N.Y. 11370

COGENERATION PLANT

MECHANICAL

ENLARGED PLOT PLAN
NORTH SIDE

PROJECT MANAGER: M.GILLESPIE	SCALE: 1"=20'
DESIGNED BY:	DATE: 09-25-2009
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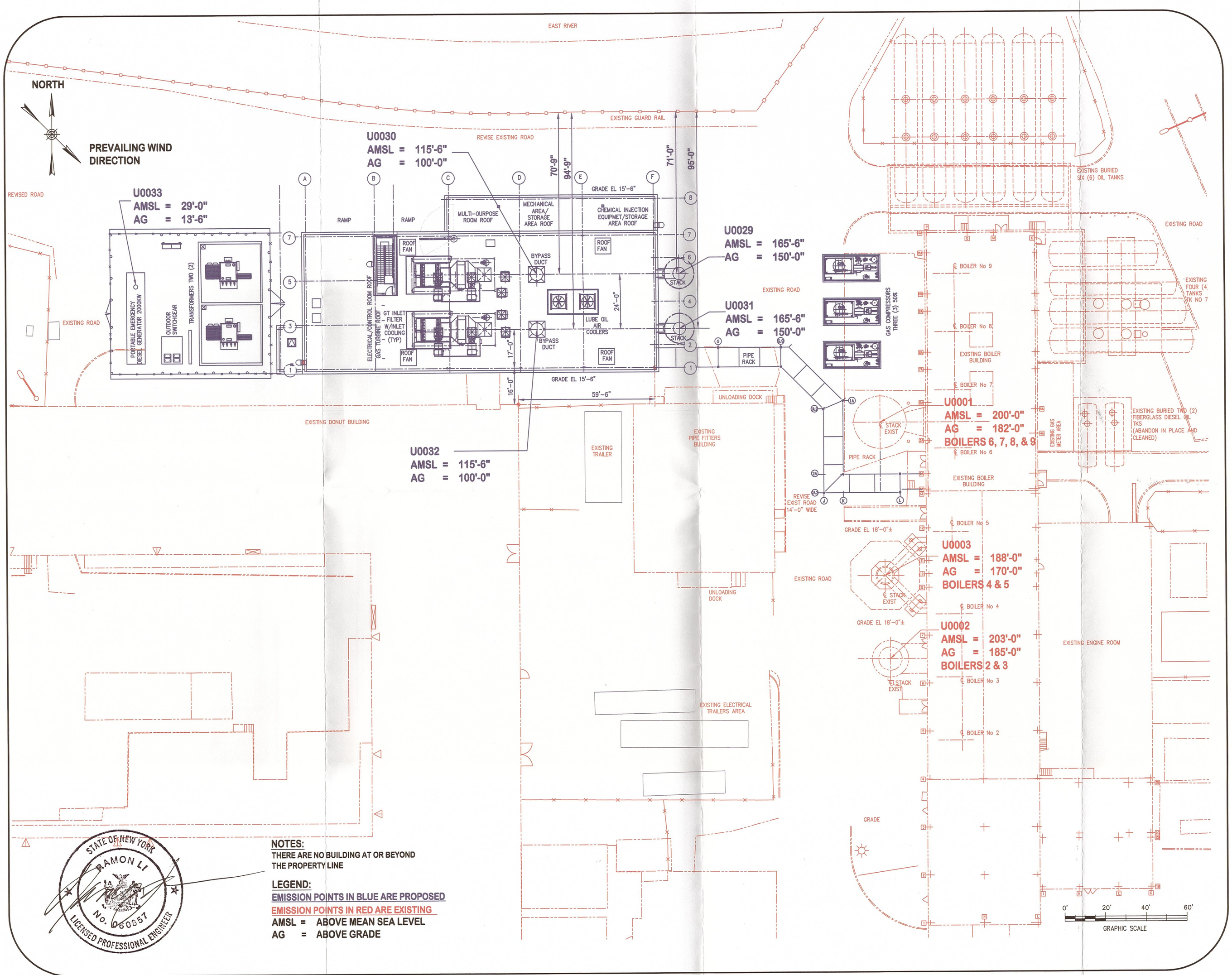
CHECKED BY: P YALLOURIS	
FILE LOCATION:	
DRAWING NO.	

FIGURE 1



STATE OF NEW YORK
RAMON LI
No. 060357
LICENSED PROFESSIONAL ENGINEER

NOTES:
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LEGEND:
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New York Power Authority

AECOM

20 Exchange Place, New York NY 10005

NEW YORK CITY DEPARTMENT OF CORRECTION

REVISIONS				
NO.	DATE	DESCRIPTION	BY	APPD.
A	12-01-09	60% SUBMITTAL		
B	10-20-10	100% SUBMITTAL		

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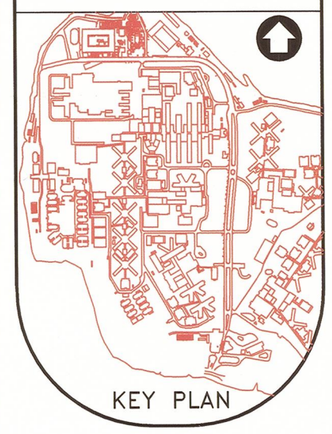

RIKERS ISLAND

17-25 HAZEN STREET
E. ELMHURST N.Y. 11370

COGENERATION PLANT

MECHANICAL

ENLARGED PLOT PLAN
NORTH SIDE

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DRAWING NO.	

FIGURE 1

DUCT BURNER AND WASTE HEAT RECOVERY BOILER INFORMATION

NYC-DOC-Rikers Island

DEP Permit Applications

Duct Burner and HRSG Design Data

Duct Burner Design Data

Make: Hamworthy – Peabody

Model: HPC ECOgen Duct Burner System

No. Burner Elements per HRSG: 2

Total Burner Duty (LHV): 39.93 mmBtu/hr

Controls: Burner Management System Control Panel. Primary control element is through flow control valve, "Fisher V150" maintaining steam pressure (165 psig). Flue gas temperature is raised form 957°F at gas turbine exhaust to 1494°F by duct burner design heat input. Gas turbine exit temperature is controlled by the firing rate in the gas turbine combustion chamber. Safety Design is per NFPA85.

HRSG Design Data

Make: Rentech

Model: Custom Design Specific to Rikers Island Requirements

Heating Surface: 17,142 ft^2 Economizer / 24,498 ft^2 Evaporator

Capacity: 35,000 lbs/hr from heat recovery only / 70,000 lbs/hr heat recovery + duct burner on

Steam Quality: Saturated @ 0.05% wet

NEW YORK STATE DEPARTAMENT OF ENVIRONMENTAL CONSERVATION

TITLE V PERMIT MODIFICATION APPLICATION

NEW YORK STATE ENVIRONMENTAL QUALITY REVIEW ACT (SEQR) ANALYSIS

New York City Department of Correction

Full Environmental Assessment Form
with Supplemental Studies

Rikers Island Cogeneration Plant

Lead Agency:

New York Power Authority
123 Main Street
White Plains, NY 10601

Prepared by:

AKRF, Inc.
440 Park Avenue South, 7th Floor
New York, NY 10016

September 2010

BACK-UP EMISSION FACTORS AND VENDOR GUARANTEES

TABLE 1
NYC-DOC-Rikers Island
Cogeneration Emission Rates

Solar Taurus 70

Emissions (per unit)									
Case No.			1	2	3	4	5	6	Notes / Equations
Fuel			Natural Gas						
Ambient Temperature (°F)			0	59	100	59	59	59	Emission rates presented on DEP application are at 59 F (ISO) conditions (bold column)
Load			100%	100%	100%	100%	75%	50%	Emission rates presented on DEP application are at 100% load conditions (bold column)
Heat Input (MMBtu/hr, LHV)			90.4	78.5	68.4	78.5	63.7	51.4	Data from Solar
Heat Input (MMBtu/hr, HHV)			99.4	86.4	75.2	86.4	70.1	56.5	MMBtu/hr, LHV x 1.1 conversion factor
Natural Gas Flowrate (SCFH)			96,544	83,835	73,049	83,835	68,029	54,893	(Heat Input, HHV, MMBtu/hr) x (1 scf / 1,030 Btu) x (1,000,000 Btu/MMBtu)
Natural Gas Flowrate (1000 SCF per Year)			845,723	734,394	639,905	734,394	595,935	480,864	Natural Gas Flowrate (SCFH) x 8,760 hrs/yr
Gas Turbine Exhaust Flow (lb/hr)			231,894	211,172	186,338	211,172	173,691	135,748	Data from Solar
Turbine Exhaust Temperauture (F)			937	955	1,000	955	978	1,068	Data from Solar
Turbine Exhaust Flow (ACFM)			138,356	127,616	116,191	127,616	106,672	88,588	(Stack Exhaust Flow, lbs/hr*0.222)*((Stack Exhaust Temp, F +459.69)/(60+459.69))
Turbine Exhaust Velocity (ft/s)			117.4	108.3	98.6	108.3	90.5	75.2	(Stack Exhaust Flow, acfm/(((Stack Exhaust Diamater,ft)^2 x PI)/4))/60 seconds/minute
Combustion Turbine Emissions		NOx	0.043	0.043	0.043	0.043	0.043	0.042	Emission Factor from Solar
		CO	--	--	--	--	--	--	--
		VOC	--	--	--	--	--	--	--
		PM10/PM2.5	0.019	0.019	0.019	0.019	0.019	0.019	Emission Factor from Solar
	Lb/MMBtu, HHV	SO2	--	--	--	--	--	--	--
		NOx	4.30	3.70	3.20	3.70	3.00	2.40	Emission Factors from Solar. VOC emissions are 10% of UHC emissions.
		CO	5.40	4.70	4.00	4.70	3.80	3.10	
		VOC	0.3	0.3	0.2	0.3	0.2	0.2	
		PM10/PM2.5	1.89	1.64	1.43	1.64	1.33	1.07	(Emission Factor from Solar, lb/MMBtu) x (Heat Input, HHV, MMBtu/hr)
	Lb/hr	SO2	0.01	0.01	0.01	0.01	0.01	0.01	Emission Factor from Solar
		NOx	37,668	32,412	28,032	32,412	26,280	21,024	(Turbine emissions, Lb/hr) x (8,760 hours/yr operation)
		CO	47,304	41,172	35,040	41,172	33,288	27,156	
		VOC	2,716	2,365	2,015	2,365	1,927	1,577	
		PM10/PM2.5	16,551	14,372	12,523	14,372	11,662	9,411	
	lbs/yr	SO2	88	88	88	88	88	88	
Duct Burner			Y	Y	Y	N	N	N	
Fuel			Natural Gas						
Load			100%	100%	100%	0%	0%	100%	Emission rates presented on DEP application are at 100% load conditions (bold column)
Fuel Flow (lbs/hr)			1,570	1,670	1,719	0	0	0	Data from Rentech
Heat Input (MMBtu/hr, LHV)			32.4	34.4	35.4	0.0	0.0	0.0	Data from Rentech
Heat Input (MMBtu/hr, HHV)			35.9	38.2	39.3	0.0	0.0	0.0	Data from Rentech
Natural Gas Flowrate (SCFH)			34,854	37,087	38,155	0	0	0	(Heat Input, HHV, MMBtu/hr) x (1 scf / 1,030 Btu) x (1,000,000 Btu/MMBtu)
Natural Gas Flowrate (1000 SCF per Year)			305,324	324,885	334,241	0	0	0	Natural Gas Flowrate (SCFH) x 8,760 hrs/yr
Duct Burner Emissions		NOx	0.070	0.070	0.070	0.070	0.070	0.070	Emission Factor from Rentech
		CO	0.080	0.080	0.080	0.080	0.080	0.080	Emission Factor from Rentech
		VOC	0.0045	0.0045	0.0045	0.0045	0.0045	0.0045	Emission Factor from Solar. VOC emissions are 10% of UHC emissions.
		PM10/PM2.5	0.010	0.010	0.010	0.010	0.010	0.010	Emission Factor from Solar.
	Lb/MMBtu, HHV	SO2	--	--	--	--	--	--	--
		NOx	2.51	2.67	2.75	0.00	0.00	0.00	(Emission Factor, lb/MMBtu) x (Heat Input, HHV, MMBtu/hr)
		CO	2.87	3.06	3.14	0.00	0.00	0.00	
		VOC	0.16	0.17	0.18	0.00	0.00	0.00	
		PM10/PM2.5	0.36	0.38	0.39	0.00	0.00	0.00	
	Lb/hr	SO2	0.49	0.39	0.39	0.00	0.00	0.00	Stack lbs/hr - Turbine lbs/hr
		NOx	22,014	23,424	24,099	0	0	0	(Duct Burner Lb/hr) x (8,760 hours/yr operation)
		CO	25,159	26,771	27,541	0	0	0	
		VOC	1,415	1,506	1,549	0	0	0	
		PM10/PM2.5	3,145	3,346	3,443	0	0	0	
	lbs/yr	SO2	4,292	3,416	3,416	0	0	0	
Total Natural Gas Flowrate (SCFH)			131,398	120,922	111,204	83,835	68,029	54,893	(Turbine Natural Gas Flowrate) + (Duct Burner Natural Gas Flowrate)
Total Natural Gas Flowrate (1000 SCF per Year)			1,151,047	1,059,280	974,146	734,394	595,935	480,864	Total Natural Gas Flowrate (SCFM) x 8,760 hrsyr
Stack Exhaust Temperature (°F)			275	292	275	292	311	305	Data from Solar
Stack Exhaust Temperature (°K)			408.15	417.59	408.15	417.59	428.15	424.82	((Stack Exhaust Temperature, F - 32)/1.8)+273.15
Stack Exhaust Flow (lbs/hr)			233,464	212,842	188,057	211,172	173,691	135,748	(Exhaust flow from turbine, lbs/hr) + (Exhaust flow from duct burner, lbs/hr)
Stack Exhaust Flow (ACFM)			73,271	68,345	59,020	67,808	57,183	44,343	(Stack Exhaust Flow, lbs/hr*0.222)*((Stack Exhaust Temp, F +459.69)/(60+459.69))
Stack Exhaust Diameter (feet)			5	5	5	5	5	5	Design data
Stack Exhaust Velocity (ft/s)			62.2	58.0	50.1	57.6	48.5	37.6	(Stack Exhaust Flow, acfm/(((Stack Exhaust Diamater,ft)^2 x PI)/4))/60 seconds/minute
Stack Exhaust Velocity (m/s)			18.957	17.682	15.270	17.544	14.794	11.473	Stack Exhaust Velocity, ft/s x 0.3048 meters/ft
Stack Exhaust Emissions		NOx	6.8	6.37	6.0	3.7	3.0	2.4	(Turbine emissions, lbs/hr) + (Duct Burner emissions, lbs/hr)
		CO	8.3	7.76	7.1	4.7	3.8	3.1	
		VOC	0.5	0.44	0.4	0.3	0.2	0.2	
		PM10/PM2.5	2.2	2.0	1.8	1.6	1.3	1.1	
	Lb/hr	SO2	0.50	0.40	0.40	0.40	0.20	0.20	Solar data lower. 0.03 lbs/hr, data in permit app. & modeling analysis is more conservative
		NOx	59,682	55,836	52,131	32,412	26,280	21,024	(Stack Exhaust Emissions, lb/hr) x (8,760 hours/yr operation)
		CO	72,463	67,943	62,581	41,172	33,288	27,156	
		VOC	4,131	3,871	3,564	2,365	1,927	1,577	
		PM10/PM2.5	19,696	17,718	15,966	14,372	11,662	9,411	
	lbs/yr	SO2	4,380	3,504	3,504	3,504	1,752	1,752	

Notes:
(1) PM10/PM2.5, NOx, CO, SO2, and UHC emission factors based on vendor data. VOC is 10% of UHC emissions.

Solar Turbines

A Caterpillar Company

Solar Turbines Incorporated

9330 Sky Park Court
San Diego, CA 92123
Tel: (858) 694-6403

Submitted Electronically

October 28, 2010

Michael Gillespie, PE
AECOM Energy
Michael.Gillespie@AECOM.com

RE: Emission Rates for Rikers Island Cogen Plant

Dear Mr. Gillespie:

The Cogen plant (1- Taurus 70-10801S Solar Turbine plus Duct Burner) to be installed at the above facility will have the following emissions rates at ISO conditions burning pipeline natural gas (guaranteed values underlined, other values included as estimates):

Turbine: Maximum heat input at ISO = 78.5, LHV (86.4 HHV)
NOx: 12 ppm at 15% O2; 0.043 lbs/mmBtu (HHV); 3.7 lbs/hr
CO: 25 ppm at 15% O2; 4.7 lbs/hr (Estimated Value)
UHC: 25 ppm at 15% O2; 2.7 lb/hr (Estimated Value)
VOC: 2.5 ppm at 15% O2; 0.3 lbs/hr (Estimated Value)
PM10/PM2.5: 0.019 lbs/mmBtu, HHV [includes both the front-half (filterables) and the back-half (condensables)] (Estimated Value)
SO2: 0.0002 lbs/mmbtu, HHV (based on sulfur content of fuel) (Estimated Value)

Duct Burner: Maximum heat input at ISO = 34.4, LHV (38.2HHV)
NOx: 0.07 lbs/mmBtu; 2.7 lbs/hr
CO: 0.08 lbs/mmBtu; 3.1 lbs/hr
VOC: 0.0045 lbs/mmBtu; 0.2 lbs/hr (Estimated Value)
PM10/PM2.5: 0.01 lbs/mmBtu – (includes both the front-half and the back-half) (Estimated Value)
SO2: 0.0002 lbs/mmbtu, HHV (based on sulfur content of fuel) (Estimated Value)

Total Emissions Values at Exhaust Stack:
NOx: 12.07 ppm at 15% O: 26.4 lbs/hr
CO: 25.08 ppm at 15% O2; 7.8 lbs/hr
VOC: 0.5 lbs/hr (Estimated Value)
PM10/PM2.5: 0.016 lbs/mmBtu, HHV [includes both the front-half (filterables) and the back-half (condensables)] 2.0 lbs/hr (Estimated Value)
SO2: 0.03 lbs/hr (Estimated Value)

Steve Boman, P.E.
Project Manager
Power Generation

NYC-DOC-Rikers Island

Example Calculations:

U0029 Stack: Turbine + Duct Burner Exhaust Through the Main Stack (Train 1)

	lbs/hr	lbs/yr
Total Particulates:	2.02	17,718

Total Particulates, lbs/hr = (Turbine Emissions, lbs/hr) + (Duct Burner Emissions, lbs/hr)

Turbine Emissions, lbs/hr = (Solar Emission Factor, lbs/mmBtu) x (Heat Input, HHV, mmBtu/hr)
Turbine Emissions, lbs/hr = 0.019 lbs/mmBtu x 86.4 mmBtu/hr
Turbine Emissions, lbs/hr = 1.64 lbs/hr

Duct Burner Emissions, lbs/hr = (Rentech Emission Factor, lbs/mmBtu) x (Heat Input, HHV, mmBtu/hr)
Duct Burner Emissions, lbs/hr = 0.01 lbs/mmBtu x 38.2 mmBtu/hr
Duct Burner Emissions, lbs/hr = 0.38 lbs/hr

Total Particulates, lbs/hr = 1.64 lbs/hr + 0.38 lbs/hr
Total Particulates, lbs/hr = 2.02 lbs/hr

Total Particulates, lbs/yr = Total Particulates, lbs/hr x 8,760 hrs/yr operation
Total Particulates, lbs/yr =2.02 lbs/hr x 8,760 hrs/yr operation
Total Particulates, lbs/yr =17,718 lbs/yr

Stack Exhaust Velocity (ft/sec):
Stack Exhaust Velocity (ft/sec) = Stack Exhaust ACFM / Stack Area

Stack Diamater (ft):	5
Stack Area (SF):	19.63
Stack Exhaust ACFM:	68,345
Stack Exhaust Velocity (ft/sec):	58.0

U0030 Stack: Turbine Exhaust through the Bypass Stack (Train 1)

	lbs/hr
Total Particulates:	1.64

Total Particulates, lbs/hr = (Turbine Emissions, lbs/hr)

Turbine Emissions, lbs/hr = (Solar Emission Factor, lbs/mmBtu) x (Heat Input, HHV, mmBtu/hr)
Turbine Emissions, lbs/hr = 0.019 lbs/mmBtu x 86.4 mmBtu/hr
Turbine Emissions, lbs/hr = 1.64 lbs/hr

Total Particulates, lbs/yr = Total Particulates, lbs/hr x 8,760 hrs/yr operation
Total Particulates, lbs/yr =1.64 lbs/hr x 8,760 hrs/yr operation
Total Particulates, lbs/yr =14,372 lbs/yr

NYC-DOC-Rikers Island

Example Calculations:

U0031 Stack: Turbine + Duct Burner Exhaust Through the Main Stack (Train 2)

	lbs/hr	lbs/yr
Total Particulates:	2.02	17,718

Total Particulates, lbs/hr = (Turbine Emissions, lbs/hr) + (Duct Burner Emissions, lbs/hr)

Turbine Emissions, lbs/hr = (Solar Emission Factor, lbs/mmBtu) x (Heat Input, HHV, mmBtu/hr)
Turbine Emissions, lbs/hr = 0.019 lbs/mmBtu x 86.4 mmBtu/hr
Turbine Emissions, lbs/hr = 1.64 lbs/hr

Duct Burner Emissions, lbs/hr = (Rentech Emission Factor, lbs/mmBtu) x (Heat Input, HHV, mmBtu/hr)
Duct Burner Emissions, lbs/hr = 0.01 lbs/mmBtu x 38.2 mmBtu/hr
Duct Burner Emissions, lbs/hr = 0.38 lbs/hr

Total Particulates, lbs/hr = 1.64 lbs/hr + 0.38 lbs/hr
Total Particulates, lbs/hr = 2.02 lbs/hr

Total Particulates, lbs/yr = Total Particulates, lbs/hr x 8,760 hrs/yr operation
Total Particulates, lbs/yr =2.02 lbs/hr x 8,760 hrs/yr operation
Total Particulates, lbs/yr =17,718 lbs/yr

Stack Exhaust Velocity (ft/sec):
Stack Exhaust Velocity (ft/sec) = Stack Exhaust ACFM / Stack Area

Stack Diamater (ft):	5
Stack Area (SF):	19.63
Stack Exhaust ACFM:	68,345
Stack Exhaust Velocity (ft/sec):	58.0

U0032 Stack: Turbine Exhaust through the Bypass Stack (Train 2)

	lbs/hr
Total Particulates:	1.64

Total Particulates, lbs/hr = (Turbine Emissions, lbs/hr)

Turbine Emissions, lbs/hr = (Solar Emission Factor, lbs/mmBtu) x (Heat Input, HHV, mmBtu/hr)
Turbine Emissions, lbs/hr = 0.019 lbs/mmBtu x 86.4 mmBtu/hr
Turbine Emissions, lbs/hr = 1.64 lbs/hr

Total Particulates, lbs/yr = Total Particulates, lbs/hr x 8,760 hrs/yr operation
Total Particulates, lbs/yr =1.64 lbs/hr x 8,760 hrs/yr operation
Total Particulates, lbs/yr =14,372 lbs/yr

REVISED PERMIT APPLICATION FORMS

PC Rev 02/09

THE CITY OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Bureau of Environmental Compliance
59-17 Junction Boulevard, 9th Floor, Flushing, New York 11373-5108
Records Control (718) 595-3855

Date: December 2, 2010

Installation #: PB008210X

Reference: Rikers Island, 17-25 Hazen Street (*Premise's Address*) East Elmhurst (*City*) NY (*State*) 11370 (*Zip*) Queens (*Borough*)

PROFESSIONAL CERTIFICATION

Being duly mindful of my responsibilities as a licensed Professional Engineer / Registered Architect in the State of New York and acting as designated agent for the applicant, I hereby certify that the application, plans, and all supplementary documents submitted in connection with this filing are complete and fully comply with all applicable laws, codes, rules, regulations, and directives of the Department of Environmental Protection, Bureau of Environmental Compliance of the City of New York in effect at the time filed.

N.Y.S. P.E. or R. A. Seal: STATE OF NEW YORK RAMON LI No. 060857 LICENSED PROFESSIONAL ENGINEER

N.Y.S. P.E. or R. A. Signature:

N.Y.S. P.E. or R. A. Name: Ramon Li, P.E.

N.Y.S. P.E. or R. A. License Number: 060857

INSTRUCTIONS: Pursuant to Engineering Directive Number 1-78, this certification must be submitted in triplicate with all APC 5-0, APC 5-R, and APC 5-PA applications and does not preclude the necessity to sign and seal the certification now contained on the application forms.

New York City Department of Environmental Protection

THE CITY OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Bureau of Environmental Compliance
59-17 Junction Boulevard, 9th Floor, Flushing, New York 11373-5108
Records Control (718) 595-3855

Date: December 2, 2010

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Reference: Rikers Island, 17-25 Hazen Street (*Premise's Address*) East Elmhurst (*City*) NY (*State*) 11370 (*Zip*) Queens (*Borough*)

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N.Y.S. P.E. or R. A. Signature:

N.Y.S. P.E. or R. A. Name: Ramon Li, P.E.

N.Y.S. P.E. or R. A. License Number: 060857

INSTRUCTIONS: Pursuant to Engineering Directive Number 1-78, this certification must be submitted in triplicate with all APC 5-0, APC 5-R, and APC 5-PA applications and does not preclude the necessity to sign and seal the certification now contained on the application forms.

New York City Department of Environmental Protection

THE CITY OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Bureau of Environmental Compliance
59-17 Junction Boulevard, 9th Floor, Flushing, New York 11373-5108
Records Control (718) 595-3855

Date: December 2, 2010

Installation #: PB008210X

Reference: Rikers Island, 17-25 Hazen Street (Premise's Address) East Elmhurst (City) NY (State) 11370 (Zip) Queens (Borough)

PROFESSIONAL CERTIFICATION

Being duly mindful of my responsibilities as a licensed Professional Engineer / Registered Architect in the State of New York and acting as designated agent for the applicant, I hereby certify that the application, plans, and all supplementary documents submitted in connection with this filing are complete and fully comply with all applicable laws, codes, rules, regulations, and directives of the Department of Environmental Protection, Bureau of Environmental Compliance of the City of New York in effect at the time filed.

N.Y.S. P.E. or R. A. Seal: STATE OF NEW YORK RAMON LI No. 060857 LICENSED PROFESSIONAL ENGINEER

N.Y.S. P.E. or R. A. Signature:

N.Y.S. P.E. or R. A. Name: Ramon Li, P.E.

N.Y.S. P.E. or R. A. License Number: 060857

INSTRUCTIONS: Pursuant to Engineering Directive Number 1-78, this certification must be submitted in triplicate with all APC 5-0, APC 5-R, and APC 5-PA applications and does not preclude the necessity to sign and seal the certification now contained on the application forms.

THE CITY OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Bureau of Environmental Compliance
59-17 Junction Boulevard, 9th Floor, Flushing, New York 11373-5107
Records Control (718) 595-3855

INDUSTRIAL PROCESSES DIVISION
ENVIRONMENTAL RATING REPORT
SUMMARY OF POINTS OF EMISSION
(FORM APC 3PA)

EN NUMBER: PB008210X

PREMISE IDENTIFICATION NUMBER:

1. COMPANY NAME: NYC Department of Correction

2. PREMISE ADDRESS: NYC-DOC-Rikers Island, 17-25 Hazen St., East Elmhurst, NY ZIP CODE: 11370

3. MAILING ADDRESS: 17-25 Hazen Street, East Elmhurst, NY ZIP CODE: 11370

TELEPHONE NUMBER: 718-546-1488

4. NAME OF PERSON PREPARING REPORT: Ramon Li, P.E.

5. ADDRESS: AKRF, Inc. 440 Park Avenue South, 7th Floor, New York, NY ZIP CODE: 10016

6. TELEPHONE NUMBER: 616-388-9724

7. SEC.	LOT	BLOCK
4	40	2605

8. EMISSION POINT NUMBER	9. OPERATION PRODUCING EMISSION	10. ENVIRONMENTAL RATING PROPOSED	ASSIGNED BY BEC
U0029	Natural gas fired turbine #1 with duct firing HRSG (main stack)	D	
U0030	Bypass stack for turbine #1	D	

THIS REPORT IS: ☐ NEW ☐ REVISION ☑ ADDENDUM

11. SIGNATURE: TITLE: Technical Director DATE: December 2, 2010

STATE OF NEW YORK RAMON LI No. 060957 LICENSED PROFESSIONAL ENGINEER

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

COPIES
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GREEN - DIVISION OF AIR
WHITE - REGIONAL OFFICE
WHITE - FIELD REP
YELLOW - APPLICANT

ID LOCATION FACILITY EMISSION POINT

A ADD
C CHANGE
E DELETE

READ INSTRUCTIONS CONTAINED IN FORM 75-15 BEFORE ANSWERING ANY QUESTION

PROCESS, EXHAUST OR VENTILATION SYSTEM

APPLICATION FOR PERMIT TO CONSTRUCT OR CERTIFICATE TO OPERATE

SECTION A

1. NAME OF OWNER / FIRM: NYC Department of Correction
2. NUMBER AND STREET ADDRESS: 60 Hudson Street, Room 719
3. CITY - TOWN - VILLAGE: New York
4. STATE: NY
5. ZIP: 10013
6. OWNER CLASSIFICATION: A ☐ COMMERCIAL C ☐ UTILITY E ☐ MUNICIPAL ☐ RESIDENTIAL; B ☐ INDUSTRIAL D ☐ FEDERAL G ☐ FARM ☒ OTHER
7. NAME & TITLE OF OWNER'S REPRESENTATIVE: Gregory McLaughlin, Warden/Support Services Division
8. TELEPHONE: 718-546-1429
9. NAME OF AUTHORIZED AGENT: AKRF, Inc.
10. TELEPHONE: 212-696-0670
11. NUMBER AND STREET ADDRESS: 440 Park Avenue South, 7th Floor
12. CITY - TOWN - VILLAGE: New York
13. STATE: NY
14. ZIP: 10016
15. NAME OF PE OR LS DIRECTLY RESPONSIBLE FOR DESIGN: Ramon Li, P.E.
16. TELEPHONE: 646-388-9724
17. SIGNATURE OF OWNER'S REPRESENTATIVE OR AGENT WHEN APPLYING FOR CONSTRUCTION
18. FACILITY NAME (IF DIFFERENT FROM OWNER'S FIRM): NYC-DOC-Rikers Island
19. FACILITY LOCATION (NUMBER AND STREET ADDRESS): 17-25 Hazen Street
20. CITY - TOWN - VILLAGE: East Elmhurst, NY
21. ZIP: 11370
22. BUILDING NAME OR NUMBER: Cogen Building
23. FLOOR NAME OR NUMBER: 1
24. START UP DATE: 07 / 2012 (MO / YR)
25. DRAWING NUMBERS OF PLANS SUBMITTED: Figures 1, 2, and 3
26. PERMIT TO CONSTRUCT: A ☒ NEW SOURCE B ☐ MODIFICATION
27. CERTIFICATE TO OPERATE: A ☐ NEW SOURCE ☐ EXISTING SOURCE B ☐ MODIFICATION

STATE OF NEW YORK RAMON LI No. 060857 LICENSED PROFESSIONAL ENGINEER

SECTION B

28. EMISSION POINT ID	29. STACK HEIGHT (FEET)	30. STACK DIAMETER (FEET)	31. STACK TEMPERATURE (°F)	32. EXIT VELOCITY (FT/SEC)	33. EXIT FLOW RATE (ACFM)
U0029	150	60	292	58.0	68,345

34. SOURCE CODE: 24
35. HRS/DAY: 365
36. DAYS/YR: 3228
37. OPERATING TIME: Winter 1624

SECTION C

38. DESCRIPTION OF EMISSION POINT: This permit application is for a 7.5 MW simple cycle gas fired turbine with duct firing HRSG (Train #1). Emission Point U0025 is the main stack, which exhausts the turbine, duct burner and HRSG. Exhaust from the turbine could, however, go through a bypass stack (Emission Point U0026) when steam demand is low. Emissions between the two stacks would be proportional to the load through each stack. Emissions from U0025 reflect total emissions through the main stack at 100 percent load and at ISO conditions (ambient temp. of 59F).

SECTION D

42. EMISSION POINT ID (FROM PART B)	43. CONTROL EQUIPMENT	44. MANUFACTURER'S NAME AND MODEL NUMBER	45. DISPOSAL METHOD	46. DATE INSTALLED MONTH / YEAR	47. USEFUL LIFE
	None			/	

SECTION E

49. CALCULATIONS: See attached emissions calculation sheet.

SECTION F

50. CONTAMINANT NAME	51. CAS NUMBER	52. TYPE OF PRODUCTION	53. UNIT	54. RW RATING	55. EMISSIONS ACTUAL	56. UNIT	57. EFF	58. PERMISSIBLE	59. ALLOW EFF	60. HOURLY EMISSIONS LB/HR ACTUAL	61. POTENTIAL	62. ANNUAL EMISSIONS LB/YR ACTUAL	63. POTENTIAL	64. PERMISSIBLE
Total Particulates	NY75-00-0				2.02	01	4			2.02	2.02	17,718	0	
Sulfur Dioxide	7446_09_5				0.40	01	4			0.40	0.40	3,504	0	
Nitrogen Oxides	NY210_00_0				6.37	01	4			6.37	6.37	55,836	0	
Carbon Monoxide	630_08_0				7.76	01	4			7.76	7.76	67,943	0	
Volatile Organic Compounds	NY998_00_0				0.44	01	4			0.44	0.44	3,871	0	

SECTION G

65. SOLID FUEL TYPE	66. TYPE	67. LIQUID FUEL THOUSANDS OF GALLONS/YR	68. TYPE	69. THOUSANDS OF GALLONS	70. SULFUR CONTENT %	71. APPLICABLE RULE	72. APPLICABLE RULE
		52		1,059,280	1030		

73. USER COMPLETES CERTIFICATION AND THE STATEMENT BELOW AND SIGNS: I THE APPLICANT OR THE APPLICANT'S REPRESENTATIVE HEREBY CERTIFY THAT THE PROCESS / EXHAUST OR VENTILATION SYSTEM HAS BEEN CONSTRUCTED AND WILL BE OPERATED IN ACCORDANCE WITH STATE SPECIFICATIONS AND IN COMPLIANCE WITH ALL PROVISIONS OF 6 NYCRR REGULATIONS.

SIGNATURE OF APPLICANT OR APPLICANT'S REPRESENTATIVE — DATE

AGENCY USE ONLY

150. LOCATION CODE | 151. FACILITY ID NO. | 152. U.T.M. (E) | 153. U.T.M. (N) | 154. SIC NUMBER | 161. DATE APPL. RECEIVED | 162. DATE APPL. REVIEWED | 163. REVIEWED BY:

PERMIT TO CONSTRUCT

164. DATE ISSUED	165. EXPIRATION DATE	166. SIGNATURE OF APPROVAL	167. FEE
/ /	/ /		

166. 1. DEVIATION FROM APPROVED APPLICATION SHALL VOID THIS PERMIT.
2. THIS IS NOT A CERTIFICATE TO OPERATE.
3. TESTS AND/OR ADDITIONAL EMISSION CONTROL EQUIPMENT MAY BE REQUIRED PRIOR TO THE ISSUANCE OF A CERTIFICATE TO OPERATE.

CERTIFICATE TO OPERATE

169. DATE ISSUED	170. EXPIRATION DATE	171. SIGNATURE OF APPROVAL	172. FEE
/ /	/ /		

173. 1. ☐ INSPECTED BY _____ DATE _____
2. ☐ INSPECTION DISCLOSED DIFFERENCES AS BUILT VS. PERMIT. CHANGES INDICATED ON FORM
3. ☐ ISSUE CERTIFICATE TO OPERATE FOR SOURCE AS BUILT
4. ☐ APPLICATION FOR C.O. DENIED _____ DATE _____ INITIALED

174. SPECIAL CONDITIONS:
1. 2. 3. 4. 5. 6.

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

COPIES
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GREEN - DIVISION OF AIR
WHITE - REGIONAL OFFICE
WHITE - FIELD REP.
YELLOW - APPLICANT

OP | LOCATION | FACILITY | EMISSION POINT

A ADD
C CHANGE
E DELETE

READ INSTRUCTIONS CONTAINED IN FORM 75-1-12 BEFORE ANSWERING ANY QUESTION

PROCESS, EXHAUST OR VENTILATION SYSTEM

APPLICATION FOR PERMIT TO CONSTRUCT OR CERTIFICATE TO OPERATE

SECTION A

1. NAME OF OWNER / FIRM: NYC Department of Correction
2. NUMBER AND STREET ADDRESS: 60 Hudson Street, Room 719
3. CITY - TOWN - VILLAGE: New York
4. STATE: NY
5. ZIP: 10013
6. OWNER CLASSIFICATION: A [ ] COMMERCIAL B [ ] INDUSTRIAL C [ ] UTILITY D [ ] FEDERAL E [ ] STATE F [ ] MUNICIPAL G [ ] FEDERAL H [ ] MUNICIPAL I [ ] RESIDENTIAL J [X] OTHER
7. NAME & TITLE OF OWNER'S REPRESENTATIVE: Gregory McLaughlin, Warden/Support Services Division
8. TELEPHONE: 718-546-1429
9. NAME OF AUTHORIZED AGENT: AKRF, Inc.
10. TELEPHONE: 212-696-0670
11. NUMBER AND STREET ADDRESS: 440 Park Avenue South, 7th Floor
12. CITY - TOWN - VILLAGE: New York
13. STATE: NY
14. ZIP: 10016
15. NAME & TITLE OF PERSON TO CONTACT REGARDING THIS APPLICATION: Ramon Li, P.E.
16. TELEPHONE: 646-388-9724
17. SIGNATURE OF OWNER'S REPRESENTATIVE OR AGENT WHEN APPLYING TO CONSTRUCT:
18. DATE: 06085
19. FACILITY NAME (IF DIFFERENT FROM OWNER / FIRM): NYC-DOC-Rikers Island
20. FACILITY LOCATION (NUMBER AND STREET ADDRESS): 17-25 Hazen Street
21. CITY - TOWN - VILLAGE: East Elmhurst, NY
22. ZIP: 11370
23. BUILDING NAME OR NUMBER: Cogen Building
24. FLOOR NAME OR NUMBER: 1
25. START UP DATE: 07 / 2012 (MO / YR)
26. DRAWING NUMBERS OF PLANS SUBMITTED: Figures 1, 2, and 3
27. PERMIT TO CONSTRUCT: A [X] NEW SOURCE B [ ] MODIFICATION
28. CERTIFICATE TO OPERATE: A [ ] NEW SOURCE B [ ] EXISTING SOURCE C [ ] MODIFICATION

SECTION B

29. EMISSION POINT	30. EMISSION SYSTEM (IF APPLICABLE)	31. EMISSION POINT HEIGHT (FEET)	32. EMISSION POINT DIAMETER (FEET)	33. EXIT VELOCITY (FEET/SEC)	34. EXIT TEMPERATURE (°F)	35. EXIT FLOW RATE (ACFM)
U0029		15.5	107	150	60	292	58.0	68,345

37. SOURCE CODE	38. PROCESS	39. DAYS/YR	40. HRS/DAY	41. OPERATING TIME (Winter, Spring, Summer, Fall)
		24	365	3 2 2 8 1 6 2 4

SECTION C

42. DESCRIBE PROCESS OR UNIT:

This permit application is for a 7.5 MW simple cycle gas fired turbine with duct firing HRSG (Train #1). Emission Point U0025 is the main stack, which exhausts the turbine, duct burner and HRSG. Exhaust from the turbine could, however, go through a bypass stack (Emission Point U0026) when steam demand is low. Emissions between the two stacks would be proportional to the load through each stack. Emissions from U0025 reflect total emissions through the main stack at 100 percent load and at ISO conditions (ambient temp. of 59F).

SECTION D

43. EMISSION POINT	44. PROCESS	45. MANUFACTURER'S NAME / MODEL NUMBER	46. DISPOSAL METHOD	47. DATE INSTALLED (MONTH / YEAR)	48. USEFUL LIFE
None					

SECTION E

49. CALCULATIONS:

See attached emissions calculation sheet.

SECTION F

50. CONTAMINANT NAME	51. CAS NUMBER	52. TYPE OF PRODUCTION	53. UNIT	54. RW RATING	55. EMISSIONS ACTUAL	56. UNIT	57. DEC	58. PERMISSIBLE	59. EFFIC	60. HOURLY EMISSIONS (LBS/HR) ACTUAL	61.	62. PERMISSIBLE	63. ANNUAL EMISSIONS (LBS/YR) ACTUAL	64.	65. PERMISSIBLE
Total Particulates	NY75-00-0				2.02	01	4			2.02	2.02		17,718	0	
Sulfur Dioxide	7446_09_5				0.40	01	4			0.40	0.40		3,504	0	
Nitrogen Oxides	NY210_00_0				6.37	01	4			6.37	6.37		55,836	0	
Carbon Monoxide	630_08_0				7.76	01	4			7.76	7.76		67,943	0	
Volatile Organic Compounds	NY998_00_0				0.44	01	4			0.44	0.44		3,871	0	

SECTION G

66. SOLID FUEL TYPE	67. %	68. LIQUID FUEL TYPE	69. THOUSANDS OF GALLONS/HR	70. %	71. SULFUR	72. GAS THOUSANDS OF CF/HR	73. SULFUR
					52	1,059,280	1030

74. APPLICABLE RULE	75. APPLICABLE RULE

Upon completion of construction and the statement listed below and forward to the Administrator for concurrence.

THE PROCESS, EXHAUST OR VENTILATION SYSTEM HAS BEEN CONSTRUCTED AND WILL BE OPERATED IN ACCORDANCE WITH THE STATED SPECIFICATIONS AND IS GOOD ENGINEERING PRACTICE AND COMPLIES WITH ALL PROVISIONS OF EXISTING REGULATIONS.

SIGNATURE OF AUTHORIZED REPRESENTATIVE OR AGENT | DATE

AGENCY USE ONLY

76. LOCATION CODE	77. FACILITY ID. NO.	78. U.T.M. (E)	79. U.T.M. (N)	80. SIC NUMBER	81. DATE APPL. RECEIVED	82. DATE APPL. REVIEWED	83. REVIEWED BY
					/ /	/ /	

PERMIT TO CONSTRUCT

84. DATE ISSUED	85. EXPIRATION DATE	86. SIGNATURE OF APPROVAL	87. FEE
/ /	/ /		

88.
1. DEVIATION FROM APPROVED APPLICATION SHALL VOID THIS PERMIT.
2. THIS IS NOT A CERTIFICATE TO OPERATE.
3. TESTS AND/OR ADDITIONAL EMISSION CONTROL EQUIPMENT MAY BE REQUIRED PRIOR TO THE ISSUANCE OF A CERTIFICATE TO OPERATE.

CERTIFICATE TO OPERATE

169. DATE ISSUED	170. EXPIRATION DATE	171. SIGNATURE OF APPROVAL	172. FEE
/ /	/ /		

173.
1. [ ] INSPECTED BY _____ DATE _____
2. [ ] INSPECTION DISCLOSED DIFFERENCES AS BUILT VS. PERMIT, CHANGES INDICATED ON FORM
3. [ ] ISSUE CERTIFICATE TO OPERATE FOR SOURCE AS BUILT
4. [ ] APPLICATION FOR C.O. DENIED _____ DATE _____ INITIALED

174. SPECIAL CONDITIONS:

1. 2.
3. 4.
5. 6.
7. 8.

OP | LOCATION | FACILITY | EMISSION POINT

A ADD
C CHANGE
D DELETE

READ INSTRUCTIONS CONTAINED IN FORM 75-11-12 BEFORE ANSWERING ANY QUESTION

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

COPIES
WHITE - ORIGINAL
GREEN - DIVISION OF AIR
WHITE - REGIONAL OFFICE
WHITE - FIELD REP
YELLOW - APPLICANT

PROCESS, EXHAUST OR VENTILATION SYSTEM

APPLICATION FOR PERMIT TO CONSTRUCT OR CERTIFICATE TO OPERATE

SECTION A

1. NAME OF OWNER / FIRM	9. NAME OF AUTHORIZED AGENT	10. TELEPHONE	19. FACILITY NAME (IF DIFFERENT FROM OWNER / FIRM)
NYC Department of Correction	AKRF, Inc.	212-696-0670	NYC-DOC-Rikers Island
2. NUMBER AND STREET ADDRESS	**11. NUMBER AND STREET ADDRESS**		**20. FACILITY LOCATION (NUMBER AND STREET ADDRESS)**
60 Hudson Street, Room 719	440 Park Avenue South, 7th Floor		17-25 Hazen Street
3. CITY - TOWN - VILLAGE / 4. STATE / 5. ZIP	**12. CITY - TOWN - VILLAGE / 13. STATE / 14. ZIP**		**21. CITY - TOWN - VILLAGE / 22. ZIP**
New York / NY / 10013	New York / NY / 10016		East Elmhurst, NY / 11370
6. OWNER CLASSIFICATION A ☐ COMMERCIAL B ☐ INDUSTRIAL C ☐ UTILITY D ☐ FEDERAL E ☐ STATE F ☐ MUNICIPAL G ☐ PUBLIC INST. H ☐ HOSPITAL I ☐ RESIDENTIAL J ☒ OTHER	**15. NAME OF INDIVIDUAL PREPARING APPLICATION** / **16. NYS LICENSE NUMBER, IF APPLICABLE** / **17. TELEPHONE**		**23. BUILDING NAME OR NUMBER** / **24. FLOOR NAME OR NUMBER**
	Ramon Li, P.E. / 060857 / 646-388-9724		Cogen Building / 1
7. NAME & TITLE OF OWNER'S REPRESENTATIVE / **8. TELEPHONE**	**18. SIGNATURE OF OWNER'S REPRESENTATIVE OR AGENT WHEN APPLYING FOR A PERMIT TO CONSTRUCT**		**25. START UP DATE** / **26. DRAWING NUMBERS OF PLANS SUBMITTED**
Gregory McLaughlin, Warden/Support Services Division / 718-546-1429			07 / 2012 (MO / YR) / Figures 1, 2, and 3
			27. PERMIT TO CONSTRUCT A ☒ NEW SOURCE B ☐ MODIFICATION / **28. CERTIFICATE TO OPERATE** A ☐ NEW SOURCE B ☐ MODIFICATION C ☐ EXISTING SOURCE

STATE OF NEW YORK RAMON LI LICENSE NO. 060857 LICENSED PROFESSIONAL ENGINEER

SECTION B

29. EMISSION POINT #	30. LONGITUDE (LEAST SIGNIFICANT DIGIT)	31. HEIGHT ABOVE GROUND (FT.)	32. STACK HEIGHT (FT.)	33. INSIDE DIMENSIONS (IN.)	34. EXIT TEMP. (°F)	35. EXIT VELOCITY (FT/SEC.)	36. EXIT FLOW RATE (ACFM)
U0029	15.5	107	150	60	292	58.0	68,345

37. SOURCE CODE	38. HRS / DAY	39. DAYS / YR	40. % OPERATION BY SEASON (WINTER / SPRING / SUMMER / FALL)
	24	365	32 / 28 / 16 / 24

SECTION C

DESCRIBE PROCESS OR UNIT

This permit application is for a 7.5 MW simple cycle gas fired turbine with duct firing HRSG (Train #1). Emission Point U0025 is the main stack, which exhausts the turbine, duct burner and HRSG. Exhaust from the turbine could, however, go through a bypass stack (Emission Point U0026) when steam demand is low. Emissions between the two stacks would be proportional to the load through each stack. Emissions from U0025 reflect total emissions through the main stack at 100 percent load and at ISO conditions (ambient temp. of 59F).

SECTION D

EMISSION CONTROL EQUIPMENT ID	CONTROL CODE	MANUFACTURER'S NAME AND MODEL NUMBER	DISPOSAL METHOD	DATE INSTALLED MONTH / YEAR	USEFUL LIFE
None				/	

SECTION E

CALCULATIONS

See attached emissions calculation sheet.

SECTION F

CONTAMINANT NAME	CAS NUMBER	TYPE OF PRODUCTION	UNIT	PROCESS RATE	EMISSIONS ACTUAL	UNIT	HOURS PER DAY	PERMISSIBLE	% CONTROL EFFICIENCY	HOURLY EMISSIONS (LBS/HR) DATE	HOURLY EMISSIONS (LBS/HR) ACTUAL	ANNUAL EMISSIONS (LBS/YR) ACTUAL	TPY	ANNUAL EMISSIONS (LBS/YR) PERMISSIBLE
Total Particulates	NY75-00-0				2.02	01	4			2.02	2.02	17,718	0	
Sulfur Dioxide	7446_09_5				0.40	01	4			0.40	0.40	3,504	0	
Nitrogen Oxides	NY210_00_0				6.37	01	4			6.37	6.37	55,836	0	
Carbon Monoxide	630_08_0				7.76	01	4			7.76	7.76	67,943	0	
Volatile Organic Compounds	NY998-00-0				0.44	01	4			0.44	0.44	3,871	0	

SECTION G

SOLID FUEL: TYPE	SOLID FUEL: TONS / YR	% S	LIQUID FUEL: TYPE	LIQUID FUEL: THOUSANDS OF GALLONS/YR	% S	GAS: TYPE	GAS: THOUSANDS OF CF/YR	GAS: STD/CF	APPLICABLE RULE	APPLICABLE RULE
						52	1,059,280	1030		

Upon completion of construction sign the statement listed below and forward to the appropriate field representative

THE PROCESS, EXHAUST OR VENTILATION SYSTEM HAS BEEN CONSTRUCTED AND WILL BE OPERATED IN ACCORDANCE WITH STATED SPECIFICATIONS AND IN COMPLIANCE WITH ALL PROVISIONS OF EXISTING REGULATIONS.

156. SIGNATURE OF AUTHORIZED REPRESENTATIVE OR AGENT / DATE

AGENCY USE ONLY

156. LOCATION CODE	157. FACILITY ID NO.	158. U.T.M. (E)	159. U.T.M. (N)	160. SIC NUMBER	161. DATE APPL. RECEIVED	162. DATE APPL. REVIEWED	163. REVIEWED BY
					/ /	/ /	

PERMIT TO CONSTRUCT

164. DATE ISSUED	165. EXPIRATION DATE	166. SIGNATURE OF APPROVAL	167. FEE
/ /	/ /		

166.
1. DEVIATION FROM APPROVED APPLICATION SHALL VOID THIS PERMIT.
2. THIS IS NOT A CERTIFICATE TO OPERATE.
3. TESTS AND/OR ADDITIONAL EMISSION CONTROL EQUIPMENT MAY BE REQUIRED PRIOR TO THE ISSUANCE OF A CERTIFICATE TO OPERATE.

CERTIFICATE TO OPERATE

169. DATE ISSUED	170. EXPIRATION DATE	171. SIGNATURE OF APPROVAL	172. FEE
/ /	/ /		

173.
1. ☐ INSPECTED BY _____ DATE _____
2. ☐ INSPECTION DISCLOSED DIFFERENCES AS BUILT VS. PERMIT, CHANGES INDICATED ON FORM
3. ☐ ISSUE CERTIFICATE TO OPERATE FOR SOURCE AS BUILT
4. ☐ APPLICATION FOR C.O. DENIED _____ DATE _____ INITIALED

174. SPECIAL CONDITIONS:

1. 2.
3. 4.
5. 6.
7. 8.

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

COPIES
WHITE - ORIGINAL
GREEN - DIVISION OF AIR
WHITE - REGIONAL OFFICE
WHITE - FIELD REP
YELLOW - APPLICANT

OP | LOCATION | FACILITY | RULES TO FOLLOW

A ADD
C CHANGE
E EDIT

READ INSTRUCTIONS CONTAINED IN FORM 751-0 BEFORE ANSWERING ANY QUESTION

PROCESS, EXHAUST OR VENTILATION SYSTEM

APPLICATION FOR PERMIT TO CONSTRUCT OR CERTIFICATE TO OPERATE

SECTION A

1. NAME OF OWNER / FIRM: NYC Department of Correction
2. NUMBER AND STREET ADDRESS: 60 Hudson Street, Room 719
3. CITY / TOWN / VILLAGE: New York | STATE: NY | ZIP: 10013
4. OWNER'S CLASSIFICATION: A ☐ COMMERCIAL B ☐ INDUSTRIAL C ☐ INSTITUTIONAL D ☐ FEDERAL E ☐ STATE F ☐ MUNICIPAL G ☐ PUBLIC UTILITY H ☐ RESIDENTIAL X ☐ OTHER
5. NAME & TITLE OF OWNER'S REPRESENTATIVE: Gregory McLaughlin, Warden/Support Services Division | TELEPHONE: 718-546-1429
6. NAME OF AUTHORIZED AGENT: AKRF, Inc.
7. NUMBER AND STREET ADDRESS: 440 Park Avenue South, 7th Floor
8. CITY / TOWN / VILLAGE: New York | STATE | ZIP: 10016
9. NAME & TITLE OF AUTHORIZED REPRESENTATIVE: Ramon Li, P.E. | TELEPHONE: 646-388-9724
10. SIGNATURE OF OWNER'S REPRESENTATIVE OR AUTHORIZED AGENT: [signature]

STATE OF NEW YORK — RAMON LI — No. 060957 — LICENSED PROFESSIONAL ENGINEER

11. FACILITY NAME (IF DIFFERENT FROM OWNER / FIRM): NYC-DOC-Rikers Island
12. FACILITY LOCATION (NUMBER AND STREET ADDRESS): 17-25 Hazen Street
13. CITY / TOWN / VILLAGE: East Elmhurst, NY | ZIP: 11370
14. BUILDING NAME OR NUMBER: Cogen Building | 15. FLOOR / LAME OR NUMBER: 1
16. START UP DATE: 07 / 2012 (M/D/Y) | 17. DRAWING NUMBERS OF PLANS SUBMITTED: Figures 1, 2, and 3
18. PERMIT TO CONSTRUCT: A ☒ NEW SOURCE B ☐ MODIFICATION
19. CERTIFICATE TO OPERATE: A ☐ NEWLY BUILT C ☐ EXISTING SOURCE B ☐ MODIFIED

SECTION B

20. EMISSION POINT	21. LOCATION (LATITUDE)	(LONGITUDE)	24. EXIT VELOCITY (FEET/SEC)	25. EXIT FLOW RATE (ACTUAL)
U 0 0 3 0	15.5	57	100	66	955	108.3	127,616

27. SOURCE CODE	28. HRS/DAY	29. DAYS/YEAR	30. % OPERATED BY SEASON (WIN / SPR / SUM / FAL)
	24	365	25 25 25 25

31. DESCRIBE EMISSION POINT: Emission Point U0026 is the bypass stack, which exhausts the 7.5 MW simple cycle gas fired turbine from Train #1. Emissions from the main stack (Emission Point U0025) and the bypass stack would be proportional to the load through each stack. Emissions from U0026 reflect total emissions through the bypass stack at 100 percent load and at ISO conditions (ambient temp. of 59F).

SECTION C

32. CONTROL EQUIPMENT / PROCESS CHANGE	33. MANUFACTURER NAME AND MODEL NUMBER	34. DISPOSAL METHOD	35. DATE INSTALLED (MONTH / YEAR)	36. USEFUL LIFE
None				

37. CALCULATIONS: See attached emissions calculation sheet.

SECTION F

38. CONTAMINANT NAME	39. CAS NUMBER	40. EMISSIONS: PTE	41. UNCONTROLLED	42. EMISSIONS: ALLOWABLE	43. PROPOSED EMISSIONS: PTE	44. UNCONTROLLED	45. ALLOWABLE EMISSIONS AMOUNT	46. PERMISSIBLE
Total Particulates	NY75-00-0	1.64	01 4		1.64	1.64	14,372 0	
Sulfur Dioxide	7446_09_5	0.01	01 4		0.01	0.01	88 0	
Nitrogen Oxides	NY210 00 0	3.70	01 4		3.70	3.70	32,412 0	
Carbon Monoxide	630 08 0	4.70	01 4		4.70	4.70	41,172 0	
Volatile Organic Compounds	NY998 00 0	0.27	01 4		0.27	0.27	2,365 0	

SECTION G

47. VALIDITY (YEARS)	48. ISSUE FOR THOUSANDS OF GALLONS	49. FEE	50. APPLICABLE RULE	51. APPLICABLE RULE
		52 734,394 1030		

Upon completion of construction the emission source(s) listed above will be in full compliance with all applicable requirements of 6 NYCRR Subchapter A and Part 201.

THE PROCESS, EXHAUST OR VENTILATION SYSTEM HAS BEEN CONSTRUCTED AND WILL BE OPERATED IN COMPLIANCE WITH THE APPLICABLE REQUIREMENTS OF THE ENVIRONMENTAL CONSERVATION LAW AND 6 NYCRR SUBCHAPTER A AND PART 201 AND ANY CONDITIONS SPECIFIED IN THIS PERMIT.

AGENCY USE ONLY

156. LOCATION CODE	157. FACILITY ID NO.	158. U.T.M. (E)	159. U.T.M. (N)	160. SIC NUMBER	161. DATE APPL. RECEIVED	162. DATE APPL. REVIEWED	163. REVIEWED BY
					/ /	/ /	

PERMIT TO CONSTRUCT

164. DATE ISSUED	165. EXPIRATION DATE	166. SIGNATURE OF APPROVAL	167. FEE
/ /	/ /		

166.
1. DEVIATION FROM APPROVED APPLICATION SHALL VOID THIS PERMIT
2. THIS IS NOT A CERTIFICATE TO OPERATE
3. TESTS AND/OR ADDITIONAL EMISSION CONTROL EQUIPMENT MAY BE REQUIRED PRIOR TO THE ISSUANCE OF A CERTIFICATE TO OPERATE

CERTIFICATE TO OPERATE

169. DATE ISSUED	170. EXPIRATION DATE	171. SIGNATURE OF APPROVAL	172. FEE
/ /	/ /		

173.
1. ☐ INSPECTED BY _____ DATE _____
2. ☐ INSPECTION DISCLOSED DIFFERENCES AS BUILT VS. PERMIT, CHANGES INDICATED ON FORM
3. ☐ ISSUE CERTIFICATE TO OPERATE FOR SOURCE AS BUILT
4. ☐ APPLICATION FOR C.O. DENIED _____ DATE _____ INITIALED

174. SPECIAL CONDITIONS:

OP LOCATION FACILITY EMISS PT

A ADD
C CHANGE
D DELETE

READ INSTRUCTIONS CONTAINED IN FORM 75-15 BEFORE ANSWERING ANY QUESTION

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

COPIES
WHITE - ORIGINAL
GREEN - DIVISION OF AIR
WHITE - REGIONAL OFFICE
WHITE - FIELD REP
YELLOW - APPLICANT

PROCESS, EXHAUST OR VENTILATION SYSTEM

APPLICATION FOR PERMIT TO CONSTRUCT OR CERTIFICATE TO OPERATE

SECTION A

1. NAME OF OWNER / FIRM: NYC Department of Correction
2. NUMBER AND STREET ADDRESS: 60 Hudson Street, Room 719
3. CITY - TOWN - VILLAGE: New York
4. STATE: NY
5. ZIP: 10013
6. OWNER CLASSIFICATION: A ☐ COMMERCIAL B ☐ INDUSTRIAL C ☐ UTILITY D ☐ FEDERAL E ☐ STATE F ☐ MUNICIPAL G ☐ PUBLIC INST. H ☐ HOSPITAL ☐ RESIDENTIAL X OTHER
7. NAME & TITLE OF OWNER'S REPRESENTATIVE: Gregory McLaughlin, Warden/Support Services Division
8. TELEPHONE: 718-546-1429
9. NAME OF AUTHORIZED AGENT: AKRF, Inc.
10. TELEPHONE: 212-696-0670
11. NUMBER AND STREET ADDRESS: 440 Park Avenue South, 7th Floor
12. CITY - TOWN - VILLAGE: New York
13. STATE: NY
14. ZIP: 10016
15. NAME OF ENGINEER OR ARCHITECT: Ramon Li, P.E.
16. LICENSE NO.: 060857
17. TELEPHONE: 646-388-9724
18. SIGNATURE OF OWNER'S REPRESENTATIVE OR AGENT WHEN APPLYING FOR PERMIT TO CONSTRUCT
19. FACILITY NAME (IF DIFFERENT FROM OWNER / FIRM): NYC-DOC-Rikers Island
20. FACILITY LOCATION (NUMBER AND STREET ADDRESS): 17-25 Hazen Street
21. CITY - TOWN - VILLAGE: East Elmhurst, NY
22. ZIP: 11370
23. BUILDING NAME OR NUMBER: Cogen Building
24. FLOOR NAME OR NUMBER: 1
25. START UP DATE: 07 / 2012 (MO / YR)
26. DRAWING NUMBERS OF PLANS SUBMITTED: Figures 1, 2, and 3
27. PERMIT TO CONSTRUCT: A X NEW SOURCE B ☐ MODIFICATION
28. CERTIFICATE TO OPERATE: A ☐ NEW SOURCE C ☐ EXISTING SOURCE B ☐ MODIFICATION

PROFESSIONAL ENGINEER — RAMON LI — No. 060857 — STATE OF NEW YORK

SECTION B

29. EMISSION POINT ID	30. UNIFORM ELEVATION (FT.)	31. AGENT HEIGHT ABOVE GRADE (FT.)	32. STACK HEIGHT (FT.)	33. INSIDE DIMENSIONS (IN.)	34. EXIT TEMP. (°F)	35. EXIT VELOCITY (FT/SEC)	36. EXIT FLOW RATE (ACFM)
U0030	15.5	57	100	66	955	108.3	127,616

37. SOURCE CODE	38. HRS / DAY	39. DAYS / YR	40. % OPERATION BY SEASON: Winter	Spring	Summer	Fall
	24	365	25	25	25	25

SECTION C

21. DESCRIBE PROCESS EQUIPMENT:

Emission Point U0026 is the bypass stack, which exhausts the 7.5 MW simple cycle gas fired turbine from Train #1. Emissions from the main stack (Emission Point U0025) and the bypass stack would be proportional to the load through each stack. Emissions from U0026 reflect total emissions through the bypass stack at 100 percent load and at ISO conditions (ambient temp. of 59F).

SECTION D

EMISSION CONTROL EQUIPMENT	MANUFACTURER / NAME AND MODEL NUMBER	DISPOSAL METHOD	DATE INSTALLED MONTH / YEAR	USEFUL LIFE
None			/	

SECTION E

CALCULATIONS

See attached emissions calculation sheet.

SECTION F

CONTAMINANT NAME	CAS NUMBER	TYPE PRODUCTION	UNIT	ENV. RATING	EMISSIONS ACTUAL	UNIT	EMISSIONS PER CY	EMISSIONS PERMISSIBLE	HOURLY EMISSIONS (LBS/HR) EFF. CONT.	EFF.	ACTUAL	ANNUAL EMISSIONS (LBS/YR) ACTUAL	EFF.	PERMISSIBLE
Total Particulates	NY75-00-0				1.64	01	4		1.64	1.64	1.64	14,372	0	
Sulfur Dioxide	7446_09_5				0.01	01	4		0.01	0.01	0.01	88	0	
Nitrogen Oxides	NY210_00_0				3.70	01	4		3.70	3.70	3.70	32,412	0	
Carbon Monoxide	630_08_0				4.70	01	4		4.70	4.70	4.70	41,172	0	
Volatile Organic Compounds	NY998-00-0				0.27	01	4		0.27	0.27	0.27	2,365	0	

SECTION G

SOLID FUEL TYPE	SOLID FUEL TONS / YR	% S	LIQUID FUEL TYPE	LIQUID FUEL THOUSANDS OF GALLONS / YR	% S	GAS TYPE	GAS THOUSANDS OF CF / YR	BTU / CF
						52	734,394	1030

APPLICABLE RULE	APPLICABLE RULE

Upon completion of construction sign the statement listed below and forward to the appropriate field representative

THE PROCESS, EXHAUST OR VENTILATION SYSTEM HAS BEEN CONSTRUCTED AND WILL BE OPERATED IN ACCORDANCE WITH STATED SPECIFICATIONS AND IN CONFORMANCE WITH ALL PROVISIONS OF EXISTING REGULATIONS

SIGNATURE OF AUTHORIZED REPRESENTATIVE OR AGENT — DATE

AGENCY USE ONLY

150. LOCATION CODE | 151. FACILITY ID. NO. | 152. U.T.M. (E) | 153. U.T.M. (N) | 154. SIC NUMBER | 161. DATE APPL. RECEIVED | 162. DATE APPL. REVIEWED | 163. REVIEWED BY

PERMIT TO CONSTRUCT

165. DATE ISSUED | 166. EXPIRATION DATE | 168. SIGNATURE OF APPROVAL | 167. FEE

160.
1. DEVIATION FROM APPROVED APPLICATION SHALL VOID THIS PERMIT
2. THIS IS NOT A CERTIFICATE TO OPERATE
3. TESTS AND/OR ADDITIONAL EMISSION CONTROL EQUIPMENT MAY BE REQUIRED PRIOR TO THE ISSUANCE OF A CERTIFICATE TO OPERATE

CERTIFICATE TO OPERATE

169. DATE ISSUED | 170. EXPIRATION DATE | 171. SIGNATURE OF APPROVAL | 172. FEE

173.
1. ☐ INSPECTED BY _____ DATE _____
2. ☐ INSPECTION DISCLOSED DIFFERENCES AS BUILT VS. PERMIT, CHANGES INDICATED ON FORM
3. ☐ ISSUE CERTIFICATE TO OPERATE FOR SOURCE AS BUILT
4. ☐ APPLICATION FOR C.O. DENIED _____ DATE _____ INITIALED

174. SPECIAL CONDITIONS:

1. 2. 3. 4. 5. 6. 7. 8.

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

COPIES
WHITE - ORIGINAL
GREEN - DIVISION OF A.P.
WHITE - REGIONAL OFFICE
WHITE - FIELD REP.
YELLOW - APPLICANT

OP LOCATION FACILITY EMISSION POINT

A ADD
C CHANGE
D DELETE

READ INSTRUCTIONS CONTAINED IN FORM 78-11-2 BEFORE ANSWERING ANY QUESTION

PROCESS, EXHAUST OR VENTILATION SYSTEM

APPLICATION FOR PERMIT TO CONSTRUCT OR CERTIFICATE TO OPERATE

SECTION A

1. NAME OF OWNER / FIRM
NYC Department of Correction

2. NUMBER AND STREET ADDRESS
60 Hudson Street, Room 719

3. CITY - TOWN - VILLAGE | 4. STATE | 5. ZIP
New York | NY | 10013

6. OWNER CLASSIFICATION
A [ ] COMMERCIAL B [ ] INDUSTRIAL C [ ] STATE D [ ] FEDERAL E [ ] MUNICIPAL F [ ] PRIVATE G [X] OTHER

7. NAME & TITLE OF OWNER'S REPRESENTATIVE
Gregory McLaughlin,
Warden/Support Services Division

8. TELEPHONE
718-546-1429

9. NAME OF AUTHORIZED AGENT
AKRF, Inc.

10. TELEPHONE
212-696-0670

11. AGENT'S MAILING ADDRESS
440 Park Avenue South, 7th Floor

12. CITY - TOWN - VILLAGE | 13. STATE | 14. ZIP
New York | NY | 10016

15. NAME OF ENGINEER (OR ARCHITECT) | LICENSE NO. | 16. TELEPHONE
Ramon Li, P.E. | 060857 | 646-388-9724

17. SIGNATURE OF OWNER'S REPRESENTATIVE OR AGENT WHEN APPLYING FOR A PERMIT TO CONSTRUCT

RAMON LI — NEW YORK — No. 060857 — LICENSED PROFESSIONAL ENGINEER

18. FACILITY NAME (IF DIFFERENT FROM OWNER'S FIRM)
NYC-DOC-Rikers Island

19. FACILITY LOCATION (NUMBER AND STREET ADDRESS)
17-25 Hazen Street

20. CITY - TOWN - VILLAGE | 21. ZIP
East Elmhurst, NY | 11370

22. BUILDING NAME OR NUMBER | 23. FLOOR NAME OR NUMBER
Cogen Building | 1

24. IF KNOWN DATE | 25. DRAWING NUMBERS OF PLANS SUBMITTED
07 / 2012 | Figures 1, 2, and 3

26. PERMIT TO CONSTRUCT
A [X] NEW SOURCE
B [ ] MODIFICATION

28. CERTIFICATE TO OPERATE
A [ ] NEW SOURCE
B [ ] MODIFICATION
C [ ] OPERATING PERMIT

SECTION B

29. EMISSION POINT	30. LENGTH (FEET)	31. DIAMETER (FEET)	32. TEMP. (°F)	33. VELOCITY (FPS)	34. FLOW RATE (ACFM)	35. FLOW RATE (DSCFM)
U0030	15.5	57	100	66	955	108.3	127,616

37. SOURCE CODE	38. HRS/DAY	39. DAYS/YR	40. ANNUAL THROUGHPUT (MM)
	24	365	2 5 2 5 2 5 2 5

41. BENEFICIAL PROCESS DESCRIPTION
Emission Point U0026 is the bypass stack, which exhausts the 7.5 MW simple cycle gas fired turbine from Train #1. Emissions from the main stack (Emission Point U0025) and the bypass stack would be proportional to the load through each stack. Emissions from U0026 reflect total emissions through the bypass stack at 100 percent load and at ISO conditions (ambient temp. of 59F).

SECTION C

42. CHEMICAL OR TRADE NAME OF EQUIPMENT	43. DISPOSAL METHOD	44. DATE (MONTH / YEAR)	45. USEFUL LIFE
None			

SECTION D

46. CALCULATIONS

See attached emissions calculation sheet.

SECTION E

47. CONTAMINANT NAME	48. EMISSION UNIT NUMBER	49. EMISSION POINT	50. EMISSION FUGITIVE	51. EMISSIONS RATE PTE	52. UNIT	53. EMISSIONS RATE PTE	54. HOURLY EMISSIONS ACTUAL	55. HOURLY EMISSIONS PERMISSIBLE	56. ANNUAL EMISSIONS ACTUAL	57. ANNUAL EMISSIONS PERMISSIBLE	58.
Total Particulates	NY75-00-0			1.64	01	4	1.64	1.64	14,372	0	
Sulfur Dioxide	7446_09_5			0.01	01	4	0.01	0.01	88	0	
Nitrogen Oxides	NY210 00 0			3.70	01	4	3.70	3.70	32,412	0	
Carbon Monoxide	630 08 0			4.70	01	4	4.70	4.70	41,172	0	
Volatile Organic Compounds	NY998 00 0			0.27	01	4	0.27	0.27	2,365	0	

SECTION G

59. SOURCE CONSTRUCTED	60. UNIT	61. THROUGHPUT OF UNIT	62. UNIT	63. HOURS OF OPERATION	64. APPLICABLE RULE	65. APPLICABLE RULE
			52	734,394	1030	

Upon permit issuance, I certify that the equipment and process described herein will be operated in compliance with all applicable requirements.

THE PROPER OPERATION OF VENTILATION SYSTEMS HAS BEEN CONSTRUCTED AND WILL BE MAINTAINED IN ACCORDANCE WITH THESE SPECIFICATIONS AND CONFORMANCE WITH ALL PROVISIONS OF 6 NYCRR, PART 212.

AGENCY USE ONLY

166. LOCATION CODE	167. FACILITY ID. NO.	168. E.I.N. (E)	169. U.T.M. (N)	169. SIC NUMBER	161. DATE APPL. RECEIVED	162. DATE APPL. REVIEWED	163. REVIEWED BY
					/ /	/ /	

PERMIT TO CONSTRUCT

164. DATE ISSUED	165. EXPIRATION DATE	166. SIGNATURE OF APPROVAL	167. FEE
/ /	/ /		

166.
1. DEVIATION FROM APPROVED APPLICATION SHALL VOID THIS PERMIT
2. THIS IS NOT A CERTIFICATE TO OPERATE
3. TESTS AND/OR ADDITIONAL EMISSION CONTROL EQUIPMENT MAY BE REQUIRED PRIOR TO THE ISSUANCE OF A CERTIFICATE TO OPERATE

CERTIFICATE TO OPERATE

169. DATE ISSUED	170. EXPIRATION DATE	171. SIGNATURE OF APPROVAL	172. FEE
/ /	/ /		

173.
1. [ ] INSPECTED BY _____ DATE _____
2. [ ] INSPECTION DISCLOSED DIFFERENCES AS BUILT VS. PERMIT, CHANGES INDICATED ON FORM
3. [ ] ISSUE CERTIFICATE TO OPERATE FOR SOURCE AS BUILT
4. [ ] APPLICATION FOR C.O. DENIED _____ DATE _____ INITIALED

174. SPECIAL CONDITIONS:
1. 2. 3. 4. 5. 6.

New York City Department of Environmental Protection

THE CITY OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Bureau of Environmental Compliance
59-17 Junction Boulevard, 9th Floor, Flushing, New York 11373-5108
Records Control (718) 595-3855

Date: December 2, 2010

Installation #: PB008210X

Reference: Rikers Island, 17-25 Hazen Street (Premise's Address) East Elmhurst (City) NY (State) 11370 (Zip) Queens (Borough)

PROFESSIONAL CERTIFICATION

Being duly mindful of my responsibilities as a licensed Professional Engineer / Registered Architect in the State of New York and acting as designated agent for the applicant, I hereby certify that the application, plans, and all supplementary documents submitted in connection with this filing are complete and fully comply with all applicable laws, codes, rules, regulations, and directives of the Department of Environmental Protection, Bureau of Environmental Compliance of the City of New York in effect at the time filed.

N.Y.S. P.E. or R. A. Seal: STATE OF NEW YORK RAMON LI No. 060857 LICENSED PROFESSIONAL ENGINEER

N.Y.S. P.E. or R. A. Signature:

N.Y.S. P.E. or R. A. Name: Ramon Li, P.E.

N.Y.S. P.E. or R. A. License Number: 060857

INSTRUCTIONS: Pursuant to Engineering Directive Number 1-78, this certification must be submitted in triplicate with all APC 5-0, APC 5-R, and APC 5-PA applications and does not preclude the necessity to sign and seal the certification now contained on the application forms.

New York City Department of Environmental Protection

THE CITY OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Bureau of Environmental Compliance
59-17 Junction Boulevard, 9th Floor, Flushing, New York 11373-5108
Records Control (718) 595-3855

Date: December 2, 2010

Installation #: PB008210X

Reference: Rikers Island, 17-25 Hazen Street (*Premise's Address*) East Elmhurst (*City*) NY (*State*) 11370 (*Zip*) Queens (*Borough*)

PROFESSIONAL CERTIFICATION

Being duly mindful of my responsibilities as a licensed Professional Engineer / Registered Architect in the State of New York and acting as designated agent for the applicant, I hereby certify that the application, plans, and all supplementary documents submitted in connection with this filing are complete and fully comply with all applicable laws, codes, rules, regulations, and directives of the Department of Environmental Protection, Bureau of Environmental Compliance of the City of New York in effect at the time filed.

N.Y.S. P.E. or R. A. Seal:

N.Y.S. P.E. or R. A. Signature:

N.Y.S. P.E. or R. A. Name: Ramon Li, P.E.

N.Y.S. P.E. or R. A. License Number: 060857

INSTRUCTIONS: Pursuant to Engineering Directive Number 1-78, this certification must be submitted in triplicate with all APC 5-0, APC 5-R, and APC 5-PA applications and does not preclude the necessity to sign and seal the certification now contained on the application forms.

New York City Department of Environmental Protection

THE CITY OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Bureau of Environmental Compliance
59-17 Junction Boulevard, 9th Floor, Flushing, New York 11373-5108
Records Control (718) 595-3855

Date: December 2, 2010

Installation #: PB008210X

Reference: Rikers Island, 17-25 Hazen Street East Elmhurst NY 11370 Queens

Premise's Address *City* *State* *Zip* *Borough*

PROFESSIONAL CERTIFICATION

Being duly mindful of my responsibilities as a licensed Professional Engineer / Registered Architect in the State of New York and acting as designated agent for the applicant, I hereby certify that the application, plans, and all supplementary documents submitted in connection with this filing are complete and fully comply with all applicable laws, codes, rules, regulations, and directives of the Department of Environmental Protection, Bureau of Environmental Compliance of the City of New York in effect at the time filed.

N.Y.S. P.E. or R. A. Seal:

N.Y.S. P.E. or R. A. Signature:

N.Y.S. P.E. or R. A. Name: Ramon Li, P.E.

N.Y.S. P.E. or R. A. License Number: 060857

INSTRUCTIONS: Pursuant to Engineering Directive Number 1-78, this certification must be submitted in triplicate with all APC 5-0, APC 5-R, and APC 5-PA applications and does not preclude the necessity to sign and seal the certification now contained on the application forms.

THE CITY OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Bureau of Environmental Compliance
59-17 Junction Boulevard, 9th Floor, Flushing, New York 11373-5107
Records Control (718) 595-3855

INDUSTRIAL PROCESSES DIVISION
ENVIRONMENTAL RATING REPORT
SUMMARY OF POINTS OF EMISSION
(FORM APC 3PA)

EN NUMBER: PB008210X

PREMISE IDENTIFICATION NUMBER:

1. COMPANY NAME: NYC Department of Correction

2. PREMISE ADDRESS: NYC-DOC-Rikers Island, 17-25 Hazen St., East Elmhurst, NY ZIP CODE: 11370

3. MAILING ADDRESS: 17-25 Hazen Street, East Elmhurst, NY ZIP CODE: 11370

TELEPHONE NUMBER: 718-546-1488

4. NAME OF PERSON PREPARING REPORT: Ramon Li, P.E.

5. ADDRESS: AKRF, Inc. 440 Park Avenue South, 7th Floor, New York, NY ZIP CODE: 10016

6. TELEPHONE NUMBER: 616-388-9724

7. SEC.	LOT	BLOCK
4	40	2605

8. EMISSION POINT NUMBER	9. OPERATION PRODUCING EMISSION	10. ENVIRONMENTAL RATING PROPOSED	ASSIGNED BY BEC
U0031	Natural gas fired turbine #2 with duct firing HRSG (main stack)	D	
U0032	Bypass stack for turbine #2	D	

THIS REPORT IS: ☐ NEW ☐ REVISION ☑ ADDENDUM

STATE OF NEW YORK RAMON LI No. 060897 LICENSED PROFESSIONAL ENGINEER

11. SIGNATURE: TITLE: Technical Director DATE: December 2, 2010

OP LOCATION FACILITY EMISSION POINT

A ADD
C CHANGE
D DELETE

READ INSTRUCTIONS CONTAINED IN FORM 75-17-13 BEFORE ANSWERING ANY QUESTION

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

COPIES
WHITE - ORIGINAL
GREEN - DIVISION OF AIR
WHITE - REGIONAL OFFICE
WHITE - FIELD REP.
YELLOW - APPLICANT

PROCESS, EXHAUST OR VENTILATION SYSTEM

APPLICATION FOR PERMIT TO CONSTRUCT OR CERTIFICATE TO OPERATE

SECTION A

1. NAME OF OWNER / FIRM: NYC Department of Correction
2. NUMBER AND STREET ADDRESS: 60 Hudson Street, Room 719
3. CITY - TOWN - VILLAGE: New York | 4. STATE: NY | 5. ZIP: 10013
6. OWNER CLASSIFICATION: A [ ] COMMERCIAL B [ ] INDUSTRIAL C [ ] UTILITY D [ ] FEDERAL E [ ] MUNICIPAL F [ ] PARK INST. G [ ] STATE H [ ] HOSPITAL I [ ] RESIDENTIAL J [X] OTHER
7. NAME & TITLE OF OWNER'S REPRESENTATIVE: Gregory McLaughlin, Warden/Support Services Division | 8. TELEPHONE: 718-546-1429
9. NAME OF AUTHORIZED AGENT: AKRF, Inc.
10. TELEPHONE: 212-696-0670
11. NUMBER AND STREET ADDRESS: 440 Park Avenue South, 7th Floor
12. CITY - TOWN - VILLAGE: New York | 13. STATE: NY | 14. ZIP: 10016
15. NAME OF REGISTERED PROFESSIONAL ENGINEER OR ARCHITECT: Ramon Li, P.E. | N.Y.S. P.E. OR ARCHITECT LICENSE NO.: 060857 | 17. TELEPHONE: 646-388-9724
16. SIGNATURE OF OWNER'S REPRESENTATIVE OR AGENT WHEN APPLYING FOR PERMIT TO CONSTRUCT
18. FACILITY NAME (IF DIFFERENT FROM OWNER / FIRM): NYC-DOC-Rikers Island
19. FACILITY LOCATION (NUMBER AND STREET ADDRESS): 17-25 Hazen Street
20. CITY - TOWN - VILLAGE: East Elmhurst, NY | 21. ZIP: 11370
22. BUILDING NAME OR NUMBER: Cogen Building | 23. FLOOR NAME OR NUMBER: 1
24. START UP DATE: 07 / 2012 (MO / YR) | 25. DRAWING NUMBERS OF PLANS SUBMITTED: Figures 1, 2, and 3
26. PERMIT TO CONSTRUCT: A [X] NEW SOURCE B [ ] MODIFICATION
27. CERTIFICATE TO OPERATE: A [ ] NEW SOURCE B [ ] MODIFICATION C [ ] EXISTING SOURCE

STATE OF NEW YORK · RAMON LI · P.E. · 060857 · LICENSED PROFESSIONAL ENGINEER

SECTION B

28. EMISSION POINT ID	29. UPWIND BUILDING ELEVATION (FT.)	30. HEIGHT ABOVE STRUCTURE (FT.)	31. HEIGHT ABOVE GROUND (FT.)	32. INSIDE DIMENSIONS (FT.)	33. EXIT VELOCITY (FT./SEC.)	34. EXIT FLOW RATE (ACFM)
U0031	15.5	107	150	60	292	58.0	68,345

35. SOURCE CODE	36. HRS / DAY	37. DAYS / YR	38. % IN OPERATION BY SEASON: WINTER	SPRING	SUMMER	FALL
	24	365	32	28	16	24

SECTION C

39. DESCRIBE PROCESS OR DUCT:

This permit application is for a 7.5 MW simple cycle gas fired turbine with duct firing HRSG (Train #2). Emission Point U0027 is the main stack, which exhausts the turbine, duct burner and HRSG. Exhaust from the turbine could, however, go through a bypass stack (Emission Point U0028) when steam demand is low. Emissions between the two stacks would be proportional to the load through each stack. Emissions from U0027 reflect total emissions through the main stack at 100 percent load and at ISO conditions (ambient temp. of 59F).

SECTION D

41. PRIMARY/CONTROL EQUIPMENT ID CODE	MANUFACTURER'S NAME AND MODEL NUMBER	DISPOSAL METHOD	DATE INSTALLED MONTH / YEAR	USEFUL LIFE
None			/	

SECTION E

46. DESCRIPTION:

See attached emissions calculation sheet.

SECTION F

47. CONTAMINANT NAME	CAS NUMBER	49. FUEL % PRODUCTION	50. UNIT	51. ENV. RATING	52. EMISSIONS ACTUAL	UNIT	HOURLY EFF. %	PERMISSIBLE	56. ALLOWABLE EFF. %	57. HOURLY EMISSIONS (LBS/HR) EXT.	ACTUAL	60. ANNUAL EMISSIONS (LBS/YR) ACTUAL	TON	PERMISSIBLE
Total Particulates	NY75-00-0				2.02	01	4			2.02	2.02	17,718	0	
Sulfur Dioxide	7446_09_5				0.40	01	4			0.40	0.40	3,504	0	
Nitrogen Oxides	NY210_00_0				6.37	01	4			6.37	6.37	55,836	0	
Carbon Monoxide	630_08_0				7.76	01	4			7.76	7.76	67,943	0	
Volatile Organic Compounds	NY998-00-0				0.44	01	4			0.44	0.44	3,871	0	

SECTION G

144. SOLID FUEL TYPE	145. THOUSANDS OF LBS/YR	146. % S	147. LIQUID FUEL TYPE	148. THOUSANDS OF GALLONS/YR	149. % S	150. GAS TYPE	151. THOUSANDS OF CF/YR	152. STUFF
						52	1,059,280	1030

153. APPLICABLE RULE	154. APPLICABLE RULE

Upon completion of construction sign the statement listed below and forward to the appropriate field representative.

155. SIGNATURE OF AUTHORIZED REPRESENTATIVE OR AGENT | DATE

THE PROCESS, EXHAUST OR VENTILATION SYSTEM HAS BEEN CONSTRUCTED AND WILL BE OPERATED IN ACCORDANCE WITH STATED SPECIFICATIONS AND IN CONFORMANCE WITH ALL PROVISIONS OF EXISTING REGULATIONS

AGENCY USE ONLY

156. LOCATION CODE | 157. FACILITY ID NO. | 158. U.T.M. (E) | 159. U.T.M. (N) | 160. SIC NUMBER | 161. DATE APPL. RECEIVED | 162. DATE APPL. REVIEWED | 163. REVIEWED BY:

PERMIT TO CONSTRUCT

164. DATE ISSUED | 165. EXPIRATION DATE | 166. SIGNATURE OF APPROVAL | 167. FEE

168.
1. DEVIATION FROM APPROVED APPLICATION SHALL VOID THIS PERMIT
2. THIS IS NOT A CERTIFICATE TO OPERATE
3. TESTS AND/OR ADDITIONAL EMISSION CONTROL EQUIPMENT MAY BE REQUIRED PRIOR TO THE ISSUANCE OF A CERTIFICATE TO OPERATE

CERTIFICATE TO OPERATE

169. DATE ISSUED | 170. EXPIRATION DATE | 171. SIGNATURE OF APPROVAL | 172. FEE

172.
1. [ ] INSPECTED BY _____ DATE _____
2. [ ] INSPECTION DISCLOSED DIFFERENCES AS BUILT VS. PERMIT, CHANGES INDICATED ON FORM
3. [ ] ISSUE CERTIFICATE TO OPERATE FOR SOURCE AS BUILT
4. [ ] APPLICATION FOR C.O. DENIED _____ DATE _____ INITIALED

173. SPECIAL CONDITIONS:

1. 2.
3. 4.
5. 6.
7. 8.

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

COPIES
WHITE - ORIGINAL
GREEN - DIVISION OF AIR
WHITE - REGIONAL OFFICE
WHITE - FIELD REF
YELLOW - APPLICANT

OP | LOCATION | FACILITY | EMISSION POINT

A ADD
C CHANGE
E DELETE

READ INSTRUCTIONS CONTAINED IN FORM 78-11-15 BEFORE ANSWERING ANY QUESTION

PROCESS, EXHAUST OR VENTILATION SYSTEM

APPLICATION FOR PERMIT TO CONSTRUCT OR CERTIFICATE TO OPERATE

SECTION A

1. NAME OF OWNER / FIRM
NYC Department of Correction

2. NUMBER AND STREET ADDRESS
60 Hudson Street, Room 719

3. CITY - TOWN - VILLAGE | 4. STATE | 5. ZIP
New York | NY | 10013

6. OWNER CLASSIFICATION
A ☐ COMMERCIAL B ☐ INDUSTRIAL C ☐ UTILITY D ☐ FEDERAL E ☐ MUNICIPAL F ☐ STATE G ☐ FISCAL AUTH. H ☐ HOSPITAL I ☐ REGIONAL J ☐ OTHER

7. NAME & TITLE OF OWNER'S REPRESENTATIVE | TELEPHONE NO.
Gregory McLaughlin, Warden/Support Services Division | 718-546-1429

8. NAME OF AUTHORIZED AGENT
AKRF, Inc.

9. NUMBER AND STREET
440 Park Avenue South, 7th Floor

10. CITY - TOWN - VILLAGE | 11. STATE | 12. ZIP
New York | NY | 10016

13. NAME OF ARCHITECT / ENGINEER | LICENSE NO. | TELEPHONE NO.
Ramon Li, P.E. | 060857 | 646-388-9724

14. SIGNATURE OF OWNER'S REPRESENTATIVE OR AGENT WHEN APPLYING FOR PERMIT TO CONSTRUCT

STATE OF NEW YORK
RAMON LI
NO. 060857
LICENSED PROFESSIONAL ENGINEER

10. TELEPHONE
212-696-0670

19. FACILITY NAME (IF DIFFERENT FROM OWNER / FIRM)
NYC-DOC-Rikers Island

20. FACILITY LOCATION (NUMBER AND STREET ADDRESS)
17-25 Hazen Street

21. CITY - TOWN - VILLAGE | 22. ZIP
East Elmhurst, NY | 11370

23. BUILDING NAME OR NUMBER
Cogen Building

24. FLOOR, ROOM OR NUMBER
1

25. START UP DATE
07 / 2012
MO / YR

26. DRAWING NUMBERS OF PLANS SUBMITTED
Figures 1, 2, and 3

27. PERMIT TO CONSTRUCT
A ☒ NEW SOURCE
B ☐ MODIFICATION

28. CERTIFICATE TO OPERATE
A ☐ NEW SOURCE
B ☐ MODIFICATION

SECTION B

29. EMISSION POINT	30. BUILDING CHARACTERISTICS: HEIGHT (FEET)	DIAMETER (FEET)	VELOCITY (FEET/SEC)	TEMPERATURE (°F)	35. EXIT GAS FLOW RATE (ACFM)
U0031	15.5	107	150	60	292	58.0	68,345

36. SOURCE CODE	37. DEC BOILER ID NO.	38. STACK/VENT ID NO.
	24	365 3228 1624

SECTION C

DESCRIBE PROCESS OR CONTROL EQUIPMENT

This permit application is for a 7.5 MW simple cycle gas fired turbine with duct firing HRSG (Train #2). Emission Point U0027 is the main stack, which exhausts the turbine, duct burner and HRSG. Exhaust from the turbine could, however, go through a bypass stack (Emission Point U0028) when steam demand is low. Emissions between the two stacks would be proportional to the load through each stack. Emissions from U0027 reflect total emissions through the main stack at 100 percent load and at ISO conditions (ambient temp. of 59F).

SECTION D

41. WATER DISCHARGE PERMIT NO.	42. SPECIAL WASTE ID NO.	43. OTHER ALL APPLICABLE ID NUMBERS	44. DISPOSAL METHOD	45. DATE INSTALLED MONTH / YEAR	46. USEFUL LIFE
None				/	

SECTION E

DESCRIPTION

See attached emissions calculation sheet.

SECTION F

47. CONTAMINANT NAME	48. CAS NUMBER	49. EMISSION RATE	50. EMISSIONS: ACTUAL	UNIT	EF	53. HOURLY EMISSIONS: PERMISSIBLE	ACTUAL	56. ANNUAL EMISSIONS: PERMISSIBLE	ACTUAL	59. REMARKS
Total Particulates	NY75-00-0		2.02	01	4	2.02	2.02	17,718	0	
Sulfur Dioxide	7446_09_5		0.40	01	4	0.40	0.40	3,504	0	
Nitrogen Oxides	NY210 00 0		6.37	01	4	6.37	6.37	55,836	0	
Carbon Monoxide	630 08 0		7.76	01	4	7.76	7.76	67,943	0	
Volatile Organic Compounds	NY998 00 0		0.44	01	4	0.44	0.44	3,871	0	

SECTION G

60. MAXIMUM FINISH (%)	61. SOLIDS TO BE REMOVED (THOUSANDS OF GALLONS/YEAR)	62. WATER TO BE EVAPORATED (THOUSANDS OF GALLONS/HOUR)	63. HEAT OF COMBUSTION (BTU/LB)	64. APPLICABLE RULE	65. APPLICABLE RULE
	52	1,059,280	1030		

UPON COMPLETION OF CONSTRUCTION I/WE CERTIFY THAT THE PROCESS, EXHAUST OR VENTILATION SYSTEM HAS BEEN CONSTRUCTED AND WILL BE OPERATED IN COMPLIANCE WITH THE STATE'S APPLICABLE RULES AND REGULATIONS AND IN ACCORDANCE WITH ALL PRESENTATIONS OF EXISTING INFORMATION.

SIGNATURE OF OWNER OR AUTHORIZED AGENT | DATE

AGENCY USE ONLY

166. LOCATION CODE	167. FACILITY ID NO.	168. U.T.M. (E)	169. U.T.M. (N)	169. SIC NUMBER	161. DATE APPL. RECEIVED	162. DATE APPL. REVIEWED	163. REVIEWED BY
					/ /	/ /	

PERMIT TO CONSTRUCT

164. DATE ISSUED	165. EXPIRATION DATE	166. SIGNATURE OF APPROVAL	167. FEE
/ /	/ /		

168.
1. DEVIATION FROM APPROVED APPLICATION SHALL VOID THIS PERMIT
2. THIS IS NOT A CERTIFICATE TO OPERATE
3. TESTS AND/OR ADDITIONAL EMISSION CONTROL EQUIPMENT MAY BE REQUIRED PRIOR TO THE ISSUANCE OF A CERTIFICATE TO OPERATE

CERTIFICATE TO OPERATE

169. DATE ISSUED	170. EXPIRATION DATE	171. SIGNATURE OF APPROVAL	172. FEE
/ /	/ /		

173.
1. ☐ INSPECTED BY _____ DATE _____
2. ☐ INSPECTION DISCLOSED DIFFERENCES AS BUILT VS. PERMIT, CHANGES INDICATED ON FORM
3. ☐ ISSUE CERTIFICATE TO OPERATE FOR SOURCE AS BUILT
4. ☐ APPLICATION FOR C.O. DENIED _____ DATE _____ INITIALED

174. SPECIAL CONDITIONS:

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

COPIES
WHITE - ORIGINAL
GREEN - DIVISION OF AIR
WHITE - REGIONAL OFFICE
WHITE - FIELD REP.
YELLOW - APPLICANT

OP | LOCATION | FACILITY | EMISSION POINT

A ADD
C CHANGE
E DELETE

READ INSTRUCTIONS CONTAINED IN FORM 75-15-0 BEFORE ANSWERING ANY QUESTION

PROCESS, EXHAUST OR VENTILATION SYSTEM

APPLICATION FOR PERMIT TO CONSTRUCT OR CERTIFICATE TO OPERATE

SECTION A

1. NAME OF OWNER / FIRM
NYC Department of Correction

2. NUMBER AND STREET ADDRESS
60 Hudson Street, Room 719

3. CITY - TOWN - VILLAGE | 4. STATE | 5. ZIP
New York | NY | 10013

6. OWNER CLASSIFICATION
A ☐ COMMERCIAL B ☐ INDUSTRIAL C ☐ UTILITY D ☐ FEDERAL E ☐ MUNICIPAL F ☐ HOSPITAL G ☐ PERSONAL H ☐ FARM X OTHER

7. NAME & TITLE OF OWNER'S REPRESENTATIVE | 8. TELEPHONE
Gregory McLaughlin, Warden/Support Services Division | 718-546-1429

9. NAME OF AUTHORIZED AGENT
AKRF, Inc.

10. TELEPHONE
212-696-0670

11. NUMBER AND STREET ADDRESS
440 Park Avenue South, 7th Floor

12. CITY - TOWN - VILLAGE | 13. STATE | 14. ZIP
New York | NY | 10016

15. NAME OF PE OR AIA ARCHITECT
Ramon Li, P.E.

16. N.Y.S. P.E. OR AIA ARCHITECT LICENSE NO.
060857

17. TELEPHONE
646-388-9724

18. SIGNATURE OF OWNER, REPRESENTATIVE OR AGENT WHEN AUTHORIZED TO SIGN THIS APPLICATION

STATE OF NEW YORK · RAMON LI · No. 060857 · LICENSED PROFESSIONAL ENGINEER

19. FACILITY NAME (IF DIFFERENT FROM OWNER / FIRM)
NYC-DOC-Rikers Island

20. FACILITY LOCATION (NUMBER AND STREET ADDRESS)
17-25 Hazen Street

21. CITY - TOWN - VILLAGE | 22. ZIP
East Elmhurst, NY | 11370

23. BUILDING NAME OR NUMBER
Cogen Building

24. FLOOR LEVEL OR NUMBER
1

25. PERMIT APPLIED FOR | 26. DRAWING NUMBERS OF PLANS SUBMITTED
07 / 2012 (MO / YR) | Figures 1, 2, and 3

27. PERMIT TO CONSTRUCT
A ☒ NEW SOURCE
B ☐ MODIFICATION

28. CERTIFICATE TO OPERATE
A ☐ NEW SOURCE
B ☐ MODIFICATION

SECTION B

29. EMISSION POINT	30. EMISSION EMBODIMENT	31. EMISSION DIAMETER (FEET)	32. EMISSION HEIGHT ABOVE GROUND (FEET)	33. EMISSION LENGTH (FEET)	34. EMISSION WIDTH (FEET)	35. EXIT VELOCITY (FEET/SEC)	36. EXIT FLOW RATE (ACFM)
U0031	15.5	107	150	60	292	58.0	68,345

37. SOURCE CODE: 24

38. OPERATING SCHEDULE: HRS/DAY 24 | DAYS/YR 365 | WKS/YR 52 | MOS/YR 12

39. START-UP DATE: 2016 (YR)

SECTION C

This permit application is for a 7.5 MW simple cycle gas fired turbine with duct firing HRSG (Train #2). Emission Point U0027 is the main stack, which exhausts the turbine, duct burner and HRSG. Exhaust from the turbine could, however, go through a bypass stack (Emission Point U0028) when steam demand is low. Emissions between the two stacks would be proportional to the load through each stack. Emissions from U0027 reflect total emissions through the main stack at 100 percent load and at ISO conditions (ambient temp. of 59F).

SECTION D

42. CONTROL ID NUMBER	43. CONTROL TYPE	44. MANUFACTURER	45. MODEL NUMBER	46. DISPOSAL METHOD	47. DATE INSTALLED (MONTH / YEAR)	48. USEFUL LIFE
None						

SECTION E

49. CALCULATIONS

See attached emissions calculation sheet.

SECTION F

50. CONTAMINANT NAME	51. CAS NUMBER	52. UNCONTROLLED EMISSIONS (PTE)	53. EMISSIONS RATE	54. EMISSIONS BASIS	55. ALLOWABLE EMISSIONS	56. ACTUAL EMISSIONS	57. HOURLY EMISSIONS DATA	58. ANNUAL EMISSIONS DATA	59. REMARKS
Total Particulates	NY75-00-0	2.02	01	4	2.02	2.02	17,718	0	
Sulfur Dioxide	7446_09_5	0.40	01	4	0.40	0.40	3,504	0	
Nitrogen Oxides	NY210_00_0	6.37	01	4	6.37	6.37	55,836	0	
Carbon Monoxide	630_08_0	7.76	01	4	7.76	7.76	67,943	0	
Volatile Organic Compounds	NY998_00_0	0.44	01	4	0.44	0.44	3,871	0	

SECTION G

60. SOLID FUEL (TYPE)	61. SOLID FUEL (AMOUNT)	62. LIQUID FUEL (THOUSANDS OF GALLONS)	63. LIQUID FUEL (% SULFUR)	64. LIQUID FUEL (BTU/GAL)	65. GASEOUS FUEL (MILLIONS OF CUBIC FEET)	66. GASEOUS FUEL (BTU/CU FT)	67. APPLICABLE RULE	68. APPLICABLE RULE
		52	1,059,280	1030				

THE PROCESS, EXHAUST OR VENTILATION SYSTEM AND AIR CONTAMINANT EMISSIONS DESCRIBED IN THIS APPLICATION WILL BE OPERATED IN COMPLIANCE WITH APPLICABLE REGULATIONS.

AGENCY USE ONLY

150. LOCATION CODE | 151. FACILITY ID NO. | 152. U.T.M. (E) | 153. U.T.M. (N) | 154. SIC NUMBER | 155. DATE APPL. RECEIVED | 156. DATE APPL. REVIEWED | 157. REVIEWED BY

PERMIT TO CONSTRUCT

158. DATE ISSUED	159. EXPIRATION DATE	160. SIGNATURE OF APPROVAL	161. FEE
/ /	/ /		

162.
1. DEVIATION FROM APPROVED APPLICATION SHALL VOID THIS PERMIT
2. THIS IS NOT A CERTIFICATE TO OPERATE
3. TESTS AND/OR ADDITIONAL EMISSION CONTROL EQUIPMENT MAY BE REQUIRED PRIOR TO THE ISSUANCE OF A CERTIFICATE TO OPERATE

CERTIFICATE TO OPERATE

163. DATE ISSUED	164. EXPIRATION DATE	165. SIGNATURE OF APPROVAL	166. FEE
/ /	/ /		

172.
1. ☐ INSPECTED BY _____ DATE _____
2. ☐ INSPECTION DISCLOSED DIFFERENCES AS BUILT VS. PERMIT, CHANGES INDICATED ON FORM
3. ☐ ISSUE CERTIFICATE TO OPERATE FOR SOURCES AS BUILT
4. ☐ APPLICATION FOR C.O. DENIED _____ DATE _____ INITIALED

173. SPECIAL CONDITIONS

1. | 2.
3. | 4.
5. | 6.
7. | 8.

OP | LOCATION | FACILITY | EMISS. PT. | SUF

A ADD
C CHANGE
E DELETE

READ INSTRUCTIONS CONTAINED IN FORM 75-1-13 BEFORE ANSWERING ANY QUESTION

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

COPIES
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GREEN - DIVISION OF AIR
WHITE - REGIONAL OFFICE
WHITE - FIELD REP.
YELLOW - APPLICANT

PROCESS, EXHAUST OR VENTILATION SYSTEM

APPLICATION FOR PERMIT TO CONSTRUCT OR CERTIFICATE TO OPERATE

SECTION A

1. NAME OF OWNER / FIRM: NYC Department of Correction
2. NUMBER AND STREET ADDRESS: 60 Hudson Street, Room 719
3. CITY - TOWN - VILLAGE: New York
4. STATE: NY
5. ZIP: 10013
6. OWNER CLASSIFICATION: A ☐ COMMERCIAL B ☐ INDUSTRIAL C ☐ UTILITY D ☐ FEDERAL E ☐ STATE F ☐ MUNICIPAL G ☐ FOR. INST. H ☐ HOSPITAL ☐ RESIDENTIAL X OTHER
7. NAME & TITLE OF OWNER'S REPRESENTATIVE: Gregory McLaughlin, Warden/Support Services Division
8. TELEPHONE: 718-546-1429
9. NAME OF AUTHORIZED CONSULTANT: AKRF, Inc.
10. TELEPHONE: 212-696-0670
11. NUMBER AND STREET ADDRESS: 440 Park Avenue South, 7th Floor
12. CITY - TOWN - VILLAGE: New York
13. STATE:
14. ZIP: 10016
15. NAME OF INDIVIDUAL PREPARING PLANS: Ramon Li, P.E.
16. N.Y.S. P.E. OR ARCHITECT LICENSE NO.: 060879
17. TELEPHONE: 646-388-9724
18. SIGNATURE OF OWNER'S REPRESENTATIVE OR AGENT WHEN APPLYING FOR A PERMIT TO CONSTRUCT:
19. FACILITY NAME (IF DIFFERENT FROM OWNER / FIRM): NYC-DOC-Rikers Island
20. FACILITY LOCATION (NUMBER AND STREET ADDRESS): 17-25 Hazen Street
21. CITY - TOWN - VILLAGE: East Elmhurst, NY
22. ZIP: 11370
23. BUILDING NAME OR NUMBER: Cogen Building
24. FLOOR NAME OR NUMBER: 1
25. START UP DATE: 07 / 2012 (MO / YR)
26. DRAWING NUMBERS OF PLANS SUBMITTED: Figures 1, 2, and 3
27. PERMIT TO CONSTRUCT: A X NEW SOURCE B ☐ MODIFICATION
28. CERTIFICATE TO OPERATE: A ☐ NEW SOURCE C ☐ EXISTING SOURCE B ☐ MODIFICATION

STATE OF NEW YORK — RAMON LI — No. 060879 — LICENSED PROFESSIONAL ENGINEER

SECTION B

29. EMISSION POINT (E)	30. GROUND ELEVATION (FT.)	31. HEIGHT ABOVE STRUCTURES (FT.)	32. LOCAL HEIGHT (FT.)	33. INSIDE DIMENSIONS (FT.)	34. EXIT TEMP. (°F)	35. EXIT VELOCITY (FT./SEC.)	36. EXIT FLOW RATE (ACFM)
U 0 0 3 2	15.5	57	100	66	955	108.3	127,616

37. SOURCE CODE	38. HRS / DAY	39. DAYS / YR	40. % OPERATION BY SEASON: WINTER	SPRING	SUMMER	FALL
	24	365	25	25	25	25

SECTION C

21. DESCRIBE PROCESS OR UNIT:

Emission Point U0028 is the bypass stack, which exhausts the 7.5 MW simple cycle gas fired turbine from Train #2. Emissions from the main stack (Emission Point U0027) and the bypass stack would be proportional to the load through each stack. Emissions from U0028 reflect total emissions through the bypass stack at 100 percent load and at ISO conditions (ambient temp. of 59F).

SECTION D

42. AIR POLLUTION CONTROL EQUIPMENT	43. CONTROL EFF. (%)	44. MANUFACTURER'S NAME AND MODEL NUMBER	45. DISPOSAL METHOD	46. DATE INSTALLED (MONTH / YEAR)	47. USEFUL LIFE
None				/	

SECTION E

49. CALCULATIONS:

See attached emissions calculation sheet.

SECTION F

50. CONTAMINANT NAME	CAS NUMBER	51. EMISSION INFORMATION	52. UNIT RATING	EMISSIONS: ACTUAL	UNIT	HOUR OF PEAK	PERMISSIBLE	53. EFF. (%)	HOURLY EMISSIONS (LBS/HR): ENF	ACTUAL	ANNUAL EMISSIONS (LBS/YR): ACTUAL	TP	PERMISSIBLE
Total Particulates	NY75-00-0			1.64	01	4			1.64	1.64	14,372	0	
Sulfur Dioxide	7446_09_5			0.01	01	4			0.01	0.01	88	0	
Nitrogen Oxides	NY210_00_0			3.70	01	4			3.70	3.70	32,412	0	
Carbon Monoxide	630_08_0			4.70	01	4			4.70	4.70	41,172	0	
Volatile Organic Compounds	NY998-00-0			0.27	01	4			0.27	0.27	2,365	0	

SECTION G

SOLID FUEL: TYPE	TONS / YR	% S	LIQUID FUEL: TYPE	THOUSANDS OF GALLONS/YR	% S	GAS: TYPE	THOUSANDS OF CF/YR	STU/CF
						52	734,394	1030

58. APPLICABLE RULE	59. APPLICABLE RULE

Upon completion of construction sign the statement listed below and forward to the appropriate field representative.

60. SIGNATURE OF AUTHORIZED REPRESENTATIVE OR AGENT | DATE

THE PROCESS, EXHAUST OR VENTILATION SYSTEM HAS BEEN CONSTRUCTED AND WILL BE OPERATED IN ACCORDANCE WITH STATED SPECIFICATIONS AND IN CONFORMANCE WITH ALL PROVISIONS OF EXISTING REGULATIONS.

AGENCY USE ONLY

156. LOCATION CODE | 157. FACILITY ID. NO. | 158. U.T.M. (E) | 159. U.T.M. (N) | 160. SIC NUMBER | 161. DATE APPL. RECEIVED | 162. DATE APPL. REVIEWED | 163. REVIEWED BY:

PERMIT TO CONSTRUCT

164. DATE ISSUED	165. EXPIRATION DATE	166. SIGNATURE OF APPROVAL	167. FEE
/ /	/ /		

166.
1. DEVIATION FROM APPROVED APPLICATION SHALL VOID THIS PERMIT.
2. THIS IS NOT A CERTIFICATE TO OPERATE.
3. TESTS AND/OR ADDITIONAL EMISSION CONTROL EQUIPMENT MAY BE REQUIRED PRIOR TO THE ISSUANCE OF A CERTIFICATE TO OPERATE.

CERTIFICATE TO OPERATE

169. DATE ISSUED	170. EXPIRATION DATE	171. SIGNATURE OF APPROVAL	172. FEE
/ /	/ /		

173.
1. ☐ INSPECTED BY _____ DATE _____
2. ☐ INSPECTION DISCLOSED DIFFERENCES AS BUILT VS. PERMIT. CHANGES INDICATED ON FORM.
3. ☐ ISSUE CERTIFICATE TO OPERATE FOR SOURCE AS BUILT.
4. ☐ APPLICATION FOR C.O. DENIED _____ DATE _____ INITIALED

174. SPECIAL CONDITIONS:

1. | 2.
3. | 4.
5. | 6.
7. | 8.

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

COPIES
WHITE - ORIGINAL
GREEN - DIVISION OF AIR
WHITE - REGIONAL OFFICE
WHITE - FIELD REP
YELLOW - APPLICANT

OP | LOCATION | FACILITY | EMISSION POINT

A ADD
C CHANGE
E DELETE

READ INSTRUCTIONS CONTAINED IN FORM 75-11-12 BEFORE ANSWERING ANY QUESTION

PROCESS, EXHAUST OR VENTILATION SYSTEM

APPLICATION FOR PERMIT TO CONSTRUCT OR CERTIFICATE TO OPERATE

SECTION A

1. NAME OF OWNER / FIRM: NYC Department of Correction
2. NUMBER AND STREET ADDRESS: 60 Hudson Street, Room 719
3. CITY / TOWN / VILLAGE: New York | 4. STATE: NY | 5. ZIP: 10013
6. OWNER CLASSIFICATION: A ☐ COMMERCIAL B ☐ INDUSTRIAL C ☐ PUBLIC UTILITY D ☐ FEDERAL E ☐ STATE F ☐ MUNICIPAL G ☐ NOT FOR PROFIT H ☐ RESIDENTIAL X ☒ OTHER
7. NAME & TITLE OF OWNER'S REPRESENTATIVE: Gregory McLaughlin, Warden/Support Services Division
8. TELEPHONE: 718-546-1429
9. NAME OF ARCHITECT / PROFESSIONAL ENGINEER: AKRF, Inc.
10. NUMBER AND STREET ADDRESS: 440 Park Avenue South, 7th Floor
11. CITY / TOWN / VILLAGE: New York | 12. STATE: NY | 13. ZIP: 10016
14. N.Y.S. P.E. OR ARCHITECT LICENSE NO.: 060857
15. TELEPHONE: 646-388-9724
16. NAME OF ARCHITECT / PROFESSIONAL ENGINEER: Ramon Li, P.E.
17. SIGNATURE OF OWNER'S REPRESENTATIVE OR AGENT WHEN APPLYING FOR A PERMIT TO CONSTRUCT
18. TELEPHONE: 212-696-0670
19. FACILITY NAME (IF DIFFERENT FROM OWNER'S NAME): NYC-DOC-Rikers Island
20. FACILITY LOCATION (NUMBER AND STREET ADDRESS): 17-25 Hazen Street
21. CITY / TOWN / VILLAGE: East Elmhurst, NY | 22. ZIP: 11370
23. BUILDING NAME OR NUMBER: Cogen Building | 24. FLOOR NAME OR NUMBER: 1
25. START UP DATE: 07 / 2012 (MO / YR)
26. DRAWING NUMBERS OF PLANS SUBMITTED: Figures 1, 2, and 3
27. PERMIT TO CONSTRUCT: A ☒ NEW SOURCE B ☐ MODIFICATION
28. CERTIFICATE TO OPERATE: A ☐ NEW SOURCE B ☐ MODIFICATION C ☐ CHANGE OF OWNER

STATE OF NEW YORK · RAMON LI · NO. 060857 · LICENSED PROFESSIONAL ENGINEER

SECTION B

29. EMISSION POINT	30. EMISSION SOURCE/GROUP	31. STACK HEIGHT (FEET)	32. STACK DIAMETER (FEET)	33. EXIT GAS TEMPERATURE (°F)	34. EXIT GAS VOLUMETRIC FLOW RATE (ACFM)	35. EXIT GAS VELOCITY (FPS)	36. EXIT FLOW (ACFM)
U0032	15.5	57	100	66	955	108.3	127,616

37. SOURCE CODE	38. HRS/DAY	39. DAYS/YR	40. % EMISSIONS BY SEASON: WINTER	SPRING	SUMMER	FALL
	24	365	25	25	25	25

41. DESCRIBE EMISSION POINT IN DETAIL

Emission Point U0028 is the bypass stack, which exhausts the 7.5 MW simple cycle gas fired turbine from Train #2. Emissions from the main stack (Emission Point U0027) and the bypass stack would be proportional to the load through each stack. Emissions from U0028 reflect total emissions through the bypass stack at 100 percent load and at ISO conditions (ambient temp. of 59F).

SECTION C

EMISSION CONTROL EQUIPMENT	MANUFACTURER NAME AND MODEL NUMBER	DISPOSAL METHOD	DATE INSTALLED MONTH / YEAR	USEFUL LIFE
42. None			/	

SECTION D

43. CALCULATIONS

See attached emissions calculation sheet.

SECTION E

44. NAME	45. CAS NUMBER	46. SATE	47. PRIMARY	48. SECONDARY	49. FUGITIVE	50. EFF. %	EMISSIONS 51. ACTUAL (TONS/YR)	52. UNIT	53. METHOD	54. ESTIMATED (LBS/HR)	55. EFF. %	HOURLY EMISSION RATE 56. DAY	57. ACTUAL	58. PERMISSIBLE	ANNUAL EMISSION RATE 59. ACTUAL (TONS/YR)	60. PERMISSIBLE
Total Particulates	NY75-00-0						1.64	01	4			1.64	1.64		14,372 0	
Sulfur Dioxide	7446_09_5						0.01	01	4			0.01	0.01		88 0	
Nitrogen Oxides	NY210_00_0						3.70	01	4			3.70	3.70		32,412 0	
Carbon Monoxide	630_08_0						4.70	01	4			4.70	4.70		41,172 0	
Volatile Organic Compounds	NY998_00_0						0.27	01	4			0.27	0.27		2,365 0	

SECTION G

61. SOURCE TYPE	62. EQUIPMENT OR PROCESS OF ORIGIN	63. YEAR	64. THROUGHPUT	65. UNIT
		52	734,394	1030

66. APPLICABLE RULE	67. APPLICABLE RULE

Upon completion of construction, with the statements listed below and forwarded to the appropriate Department office:

THE PROCESS, EXHAUST OR VENTILATION SYSTEM HAS BEEN CONSTRUCTED AND WILL BE OPERATED IN ACCORDANCE WITH THE STATED SPECIFICATIONS AND IN COMPLIANCE WITH ALL PROVISIONS OF 6 NYCRR PART 200 AND CHAPTER III, SUBCHAPTER A OF THE NEW YORK STATE ENVIRONMENTAL CONSERVATION LAW.

SIGNATURE OF OWNER'S REPRESENTATIVE OR AGENT | DATE

AGENCY USE ONLY

68. LOCATION CODE	69. FACILITY ID NO.	69a. U.T.M. (E)	69b. U.T.M. (N)	69c. SIC NUMBER	69d. DATE APPL. RECEIVED	69e. DATE APPL. REVIEWED	69f. REVIEWED BY:
					/ /	/ /	

PERMIT TO CONSTRUCT

69A. DATE ISSUED	69B. EXPIRATION DATE	69C. SIGNATURE OF APPROVAL	69D. FEE
/ /	/ /		

69E.
1. DEVIATION FROM APPROVED APPLICATION SHALL VOID THIS PERMIT
2. THIS IS NOT A CERTIFICATE TO OPERATE
3. TESTS AND/OR ADDITIONAL EMISSION CONTROL EQUIPMENT MAY BE REQUIRED PRIOR TO THE ISSUANCE OF A CERTIFICATE TO OPERATE

CERTIFICATE TO OPERATE

69G. DATE ISSUED	69H. EXPIRATION DATE	69I. SIGNATURE OF APPROVAL	69J. FEE
/ /	/ /		

69K.
1. ☐ INSPECTED BY _____ DATE _____
2. ☐ INSPECTION DISCLOSED DIFFERENCES AS BUILT VS. PERMIT. CHANGES INDICATED ON FORM
3. ☐ ISSUE CERTIFICATE TO OPERATE FOR SOURCE AS BUILT
4. ☐ APPLICATION FOR C.O. DENIED _____ DATE _____ INITIALED

69L. SPECIAL CONDITIONS:

1. | 2.
3. | 4.
5. | 6.
7. | 8.

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

COPIES
WHITE - ORIGINAL
GREEN - DIVISION OF AIR
WHITE - REGIONAL OFFICE
WHITE - FIELD REP.
YELLOW - APPLICANT

OP | LOCATION | FACILITY | EMISSION POINT

A ADD
C CHANGE
E DELETE

READ INSTRUCTIONS CONTAINED IN FORM 7541-I-I2 BEFORE ANSWERING ANY QUESTION

PROCESS, EXHAUST OR VENTILATION SYSTEM

APPLICATION FOR PERMIT TO CONSTRUCT OR CERTIFICATE TO OPERATE

SECTION A

1. NAME OF OWNER / FIRM: NYC Department of Correction
2. NUMBER AND STREET ADDRESS: 60 Hudson Street, Room 719
3. CITY - TOWN - VILLAGE: New York | 4. STATE: NY | 5. ZIP: 10013
6. OWNER CLASSIFICATION: A [ ] COMMERCIAL B [ ] INDUSTRIAL C [ ] UTILITY D [ ] FEDERAL E [ ] STATE F [ ] MUNICIPAL G [ ] HOSPITAL H [ ] RESIDENTIAL I [X] OTHER
7. NAME & TITLE OF OWNER'S REPRESENTATIVE: Gregory McLaughlin, Warden/Support Services Division | TELEPHONE NO.: 718-546-1429

8. NAME OF CONSULTING FIRM: AKRF, Inc.
9. USUAL STREET ADDRESS: 440 Park Avenue South, 7th Floor
10. CITY - TOWN - VILLAGE: New York | 11. STATE: NY | 12. ZIP: 10016
13. NAME & P.E. OR ARCHITECT: Ramon Li, P.E. | LICENSE NO.: 060857 | 14. TELEPHONE: 646-388-9724

STATE OF NEW YORK · RAMON LI · No. 060857 · LICENSED PROFESSIONAL ENGINEER

15. SIGNATURE OF OWNER'S REPRESENTATIVE OR AGENT WHEN APPLICATION IS MADE FOR A PERMIT TO CONSTRUCT:

16. FACILITY NAME (IF DIFFERENT FROM OWNER / FIRM): NYC-DOC-Rikers Island
17. FACILITY LOCATION (NUMBER AND STREET ADDRESS): 17-25 Hazen Street
18. CITY - TOWN - VILLAGE: East Elmhurst, NY | 19. ZIP: 11370
20. BUILDING NAME OR NUMBER: Cogen Building | 21. FLOOR NAME OR NUMBER: 1
22. START UP DATE: 07 / 2012 (MO / YR) | 23. DRAWING NUMBERS OF PLANS SUBMITTED: Figures 1, 2, and 3
24. PERMIT TO CONSTRUCT: A [X] NEW SOURCE B [ ] MODIFICATION
25. CERTIFICATE TO OPERATE: A [ ] NEW SOURCE B [ ] MODIFICATION C [ ] EXISTING SOURCE

SECTION B

26. EMISSION POINT	27. EMISSION SOURCE/CONTROL	28. STACK HEIGHT (FEET)	29. STACK DIAMETER (FEET)	30. STACK GAS EXIT TEMP. (°F)	31. STACK GAS EXIT VELOCITY (FT./SEC.)	32. STACK GAS FLOW RATE (ACFM)
U0032	15.5	57	100	66	955	108.3	127,616

33. SOURCE CODE	34. HRS/DAY	35. DAYS/YR	36. CONSTRUCTION DATE: MON.	DAY	YR
	24	365	25	25	25

37. DESCRIPTION OF EMISSION POINT SOURCE: Emission Point U0028 is the bypass stack, which exhausts the 7.5 MW simple cycle gas fired turbine from Train #2. Emissions from the main stack (Emission Point U0027) and the bypass stack would be proportional to the load through each stack. Emissions from U0028 reflect total emissions through the bypass stack at 100 percent load and at ISO conditions (ambient temp. of 59F).

SECTION C

38. PREVENTIVE CONTROL EQUIPMENT	39. MANUFACTURER	40. MODEL NO.	41. DISPOSAL METHOD	42. DATE INSTALLED MO/YR	43. USEFUL LIFE
None				/	

44. CALCULATIONS: See attached emissions calculation sheet.

SECTION D

45. CONTAMINANT NAME	46. CAS NUMBER	47. SOURCE CODE	48. EMISSION RATE (PPH)	49. EMISSION RATE (LBS/HR)	50. EMISSION FACTOR	51. EMISSION FACTOR (LBS/HR)	52. HOURLY EMISSIONS (LBS/HR) ACTUAL	53. HOURLY EMISSIONS (LBS/HR) ALLOWABLE	54. ANNUAL EMISSIONS (LBS/YR) ACTUAL	55. ANNUAL EMISSIONS (LBS/YR) ALLOWABLE	56. PERMIT NUMBER
Total Particulates	NY75-00-0			1.64	01	4		1.64	1.64	14,372	0	
Sulfur Dioxide	7446_09_5			0.01	01	4		0.01	0.01	88	0	
Nitrogen Oxides	NY210_00_0			3.70	01	4		3.70	3.70	32,412	0	
Carbon Monoxide	630_08_0			4.70	01	4		4.70	4.70	41,172	0	
Volatile Organic Compounds	NY998_00_0			0.27	01	4		0.27	0.27	2,365	0	

SECTION G

57. SOLID WASTE FEED RATE	58. LIQUID WASTE THROUGHPUT OF GALLONS PER	59. HOURS	60. THROUGHPUT OF GALLONS	61. BTU/LB	62. APPLICABLE RULE	63. APPLICABLE RULE
		52	734,394	1030		

Upon completion of construction the stationary source(s) shall be operated in compliance with applicable requirements of 6 NYCRR Subparts 201-6 and Part 227. If this process is subject to Reasonably Available Control Technology (RACT) requirements, the owner and/or operator must submit a certification in accordance with 6 NYCRR Part 201-6.4(d)(4).

THE PROCESS, EXHAUST OR VENTILATION SYSTEM HAS BEEN CONSTRUCTED AND WILL BE OPERATED IN ACCORDANCE WITH THE APPLICATION AND IN COMPLIANCE WITH ALL PROVISIONS OF 6 NYCRR PART 201 AND APPLICABLE RULES AND REGULATIONS.

SIGNATURE OF OWNER OR AUTHORIZED REPRESENTATIVE | TITLE | DATE

AGENCY USE ONLY

156. LOCATION CODE | 157. FACILITY ID. NO. | 158. U.T.M. (E) | 159. U.T.M. (N) | 160. SIC NUMBER | 161. DATE APPL. RECEIVED | 162. DATE APPL. REVIEWED | 163. REVIEWED BY

PERMIT TO CONSTRUCT

164. DATE ISSUED	165. EXPIRATION DATE	166. SIGNATURE OF APPROVAL	167. FEE
/ /	/ /		

168.
1. DEVIATION FROM APPROVED APPLICATION SHALL VOID THIS PERMIT.
2. THIS IS NOT A CERTIFICATE TO OPERATE.
3. TESTS AND/OR ADDITIONAL EMISSION CONTROL EQUIPMENT MAY BE REQUIRED PRIOR TO THE ISSUANCE OF A CERTIFICATE TO OPERATE.

CERTIFICATE TO OPERATE

169. DATE ISSUED	170. EXPIRATION DATE	171. SIGNATURE OF APPROVAL	172. FEE
/ /	/ /		

173.
1. [ ] INSPECTED BY _____ DATE _____
2. [ ] INSPECTION DISCLOSED DIFFERENCES AS BUILT VS. PERMIT. CHANGES INDICATED ON FORM
3. [ ] ISSUE CERTIFICATE TO OPERATE FOR SOURCE AS BUILT
4. [ ] APPLICATION FOR C.O. DENIED _____ DATE _____ INITIALED

174. SPECIAL CONDITIONS:
1. 2. 3. 4. 5. 6.

AGENCY USE ONLY

BASIS OF DESIGN REPORT

Rikers Island
Basis of Design

Revision 2.0

10/12/2009

New York Power Authority

DMJM HARRIS | AECOM

Rikers Island Cogeneration Project Basis of Design

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Appendix D Heat and Mass Balance Diagrams
Appendix E Prime Mover Curves
Appendix F Preliminary Site Layout Drawing
Appendix G Existing and Future Equipment Drawing
Appendix H Electrical Drawings
Appendix I Control Diagrams

1.0 Introduction

Rikers Island is a main holding facility for suspects involved in criminal court cases in New York City. There are 10 detention centers on Rikers Island (the "Site" or Rikers) that house approximately 15,000 suspects. Rikers Island has its own laundry and bakery operations. In the fall of 2006, NYC Department of Correction ("NYC DOC") requested NYPA to perform a feasibility study to evaluate different energy efficiency technologies (renewable power and cogeneration) to reduce energy consumption, lower emissions, and increase reliability at Rikers Island.

It is critical that Rikers Island has a reliable and continuous energy supply. Rikers has expanded over a number of years and emergency generation for critical loads has been included at all facilities. Rikers has experienced several power outages in the past few years which require them to operate the numerous back-up diesel fueled generators on site for extended periods of time. While these diesel generators have been adequate for emergency back-up they are not configured to provide 100% redundancy and the Department of Correction (DOC) is seeking another more reliable option; consistent onsite power generation on the island.

The feasibility study completed April 2007 concluded that cogeneration showed significant promise in meeting those goals of reduce energy consumption, lowering emissions and increasing power reliability. Pursuant to that, the New York Power Authority (NYPA) has been commissioned by NYC DOC to complete a 30% design document for a Cogeneration Facility on Rikers Island.

This Basis of Design is based on a preliminary cogeneration study completed April 2007 as well as a more detailed modeling assessment completed in 2008. The preliminary feasibility study looked at several different cogeneration configurations to determine the most favorable. Based on the initial feasibility analysis the best configuration from an economic, environmental, and reliability standpoint were three 7MW (nominal) gas turbines with enough thermal chilling to utilize the excess recovered heat in the summer period. The detailed modeling study assessed the impact of a detailed hourly load as well as future heating and cooling plans at Riker's Island to determine the best configuration. The first revision of the Basis of Design documents was utilized during a Value Engineering review that took place in January and February of 2009. The results of both studies as well as the value engineering activities have contributed to the Basis of Design below. Following receipt of bids for the major equipment this modeling will be repeated to determine the recommended configuration.

2.0 Overall Design Recommendation

Based on hourly models of electric demand, thermal demand, weather, and turbine load variation the current cogeneration design recommendation is to install two (2) nominal 7MW gas turbine generators with Heat Recovery Steam Generators (HRSGs) that include duct burners for supplemental firing. Two turbines will not be able to fully cover the peak winter load; however, the installation of a third turbine which would run mainly to cover the winter load is not deemed economic at this time. Also, with subsequent removal of the electric resistance heating on the island (planned as part of the DOC Master Plan for Rikers Island) the winter peak will be significantly diminished leaving a third turbine operating less than 160 hours per year. At that point the third turbine would mainly be serving as a spare. While additional turbine configurations and sizes may be

considered, turbines much larger than 7MW may be significantly oversized resulting in part load inefficiencies and result in lower savings. Also, turbines with power generation significantly smaller than 7MW may not be able to cover the majority of the summer load when significant savings can be accrued. Duct burner firing is included as part of the base design as it increases the overall efficiency of the steam production and decreases the need for boilers. The use of inlet turbine cooling was also studied as this can increase the electricity production in the summertime and provide a sink for excess steam production. As this time only coils for this inlet cooling is included in the Basis of Design. It is anticipated that as future funding comes available a dedicated chiller plant will be constructed for these gas turbines.

Below is a summary table of the results of the detailed analysis along with important assumptions. Additionally, graphs illustrating potential future electrical and thermal loads on the island are shown. Detailed information on this analysis is contained in Appendix A.

Table 2.1 Design Recommendation Economic Summary

Description	Case 1: 3 x 7MW Turbines w/DB and IC	Case 2: 2 x 7MW Turbines w/DB and IC	Case 3: 2 x 7MW Turbines w/DB no IC	Case 4: 2 x 7MW Turbines wo/DB and IC
Case Summary	Original Feasibility	Sensitivity	Basis of Design	Sensitivity
Current Natural Gas Price ($/MMBTU)	8.50	8.50	8.50	8.50
Purchased Electricity Cost ($k/year)	1,366	3,257	3,597	3,597
Differential O&M Costs ($k/year)	965	837	820	820
Net Cost of Electricity ($/kWh)	0.0570	0.065	0.0633	0.072
Net Operating Savings ($k/year)	7,205	6,152	5,956	5,177

Important Assumptions:

- **Gas Price: Includes expected increase ~$8.50/MMbtu**
- **Cogeneration Gas Price: Assumes slightly discounted rate ~$0.50/MMbtu below Tariff Pricing**
- **Power Price: Includes expected increases ~ $0.110/kWh, Future PASNY Tariff**
- **Stand-by Power Price: Future PASNY 4 Tariff for Predicted Max Demand**
- **Maintenance Costs ~$0.009/kWh of generated power**
- **Electric Bills Include Demand Reduction Credits**
- **Case 1 Includes Heat Recovery Credit for Decreased D/A Steam w/additional economizer**
- **Electrical and Thermal Profiles based on historic usage for the Oct. '06 to Sept. '07 calendar year**

Potential Rikers Island Future Electric and Thermal Load Information

- Phase 1 – No change in current levels of electrical and thermal demand
- Phase 2 – Eliminate 2300 Temporary Beds Replace with 2832 Permanent Beds (permanent buildings would include thermal cooling addition)
- Phase 3 – Eliminate 2000 Temporary Beds, No Permanent Bed Replacement

Figure 2.1 Rikers Island Phasing Winter Electrical and Thermal Demand

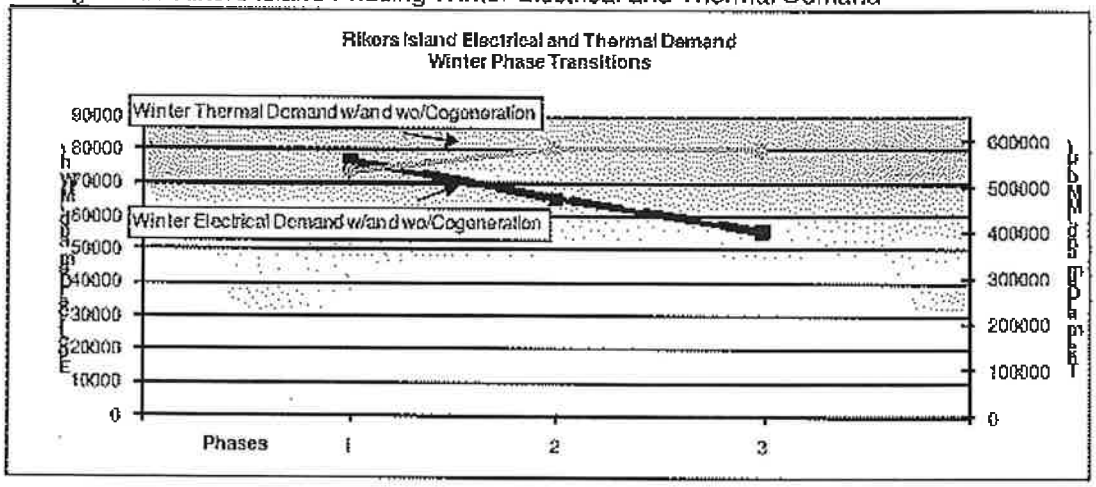
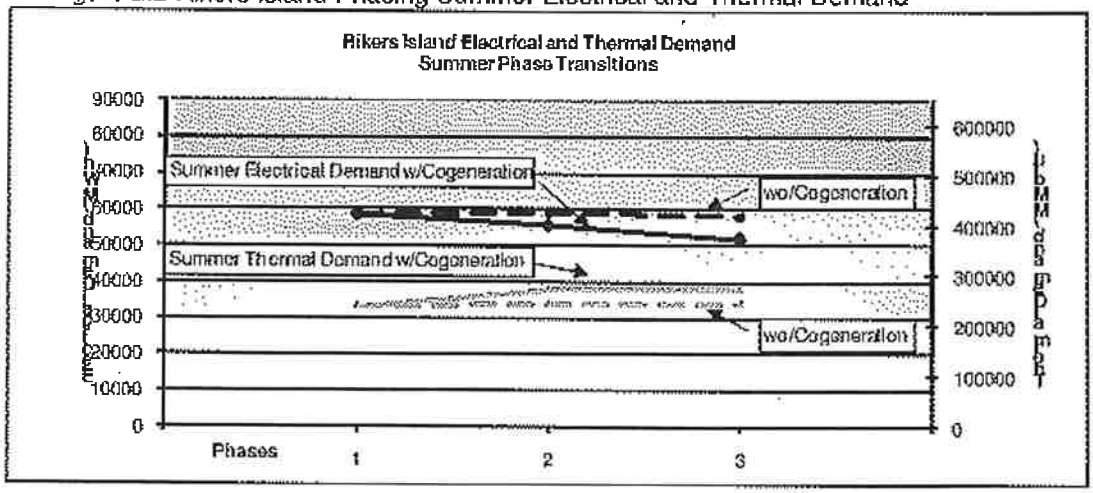


Figure 2.2 Rikers Island Phasing Summer Electrical and Thermal Demand



3.0 Site Information

3.1 Utility Pricing

The most important economic aspect of the project is the fuel price. Currently the fuel price for Riker's Island is based on a negotiated 10 year contract. Based on the most recent year of bills the average yearly cost is $7.87/MMbtu. At a minimum this cost is expected to increase to approximately $8.50/MMbtu. However, several sensitivities were run at even higher gas prices to demonstrate the impact on overall financial savings. It is assumed the Cogeneration Gas will be procured at this rate or slightly better due to the profile and timing of gas purchases. This information will be confirmed with the Utility providing the gas as the design process continues and future modeling will use the revised natural gas costs. To provide the client with an estimate of the impact of changes in natural gas costs, several economic sensitivity scenarios for natural gas price

have been completed for the current electrical and thermal demand profile utilizing the Basis of Design configuration of two 7MW turbines with duct burners no inlet cooling:

Table 3.1.1 Gas Price Economic Sensitivity

Gas Price ($/MMbtu)	% Change	Annual Project Savings ($k)
$10.50	+23.5%	$ 4,626
$15.00	+76.5%	$ 1,636

Currently, the electricity price is averaging a little over $0.100/kWh for the past year, for this analysis an increase in average price to $0.110/kWh was assumed. In the future all the electricity meters for the island will be consolidated to one point of interconnection with one meter. The final future Con Edison tariff rate is still under investigation, for now it is assumed the rate will produce pricing similar to the one currently in place. Several economic sensitivity scenarios for electricity price have been completed for the Basis of Design and are shown in the table below:

Table 3.1.2 Electric Price Economic Sensitivity

Electricity Price ($/kWh)	% Change	Annual Project Savings ($k)
$0.1265	+15%	$ 7,902
$0.1408	+28%	$ 9,590

The most important aspect of the future rate will be the stand-by charges. For the basis of design it is assumed that the amount of power purchased for stand-by will be the maximum amount of peak power purchased over the model year. The analysis above includes the PASNY 4 Tariff which is currently used to calculate stand-by rates for NYPA customers. This amount of peak power decreases with each phase since the amount of electrical heating produced is also decreasing with conversion to permanent buildings with heating provided from the central plant.

Currently the only charge for water has been ~$40k a year for chemical treatment. Water is provided by the City and Rikers is not charged separately for this service. It is not anticipated that there will be a significant increase in water usage due to the cogeneration project. However, the addition of chilling, thermal or electrical may increase water usage required for cooling tower evaporation.

3.2 Utility Usage

Several different hourly utility usage scenarios were created based on a meeting with the DOC planning team on January 16, 2008. The current usage of the island was deemed as the Phase 1 or Base Case scenario. Interval metering data from NYPA was collected for the 7 time of use accounts:

Account #'s	Annual Usage (kWh)
29-0118-1358-4500-5	7,449,600
29-0118-1358-6000-4	12,753,600

29-0118-4001-0000-3	8,539,200
29-0118-6030-2000-8	21,595,200
29-0118-1364-0600-5	40,464,000
29-0118-1364-0100-6	17,616,000
29-0118-4000-0000-5	8,475,600

Billing data for the other 4 accounts was included in the hourly profiles by adding incremental % load increase to each hour based on the amount of kWh for these accounts.

Account #'s	Annual Usage (kWh)
29-0118-4002-0000-1	4,279,200
29-0118-4003-0000-9	6,485,600
29-0118-4004-0000-7	109,440
29-0118-4007-0200-6	7,535,200

Thermal data was collected on an hourly basis from the powerhouse control system for a simultaneous time period. This data was verified with natural gas bills and adjusted appropriately for Rikers Boiler Efficiency.

Account #'s	Annual Usage (MMbtu)
29-0118-4002-0000-1	1,053,633

The electrical and thermal profiles are based on the most recent full year of data available during the feasibility study for the site from October 2006 to September 2007.

3.3 Phase Modeling for Current and Future Site Usage

3.3.1 Phase 1 Current Site Usage

Phase 1 assumes cogeneration with no change to current thermal or electrical profiles. This phase results in some purchased electricity in the winter due to the high winter electric heating demand and some excess summer waste heat. The hourly electrical profile was created based on the interval metering data for the time of day accounts as well as a factor for the non-time of day accounts. The hourly thermal profile was created based on hourly snapshot data from the powerhouse. The final profile was created using this data with the monthly gas usage bills to create an hourly thermal profile. Below are approximate maximum and minimum seasonal demands for electricity and thermal heat. These demands do not necessarily occur simultaneously. Detailed hourly seasonal profiles for Phase 1 are contained in Appendix C.

Table 3.1.1 Phase 1 Electrical Demand

Description	Units	Max.	Min.	Avg.
Winter Electrical Demand:	kW	26490	11466	18529
Summer Max Electrical Demand:	kW	17669	9428	13111
Average (Shoulder Period) Electrical Demand:	kW	25911	8642	14806
Total Annual Electrical Demand:	kW	26490	8642	15482

Table 3.1.2 Phase 1 Thermal Demand

Description	Units	Max.	Min.	Avg.
Winter Max Thermal Steam Demand:	klbs/hr	204	64	133
Summer Max Thermal Steam Demand:	klbs/hr	69	25	42
Average (Shoulder Period) Thermal Steam Demand:	klbs/hr	185	22	90
Total Annual Thermal Demand:	klbs/hr	204	22	88

3.3.2 Phase 2 Future Site Usage

Phase 2 assumes Cogeneration with future predictions for electrical and thermal profiles. This phase assumes ~2300 beds in the modular units are replaced with permanent facilities as well as thermal air conditioning added to at least one permanent facility. It is assumed that the new permanent facilities will have thermal steam heating as well as thermal cooling with the exception of the new RMSC facility which has already been designed with electric roof-top units.

Table 3.2.1 Facilities Removed

Jail Name	Type	# of Beds	Heating	Cooling
MOD AREA 1	MODS	300	Electricity	Electricity
MOD AREA 2	MODS	800	Electricity	Electricity
MOD AREA 3	MODS	300	Electricity	Electricity
MOD AREA 4	MODS	400	Electricity	Electricity
MOD AREA 5	MODS	500	Electricity	Electricity

Table 3.2.2 Facilities Added

Jail Name	Type	# of Beds	Heating	Cooling
Facility 1	Permanent	800	Thermal	Electricity
Facility 2	Permanent	1200	Thermal	Thermal
Facility 3	Permanent	832	Thermal	Thermal
Facility 4	Permanent	800*	Thermal	Thermal

*Bed Number assumed for NIC for Chilling Calculation Purposes and may not actually reflect number of beds in NIC.

Based on the high correlation between current electric usage and heating degree days, the amount of load converted from electric to thermal was calculated using a regression of Heating Degree Days and Cooling Degree Days with electric usage. See figures below for these curves:

Figure 3.2.1 Heating Degree Days and Daily Electric Usage

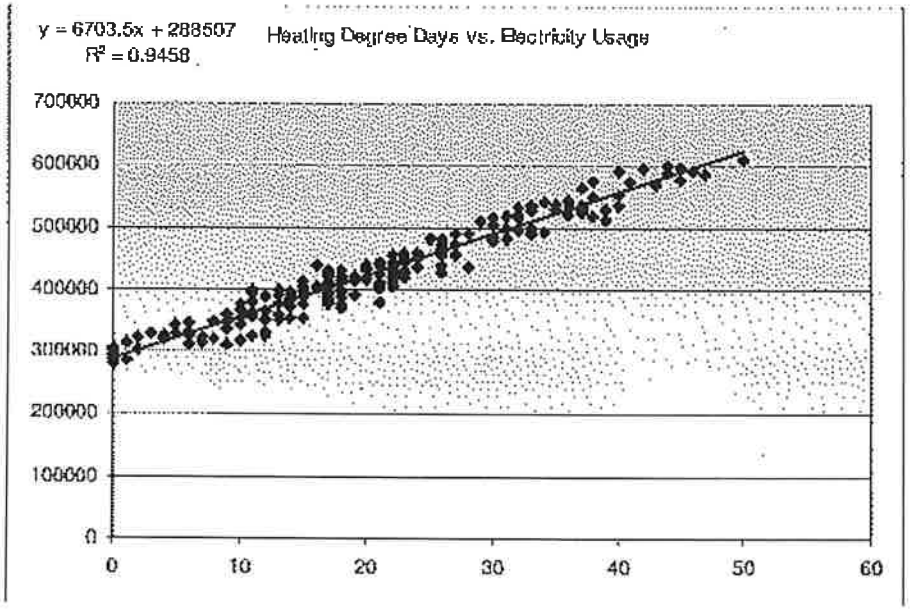
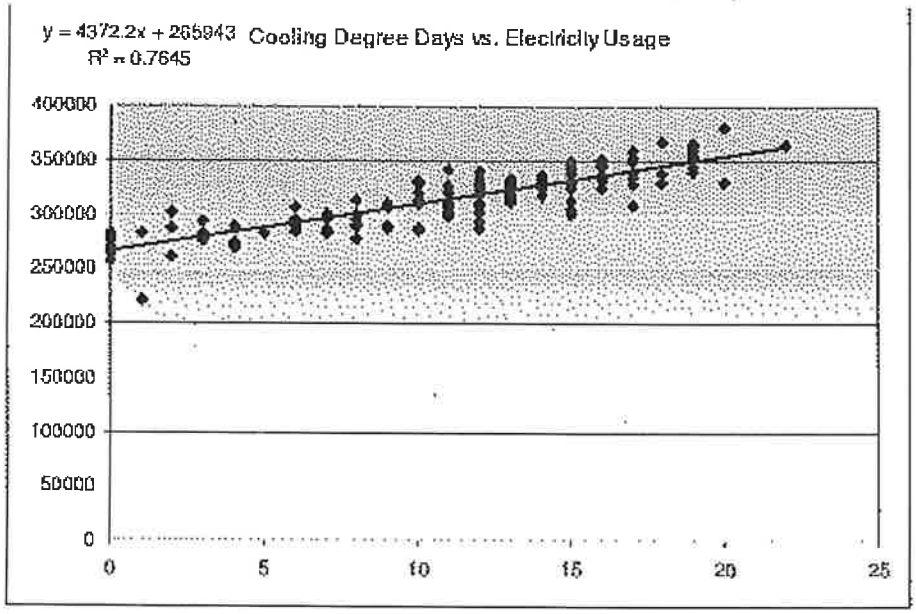


Figure 3.2.2 Cooling Degree Days and Daily Electric Usage



More detailed information on these calculations can be found in Appendix B.

The project economics of the Phase 2 profiles are helped by an increase the amount of thermal energy recovered in the summer; however, the decrease in the amount of power cogenerated in the winter due to the elimination of the electric heating in the Mods negatively impacts project economics. Below are

approximate maximum and minimum seasonal demands for electricity and thermal heat. These demands do not necessarily occur simultaneously. Detailed hourly seasonal profiles for Phase 2 are contained in Appendix C.

Table 3.2.3 Phase 2 Electrical Demand

Description	Units	Max.	Min.	Avg.
Winter Electrical Demand:	kW	20079	11017	15996
Summer Max Electrical Demand:	kW	16069	9262	12507
Average (Shoulder Period) Electrical Demand:	kW	19695	8642	13444
Total Annual Electrical Demand:	kW	20079	8642	13828

Table 3.2.4 Phase 2 Thermal Demand

Description	Units	Max.	Min.	Avg.
Winter Max Thermal Steam Demand:	klbs/hr	233	66	147
Summer Max Thermal Steam Demand:	klbs/hr	79	28	51
Average (Shoulder Period) Thermal Steam Demand:	klbs/hr	214	23	97
Total Annual Thermal Demand:	klbs/hr	233	23	98

3.3.3 Phase 3 and Phase 3a Future Site Usage

Phase 3 assumes cogeneration based on future predictions for thermal and electrical profiles as provided by DOC. This phase assumes that in addition to the load changes in Phase 2, several of the Sprungs (~ 2000 beds) are removed. Two cases for additional replacement facilities are run in Phase 3, an additional 2000 bed facility on the island and a Phase 3a with no additional permanent facilities being added.

Table 3.3.1 Phase 3 and 3a Facilities Removed

Jail Name	Type	# of Beds
SPRUNG 1	SPRUNGS	2000

Table 3.3.2 Phase 3 and 3a Facilities Added

Jail Name	Type	# of Beds
Phase 3 Unknown	Permanent	2000
Phase 3a Unknown	Permanent	0

The electrical profile for Phase 3 and 3a is the profile for Phase 2 modified by removal of winter heating and summer cooling load in proportion to respective loads per bed. The thermal profile for Phase 3 is the profile for Phase 2 modified by the increase in winter heating and summer cooling load in proportion to respective loads per bed. The thermal profile for Phase 3a is the profile for Phase 2 with no increase in winter heating and summer cooling load in proportion to respective loads per bed.

Again the results are helped due to the thermal chilling in the summer but are also worsened by the removal of the electric heating load in the winter. Below are approximate maximum and minimum seasonal demands for electricity and thermal heat. These demands do not necessarily occur simultaneously. Detailed hourly seasonal profiles for Phase 3 and 3a are contained in Appendix C.

Table 3.3.3 Phase 3 Electrical Demand

Description	Units	Max.	Min.	Avg.
Winter Electrical Demand:	kW	15944	9708	13045
Summer Max Electrical Demand:	kW	14202	8692	11701
Average (Shoulder Period) Electrical Demand:	kW	15178	8642	12228
Total Annual Electrical Demand:	kW	15944	8642	12289

Table 3.3.4 Phase 3 Thermal Demand

Description	Units	Max.	Min.	Avg.
Winter Max Thermal Steam Demand:	klbs/hr	253	68	157
Summer Max Thermal Steam Demand:	klbs/hr	94	28	57
Average (Shoulder Period) Thermal Steam Demand:	klbs/hr	235	23	101
Total Annual Thermal Demand:	klbs/hr	253	23	105

4.0 Equipment Specifications

4.1 Prime Mover

Specific Code Requirements
In addition to the applicable federal, state, and city regulations regarding Building, Plumbing, Electrical, Mechanical, and Fire, The following codes and standards must be applied at a minimum in design and construction of the Rikers Island Cogeneration Facilities.

(a) New York City Building Construction Code
(b) New York Board of Public Utilities Regulations
(c) ASME (American Society of Mechanical Engineers) Code Requirements
    (1) Pressure Vessels (Fired and Unfired)
(d) ANSI (American National Standards Institute)
(e) ABMA (American Boilers Manufacturers Association)
(f) UL (Underwriters Laboratory)
(g) IEEE (Institute of Electrical and Electronics Engineers)
(h) NEC (National Electric Code)
(i) NFPA (National Fire Protection Association)
    (1) Boiler and Combusting Systems Hazards Code
(j) OSHA (Occupational Safety and Health Act)
(k) EPA (Environmental Protection Agency)
(l) ASCE (American Society of Civil Engineers)
(m) ASHRAE (American Society of Heating, Refrigerating, and Air Conditioning Engineers)

Description
The preliminary feasibility study determined that the best prime mover for Riker's Island Cogeneration Facility is a Gas Turbine. Some of the reasons for the Gas Turbine selection include steam waste heat recovery, continuous operation, and the base loaded nature of the Rikers operation. A variety of prime movers in the

5-10MW range were selected for modeling. A set of power, fuel, and steam curves for each prime mover were created utilizing the GT Pro/Thermoflex Software package. This package has updated data from each of the gas turbine vendors and is able to model each turbine and HRSG package directly. The following gas turbines were modeled (Gas Turbine Curves found in Appendix D):

Table 4.1.1 Gas Turbine at Conditions (100% Load, 59F, 70%RH)

Manufacturer	Model	Net Power Output (kW)	Simple Cycle Heat Rate (btu/kWh, HHV)	Approximate Steam Output (klbs/hr)
GE	GE-10	10740	12350	63.4
Kawasaki	GPB-70	6600	12800	40.0
Siemens	SGT-300	7530	12700	46.1
Solar	Taurus 60	5250	12700	29.2
Solar	Taurus 70	7090	11620	31.3
Solar	Mars 90	9000	12400	50.5

With the exception of the Taurus 60, each gas turbine was modeled at 5 different ambient temperatures ranging from 23°F – 85°F. The Taurus 60 was modeled at three different temperatures ranging from 23°F – 85°F. The actual temperatures modeled were: 23°F, 38.5°F, 54°F, 69.5°F, 85°F. Also the electrical load was varied from 50% - 100%. The actual electrical load percentages modeled: 50%, 62.5%, 75%, 87.5%, and 100%.

It should be noted that while the GE-10 was modeled, current information from the vendor would suggest that it is not a commercially viable turbine for this project due to redesign activities and a lack of ability to provide systems in the time frames required for our project. However, the results of the modeling give insight to comparable turbines of this size and therefore the results are included in this report.

Each gas turbine was modeled in each of the phases described in the Electrical and Thermal profiles section. In the model ambient air temperature was varied hourly to match average, max, and min temperatures for weather at Rikers Island. The most relevant profiles are shown in the tables below. Data on other Turbine scenarios is contained in Appendix A.

Table 4.1.3 Results of 3 Turbine Modeling

Turbine	Hours of Run Time (hrs)	Average Load (%)	Average Heat Rate (btu/kWh)
GE-10	8760	68%	14,163
GE-10	8541	67%	14,279
GE-10	452	66%	14,000
GPB-70	8760	82%	13,396
GPB-70	8760	82%	13,396
GPB-70	6158	81%	13,447
SGT-300	8760	79%	13,314
SGT-300	8760	79%	13,314
SGT-300	4424	77%	13,343

Taurus 70	8,760	80%	12,238
Taurus 70	8,760	80%	12,238
Taurus 70	5,175	78%	12,282
Mars 90	8760	74%	13,176
Mars 90	8757	73%	13,176
Mars 90	1908	71%	13,111

Table 4.1.4 Results of 2 Turbine Modeling without Inlet Cooling

Turbine	Hours of Run Time (hrs)	Average Load (%)	Average Heat Rate (btu/kWh)
Taurus 70	8672	95%	11,780
Taurus 70	8670	95%	11,780
Taurus 70	---	---	---
Taurus 60	8672	100%	12,650
Taurus 60	8672	100%	12,650
Taurus 60	---	---	---

Table 4.1.5 Results of 2 Turbine Modeling with Inlet Cooling

Turbine	Hours of Run Time (hrs)	Average Load (%)	Average Heat Rate (btu/kWh)
Taurus 70	8672	93%	11,700
Taurus 70	8666	93%	11,700
Taurus 70	---	---	---
Taurus 60	8672	100%	12,500
Taurus 60	8672	100%	12,500
Taurus 60	---	---	---

Based on this savings analysis and the capital costs of each case, the basis of design will assume two 7MW gas turbines, similar to the Solar Taurus 70 with supplemental duct burner firing but no inlet cooling.

Preliminary Design Conditions

Fuel to Gas Turbine (Estimated)
Pressure: 350 psig (1)
Min Temperature: 270°F (2)
Max Temperature: 402°F (2)
Flow Max (per Turbine): 92.4 MMbtu/hr HHV (1548 scf/m, 1.075 lbs/s)
Flow Min (per Turbine): 60.1 MMbtu/hr HHV (968 scf/m, 0.68 lbs/s)
Total Flow Max: 184.8 MMbtu/hr HHV (3095 scf/m, 2.15 lbs/s) (3)
Total Flow Min: 120.2 MMbtu/hr HHV (2013 scf/m, 1.40 lbs/s) (4)

Air to Gas Turbine (Estimated)
Pressure: Ambient (14.7 psia)
Temperature: Ambient (wo/Inlet Cooling) (23°F - 85°F)
Humidity: 70%
Flow Max: 61.7 lbs/s (Max Load at 15°F)

Flow Min: 57.3 lbs/s (Min Load at 60°F)

Gas Turbine Exhaust (Estimated)
Pressure: 15 to 16 psia
Max Temperature: 944°F (Varies w/Load and OAT)
Min Temperature: 702°F (Varies w/Load and OAT)
Flow Max: 62.7 lbs/s
Flow Min: 58.0 lbs/s

Gas Turbine Power Output (Estimated)
Max Power (Gross): 8421 kW (100% load, 15°F)
Min Power (Gross): 4315 kW (60% load, 60°F)

NOTES: (1) Needs to be verified with Equipment Vendor
(2) Dependent on final gas line pressure and gas compressor specifications
(3) Assumes 2 Turbines Max
(4) Assumes 2 Turbines Min

Equipment Specifications

Prime Mover

Description	Value	Units
# of Gas Turbines	2	---
Fuel	Natural Gas	---
Net Power Output Capacity (100%, 59°F)	7090	kW
Approximate Heat Rate (100%, 59°F, HHV)	11,620	Btu/kW
Availability	99%	
Minimum Time Between Inspections	30,000	hrs
Noise Requirements (3 ft from enclosure)	70	dB

As can be seen in the tables above, the best fit from a loading standpoint was a 2 x 7MW turbine configuration. However, not all turbine manufacturers make 7MW turbines at the specified heat rate during the bid process each turbine should be evaluated on total life cycle cost

Recommended Vendors:
The following table is a list of recommended equipment vendors.

Table 4.1.8 Recommended Gas Turbine Vendors and Contact Information

Company	Name	Phone	Email
Kawasaki	Mario DeRobertis	908-277-6611	Mario.DeRobertis@kmc-usa.com
Siemens	Kristi Aaby	281-856-4515	Kristi.Aaby@siemens.com
Solar	Bernie Pfeifer	201-825-8200	berniepfeifer@solarturbines.com

4.2 Heat Recovery Steam Generator

Code Requirements
In addition to the applicable federal, state, and city regulations regarding Building, Plumbing, Electrical, Mechanical, and Fire, The following codes and

standards must be applied at a minimum in design and construction of the Rikers Island Cogeneration Facilities.

(a) New York City Building Construction Code
(b) New York Board of Public Utilities Regulations
(c) ASME (American Society of Mechanical Engineers) Code Requirements
    (1) Pressure Vessels (Fired and Unfired)
(d) ANSI (American National Standards Institute)
(e) ABMA (American Boilers Manufacturers Association)
(f) UL (Underwriters Laboratory)
(g) IEEE (Institute of Electrical and Electronics Engineers)
(h) NEC (National Electric Code)
(i) NFPA (National Fire Protection Association)
    (1) Boiler and Combusting Systems Hazards Code
(j) OSHA (Occupational Safety and Health Act)
(k) EPA (Environmental Protection Agency)
(l) ASCE (American Society of Civil Engineers)
(m) ASHRAE (American Society of Heating, Refrigerating, and Air Conditioning Engineers)

Description
Heat Recovery Steam Generators (HRSGs) are required to recover the heat off the gas turbine exhaust. Currently Rikers Island generates steam at one pressure level (150 psig) in several dual fuel boilers. Steam is distributed at three different pressure levels high pressure (150 psig), medium pressure (80 psig), and low pressure (20 psig). The steam headers are controlled by several PRV's. Each gas turbine will have an individual HRSG. The HRSGs for each of the gas turbines will be specified to generate steam at 150 psig and 100% dryness. The incoming make-up water is a mixture that is approximately 70% condensate and 30% make-up water. The existing steam distribution and condensate return systems are not being modified as part of the scope of this project. It is assumed that the future modifications will provide similar levels of condensate return and that the 30% makeup will remain constant for future loads.

There are currently three deaerators which operate at approximately 230°F. Each deaerator has a capacity of 288,000 lbs/hr. Typically two of the three deaerators are operated and one deaerator is kept in reserve. There are five fairly new boiler feed water pumps directly beneath the deaerator. The total capacity of the pumps is approximately 400,000 lbs/hr which is suitable for the maximum average load of 160,000 lbs/hr. There are also five condensate make-up water pumps that have a total capacity of 400,000 lbs/hr. Since at this time no additional steam capacity is needed due to the addition of the gas turbines this equipment should be adequate for BFW supply. Please see Appendix G for existing and future equipment drawing.

The HRSG will require controls and a configuration that allows for operation at a widely varying seasonal demand. The ability to turndown the HRSG during low steam usage periods through the use of a bypass damper will be required. Additionally, a controls interface with the existing boilers will be required to ensure the optimum utilization of the HRSGs and boilers. Integration of the burner flame safety and firing controls must included in the HRSG design. These should all be integrated into the system controls package.

For optimal heat recovery three configurations were proposed utilizing various existing BFW equipment and minimizing stack losses. The first configuration was to include an integral deaerator as part of HRSG. This would allow the make-up water from the condensate tank to be fed directly into the HRSG unit. The advantage of this configuration was that maximum heat could be recovered from the flue gases resulting in a lower stack temperature and less steam required to the deaerator. The disadvantage was the cost of this configuration and lack of utilization of existing equipment. Another configuration proposed utilized existing equipment and maximizes heat recovery but requires additional water lines to pump the water from an economizer in the HRSG back to the deaerator. The final configuration recommended does not require any additional feed water equipment but eliminates the additional feed water economizer thus some additional heat losses occur.

Due to the elimination of the feed water economizer section the HRSG will recover heat down to 350°F with a minimum stack temperature of 250°F. The minimum stack temperature will be highly dependent on the amount of sulfur in the fuel and designers should assume current natural gas conditions to remain in effect in the future.

The HRSG design is highly contingent upon the environmental restrictions and requirements. A more detailed design of the HRSG will need to be completed to determine if the seasonal variance in flow is possible. Specifications should require suppliers to provide the data required for this level of analysis so that full modeling of submittals can be completed. A hot gas turbine by-pass or equivalent type of control will be required to provide a means of eliminating waste heat during periods of low steam demand. Heat recovery steam generators can be configured in two basic design types: wet only operation (wet) or wet/dry operation (dry). The conventional design is based on a wet configuration where the system requires water and steam flow through the unit at all times. While these units do have some turn down capacity there is a lower limit at which the exhaust must be bypassed around the HRSG. This configuration therefore will require a bypass damper. The dry HRSG is designed such that the material will allow for periods of operation without flow on the water/steam side of the heat exchange surfaces. This type of HRSG requires special materials and is normally more expensive than a conventional HRSG. Additionally, this type of unit requires more complex operational procedures. This is mainly related to required cool down periods when the unit has been operated dry and the inability to immediately introduce flow on the water/steam side of the system. Based on the additional cost, complexity and operational limitations these units are only recommended when the environmental conditions are such that a bypass or dual SCR are cost prohibitive. Our recommendation for this system is to install a

conventional (wet) HRSG with a modulating bypass damper to allow for the variations in steam usage on Rikers Island.

The HRSG will also include a duct burner for supplemental firing during high usage periods. A duct burner would allow the HRSG to be supplementally fired and produce almost double the output during winter operation. The advantage of the duct burner is that the overall efficiency of the firing is substantially better than firing the existing boilers. A duct burner takes advantage of the hot exhaust and O2 content of the Gas Turbine and combusts additional fuel for added heat recovery at a higher efficiency since the combustion air has been already pre-heated. Also with supplemental firing the HRSG would be able to produce enough steam to replace the firing of an existing boiler. The addition of the duct burner will impact operation and turndown in the summer months and this range of turndown must be accounted for in the final designs. The duct burner should be designed to supplemental fire up to a temperature of 1600°F in high load periods yielding approximately 75klbs/hr of total steam from the HRSG.

Preliminary Design Conditions

HRSG Steam (Estimated)
Pressure: 150 psig
Temperature: 368°F (min. above saturation)
Max Flow (per HRSG): 78.1 klbs/hr (1)
Min Flow (per HRSG): 13.3 klbs/hr (1) (2)
Total Flow Max: 156.2 klbs/hr (3)
Total Flow Min: 23 klbs/hr (2)

HRSG Make-up Water (Estimated)
Pressure: 30 psig
Temperature: 150°F
% Condensate: 70%
Total Max Flow: 154.7 klbs/hr (76.6 klbs/hr per HRSG)
Total Min Flow: 23.2 klbs/hr (11.6 klbs/hr per HRSG) (2)

HRSG Exhaust In (Estimated)
Pressure: 15 psia to 16 psia
Temperature: 1600°F to 702°F
Max Flow: 62.7 lbs/s
Min Flow: 58.0 lbs/s

HRSG Exhaust Out (Estimated)
Pressure: 14.7 psia
Temperature: 350°F
Max Flow: 62.7 lbs/s
Min Flow: 58.0 lbs/s

HRSG Bypass (Estimated)
Max Flow (per HRSG): 17.5 MMbtu/hr
Total Max Flow: 35.0 MMbtu/hr
Min Flow: 0 MMbtu/hr

NOTES: (1) Includes 1% for BD
(2) This is the min steam demand for one turbine, actual min demand for island is 22.2 klbs/hr
(3) Actual Model Max Steam Demand Generated

Equipment Specifications

HRSG Specifications

Description	Value	Units
# of HRSGs	2 (1 per Gas Turbine)	---
# of Steam Pressure Levels	1	---
Steam Pressure	150	psig
Steam Quality	1	---
Min. Stack Temperature	250	F
Estimated Max Heat Recovery	76	MMbtu/hr
Estimated Min Heat Recovery	22*	MMbtu/hr

*This may not be feasible without stack by-pass

Duct Burner Fuel (Estimated)
Pressure: 30 psia
Temperature: 1600°F
Max Flow: 48 MMbtu/hr HHV (790 scf/m, 0.558 lbs/s)
Min Flow: 0 MMbtu/hr HHV (0 scf/m)

Duct Burner Specifications

Description	Value	Units
# of Duct Burners	2 (1 per HRSG)	---
Duct Burner Fuel	Natural Gas	---
Duct Burner Firing Max. Temperature	1600	°F
Duct Burner Firing Max. Capacity (Estimated)	48	MMbtu/hr

Recommended Vendors:
The HRSG vendor will be determined by the Gas Turbine Vendor. In order to avoid maintenance and operations conflict as well as solidify warrantees the gas turbine and HRSG should be purchased from the same vendor.

Vendor Recommendations

Vendor	Location	Phone
Indeck Boiler Corporation	St. Hyacinthe, Quebec	(814) 464-1203
Rentech Boilers	Abilene, TX	(973) 539-8242
C-B, Energy Recovery	Lincoln, NE	(402) 434-2006

4.3 Electric Generator

Code Requirements

In addition to the applicable federal, state, and city regulations regarding Building, Plumbing, Electrical, Mechanical, and Fire, The following codes and standards must be applied at a minimum in design and construction of the Rikers Island Cogeneration Facilities.

(a) New York City Building Construction Code

(b) New York Board of Public Utilities Regulations

(c) ASME (American Society of Mechanical Engineers) Code Requirements

(1) Pressure Vessels (Fired and Unfired)

(d) ANSI (American National Standards Institute)

(e) ABMA (American Boilers Manufacturers Association)

(f) UL (Underwriters Laboratory)

(g) IEEE (Institute of Electrical and Electronics Engineers)

(h) NEC (National Electric Code)

(i) NFPA (National Fire Protection Association)

(1) Boiler and Combusting Systems Hazards Code

(j) OSHA (Occupational Safety and Health Act)

(k) EPA (Environmental Protection Agency)

(l) ASCE (American Society of Civil Engineers)

(m) ASHRAE (American Society of Heating, Refrigerating, and Air Conditioning Engineers)

Equipment Description

Each gas turbine skid shall contain an electric generator. The electric generator shall produce three phase AC power at 60Hz and 13.8 kV. The generators will tie into the electric distribution system as described in Section 4.6.

Preliminary Design Conditions

Gas Turbine Power Output (Estimated)

Max Power (Gross): 8421 kW (100% load, 15°F)

Min Power (Gross): 4315 kW (60% load, 60°F)

Equipment Specifications

Electric Generator Equipment Specifications

Description	Value	Units
# of Generators	3 (1 per Gas Turbine)	---
Type	Synchronous	---
Power	Alternating Current	
Frequency	60	Hz
Generator Voltage	13.8	kV
Efficiency	>96%	%

Recommended Vendors
The generator vendor will be determined by the Gas Turbine Vendor. In order to avoid maintenance and operations conflict as well as solidify warrantees the gas turbine and generator should be purchased from the same vendor.

4.4 Fuel Supply/Gas Compressor

Code Requirements
In addition to the applicable federal, state, and city regulations regarding Building, Plumbing, Electrical, Mechanical, and Fire, The following codes and standards must be applied at a minimum in design and construction of the Rikers Island Cogeneration Facilities.

(a) New York City Building Construction Code
(b) New York Board of Public Utilities Regulations
(c) ASME (American Society of Mechanical Engineers) Code Requirements
    (1) Pressure Vessels (Fired and Unfired)
(d) ANSI (American National Standards Institute)
(e) ABMA (American Boilers Manufacturers Association)
(f) UL (Underwriters Laboratory)
(g) IEEE (Institute of Electrical and Electronics Engineers)
(h) NEC (National Electric Code)
(i) NFPA (National Fire Protection Association)
    (1) Boiler and Combusting Systems Hazards Code
(j) OSHA (Occupational Safety and Health Act)
(k) EPA (Environmental Protection Agency)
(l) ASCE (American Society of Civil Engineers)
(m) ASHRAE (American Society of Heating, Refrigerating, and Air Conditioning Engineers)

Description
Natural Gas is supplied to the island through two (2) independent gas lines. One pipeline from Queens and another from the Bronx. The Bronx line is a 10 inch line carrying 10 psi natural gas. The Queens line is smaller and starts out as a 4 inch line running 60 psi natural gas. This line is eventually reduced in pressure down to 10 psi at a point where the pipe size changes to 8 inch. The Bronx gas line serves the powerhouse and the Queens line serves other facilities on the island. Due to the size, pressure, carrying capacity and location of the Bronx line it is recommended that this line be utilized to supply the turbines with Natural Gas.

In order to provide natural gas at the required pressures a gas compressor will be required. The size of the gas compressor should be based on the minimum requirements of supply gas pressure from the utility as well as the required natural gas pressure as specified by the gas turbine supplier. A minimum of 3 gas compressors each sized for 100% of one gas turbine load should be utilized.

This configuration offers improved reliability as failure of a gas compressor will not limit gas turbine operation.

These gas compressors will not be tied to a common header. However piping should be such that a spare compressor is available for each gas turbine. A bypass line, recirculation system and gas cooler should also be provided for control and operation at the full range of flow conditions. The base pipeline gas assumptions are shown below based a two nominal 7.0MW turbine configuration.

Preliminary Design Conditions

Pipeline Gas Flow Specifications (Estimated)
Pressure: Undetermined >15 psig
Temperature: Undetermined, Ambient
Max Flow: 370 MMbtu/hr HHV (6200 scfm)

Gas Compressor Flow Specifications (Estimated)
Pressure: Undetermined >15 psig
Temperature: Undetermined, Ambient
Max Flow: 185 MMbtu/hr HHV (3100 scfm)

Equipment Specifications

Gas Compressor Specifications

Description	Value	Units
# of Compressors	3	--
Max Capacity per Turbine	92.5	MMbtu/hr
Min Capacity per Turbine	59	MMbtu/hr
Pressure Ratio	To be determined by final Turbine Vendor and Pipeline Pressure Estimated range 7 – 23	(psi/psi)
Minimum Efficiency	70	%
Power Demand	168 – 290	kW

Vendor Recommendations

Vendor	Location	Phone
Toromont	Denver, CO	(303) 292-2423
SCFM	Tulsa, OK	(918) 663-1309
AG Equipment	Broken Arrow, OK	(918) 250-7386

4.5 Make-up Water Supply/Treatment

Code Requirements
In addition to the applicable federal, state, and city regulations regarding Building, Plumbing, Electrical, Mechanical, and Fire, The following codes and standards must be applied at a minimum in design and construction of the Rikers Island Cogeneration Facilities.

(a) New York City Building Construction Code
(b) New York Board of Public Utilities Regulations
(c) ASME (American Society of Mechanical Engineers) Code Requirements
    (1) Pressure Vessels (Fired and Unfired)
(d) ANSI (American National Standards Institute)
(e) ABMA (American Boilers Manufacturers Association)
(f) UL (Underwriters Laboratory)
(g) IEEE (Institute of Electrical and Electronics Engineers)
(h) NEC (National Electric Code)
(i) NFPA (National Fire Protection Association)
    (1) Boiler and Combusting Systems Hazards Code
(j) OSHA (Occupational Safety and Health Act)
(k) EPA (Environmental Protection Agency)
(l) ASCE (American Society of Civil Engineers)
(m) ASHRAE (American Society of Heating, Refrigerating, and Air Conditioning Engineers)

Description

While the current level of water treatment may be adequate for steam generated at 150 psig. The current treatment system removes hardness from the incoming make-up water through a cation resin bed which removes some of the water hardness. These resin beds are regenerated automatically based on effluent hardness using a brine solution. Following the make-up water treatment, the water is combined with return condensate in one of two condensate tanks. At this time pH is adjusted as necessary using caustic. From this point the boiler feed water is mechanically deaerated using low pressure steam in a horizontal deaerator. Both sulfite and phosphate are then injected to control solids and oxygen corrosion in the steam drum.

Currently most of the chemical treatment is done manually. There has been a history of fouled tubes and the current practice of periodic acid washing which will not be acceptable for the HRSGs. The water treatment system for the HRSGs should be specified to provide for a completely automated chemical injection process. The system should be set-up to monitor chemical injection levels real time and adjust accordingly.

Design Conditions

Make-up Water Specifications (Estimated)
Pressure: 5 psig
Temperature: 60°F

Condensate Specifications (Estimated)
Pressure: 5 psig
Temperature: 190°F
Condensate Return %: 70%

Equipment Specification:

Water Treatment Specifications

Description	Value
Max TDS	ASME (or ABMA) BFW limits for 150 psig steam
Hardness	ASME (or ABMA) BFW limits for 150 psig steam
Suspended Solids	ASME (or ABMA) BFW limits for 150 psig steam
Silica	ASME (or ABMA) BFW limits for 150 psig steam

Equipment Specifications

- Individualized Water Treatment Equipment per Gas Turbine Skid
- Automatic Chemical Treatment Injection
- Real Time Monitoring of Chemical Injection

Recommended Vendors

GE
Nalco

4.6 Electrical Distribution

Code Requirements
In addition to the applicable federal, state, and city regulations regarding Building, Plumbing, Electrical, Mechanical, and Fire, The following codes and standards must be applied at a minimum in design and construction of the Rikers Island Cogeneration Facilities.

(a) New York City Building Construction Code
(b) New York Board of Public Utilities Regulations
(c) ASME (American Society of Mechanical Engineers) Code Requirements
    (1) Pressure Vessels (Fired and Unfired)
(d) ANSI (American National Standards Institute)
(e) ABMA (American Boilers Manufacturers Association)
(f) UL (Underwriters Laboratory)
(g) IEEE (Institute of Electrical and Electronics Engineers)
(h) NEC (National Electric Code)
(i) NFPA (National Fire Protection Association)
    (1) Boiler and Combusting Systems Hazards Code
(j) OSHA (Occupational Safety and Health Act)
(k) EPA (Environmental Protection Agency)
(l) ASCE (American Society of Civil Engineers)
(m) ASHRAE (American Society of Heating, Refrigerating, and Air Conditioning Engineers)

Description
Four (4) main 26.4kV electrical feeders supply Rikers Island with power from Con Edison's utility grid system. Two (2) of the electrical feeders come over on the main transportation bridge to the island. The other two (2) feeders run underwater to the island. All four (4) feeders form a parallel network design. The system is set up so that only two of the four (4) feeders are required to supply the island with 100% of its required power. All feeders approach on the south side of the island and the voltage is stepped down to 4160V, 480V, and 208V at various substations throughout the site. There are two main substations R1 and R2 that receive all four of the main feeders and each serve the "temporary facilities" (Sprungs and Mods) on the east and west side respectively. The major facilities are served directly from these feeders and numerous transformers are located throughout the Site to provide electrical power to various jails and support locations.

The electrical distribution layout is highly dependent on the negotiations with Con Edison which are currently ongoing. The interconnection and system modifications are currently being design in conjunction with others and will be provided as a supplement to this document as they become available.

A preliminary one line and location diagram are provided in Appendix H.

Design Conditions
N/A

Equipment Specifications

Transformers

Description	Value	Units
# of Transformers	6	--

Recommended Vendors

Switchgear Vendors
- GE
- Siemens
- Square D

Transformer Vendors
- GE
- Siemens
- ABB

4.7 Thermal Distribution

Code Requirements
In addition to the applicable federal, state, and city regulations regarding Building, Plumbing, Electrical, Mechanical, and Fire, The following codes and standards must be applied at a minimum in design and construction of the Rikers Island Cogeneration Facilities.

(a) New York City Building Construction Code
(b) New York Board of Public Utilities Regulations
(c) ASME (American Society of Mechanical Engineers) Code Requirements
    (1) Pressure Vessels (Fired and Unfired)
(d) ANSI (American National Standards Institute)
(e) ABMA (American Boilers Manufacturers Association)
(f) UL (Underwriters Laboratory)
(g) IEEE (Institute of Electrical and Electronics Engineers)
(h) NEC (National Electric Code)
(i) NFPA (National Fire Protection Association)
    (1) Boiler and Combusting Systems Hazards Code
(j) OSHA (Occupational Safety and Health Act)
(k) EPA (Environmental Protection Agency)
(l) ASCE (American Society of Civil Engineers)
(m) ASHRAE (American Society of Heating, Refrigerating, and Air Conditioning Engineers)

Description

There are currently three (3) different steam pressure levels distributed on the island. The main pressure levels are nominally 140 psi, 60 psi, and 8 psi. High pressure steam is let down through a number of pressure reduction valves (PRV's) throughout the Site including the powerhouse. There are four (4) main steam headers on the island with two (2) main distribution tunnels serving the east and west sides of the island. There are approximately 3 miles of underground steam tunnels at Rikers. These steam tunnels were recently updated for lighting and asbestos abatement. The steam piping appeared to be in good condition although a significant amount of water was noted in the tunnels which may be a result of leaking pipes. There are various condensate and sump pump stations throughout the steam tunnels which send water back to the power house. Several of these are out of service resulting in some standing water in the steam tunnels. It is anticipated that no modifications to the existing steam and condensate distribution system will be required.

There are two main thermal distribution connections that will be required as well as other minor connections depending on the final configuration. The two main thermal connections are for HRSG feedwater to the HRSG and HRSG steam output from the HRSG. Specifications for all internal thermal connections will be included in the design and should be completed in a manner to support good operational and maintenance practices. Connections to the existing system should be provided in a manner that allow for continued operation of all existing boilers. Additionally the system should be configured to allow for minimal disruption of operations of the existing boiler systems. The Site has a continuous operational requirement and the impact of integrating the new systems with the existing must address the ability to remain in service during construction.

The HRSG feedwater connection shall be located downstream of the Deaerator. The exact location of this connection in the powerhouse shall be determined upon final water treatment configuration but will likely be located in the same area as the current water treatment filtration system. No additional modifications to the condensate collection system external to the powerhouse are included in the current scope of this project.

The HRSG steam connection shall be located upstream of the steam PRV system inside the powerhouse. No future modifications to the steam distribution system are included in the current scope of this project. Please see drawing in Appendix G.

Design Conditions

HRSG Steam (Estimated)
Pressure: 150 psig
Temperature: 368°F (min. above saturation)
Total Flow Max: 74.5 klbs/hr
Total Flow Min: 23 klbs/hr

HRSG Make-up Water (Estimated)
Pressure: 30 psig
Temperature: 150°F

% Condensate: 70%
Total Max Flow: 75.3 klbs/hr
Total Min Flow: 23.2 klbs/hr

Equipment Specifications

Thermal Distribution Pipe Specifications

Description	Value	Units
Pipe Size	TBD in final design	
Pipe Spec	Carbon Steel - 300# rating (per ASME guidelines for saturated 150 psig steam)	

4.8 System Controls

Description
The new cogeneration system controls will provide for a common operator interface and consolidate the activities of the all new equipment to a common control room. This system will provide both control and monitoring functionality and will serve as the main data collection system for the new plant. The control system will be able to control both the power and thermal generation from one system. The existing controls for the powerhouse will need to interface with the new control system and should provide the operators with remote access to the existing panels. Existing controls that can not be interfaced need to be clearly identified so that expansion of the scope of supply is considered to allow for the upgrading of these controls to provide for their integration. See Appendix I for a preliminary control diagram.

The system should also be designed for interface with real time power pricing and automated control of power and thermal generation equipment based on real time economic decisions.

Design Conditions

N/A

Equipment Specification

System Control Specifications

System Control Specifications
Minimum of 2 User Stations
- Graphic User Interface
- PC based interface control options
- Historical Data Collection
  - 15 Second Storage for 1 Year
  - Ability to export data to spreadsheet
- Real Time Graphing Capacity
    - Ability to set up to 20 standard daily monitoring graphs

    - Ability to custom select parameters for short term monitoring
- Reporting Capabilities
    - Ability to create 5 standard custom reports
- Control of onboard GT functions
- Control of HRSG
- Duct Firing Controls
- HRSG Flame Safety System
- Control of BFW system
- Control of Existing Boiler Operation

Specific monitoring, control and system points will be identified as specific equipment is identified.

4.9 Site Preparation/Buildings

Specific Code Requirements
In addition to the applicable federal, state, and city regulations regarding Building, Plumbing, Electrical, Mechanical, and Fire, The following codes and standards must be applied at a minimum in design and construction of the Rikers Island Cogeneration Facilities.

(a) New York City Building Construction Code

(b) New York Board of Public Utilities Regulations

(c) ASME (American Society of Mechanical Engineers) Code Requirements

(1) Pressure Vessels (Fired and Unfired)

(d) ANSI (American National Standards Institute)

(e) ABMA (American Boilers Manufacturers Association)

(f) UL (Underwriters Laboratory)

(g) IEEE (Institute of Electrical and Electronics Engineers)

(h) NEC (National Electric Code)

(I) NFPA (National Fire Protection Association)

(1) Boiler and Combusting Systems Hazards Code

(j) OSHA (Occupational Safety and Health Act)

(k) EPA (Environmental Protection Agency)

(l) ASCE (American Society of Civil Engineers)

(m) ASHRAE (American Society of Heating, Refrigerating, and Air Conditioning Engineers)

Description
The gas turbine and ancillary equipment will need to be kept inside of a weather proof enclosure. Additionally conditioned indoor space will be required for the control systems, maintenance area, and office space. The estimated size for the building facilities will depend on the final turbine/HRSG set chosen as well as the location of electrical equipment. Based on a nominal 2 x 7MW HRSG configuration the following space requirements have been estimated. These estimates are subject to change and negotiation depending on final design

configuration. A drawing with the approximate site dimensions as well as site space requirements is shown in Appendix F.

Design Conditions
One major concern is the ability of the building to withstand flooding and hurricane type natural disasters. The specific design conditions will be the 100 year flood plain contingency.

Equipment Specifications

Building Layout Requirements

Space Description	Amount
GT/HRSG/Switchgear/etc.	9000 ft^2

Minimum Structural Requirements

Space Description	Amount
Weight of Equipment	TBD by Gas Turbine Vendor
Hurricane/Flood Plain Protection	100 yr flood

4.10 Environmental/Emissions Equipment

Description
It is critical that this project reduce the amount of air emissions that are currently being produced by purchasing utility power and boiler firing. It is also critical that this project complies with the state and federal regulations regarding air emissions. Depending on the gas turbine a Selective Catalytic Reduction (SCR) section may be required to maximize the reduction in emissions and meet the environmental emissions regulations. The final configuration of the SCR should be determined by the HRSG vendor working with the environmental consultants.

Design Conditions

See Section 4.1 and 4.2 for GT and HRSG exhaust conditions.

Equipment Specifications

The environmental emissions equipment shall be designed to meet the following emissions specifications.

Emission Specifications

Description	Value	Units
NOx	TBD by AKRF	lbs/MMbtu
SOx	TBD by AKRF	lbs/MMbtu
CO	TBD by AKRF	lbs/MMbtu
PM 2.5	TBD by AKRF	lbs/MMbtu

Vendor Recommendations
The environmental emissions control equipment vendor will be determined by the Gas Turbine Vendor. In order to avoid maintenance and operations conflict as

well as solidify warrantees the gas turbine and generator should be purchased from the same vendor.

5.0 Other Information

5.1 Thermal Cooling Equipment

Due to cost constraints and economic performance only cooling coils for the gas turbines are included as part of the base design. Other thermal cooling equipment is not included at this time. The information below is included for future project reference.

Optional Inlet Cooling

Description
Another thermal chilling option is to utilize the excess steam for thermal chilling of the turbine inlet air. Increasing inlet air temperatures not only reduce the amount of power produced from the turbine but decrease the overall efficiency. One way to mitigate this de-rating is to install inlet air cooling. The only extra turbine equipment would be a set of coils at the inlet air intake sized for exchange with chilled water and chilled water piping from the thermal chiller to the inlet air intake. All of the turbines should be fitted with inlet air coils; however, the chilled water system should only be sized for two out of the three turbines at max load. This equipment is not critical for operations and no additional equipment for redundancy is necessary. Also, most of the summer only two turbines will be necessary for meeting demand and the thermal chilling does not need to be oversized. The standard equipment for any thermal chilling system will still be required: chiller, cooling water pumps, cooling tower, and chilled water pumps.

Design Conditions

Inlet Air to Chiller (Worst Case, Estimated):
Temperature: 97°F
Humidity: 40%
Dew Point: 76°F
Max Flow: 61.7 lbs/s

Inlet Air from Chiller (Estimated):
Temperature: 54°F
Humidity: 100%
Max Flow: 61.7 lbs/s

Steam to Inlet Chiller Estimated:
Temperature: 365°F
Pressure: 164 psia
Max Flow: 0.833 lbs/s

Equipment Specifications

Optional Inlet Air Cooling

Description	Value	Units

# of Units	2	---
Size	Supply 1 Turbine	---
Type	2-Stage Steam	---
COP	1.4	---

Rikers Island Facility HVAC

Description
In order to reduce the amount of turbine exhaust heat wasted during periods of low steam demand thermal cooling equipment should be installed at various locations on the Island. A few of these locations have already been identified including inlet air cooling for the gas turbines and thermal chilling at the hospital, JATC, and GVRC. Thermal chilling at these locations shall be accomplished by utilizing the existing steam system to distribute steam to distributed thermal chillers. A central chilled water system will not be economic due to the long distances between these facilities.

Design Conditions

Air to Chiller
Standard ASHRAE conditions for New York City

Steam to Inlet Chiller Estimated:
Temperature: 365°F
Pressure: 164 psia
Max Flow: 0.833 lbs/s

Equipment Specifications

Facility Air Cooling

Description	Value	Units
Type	2-Stage Steam	---
COP	1.4	---

5.2 Prison Barge
The prison barge was briefly scoped for the potential to wheel cogenerated power across the river to the barge. A summary of the most recent bills for this facility is shown below:

Table 5.1.1 Prison Barge Usage Information

	Max Demand (kW)	Total Usage (kWh)	Total Cost ($)	Average Cost per (kWh)
Jan	1,466	858,000	$ 73,616.00	$ 0.08
Feb	1,410	912,000	$ 74,985.00	$ 0.08
Mar	1,576	800,800	$ 80,379.00	$ 0.10
Apr	1,902	916,800	$ 86,913.00	$ 0.09

May	1,922	1,049,600	$ 101,090.00	$ 0.10
Jun	2,094	1,358,400	$ 159,305.00	$ 0.12
Jul	2,096	1,306,400	$ 161,225.00	$ 0.12
Aug	2,222	1,344,000	$ 153,923.00	$ 0.11
Sept	2,360	1,540,800	$ 180,078.00	$ 0.12
Oct	1,716	1,010,400	$ 81,386.00	$ 0.08
Nov	1,538	859,200	$ 65,939.00	$ 0.08
Dec	1,532	986,400	$ 72,751.00	$ 0.07
Max/Totals	2,360	12,972,800	$ 1,291,599.00	$ 0.0996

Based on bills the summer peak is approximately 2MW and the winter peak is 1.5MW. Currently, the added summer power would be generated in simple cycle at a heat rate of ~12,000 btu/kWh, and a cost of ~$0.09/kWh. This would provide no additional savings to the barge and only increase the cost of the project.

Alternatively the barge should be investigated for the potential for its own smaller cogeneration system. With both heating and chilling load there is potential for a decent payback.

Based on these factors the current design should not include the equipment required to connect the new cogeneration system to the Barge. Electrical design should address the requirement as option pricing so that a full economic evaluation can be provided.

5.3 Steam Turbine Generation

Another alternative requested for evaluation was the installation of a steam turbine based generation to recover additional energy.

The addition of a condensing steam turbine generator should not be included in the current scope as the economics and the additional complexity of the system are not justified.

There are currently pressure reduction valves to provide the lower pressure steam needed for the distribution system. The addition of back pressure steam turbines could recover some of the energy lost through that process; however they are not recommended at this time due to the low pressure drop, the additional complexity of these systems, and the maintenance requirements of steam turbine systems. Should designers determine that there are significant quantities of steam required at less than 150 psi this can be reevaluated.

Appendix A

STATE OF NEW YORK
RAMON LI
No. 060857
LICENSED PROFESSIONAL ENGINEER

2 Taurus 70's with Duct Burners no Inlet Cooling

Utility Cost Averages	Purchased Electricity	Avg. Natural Gas Cost
Current	$ 0.11	$ 8.50
Future	$ 0.18	$ 8.01

Total Savings	$ 6,152,328

Reformatted Savings by Time Period

Month	Peak 8AM-6PM	Evening Peak 6PM-10PM	Off Peak 10PM-8AM, Weekends
Jan	$ 931,407	$ 97,147	$ 161,455
Feb	$ 375,539	$ 83,367	$ 134,551
Mar	$ 375,224	$ 85,313	$ 103,361
Apr	$ 315,513	$ 68,233	$ 31,296
May	$ 254,977	$ 44,809	$ (76,423)
Jun	$ 320,839	$ 95,515	$ 44,752
Jul	$ 400,868	$ 100,980	$ 51,888
Aug	$ 420,143	$ 109,660	$ 97,529
Sep	$ 417,984	$ 108,190	$ 114,319
Oct	$ 332,631	$ 77,746	$ 78,607
Nov	$ 329,873	$ 73,725	$ 48,973
Dec	$ 368,089	$ 83,607	$ 90,651

Total Costs

Description	Current	Future
Fuel Cost	$ 9,356,068	$ 14,028,814
Electricity Cost	$ 14,920,066	$ 3,258,323
Operations and Maintenance Costs	$ 250,000	$ 1,086,669
Other Costs	$ -	$ -
Total Cost	$ 24,526,135	$ 18,373,806

Electrical and Steam Demand Profiles from '06-'07

Electricity Demand	135,288,634	kWh
Steam Demand	709,765	klbs
% Electricity Profile Sensitivity	0%	
% Steam Profile Sensitivity	0%	

Environmental Calculations

	CO2e Factors from PlaNYC		Tons CO2e	CO2 Numbers with Factors from NYPA
CO2 Emissions Electricity (current)	985	lbs CO2e/MWh	66,631	66,501
CO2 Emissions Fuel (current) (NG)	117	lbs CO2e/MMbtu	61,740	64,926
CO2 Emissions Fuel (current) (Oil)	174	lbs CO2e/MMbtu	3,214	3,630
Total Current			131,585	135,057
CO2 Emissions Electricity (future)	985	lbs CO2e/MWh	7,165	7,151
CO2 Emission (Gas Turbine and Boilers) (future)	117	lbs CO2e/MMbtu	102,679	107,978
Total Future			109,844	115,129
Differential Emissions CO2e (Tons)			21,741	19,928

For Summary Table

Case Description	2 Taurus 70's with Duct Burners no Inlet Cooling
Purchased Electricity Cost ($K/year)	$ 3,258,323
Differential O&M Costs ($K/year)	$ 836,669
Net Cost of Electricity ($/kWh)	$ 0.065
Net Operating Savings ($K/year)	$ 6,152,328
Estimated CO2e Reduction from PlaNYC	21,741

Electricity Tariff

Increases	19%	19%	33%

NYPA Tariff	Energy Demand	Energy Commodity	Delivery Demand - Summer	Delivery Demand - Winter
Peak	$ 10.0725	$ 0.1030	$ 24.9508	$ 5.2402
Part Peak	$ -	$ 0.1030	$ 24.9508	$ 5.2402
Light Sub	$ -	$ 0.0503	$ 24.9508	$ 5.2402
Deep Sub	$ -	$ 0.0503	$ 24.9508	$ 5.2402

	Stand-by Delivery
SC NYPA	
Monthly Charge	$ 1,198.00
Contract	$ 3.78
Contract Demand	26,490
As-Used Daily Demand	
Peak	$ 0.48840
Off Peak	$ 0.22210
Super Off Peak	$ 0.21520

Gas Tariff

Increases	8%	8%
Turbine Fuel Discount	$	0.50

Month	Current	Future for Turbine
Jan	$ 7.649	$ 7.149
Feb	$ 8.517	$ 8.017
Mar	$ 9.249	$ 8.749
Apr	$ 8.991	$ 8.491
May	$ 9.164	$ 8.664
Jun	$ 9.206	$ 8.706
Jul	$ 8.427	$ 7.927
Aug	$ 7.431	$ 6.931
Sep	$ 6.864	$ 6.364
Oct	$ 5.711	$ 5.211
Nov	$ 9.244	$ 8.744
Dec	$ 9.610	$ 9.110

Electrical and Thermal Profiles

Current Electrical Profile

Month	Energy Demand	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Units	kW	kWh	kWh	kWh	kWh
Jan	25,411	4,224,001	1,740,100	8,277,591	14,241,782
Feb	26,490	4,417,448	1,811,521	8,754,538	14,983,507
Mar	25,911	3,960,616	1,675,202	8,055,923	13,691,741
Apr	20,149	3,254,513	1,352,341	6,516,572	11,123,425
May	15,397	2,741,570	1,109,999	5,207,931	9,059,499
Jun	17,245	2,962,879	1,110,294	5,034,634	9,107,807
Jul	17,300	3,229,278	1,236,694	5,582,709	10,048,681
Aug	17,669	3,285,175	1,254,444	5,668,856	10,208,475
Sep	16,766	2,923,241	1,117,272	5,009,757	9,050,270
Oct	17,057	2,854,787	1,222,082	5,742,021	9,818,890
Nov	19,353	3,155,484	1,334,353	6,285,986	10,775,823
Dec	24,463	3,852,045	1,675,098	7,701,590	13,178,733
Totals		40,861,038	16,589,489	77,838,107	135,288,634

Current Fuel Demand Profile

Month	Energy Demand	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Units	MMbtu/hr	MMbtu	MMbtu	MMbtu	MMbtu
Jan	279	46,121	18,637	86,557	151,315
Feb	266	44,730	17,716	84,084	146,530
Mar	254	40,123	16,290	76,363	132,777
Apr	217	32,157	13,438	60,529	106,124
May	153	17,394	6,629	29,221	53,244
Jun	88	13,875	5,635	24,166	43,625
Jul	80	13,699	5,336	23,347	42,182
Aug	88	13,313	5,378	23,317	42,008
Sep	94	12,680	5,191	22,884	40,675
Oct	163	21,177	8,646	39,020	68,843
Nov	197	29,496	12,023	55,446	96,965
Dec	268	38,995	15,985	74,311	129,292
Totals		323,430	130,904	599,245	1,053,579

Future Electrical Billing Profile

Month	Energy Demand	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Units	kW	kWh	kWh	kWh	kWh
Jan	16,480	875,563	395,849	1,633,754	2,905,167
Feb	9,907	1,281,388	557,186	2,555,627	4,394,202
Mar	9,499	684,382	352,585	1,511,306	2,548,273
Apr	5,079	289,141	139,251	553,253	981,645
May	945	9,482	1,534	9,466	20,482
Jun	9,293	74,547	5,882	37,648	118,078
Jul	2,848	122,763	12,239	60,641	195,643
Aug	3,217	201,184	34,591	109,176	344,951
Sep	2,314	62,672	5,026	31,879	99,577
Oct	2,310	43,626	46,502	149,237	239,365
Nov	4,283	154,404	105,887	347,634	607,126
Dec	8,464	570,380	315,755	1,207,515	2,093,150
Totals		4,369,534	1,970,988	8,707,136	14,547,659

Future Electrical Generation

Month	Energy Demand	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Units	kW	kWh	kWh	kWh	kWh
Jan	8,921	3,348,438	1,344,341	6,643,837	11,336,616
Feb	10,583	3,136,060	1,254,335	6,198,910	10,589,305
Mar	16,413	3,276,234	1,322,617	6,544,617	11,143,467
Apr	15,070	2,905,371	1,213,090	5,963,319	10,141,780
May	14,452	2,732,088	1,108,465	5,198,465	9,039,017
Jun	7,952	2,888,331	1,104,412	4,996,986	8,989,729
Jul	14,452	3,106,515	1,224,455	5,522,068	9,853,038
Aug	14,452	3,083,991	1,219,853	5,559,680	9,863,524
Sep	14,452	2,860,560	1,112,246	4,977,878	8,950,693
Oct	14,746	2,811,161	1,175,580	5,592,784	9,579,525
Nov	15,069	3,001,080	1,229,266	5,938,352	10,168,697
Dec	15,999	3,281,666	1,309,843	6,494,075	11,085,583
Totals		36,491,504	14,618,501	69,630,971	120,740,975

Future Total Fuel

Month	Energy Demand	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Units	MMbtu/hr	MMbtu	MMbtu	MMbtu	MMbtu
Jan	348	60,782	24,507	116,004	201,293
Feb	335	58,354	23,166	111,112	192,631
Mar	326	54,888	22,197	106,255	183,339
Apr	281	46,530	19,179	89,875	155,584
May	219	35,059	13,772	65,002	113,833
Jun	172	34,078	13,256	61,331	108,665
Jul	167	36,175	14,320	66,223	116,718
Aug	173	36,001	14,289	66,560	116,850
Sep	167	34,040	13,414	61,648	109,102
Oct	230	38,000	15,582	73,350	126,931
Nov	260	44,496	18,089	85,555	148,140
Dec	335	53,621	21,733	103,764	179,119
Totals		532,025	213,504	1,006,678	1,752,207

Future Turbine Fuel

Month	Energy Demand	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Units	MMbtu/hr	MMbtu	MMbtu	MMbtu	MMbtu
Jan	183	38,122	15,290	75,373	128,785
Feb	185	35,337	14,134	69,689	119,161
Mar	183	37,538	15,116	74,574	127,227
Apr	176	34,648	14,082	69,140	117,870
May	169	33,087	13,367	63,547	109,991
Jun	167	34,034	13,193	61,221	108,447
Jul	167	36,175	14,320	66,223	116,718
Aug	167	35,980	14,282	66,533	116,804
Sep	167	33,804	13,258	61,063	108,125
Oct	171	33,698	13,915	66,678	114,292
Nov	173	30,952	14,219	68,953	118,124
Dec	180	37,588	15,012	74,159	126,759
Totals		424,968	170,183	817,153	1,412,303

Future Boiler Fuel

Month	Energy Demand	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Units	MMbtu/hr	MMbtu	MMbtu	MMbtu	MMbtu
Jan	164	22,661	9,217	40,631	72,509
Feb	150	23,016	9,032	41,422	73,471
Mar	143	17,349	7,081	31,681	56,112
Apr	105	11,881	5,007	20,735	37,713
May	51	1,977	410	1,455	3,842
Jun	6	44	63	111	218
Jul	-	0	-	0	0
Aug	6	12	7	27	46
Sep	-	236	156	585	977
Oct	59	4,302	1,666	6,671	12,640
Nov	87	9,545	3,869	16,602	30,016
Dec	156	16,033	6,721	29,606	52,360
Totals		107,057	43,321	189,525	339,903

Future Cogeneration Steam Profile

Month	Max Steam Generated	Steam Recovered	Steam Unrecovered	Boiler Steam	Total
Units	MMbtu	MMbtu	MMbtu	MMbtu	MMbtu
Jan	46,981	46,981	-	63,625	110,606
Feb	42,864	42,864	-	64,193	107,057
Mar	46,691	46,691	-	50,388	97,079
Apr	43,415	43,415	-	34,422	77,837
May	40,041	36,773	3,268	3,443	40,216
Jun	39,714	33,636	6,078	193	33,829
Jul	43,218	33,216	10,001	0	33,217
Aug	43,258	32,981	10,277	41	33,022
Sep	39,563	30,714	8,849	869	31,583
Oct	41,956	39,465	2,491	11,482	50,947
Nov	43,796	43,796	-	27,364	71,160
Dec	46,799	46,799	-	47,716	94,515
Totals		477,332	40,964	303,735	781,067

Electrical and Thermal Cost Profiles

Current Electrical Cost Profiles

Month	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Jan	$ 746,353	$ 201,371	$ 472,166	$ 1,419,890
Feb	$ 778,503	$ 209,658	$ 498,532	$ 1,487,693
Mar	$ 725,372	$ 195,117	$ 462,101	$ 1,382,590
Apr	$ 582,044	$ 156,841	$ 372,030	$ 1,110,915
May	$ 470,990	$ 127,738	$ 295,779	$ 894,507
Jun	$ 658,051	$ 186,033	$ 432,718	$ 1,276,803
Jul	$ 686,607	$ 199,277	$ 460,879	$ 1,346,763
Aug	$ 699,916	$ 202,639	$ 469,052	$ 1,371,608
Sep	$ 644,165	$ 184,760	$ 426,485	$ 1,255,410
Oct	$ 504,060	$ 145,158	$ 327,363	$ 972,581
Nov	$ 562,089	$ 154,293	$ 358,684	$ 1,075,066
Dec	$ 696,446	$ 188,693	$ 441,103	$ 1,326,242
Totals	$ 7,755,596	$ 2,147,577	$ 5,016,893	$ 14,920,066

Current Fuel Cost Profiles (NG)

Month	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Jan	$ 352,779	$ 142,553	$ 662,068	$ 1,157,400
Feb	$ 380,976	$ 150,890	$ 716,169	$ 1,248,036
Mar	$ 371,079	$ 150,662	$ 706,247	$ 1,227,988
Apr	$ 289,133	$ 120,829	$ 544,746	$ 954,708
May	$ 159,399	$ 60,750	$ 267,789	$ 487,938
Jun	$ 127,274	$ 51,875	$ 222,478	$ 401,626
Jul	$ 113,754	$ 44,964	$ 196,733	$ 355,451
Aug	$ 98,926	$ 39,962	$ 173,266	$ 312,154
Sep	$ 80,485	$ 35,629	$ 157,067	$ 279,181
Oct	$ 120,952	$ 49,382	$ 222,855	$ 393,189
Nov	$ 272,667	$ 111,142	$ 512,557	$ 896,365
Dec	$ 374,757	$ 153,625	$ 714,152	$ 1,242,533
Totals	$ 2,748,180	$ 1,112,262	$ 5,095,627	$ 8,956,068

Current Fuel Cost Profiles (Oil)*

Month	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Jan	$ 28,085	$ 11,349	$ 52,708	$ 92,142
Feb	$ 27,238	$ 10,788	$ 51,202	$ 89,228
Mar	$ 24,433	$ 9,920	$ 46,501	$ 80,853
Apr	$ -	$ -	$ -	$ -
May	$ -	$ -	$ -	$ -
Jun	$ -	$ -	$ -	$ -
Jul	$ -	$ -	$ -	$ -
Aug	$ -	$ -	$ -	$ -
Sep	$ -	$ -	$ -	$ -
Oct	$ -	$ -	$ -	$ -
Nov	$ 17,061	$ 7,321	$ 33,764	$ 58,046
Dec	$ 23,746	$ 9,734	$ 45,251	$ 78,731
Totals	$ 121,463	$ 49,112	$ 229,425	$ 400,000

Current Maintenance Cost Profiles*

Month	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Jan	$ 10,944	$ 4,422	$ 20,539	$ 35,905
Feb	$ 10,614	$ 4,204	$ 19,952	$ 34,770
Mar	$ 9,521	$ 3,865	$ 18,120	$ 31,506
Apr	$ 7,630	$ 3,189	$ 14,363	$ 25,182
May	$ 4,127	$ 1,573	$ 6,934	$ 12,634
Jun	$ 3,280	$ 1,337	$ 5,734	$ 10,352
Jul	$ 3,203	$ 1,266	$ 5,540	$ 10,009
Aug	$ 3,159	$ 1,276	$ 5,533	$ 9,968
Sep	$ 2,990	$ 1,232	$ 5,430	$ 9,652
Oct	$ 5,025	$ 2,052	$ 9,259	$ 16,336
Nov	$ 6,999	$ 2,853	$ 13,157	$ 23,009
Dec	$ 9,253	$ 3,793	$ 17,633	$ 30,679
Totals	$ 76,746	$ 31,062	$ 147,193	$ 250,000

* Distributed on a Boiler Usage Basis

Future Electrical Cost Profile

Month	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Jan	$ 323,199	$ 67,541	$ 124,462	$ 515,202
Feb	$ 307,257	$ 87,583	$ 170,868	$ 565,708
Mar	$ 232,278	$ 62,758	$ 118,299	$ 413,335
Apr	$ 133,396	$ 35,323	$ 70,071	$ 238,790
May	$ 53,046	$ 17,179	$ 42,698	$ 112,923
Jun	$ 149,920	$ 20,063	$ 44,116	$ 214,100
Jul	$ 93,513	$ 22,136	$ 45,274	$ 160,923
Aug	$ 110,005	$ 26,318	$ 47,717	$ 184,039
Sep	$ 77,794	$ 19,732	$ 43,826	$ 141,352
Oct	$ 73,656	$ 23,146	$ 49,734	$ 146,536
Nov	$ 108,390	$ 30,560	$ 59,721	$ 198,671
Dec	$ 206,336	$ 57,401	$ 103,006	$ 366,743
Total	$ 1,868,789	$ 469,742	$ 919,792	$ 3,258,323

Future Gas Cost Profile

Month	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Jan	$ 445,861	$ 179,808	$ 849,671	$ 1,475,290
Feb	$ 479,346	$ 190,243	$ 911,527	$ 1,581,116
Mar	$ 488,861	$ 197,727	$ 945,413	$ 1,632,002
Apr	$ 401,042	$ 165,407	$ 773,534	$ 1,339,983
May	$ 304,750	$ 119,531	$ 563,915	$ 988,197
Jun	$ 296,713	$ 115,446	$ 534,027	$ 946,185
Jul	$ 286,748	$ 113,510	$ 524,921	$ 925,179
Aug	$ 249,526	$ 99,039	$ 461,326	$ 809,891
Sep	$ 216,741	$ 85,439	$ 392,605	$ 694,785
Oct	$ 200,183	$ 87,035	$ 385,587	$ 667,806
Nov	$ 393,857	$ 160,106	$ 756,408	$ 1,310,371
Dec	$ 496,522	$ 203,358	$ 960,130	$ 1,658,010
Total	$ 4,260,150	$ 1,709,649	$ 8,059,015	$ 14,028,814

Future Maintenance Costs

Month	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Jan	$ 37,696	$ 15,199	$ 71,942	$ 124,836
Feb	$ 36,189	$ 14,367	$ 68,908	$ 119,464
Mar	$ 34,040	$ 13,766	$ 65,896	$ 113,702
Apr	$ 28,856	$ 11,894	$ 55,738	$ 96,488
May	$ 21,743	$ 8,541	$ 40,312	$ 70,596
Jun	$ 21,134	$ 8,221	$ 38,036	$ 67,391
Jul	$ 22,435	$ 8,881	$ 41,069	$ 72,385
Aug	$ 22,327	$ 8,862	$ 41,278	$ 72,467
Sep	$ 21,111	$ 8,319	$ 38,732	$ 67,662
Oct	$ 23,567	$ 9,663	$ 45,480	$ 78,719
Nov	$ 27,595	$ 11,218	$ 53,059	$ 91,872
Dec	$ 33,254	$ 13,478	$ 64,352	$ 111,084
Total	$ 329,947	$ 132,409	$ 624,313	$ 1,086,669

Equipment Data Profiles

Taurus 70 Modeling

Equipment Type	Prime Mover
Manufacturer	Solar
Model #	Taurus 70
Type	Gas Turbine
Description	Nominal 7.5MW Turbine w/HRSG

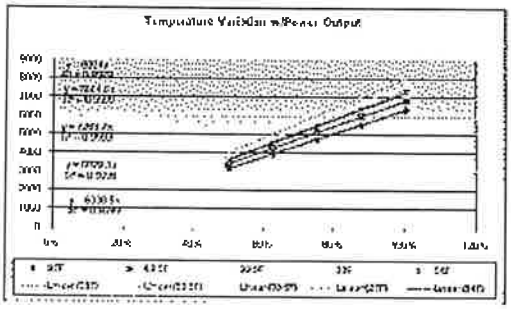
Temperature (oF)	59 F

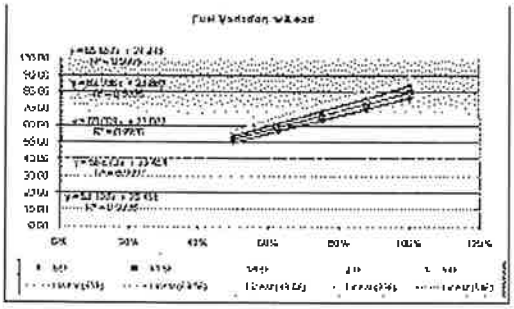
Load	Power Output (kW) (Iso)	Fuel Rate (MMBtu/hr)	Heat Rate/ Efficiency (btu/kW)	Total Recoverable Thermal Output (MMBtu/hr)	Steam Output (lbs/hr)
100%	7090.2	87.4	11670.0	35.9	35.9
80%	5672.1	70.7	12456.1	30.1	30.1
60%	4254.1	58.9	13849.6	24.4	24.4
50%	3545.1	53.1	14964.5	21.5	21.5

Turbine Curves vary on Temperature and Load

	a	b	c
Fuel Rate	0	-27.241	8697.4
Power Output	0	-0.2023	70.611
Heat Rate	0.000002	-0.0001	0.4901
Steam Output			

	a	b	c
Fuel Rate	0	0	0
Power Output	0.0003	-0.0404	25.052
Heat Rate	0	0.0746	-8.9859
Steam Output			





Duct Burner Firing	Duct Burner Firing Taurus 70
Manufacturer	Solar
Model #	Solar 70 Duct Burner
Type	Duct Burner

Load	Fuel Rate	Heat Rate/ Efficiency	Total Recoverable Thermal Output	Steam Output
100%	38	0.92	34.96	34.96
75%	28.5	0.91	25.935	25.935
50%	19	0.9	17.1	17.1
25%	9.5	0.89	8.455	8.455
Curve Coefficient A	-1.9007	0		0
Curve Coefficient B	45.364	0.04		40
Curve Coefficient C	0.0141	0.88		1E-13

Load Match	Taurus 70	Taurus 70	
Hours of Run Time	8672	8666	0
Availability	99%	99%	#DIV/0!
Heat Rate (btu/kW)	11,696	11,697	#DIV/0!

Weather Data

Heating Degree Days

Month	Avg	Max	Min	Total
January	25.92794468	48.87717069	0	19290.39084
February	31.96428571	51.56426724	15.76496067	23496
March	22.09245894	47.98140518	0	10436.78945
April	14.25759773	31.85852587	0	10265.47036
May	2.897595993	18.42279312	0	2155.811419
June	0.454274578	8.569922428	0	327.077696
July	0.054680694	4.091344843	0	40.68243651
August	0.413386555	11.25706898	0	307.5505972
September	0.500316858	9.465637945	0	364.5481379
October	7.254745902	22.00565518	0	5397.530951
November	11.66460954	26.48423277	0	8398.518866
December	19.37207034	40.81568804	0	14412.82033
Annual Total	87.87267295	203.9	22.2	769764.615

Cooling Degree Days

Month	Avg	Max	Min	Total
January	0.055110743	6.614607659	0	41.00702071
February	0	0	0	0
March	0.027942809	4.376646326	0	20.78944987
April	0.590931059	13.32847166	0	425.4703627
May	4.833079864	26.75620966	0	3595.811419
June	9.654274578	28.99436599	0	6951.077696
July	13.02242263	30.11314416	0	9688.682437
August	12.70170914	32.35130049	0	9451.559597
September	8.772983525	26.75620966	0	6316.548138
October	1.448294789	20.04234066	0	1077.530951
November	0.29794287	7.738580826	0	214.5188663
December	0.017231632	3.25766816	0	12.82033457
Annual Total	87.87267295	203.9	22.2	769764.615

Reliability

Assume 1 Prime Mover Down in Each Peak Period

Availability	99%
	kWh Penalty
Winter	$ 7,500
Summer	$ 6,500

Rikers Boiler Operation

Equipment Type	Boiler
Manufacturer	Various
Model	Rikers Boilers
Type	Steam Boiler
Description	70klbs/hr Boiler
Load	
100%	
75%	
50%	
25%	
Curve Method A	
Curve Coefficient 0	
Curve Coefficient 1	

Fuel Rate	Heat Rate/ Efficiency	Total Recoverable Thermal Output	Steam Output
92.10526316	0.76	70	70
70.94594595	0.74	52.5	52.5
50	0.7	35	35
29.16666667	0.6	17.5	17.5
	-0.32		
	0.608		
	0.47		

Equipment Data Profiles

Taurus 60 Modeling

Equipment Type	Prime Mover
Manufacturer	Solar
Model #	Taurus 60
Type	Gas Turbine
Description	Nominal 5.5MW Turbine w/HRSG

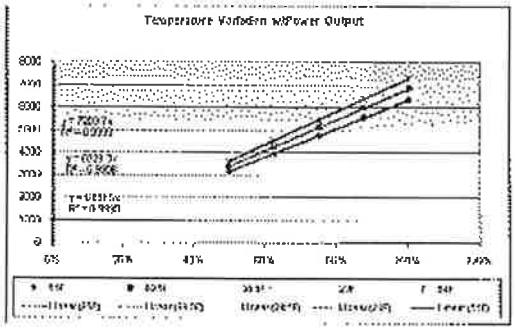
Turbine Inlet Temp	59 F

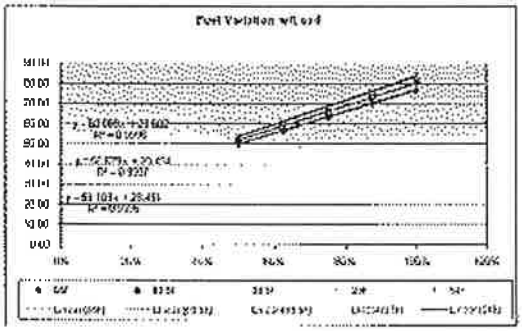
Load	Power Output (kW) (Iso)	Fuel Rate (MMbtu/hr)	Heat Rate/ Efficiency (btu/kW)	Total Recoverable Thermal Output (MMbtu/hr)	Steam Output (lbs/hr)
100%	5253	67	12679	29.19	29.19
75%	3940	55	13910	24.13	24.13
50%	2627	43	16370	19.08	19.08
25%	1313	31	23751	14.02	14.02

Turbine Curves vary on Temperature and Load

Coefficient	a	b	c
Power Output	0.00	-19.39	6397.00
Fuel Usage	0.00	-0.10	54.39
Steam Output	0.00	0.00	0.34

Coefficient	a	b	c
Power Output	0.00	0.00	0.00
Fuel Usage	0.00	-0.04	21.16
Steam Output	0.00	-0.09	4.87





Duct Burner Firing	Duct Burner Firing Taurus 60
Equipment Type	Solar
Manufacturer	Solar 60 Duct Burner
Model #	Duct Burner
Type	

Load	Fuel Rate	Heat Rate/ Efficiency	Total Recoverable Thermal Output	Steam Output
100%	40.80	0.92	37.5	37.5
75%	30.60	0.91	27.8	27.8
50%	20.40	0.9	18.4	18.4
25%	10.20	0.89	9.1	9.1
Curve Coefficient A	(0.60)	0		1.792
Curve Coefficient B	32.30	0.04		28.424
Curve Coefficient C	(0.00)	0.88		-20.13

	Taurus 70	Taurus 70	
Inlet Cooling Type	0	-6	0
% Load	93%	93%	0%
Heat Rate (btu/kW)	11,690	11,697	0

2 Taurus 70's with Duct Burners no Inlet Cooling

Utility Cost Averages	Purchased Electricity	Avg. Natural Gas Cost
Current	$ 0.11	$ 8.50
Future	$ 0.18	$ 8.01

Total Savings	$ 5,954,817

Reformatted Savings by Time Period

Month	Peak 8AM-6PM	Evening Peak 6PM-10PM	Off Peak 10PM-8AM, Weekends
Jan	$ 331,764	$ 97,241	$ 162,261
Feb	$ 375,766	$ 83,438	$ 134,984
Mar	$ 375,932	$ 85,494	$ 104,311
Apr	$ 318,382	$ 69,216	$ 34,768
May	$ 238,798	$ 45,069	$ (72,963)
Jun	$ 283,136	$ 89,898	$ 45,926
Jul	$ 353,493	$ 90,414	$ 57,631
Aug	$ 368,647	$ 98,427	$ 97,660
Sep	$ 380,801	$ 101,626	$ 115,347
Oct	$ 337,750	$ 77,809	$ 79,757
Nov	$ 332,009	$ 74,347	$ 52,198
Dec	$ 368,308	$ 83,727	$ 91,443

Total Costs

Description	Current	Future
Fuel Cost	$ 9,356,068	$ 13,903,841
Electricity Cost	$ 14,920,066	$ 3,597,571
Operations and Maintenance Costs	$ 250,000	$ 1,069,906
Other Costs	$ -	$ -
Total Cost	$ 24,526,135	$ 18,571,318

Electrical and Steam Demand Profiles from '06-'07

Electricity Demand	135,288,634	kWh
Steam Demand	709,765	klbs
% Electricity Profile Sensitivity	0%	
% Steam Profile Sensitivity	0%	

Environmental Calculations

	CO2e Factors from PlaNYC		CO2e Factors from PlaNYC	Tons CO2e	CO2 Numbers with Factors from NYPA
CO2 Emissions Electricity Current	985	lbs CO2e/MWh		66,631	66,501
CO2 Emissions Boiler Current (Net)	117	lbs CO2e/MMbtu		61,740	64,926
CO2 Emissions Boiler Current (Duct)	174	lbs CO2e/MMbtu		3,214	3,630
Total Current				131,585	135,057
CO2 Emissions Electricity Future	985	lbs CO2e/MWh		8,082	8,066
CO2 Emissions Gas Turbine and Boiler Total	117	lbs CO2e/MMbtu		101,735	106,985
Total Future				109,817	115,051
Differential Emissions CO2e (Tons)				21,768	20,006

For Summary Table

Type Description	2 Taurus 70's with Duct Burners no Inlet Cooling
Purchased Electricity Cost ($/year)	$ 3,597,571
Differential O&M Costs ($k/year)	$ 819,906
Net Cost of Electricity ($/kWh)	$ 0.066
Net Operating Savings ($k/year)	$ 5,954,817
Estimated CO2e Reduction from PlaNYC	21,768

Electricity Tariff

Increases	18%	19%	33%

NYPA 100	Energy Demand	Energy Commodity	Delivery Demand Summer	Delivery Demand Winter
8am-10pm	$ 10.0725	$ 0.1030	$ 24.9508	$ 5.2402
10pm-10am	$ -	$ 0.1030	$ 24.9508	$ 5.2402
Weekends	$ -	$ 0.0503	$ 24.9508	$ 5.2402

NYPA	Stand-by Delivery
Monthly Charge	$ 1,198.00
Contract	$ 3.78
Contract Demand	26,490
Actual Daily Demand	
Peak	$ 0.48840
Shld	$ 0.22210
Off-Pk	$ 0.21570

Gas Tariff

Increases	8%	8%
Turbine Fuel Discount		$ 0.50

Month	Current	Future for Turbine
Jan	$ 7.649	$ 7.149
Feb	$ 8.517	$ 8.017
Mar	$ 9.249	$ 8.749
Apr	$ 8.991	$ 8.491
May	$ 9.164	$ 8.664
Jun	$ 9.206	$ 8.706
Jul	$ 8.427	$ 7.927
Aug	$ 7.431	$ 6.931
Sep	$ 6.864	$ 6.364
Oct	$ 5.711	$ 5.211
Nov	$ 9.244	$ 8.744
Dec	$ 9.610	$ 9.110

Electrical and Thermal Profiles

Current Electrical Profile

Month	Energy Demand	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Units	kW	kWh	kWh	kWh	kWh
Jan	25,411	4,224,001	1,740,190	8,277,591	14,241,782
Feb	26,490	4,417,448	1,811,521	8,754,538	14,983,507
Mar	25,911	3,960,616	1,675,207	8,055,973	13,691,741
Apr	20,149	3,254,513	1,352,341	6,516,572	11,123,425
May	15,397	2,741,570	1,109,999	5,207,931	9,059,499
Jun	17,245	2,962,879	1,118,294	5,084,634	9,107,807
Jul	17,300	3,229,278	1,236,694	5,582,709	10,048,681
Aug	17,669	3,285,175	1,254,644	5,668,856	10,208,475
Sep	16,766	2,923,241	1,117,272	5,009,757	9,050,270
Oct	17,057	2,854,787	1,222,082	5,742,021	9,818,890
Nov	19,353	3,155,484	1,334,353	6,285,986	10,775,823
Dec	24,463	3,852,045	1,625,098	7,701,590	13,178,733
Totals		40,861,038	16,589,480	77,838,107	135,288,634

Current Fuel Demand Profile

Month	Energy Demand	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Units	MMbtu/hr	MMbtu	MMbtu	MMbtu	MMbtu
Jan	279	46,121	18,637	86,557	151,315
Feb	266	44,730	17,716	84,084	146,530
Mar	254	40,123	16,290	76,363	132,777
Apr	217	32,157	13,438	60,529	106,124
May	153	17,394	6,629	29,223	53,244
Jun	88	13,825	5,635	24,166	43,625
Jul	80	13,499	5,336	23,347	42,182
Aug	88	13,313	5,378	23,317	42,008
Sep	94	12,660	5,191	22,824	40,675
Oct	163	21,177	8,646	39,020	68,843
Nov	197	29,496	12,023	55,446	96,965
Dec	268	38,995	15,985	74,311	129,292
Totals		323,430	130,904	599,245	1,053,579

Future Electrical Billing Profile

Month	Energy Demand	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Units	kW	kWh	kWh	kWh	kWh
Jan	16,489	879,235	397,509	1,637,255	2,913,999
Feb	9,907	1,281,388	557,186	2,555,627	4,394,202
Mar	9,499	687,867	354,808	1,515,669	2,558,340
Apr	5,079	290,457	141,713	556,273	988,443
May	2,631	55,048	8,588	30,963	94,599
Jun	11,312	241,542	39,743	131,758	413,044
Jul	4,779	391,015	101,268	745,062	737,345
Aug	5,425	469,746	131,162	318,125	919,033
Sep	4,175	218,817	49,263	126,859	394,939
Oct	2,391	47,781	51,224	151,657	250,163
Nov	4,283	167,643	112,930	358,080	638,653
Dec	8,464	578,217	316,855	1,212,371	2,107,443
Totals		5,308,252	2,262,249	8,839,701	16,410,202

Future Electrical Generation

Month	Energy Demand	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Units	kW	kWh	kWh	kWh	kWh
Jan	8,921	3,344,766	1,342,681	6,640,336	11,327,783
Feb	16,583	3,136,060	1,254,335	6,198,910	10,589,305
Mar	15,413	3,272,754	1,320,394	6,540,254	11,133,401
Apr	15,070	2,964,056	1,210,628	5,960,299	10,134,983
May	17,766	2,686,522	1,101,411	5,176,968	8,964,900
Jun	5,933	2,721,337	1,070,550	4,902,876	8,694,763
Jul	12,521	2,838,763	1,135,427	5,337,647	9,311,336
Aug	12,244	2,815,430	1,123,281	5,350,732	9,289,443
Sep	12,591	2,704,425	1,068,009	4,882,897	8,655,331
Oct	14,685	2,807,506	1,170,858	5,590,364	9,568,727
Nov	15,069	2,987,841	1,221,423	5,927,906	10,137,170
Dec	15,999	3,273,828	1,308,243	6,489,219	11,071,290
Totals		35,552,786	14,327,239	68,998,406	118,878,432

Future Total Fuel

Month	Energy Demand	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Units	MMbtu/hr	MMbtu	MMbtu	MMbtu	MMbtu
Jan	348	60,709	24,481	115,938	201,129
Feb	335	58,354	23,166	111,112	192,631
Mar	326	54,792	22,160	106,177	183,129
Apr	281	46,228	19,055	89,535	154,817
May	218	34,334	13,611	64,562	112,507
Jun	161	22,884	13,002	60,728	106,614
Jul	161	34,246	13,698	65,079	113,024
Aug	163	34,052	13,595	65,185	112,831
Sep	162	32,815	13,068	60,869	106,751
Oct	230	37,775	15,485	73,212	126,471
Nov	260	44,111	17,031	86,206	147,247
Dec	335	53,526	21,708	103,701	178,935
Totals		523,825	210,959	1,001,302	1,736,086

Future Turbine Fuel

Month	Energy Demand	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Units	MMbtu/hr	MMbtu	MMbtu	MMbtu	MMbtu
Jan	183	38,097	15,278	75,349	128,725
Feb	185	35,337	14,134	69,689	119,161
Mar	183	37,517	15,100	74,543	127,161
Apr	176	34,667	14,073	69,146	117,886
May	169	32,845	13,359	63,533	109,736
Jun	161	32,880	13,001	60,722	106,602
Jul	161	34,246	13,698	65,079	113,024
Aug	163	34,051	13,595	65,182	112,828
Sep	161	32,726	12,975	60,537	106,238
Oct	171	33,766	13,902	66,786	114,453
Nov	173	34,877	14,168	68,898	117,943
Dec	180	37,530	15,001	74,123	126,654
Totals		418,539	168,783	813,588	1,400,410

Future Boiler Fuel

Month	Energy Demand	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Units	MMbtu/hr	MMbtu	MMbtu	MMbtu	MMbtu
Jan	164	22,617	9,203	40,589	72,404
Feb	150	23,016	9,032	41,422	73,471
Mar	143	17,275	7,060	31,633	55,968
Apr	105	11,562	4,981	20,388	36,931
May	50	1,489	252	1,030	2,770
Jun	-	4	2	7	12
Jul	-	-	-	-	-
Aug	-	1	-	2	3
Sep	1	80	93	331	513
Oct	59	4,009	1,583	6,426	12,018
Nov	87	9,234	3,763	16,308	29,304
Dec	156	15,996	6,707	29,578	52,281
Totals		105,286	42,676	187,714	335,676

Future Cogeneration Steam Profile

Month	Max Steam Generated	Steam Recovered	Steam Unrecovered	Boiler Steam	Total
Units	MMbtu	MMbtu	MMbtu	MMbtu	MMbtu
Jan	47,025	47,025	-	63,529	110,554
Feb	42,864	42,864	-	64,193	107,057
Mar	46,754	46,754	-	50,255	97,009
Apr	43,830	43,830	-	33,706	77,536
May	41,743	36,422	5,321	2,479	38,901
Jun	41,608	31,862	9,746	11	31,873
Jul	44,915	30,819	14,096	-	30,819
Aug	44,733	30,689	14,044	3	30,692
Sep	41,301	29,262	12,039	455	29,718
Oct	42,884	39,379	3,505	10,919	50,298
Nov	44,139	44,139	-	26,705	70,845
Dec	46,820	46,820	-	47,643	94,463
Totals		469,966	58,751	299,898	769,765

Electrical and Thermal Cost Profiles

Current Electrical Cost Profiles

Month	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Jan	$ 746,351	$ 201,371	$ 472,166	$ 1,419,890
Feb	$ 779,503	$ 209,658	$ 498,532	$ 1,487,693
Mar	$ 725,372	$ 195,117	$ 462,101	$ 1,382,590
Apr	$ 582,044	$ 156,841	$ 372,030	$ 1,110,915
May	$ 470,990	$ 127,738	$ 295,779	$ 894,507
Jun	$ 658,051	$ 186,033	$ 432,718	$ 1,276,803
Jul	$ 686,607	$ 199,277	$ 460,879	$ 1,346,763
Aug	$ 699,916	$ 202,639	$ 469,052	$ 1,371,608
Sep	$ 644,165	$ 184,760	$ 426,485	$ 1,255,410
Oct	$ 504,060	$ 141,158	$ 327,363	$ 972,581
Nov	$ 562,089	$ 154,793	$ 358,684	$ 1,075,566
Dec	$ 696,446	$ 188,693	$ 441,103	$ 1,326,242
Total	$ 7,755,596	$ 2,147,677	$ 5,016,893	$ 14,928,066

Current Fuel Cost Profiles (NG)

Month	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Jan	$ 352,779	$ 142,553	$ 662,068	$ 1,157,400
Feb	$ 380,976	$ 150,890	$ 716,169	$ 1,248,036
Mar	$ 371,079	$ 150,662	$ 706,247	$ 1,227,988
Apr	$ 289,133	$ 120,829	$ 544,246	$ 954,208
May	$ 159,399	$ 60,750	$ 267,789	$ 487,938
Jun	$ 127,274	$ 51,875	$ 222,478	$ 401,626
Jul	$ 113,754	$ 44,964	$ 196,733	$ 355,451
Aug	$ 98,926	$ 39,962	$ 173,266	$ 312,154
Sep	$ 85,485	$ 35,629	$ 157,067	$ 278,181
Oct	$ 120,952	$ 49,382	$ 222,855	$ 393,189
Nov	$ 272,667	$ 111,142	$ 512,557	$ 896,365
Dec	$ 374,757	$ 153,625	$ 714,152	$ 1,242,533
Total	$ 2,748,180	$ 1,112,262	$ 5,095,627	$ 8,956,069

Current Fuel Cost Profiles (Oil)*

Month	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Jan	$ 28,085	$ 11,349	$ 52,708	$ 92,142
Feb	$ 27,238	$ 10,788	$ 51,202	$ 89,228
Mar	$ 24,433	$ 9,920	$ 46,501	$ 80,853
Apr	$ -	$ -	$ -	$ -
May	$ -	$ -	$ -	$ -
Jun	$ -	$ -	$ -	$ -
Jul	$ -	$ -	$ -	$ -
Aug	$ -	$ -	$ -	$ -
Sep	$ -	$ -	$ -	$ -
Oct	$ -	$ -	$ -	$ -
Nov	$ 17,961	$ 7,321	$ 33,764	$ 59,046
Dec	$ 23,746	$ 9,734	$ 45,251	$ 78,731
Total	$ 121,463	$ 49,112	$ 229,425	$ 400,000

Current Maintenance Cost Profiles*

Month	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Jan	$ 10,944	$ 4,422	$ 20,539	$ 35,905
Feb	$ 10,614	$ 4,704	$ 19,952	$ 34,770
Mar	$ 9,521	$ 3,865	$ 18,120	$ 31,506
Apr	$ 7,630	$ 3,189	$ 14,363	$ 25,182
May	$ 4,127	$ 1,573	$ 6,934	$ 12,634
Jun	$ 3,280	$ 1,337	$ 5,734	$ 10,352
Jul	$ 3,703	$ 1,266	$ 5,540	$ 10,009
Aug	$ 3,159	$ 1,276	$ 5,533	$ 9,968
Sep	$ 2,990	$ 1,232	$ 5,430	$ 9,652
Oct	$ 5,025	$ 2,052	$ 9,259	$ 16,336
Nov	$ 6,999	$ 2,853	$ 13,157	$ 23,009
Dec	$ 9,253	$ 3,793	$ 17,633	$ 30,679
Total	$ 76,746	$ 31,062	$ 142,193	$ 250,000

* Distributed on a Boiler Usage Basis

Future Electrical Cost Profile

Month	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Jan	$ 323,671	$ 67,750	$ 124,630	$ 516,059
Feb	$ 307,257	$ 87,583	$ 170,868	$ 565,708
Mar	$ 232,717	$ 63,019	$ 118,518	$ 414,254
Apr	$ 133,613	$ 35,600	$ 70,223	$ 239,445
May	$ 76,340	$ 18,552	$ 43,780	$ 138,671
Jun	$ 198,905	$ 28,130	$ 48,854	$ 275,889
Jul	$ 157,508	$ 38,070	$ 54,557	$ 250,136
Aug	$ 176,364	$ 42,847	$ 58,235	$ 277,446
Sep	$ 123,745	$ 28,736	$ 48,607	$ 201,088
Oct	$ 75,145	$ 23,751	$ 49,855	$ 148,751
Nov	$ 110,193	$ 31,543	$ 60,247	$ 201,982
Dec	$ 207,271	$ 57,618	$ 103,251	$ 368,139
Totals	$ 2,122,728	$ 523,208	$ 951,635	$ 3,597,571

Future Gas Cost Profile

Month	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Jan	$ 405,314	$ 179,617	$ 849,131	$ 1,474,061
Feb	$ 479,346	$ 190,243	$ 911,527	$ 1,581,116
Mar	$ 487,987	$ 197,395	$ 944,705	$ 1,630,087
Apr	$ 388,323	$ 164,291	$ 770,469	$ 1,323,083
May	$ 298,219	$ 118,052	$ 559,898	$ 976,169
Jun	$ 286,299	$ 113,204	$ 528,725	$ 928,227
Jul	$ 271,458	$ 108,581	$ 515,857	$ 895,895
Aug	$ 236,006	$ 94,225	$ 451,784	$ 782,014
Sep	$ 208,870	$ 83,205	$ 387,517	$ 679,592
Oct	$ 198,863	$ 81,486	$ 384,746	$ 665,097
Nov	$ 390,330	$ 158,660	$ 753,206	$ 1,302,205
Dec	$ 495,635	$ 201,122	$ 959,536	$ 1,656,294
Totals	$ 4,196,650	$ 1,690,090	$ 8,017,101	$ 13,903,841

Future Maintenance Costs

Month	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Jan	$ 37,414	$ 15,087	$ 71,450	$ 123,951
Feb	$ 35,962	$ 14,277	$ 68,475	$ 118,714
Mar	$ 33,767	$ 13,656	$ 65,434	$ 112,858
Apr	$ 28,489	$ 11,743	$ 55,178	$ 95,410
May	$ 21,159	$ 8,388	$ 39,788	$ 69,335
Jun	$ 20,265	$ 8,013	$ 37,425	$ 65,704
Jul	$ 21,105	$ 8,442	$ 40,107	$ 69,654
Aug	$ 20,985	$ 8,378	$ 40,172	$ 69,535
Sep	$ 20,223	$ 8,053	$ 37,512	$ 65,788
Oct	$ 23,280	$ 9,543	$ 45,118	$ 77,941
Nov	$ 27,184	$ 11,050	$ 52,510	$ 90,745
Dec	$ 32,987	$ 13,378	$ 63,908	$ 110,273
Totals	$ 322,820	$ 130,008	$ 617,077	$ 1,069,906

Equipment Data Profiles

Taurus 70 Modeling

Equipment Type	Prime Mover
Manufacturer	Solar
Model	Taurus 70
Type	Gas Turbine
Description	Nominal 7.5MW Turbine w/HRSG

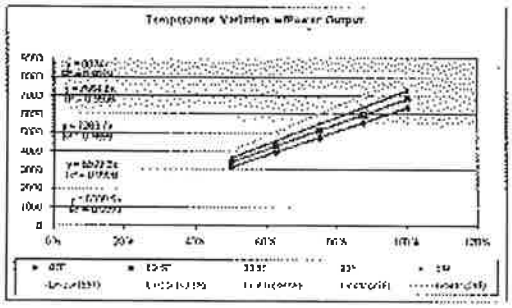
Ambient Temp Deg F 59 F

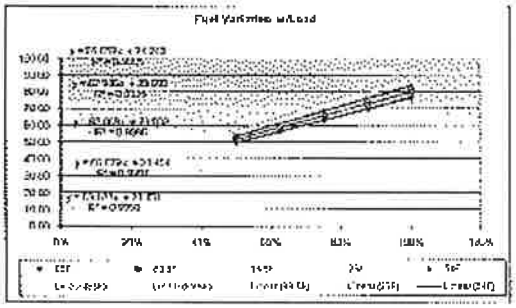
Load	Power Output (kW) (Iso)	Fuel Rate (MMbtu/hr)	Heat Rate/ Efficiency (btu/kW)	Total Recoverable Thermal Output (MMbtu/hr)	Steam Output (lbs/hr)
100%	7000.2	82.4	11620.0	35.9	35.9
80%	5672.1	70.7	12456.1	30.1	30.1
60%	4254.1	58.9	13849.6	24.4	24.4
50%	3545.1	53.1	14964.5	21.5	21.5

Turbine Curves vary on Temperature and Load

	a	b	c
Fuel Flow Coefficients	0	-27.741	8697.4
Power Output	0	-0.2023	70.611
Fuel Usage	0.000002	-0.0001	0.4901
Steam Output			

	a	b	c
Heat Rate Coefficients	0	0	0
Power Output	0.0003	-0.0404	25.052
Fuel Usage	0	0.0746	-8.9859
Steam Output			





Duct Burner Firing	Duct Burner Firing Taurus 70
Equipment Type	Solar
Manufacturer	Solar 70 Duct Burner
Model	Duct Burner
Type	

Load	Fuel Rate	Heat Rate/ Efficiency	Total Recoverable Thermal Output	Steam Output
100%	38	0.92	34.96	34.96
75%	28.5	0.91	25.935	25.935
50%	19	0.9	17.1	17.1
25%	9.5	0.89	8.455	8.455
Curve Coefficient A	-1.9002	0		0
Curve Coefficient B	45.364	0.04		40
Curve Coefficient C	0.0141	0.88		-1E-13

	Taurus 70	Taurus 70	
Prime Mover	8677	8670	0
Generation Type	95%	95%	#DIV/0!
Load	11,780	11,780	#DIV/0!
Heat Rate (btu/kW)			

Weather Data

Heating Degree Days

Month	Avg	Max	Min	Total	
January		25.92794468	48.87712069	0	19290.39084
February		30.96428571	51.56426724	15.76496067	23496
March		22.09245894	47.98140518	0	16436.78945
April		14.25759773	31.85852587	0	10265.47036
May		2.897595993	18.42279312	0	2155.811419
June		0.454274578	8.569922428	0	327.077696
July		0.054680694	4.091344843	0	40.68743651
August		0.413386555	11.25706898	0	307.5595972
September		0.506316858	9.465603945	0	364.5481379
October		7.254745902	22.00565518	0	5397.530951
November		11.66460954	26.48423277	0	8398.518869
December		19.37207034	40.81568104	0	14412.82033
Annual Total		87.87267295	203.9	22.2	769764.615

Cooling Degree Days

Month	Avg	Max	Min	Total	
January		0.055110243	6.644602659	0	41.00202073
February		0	0	0	0
March		0.027942809	4.376646326	0	20.78944987
April		0.590931059	13.32847166	0	425.4703627
May		4.833079864	26.75670966	0	3595.811419
June		9.054274578	28.09416549	0	6951.077696
July		13.02242263	30.11314416	0	9688.682437
August		12.70370914	32.35110049	0	9451.559597
September		8.772983525	26.75620966	0	6316.548138
October		1.448294789	20.04234066	0	1077.530951
November		0.29794287	7.733580826	0	214.5188663
December		0.017231632	3.75766816	0	12.82033457
Annual Total		87.87267295	203.9	22.2	769764.615

Reliability

Assume 1 Prime Mover Down in Each Peak Period

Availability	95%
	kWh Penalty
[illegible]	$ 7,500
[illegible]	$ 6,500

Rikers Boiler Operation

	Boiler
[illegible]	Various
[illegible]	Rikers Boilers
[illegible]	Steam Boiler
[illegible]	70klbs/hr Boiler

	Fuel Rate	Heat Rate/ Efficiency	Total Recoverable Thermal Output	Steam Output
[illegible]	92.10526316	0.76	70	70
75%	70.94594595	0.74	52.5	52.5
50	50	0.7	35	35
25%	29.16666667	0.6	17.5	17.5
Curve Coefficient A		-0.37		
Curve Coefficient B		0.608		
Curve Coefficient C		0.47		

Equipment Data Profiles

Taurus 60 Modeling

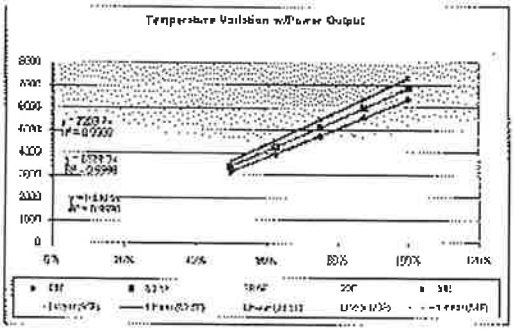
Equipment Type	Prime Mover
Manufacturer	Solar
Model #	Taurus 60
Type	Gas Turbine
Description	Nominal 5.5MW Turbine w/HRSG
Inlet Air Temp	59 F

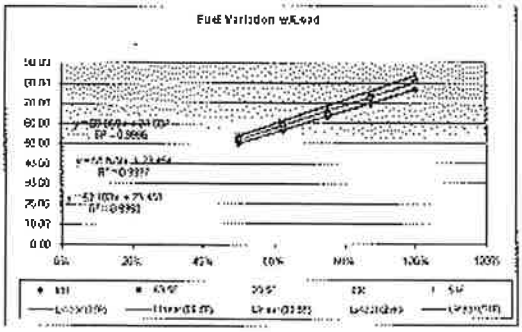
Load	Power Output (kW) (Iso)	Fuel Rate (MMbtu/hr)	Heat Rate/ Efficiency (btu/kW)	Total Recoverable Thermal Output (MMbtu/hr)	Steam Output (lbs/hr)
100%	5253	67	12679	29.19	29.19
75%	3940	55	13910	24.13	24.13
50%	2627	43	16370	19.08	19.08
25%	1313	31	23751	14.02	14.02

Turbine Curves vary on Temperature and Load

Coefficients	a	b	c
Power Output	0.00	-39.39	6397.00
Fuel Input	0.00	-0.10	54.39
Steam Output	0.00	0.00	0.34

Coefficients	a	b	c
Power Output	0.00	0.00	0.00
Fuel Input	0.00	-0.04	21.16
Steam Output	0.00	-0.09	4.87





Duct Burner Firing	Duct Burner Firing Taurus 60
Equipment Type	Solar
Manufacturer	Solar 60 Duct Burner
Model #	Duct Burner
Type	

Load	Fuel Rate	Heat Rate/ Efficiency	Total Recoverable Thermal Output	Steam Output
100%	40.80	0.92	37.5	37.5
75%	30.60	0.91	27.8	27.8
50%	20.40	0.9	18.4	18.4
25%	10.20	0.89	9.1	9.1
Curve Coefficient A	(0.00)	0		1.797
Curve Coefficient B	32.30	0.04		28.424
Curve Coefficient C	(0.00)	0.88		-27.13

Prime Mover	Taurus 70	Taurus 70	
Deration from ISO	0	-2	0
Availability	95%	95%	0%
Heat Rate (btu/kW)	11,780	11,780	0

2 Taurus 70's with Duct Burners no Inlet Cooling

Utility Cost Averages	Purchased Electricity	Avg. Natural Gas Cost
Current	$ 0.11	$ 8.50
Future	$ 0.18	$ 8.04

Total Savings	$ 5,177,059

Reformatted Savings by Time Period

Month	Peak 8AM-6PM	Evening Peak 6PM-10PM	Off Peak 10PM-8AM; Weekends
Jan	$ 288,268	$ 79,439	$ 82,289
Feb	$ 325,512	$ 63,464	$ 38,528
Mar	$ 331,900	$ 68,104	$ 23,850
Apr	$ 289,086	$ 56,967	$ (16,951)
May	$ 232,092	$ 43,068	$ (76,657)
Jun	$ 284,104	$ 90,281	$ 47,724
Jul	$ 354,535	$ 90,831	$ 54,612
Aug	$ 369,677	$ 98,841	$ 99,628
Sep	$ 381,333	$ 101,603	$ 115,606
Oct	$ 325,499	$ 74,829	$ 67,098
Nov	$ 306,953	$ 64,487	$ 6,167
Dec	$ 328,791	$ 66,404	$ 17,687

Total Costs

Description	Current	Future
Fuel Cost	$ 9,350,068	$ 14,681,599
Electricity Cost	$ 14,920,066	$ 3,597,571
Operations and Maintenance Costs	$ 750,000	$ 1,069,906
Other Costs	$ -	$ -
Total Cost	$ 24,526,135	$ 19,349,075

Electrical and Steam Demand Profiles from '06-'07

Electricity Demand	135,288,634	kWh
Steam Demand	769,765	klbs
% Electricity Profile Sensitivity	0%	
% Steam Profile Sensitivity	0%	

Environmental Calculations

	CO2e Factors from PlaNYC	CO2e Factors from PlaNYC	Tons CO2e	CO2 Numbers with Factors from NYPA
CO2 Emissions (Electricity Purch)	985	lbs CO2e/MWh	66,631	66,501
CO2 Emissions Boiler Fuel Burn (NG)	117	lbs CO2e/MMbtu	61,740	64,926
CO2 Emissions Boiler Fuel Burn (Oil)	174	lbs CO2e/MMbtu	3,214	3,630
Total Steam			131,585	135,057
CO2 Emissions Electricity Purch	985	lbs CO2e/MWh	8,082	8,066
CO2 Emissions Gas Turbine and Boiler Fuel	117	lbs CO2e/MMbtu	107,020	112,542
Total Facility			115,102	120,609
Diff. Annual Emissions CO2e (tons)			16,483	14,448

For Summary Table

Case Description	2 Taurus 70's with Duct Burners no Inlet Cooling
Purchased Electricity Cost ($k/year)	$ 3,597,571
Differential O&M Costs ($k/year)	$ 819,906
Net Cost of Electricity ($/kWh)	$ 0.072
Net Operating Savings ($k/year)	$ 5,177,059
Annual CO2e Reduction from PlaNYC	16,483

Electricity Tariff

Increases	19%	19%	39%

NYPA100	Energy Demand	Energy Commodity	Delivery Demand - Summer	Delivery Demand - Winter
8am-6pm	$ 10.0725	$ 0.1030	$ 24.9508	$ 5.2402
6pm-10pm	$ -	$ 0.1030	$ 24.9508	$ 5.2402
10pm-8am	$ -	$ 0.0503	$ 24.9508	$ 5.2402
Weekends	$ -	$ 0.0503	$ 24.9508	$ 5.2402

NYPA100	Stand-by Delivery
Monthly charge	$ 1,198.00
SC1 Gas	$ 3.78
Contract Demand	26,400
As Used Daily Demand	
8am-6pm	$ 0.48840
6pm-10pm	$ 0.22230
10pm-8am	$ 0.21520

Gas Tariff

Increases	8%	8%
Turbine Fuel Discount	$	0.50

Month	Current	Future for Turbine
Jan	$ 7.649	$ 7.149
Feb	$ 8.517	$ 8.017
Mar	$ 9.249	$ 8.749
Apr	$ 8.991	$ 8.491
May	$ 9.164	$ 8.664
Jun	$ 9.206	$ 8.706
Jul	$ 8.427	$ 7.927
Aug	$ 7.431	$ 6.931
Sep	$ 6.864	$ 6.364
Oct	$ 5.711	$ 5.211
Nov	$ 9.244	$ 8.744
Dec	$ 9.610	$ 9.110

Electrical and Thermal Profiles

Current Electrical Profile

Month	Energy Demand	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Units	kW	kWh	kWh	kWh	kWh
Jan	25,411	4,224,001	1,740,190	8,277,591	14,241,782
Feb	26,490	4,417,448	1,811,521	8,754,538	14,983,507
Mar	25,911	3,960,616	1,675,707	8,055,923	13,691,741
Apr	20,149	3,254,513	1,352,341	6,516,572	11,123,425
May	15,397	2,741,570	1,109,999	5,207,931	9,059,499
Jun	17,245	2,962,878	1,110,294	5,034,634	9,107,807
Jul	17,300	3,229,278	1,236,694	5,582,709	10,048,681
Aug	17,669	3,285,175	1,254,444	5,668,856	10,208,475
Sep	16,766	2,923,241	1,117,777	5,009,757	9,050,270
Oct	17,057	2,854,787	1,222,082	5,742,021	9,818,890
Nov	19,353	3,155,484	1,334,353	6,285,986	10,775,823
Dec	24,463	3,852,045	1,625,098	7,701,590	13,178,733
Totals		40,861,038	16,589,489	77,838,107	135,288,634

Current Fuel Demand Profile

Month	Energy Demand	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Units	MMbtu/hr	MMbtu	MMbtu	MMbtu	MMbtu
Jan	279	46,121	18,637	86,557	151,315
Feb	286	44,730	17,716	84,084	146,530
Mar	254	40,173	16,290	76,363	132,777
Apr	217	32,157	13,438	60,529	106,124
May	153	17,394	6,629	29,221	53,244
Jun	88	13,825	5,635	24,166	43,625
Jul	80	13,499	5,336	23,347	42,182
Aug	88	13,313	5,378	23,317	42,008
Sep	94	12,600	5,191	22,884	40,675
Oct	163	21,177	8,646	39,020	68,843
Nov	197	29,496	12,023	55,446	96,965
Dec	268	38,995	15,985	74,311	129,292
Totals		323,480	130,904	599,245	1,053,579

Future Electrical Billing Profile

Month	Energy Demand	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Units	kW	kWh	kWh	kWh	kWh
Jan	16,489	879,235	397,509	1,637,255	2,913,999
Feb	9,907	1,281,388	557,186	2,555,627	4,394,202
Mar	9,499	687,867	354,808	1,515,669	2,558,340
Apr	5,079	290,457	141,713	556,273	988,443
May	2,631	55,048	8,588	30,963	94,599
Jun	11,317	241,542	39,743	131,758	413,044
Jul	4,779	391,015	101,768	245,062	737,345
Aug	5,425	469,746	131,162	318,125	919,033
Sep	4,175	218,817	49,763	126,859	394,939
Oct	2,391	47,781	51,224	151,657	250,163
Nov	4,283	167,643	122,930	358,080	638,653
Dec	8,464	578,217	316,855	1,212,371	2,107,443
Totals		5,308,252	2,262,249	8,839,701	16,410,202

Future Electrical Generation

Month	Energy Demand	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Units	kW	kWh	kWh	kWh	kWh
Jan	8,921	3,344,766	1,342,681	6,640,336	11,327,783
Feb	16,583	3,136,060	1,254,335	6,198,910	10,589,305
Mar	16,413	3,272,754	1,320,394	6,540,254	11,133,401
Apr	15,070	2,064,056	1,210,678	5,860,299	10,134,983
May	12,766	2,686,522	1,101,411	5,176,968	8,964,900
Jun	5,933	2,721,337	1,070,550	4,907,876	8,694,763
Jul	12,521	2,838,263	1,135,427	5,337,647	9,311,336
Aug	12,244	2,815,430	1,123,281	5,350,732	9,289,443
Sep	12,591	2,704,475	1,068,009	4,882,807	8,655,331
Oct	14,665	2,807,506	1,170,858	5,590,364	9,568,727
Nov	15,069	2,987,841	1,221,423	5,927,906	10,137,170
Dec	15,999	3,273,828	1,308,243	6,489,219	11,071,290
Totals		35,552,786	14,327,239	68,998,406	118,878,432

Future Total Fuel

Month	Energy Demand	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Units	MMbtu/hr	MMbtu	MMbtu	MMbtu	MMbtu
Jan	384	66,216	26,734	126,078	219,027
Feb	368	64,069	25,437	122,079	211,586
Mar	356	59,439	23,997	114,687	198,123
Apr	309	49,434	20,394	95,219	165,047
May	231	35,067	13,766	65,143	113,976
Jun	162	37,887	13,004	60,733	106,624
Jul	161	34,246	13,698	65,079	113,024
Aug	163	34,052	13,595	65,187	112,834
Sep	171	32,878	13,124	61,082	107,084
Oct	243	39,173	16,033	75,576	130,732
Nov	288	46,796	18,989	90,152	155,937
Dec	369	57,561	23,472	111,244	192,277
Totals		551,769	222,242	1,052,260	1,826,271

Future Turbine Fuel

Month	Energy Demand	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Units	MMbtu/hr	MMbtu	MMbtu	MMbtu	MMbtu
Jan	183	38,097	15,278	75,349	128,725
Feb	185	35,337	14,134	69,689	119,161
Mar	183	37,517	15,100	74,543	127,161
Apr	176	34,667	14,073	69,146	117,886
May	169	32,845	13,359	63,533	109,736
Jun	161	32,880	13,001	60,777	106,602
Jul	161	34,246	13,698	65,079	113,024
Aug	163	34,051	13,595	65,182	112,828
Sep	161	32,726	12,975	60,537	106,238
Oct	171	33,766	13,902	66,786	114,453
Nov	173	34,877	14,168	68,898	117,943
Dec	180	37,530	15,001	74,123	126,654
Totals		418,539	168,283	813,588	1,400,410

Future Boiler Fuel

Month	Energy Demand	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Units	MMbtu/hr	MMbtu	MMbtu	MMbtu	MMbtu
Jan	200	28,118	11,455	50,729	90,303
Feb	183	28,732	11,304	52,390	92,425
Mar	173	21,922	8,897	40,144	70,967
Apr	133	14,767	6,321	26,073	47,161
May	63	2,222	907	1,610	4,240
Jun	1	7	3	12	22
Jul	-	-	-	-	-
Aug	-	1	-	4	6
Sep	10	151	149	545	846
Oct	72	5,358	2,131	8,790	16,279
Nov	115	11,919	4,821	21,254	37,995
Dec	189	20,032	8,471	37,121	65,624
Totals		133,230	53,959	238,672	425,861

Future Cogeneration Steam Profile

Month	Max Steam Generated	Steam Recovered	Steam Unrecovered	Boiler Steam	Total
Units	MMbtu	MMbtu	MMbtu	MMbtu	MMbtu
Jan	47,025	47,025	-	63,529	110,554
Feb	42,864	42,864	-	64,193	107,057
Mar	46,754	46,754	-	50,255	97,009
Apr	43,830	43,830	-	33,706	77,536
May	41,743	36,422	5,322	2,479	38,901
Jun	41,608	31,862	9,746	11	31,873
Jul	44,915	30,819	14,096	-	30,819
Aug	44,733	30,689	14,044	3	30,692
Sep	41,301	29,262	12,039	455	29,718
Oct	42,884	39,379	3,505	10,919	50,298
Nov	44,139	44,139	-	26,705	70,845
Dec	46,820	46,820	-	47,643	94,463
Totals		460,866	58,751	299,898	769,765

Electrical and Thermal Cost Profiles

Current Electrical Cost Profiles

Month	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Jan	$ 746,353	$ 201,371	$ 472,166	$ 1,419,890
Feb	$ 779,503	$ 209,658	$ 498,532	$ 1,487,693
Mar	$ 725,372	$ 195,117	$ 462,101	$ 1,382,590
Apr	$ 582,044	$ 156,841	$ 372,030	$ 1,110,915
May	$ 470,990	$ 127,738	$ 295,779	$ 894,507
June	$ 658,051	$ 186,033	$ 432,718	$ 1,276,803
July	$ 686,607	$ 199,277	$ 460,879	$ 1,346,763
Aug	$ 699,916	$ 202,639	$ 469,052	$ 1,371,608
Sep	$ 644,165	$ 184,760	$ 426,485	$ 1,255,410
Oct	$ 504,060	$ 141,158	$ 327,363	$ 972,581
Nov	$ 562,089	$ 154,793	$ 358,684	$ 1,075,566
Dec	$ 696,446	$ 188,693	$ 441,103	$ 1,326,242
Total	$ 7,755,596	$ 2,147,577	$ 5,016,893	$ 14,920,000

Current Fuel Cost Profiles (NG)

Month	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Jan	$ 357,779	$ 147,553	$ 662,068	$ 1,167,400
Feb	$ 380,976	$ 150,890	$ 716,169	$ 1,248,036
Mar	$ 371,079	$ 150,662	$ 706,247	$ 1,227,988
Apr	$ 289,133	$ 120,829	$ 544,246	$ 954,208
May	$ 159,389	$ 60,750	$ 267,789	$ 487,928
June	$ 127,274	$ 51,875	$ 222,478	$ 401,626
July	$ 113,754	$ 44,964	$ 196,733	$ 355,451
Aug	$ 98,976	$ 39,962	$ 173,266	$ 312,154
Sep	$ 86,485	$ 35,629	$ 157,067	$ 279,181
Oct	$ 170,952	$ 49,382	$ 222,855	$ 393,189
Nov	$ 272,667	$ 111,142	$ 512,557	$ 896,365
Dec	$ 374,757	$ 153,625	$ 714,152	$ 1,242,533
Total	$ 2,748,180	$ 1,112,262	$ 5,095,627	$ 8,956,068

Current Fuel Cost Profiles (Oil)*

Month	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Jan	$ 28,085	$ 11,349	$ 52,708	$ 92,142
Feb	$ 27,238	$ 10,788	$ 51,202	$ 89,228
Mar	$ 24,433	$ 9,920	$ 46,501	$ 80,853
Apr	$ -	$ -	$ -	$ -
May	$ -	$ -	$ -	$ -
June	$ -	$ -	$ -	$ -
July	$ -	$ -	$ -	$ -
Aug	$ -	$ -	$ -	$ -
Sep	$ -	$ -	$ -	$ -
Oct	$ -	$ -	$ -	$ -
Nov	$ 17,961	$ 7,321	$ 33,764	$ 59,046
Dec	$ 23,746	$ 9,734	$ 45,251	$ 78,731
Total	$ 121,463	$ 49,112	$ 229,425	$ 400,000

Current Maintenance Cost Profiles*

Month	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Jan	$ 10,944	$ 4,422	$ 20,539	$ 35,905
Feb	$ 10,614	$ 4,204	$ 19,952	$ 34,770
Mar	$ 9,571	$ 3,865	$ 18,120	$ 31,506
Apr	$ 7,690	$ 3,189	$ 14,363	$ 25,182
May	$ 4,177	$ 1,573	$ 6,934	$ 12,684
June	$ 3,280	$ 1,337	$ 5,734	$ 10,352
July	$ 3,203	$ 1,266	$ 5,540	$ 10,009
Aug	$ 3,150	$ 1,276	$ 5,533	$ 9,968
Sep	$ 2,990	$ 1,232	$ 5,430	$ 9,652
Oct	$ 5,025	$ 2,052	$ 9,259	$ 16,336
Nov	$ 6,999	$ 2,853	$ 13,157	$ 23,009
Dec	$ 9,253	$ 3,793	$ 17,633	$ 30,679
Total	$ 76,746	$ 31,062	$ 142,193	$ 250,000

* Distributed on a Boiler Usage Basis

Future Electrical Cost Profile

Month	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Jan	$ 323,671	$ 67,750	$ 124,639	$ 516,059
Feb	$ 307,257	$ 87,583	$ 170,868	$ 565,708
Mar	$ 232,717	$ 63,019	$ 118,518	$ 414,254
Apr	$ 133,613	$ 35,609	$ 70,223	$ 239,445
May	$ 76,340	$ 18,552	$ 43,780	$ 138,671
Jun	$ 198,905	$ 28,130	$ 48,854	$ 275,889
Jul	$ 157,508	$ 38,070	$ 54,557	$ 250,136
Aug	$ 176,364	$ 42,847	$ 58,235	$ 277,446
Sep	$ 123,745	$ 28,736	$ 48,607	$ 201,088
Oct	$ 75,145	$ 23,751	$ 49,855	$ 148,751
Nov	$ 110,193	$ 31,543	$ 60,247	$ 201,982
Dec	$ 207,271	$ 57,618	$ 103,251	$ 368,139
Totals	$ 2,122,728	$ 523,208	$ 951,635	$ 3,597,571

Future Gas Cost Profile

Month	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Jan	$ 487,431	$ 196,845	$ 926,691	$ 1,610,967
Feb	$ 528,028	$ 209,591	$ 1,004,940	$ 1,742,559
Mar	$ 530,965	$ 214,383	$ 1,023,413	$ 1,768,761
Apr	$ 427,149	$ 176,335	$ 821,583	$ 1,425,066
May	$ 304,940	$ 119,476	$ 565,216	$ 989,632
Jun	$ 286,329	$ 113,216	$ 528,772	$ 928,317
Jul	$ 271,458	$ 108,581	$ 515,857	$ 895,895
Aug	$ 236,011	$ 94,225	$ 451,798	$ 782,033
Sep	$ 209,300	$ 83,593	$ 388,985	$ 681,878
Oct	$ 206,564	$ 84,618	$ 398,248	$ 689,429
Nov	$ 415,155	$ 168,454	$ 798,933	$ 1,382,542
Dec	$ 534,417	$ 218,073	$ 1,032,030	$ 1,784,519
Totals	$ 4,437,746	$ 1,787,388	$ 8,456,465	$ 14,681,599

Future Maintenance Costs

Month	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Jan	$ 38,792	$ 15,662	$ 73,862	$ 128,315
Feb	$ 37,534	$ 14,902	$ 71,519	$ 123,956
Mar	$ 34,822	$ 14,058	$ 67,188	$ 116,069
Apr	$ 28,961	$ 11,948	$ 55,783	$ 96,692
May	$ 20,544	$ 8,665	$ 38,163	$ 66,772
Jun	$ 19,267	$ 7,618	$ 35,580	$ 62,465
Jul	$ 20,063	$ 8,025	$ 38,126	$ 66,214
Aug	$ 19,949	$ 7,965	$ 38,189	$ 66,103
Sep	$ 19,261	$ 7,689	$ 35,785	$ 62,734
Oct	$ 22,920	$ 9,393	$ 44,275	$ 76,588
Nov	$ 27,415	$ 11,125	$ 52,815	$ 91,355
Dec	$ 33,722	$ 13,751	$ 65,171	$ 112,644
Totals	$ 323,249	$ 130,199	$ 616,458	$ 1,069,906

Equipment Data Profiles

Taurus 70 Modeling

Equipment Type	Prime Mover
Manufacturer	Solar
Model #	Taurus 70
Type	Gas Turbine
Description	Nominal 7.5MW Turbine w/HRSG

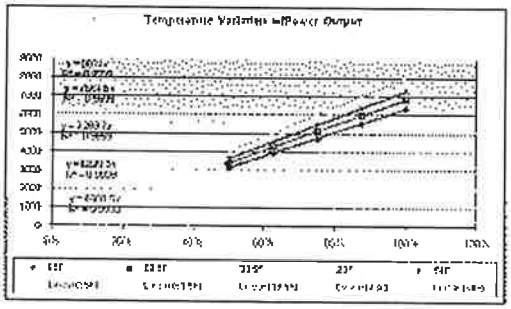
Temperature (°F) 59 F

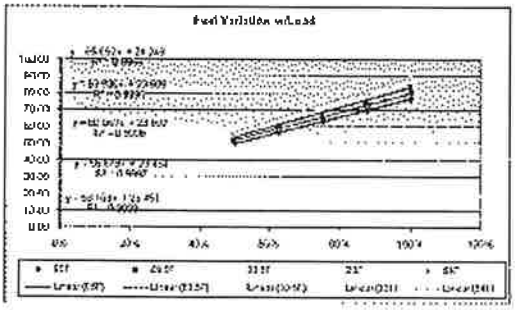
Load	Power Output (kW) (Iso)	Fuel Rate (MMbtu/hr)	Heat Rate/ Efficiency (btu/kW)	Total Recoverable Thermal Output (MMbtu/hr)	Steam Output (lbs/hr)
100%	7098.2	82.4	11620.0	35.9	35.9
80%	5672.1	70.7	12456.1	30.1	30.1
60%	4254.1	58.9	13849.6	24.4	24.4
50%	3545.1	53.1	14964.5	21.5	21.5

Turbine Curves vary on Temperature and Load

	a	b	c
Fuel Curve	0	-27.241	8697.4
Power Output	0	-0.2023	70.611
Heat Rate	0.000E+00	-0.0001	0.4901
Steam Output			

	a	b	c
Fuel Curve	0	0	0
Power Output	0.0003	-0.0404	25.052
Heat Rate	0	0.0746	-8.9859
Steam Output			





Duct Burner Firing	Duct Burner Firing Taurus 70
Equipment Type	Solar
Manufacturer	Solar 70 Duct Burner
Model #	Duct Burner
Type	

Load	Fuel Rate	Heat Rate/ Efficiency	Total Recoverable Thermal Output	Steam Output
100%	38	0.92	34.96	34.96
75%	28.5	0.91	25.935	25.935
50%	19	0.9	17.1	17.1
25%	9.5	0.89	8.455	8.455
Curve Coefficient A	-1.9002	0		0
Curve Coefficient B	45.364	0.04		40
Curve Coefficient C	0.0141	0.88		-1E-13

Prime Mover	Taurus 70	Taurus 70	---
Hours of Operation	8672	8670	0
HHV%	95%	95%	#DIV/0!
Heat Rate (btu/kW)	11,780	11,780	#DIV/0!

Weather Data

Heating Degree Days

Month	Avg	Max	Min	Total	
January		25.92794468	48.87712669	0	19290.39084
February		34.96428571	51.56426774	15.76496067	23496
March		22.09245894	47.98146518	0	16436.78945
April		14.25759773	31.85852587	0	10265.47036
May		2.897595993	18.42279312	0	2155.811419
June		0.454274578	8.569977426	0	377.077096
July		0.054680694	4.091344843	0	40.68243651
August		0.413386555	11.25706898	0	307.5595977
September		0.506316858	9.465637945	0	364.5481379
October		7.254745907	27.00565518	0	5397.530951
November		11.66160954	26.48423277	0	8398.518866
December		19.37707034	40.81568104	0	14412.82033
Annual Total		87.87267295	203.9	22.2	769764.615

Cooling Degree Days

Month	Avg	Max	Min	Total	
January		0.055110243	6.614602659	0	41.00202071
February		0	0	0	0
March		0.027942809	4.376646326	0	20.78944987
April		0.590931059	13.37847166	0	425.4703627
May		4.833079864	26.75620966	0	3595.811419
June		9.654274578	28.99416599	0	6951.077696
July		13.02242263	30.11314416	0	9688.682437
August		12.70370914	32.35110049	0	9451.559597
September		8.772980525	26.75620966	0	6316.548138
October		1.448294289	20.04234066	0	1077.530951
November		0.29794287	7.733580826	0	214.5188663
December		0.017231632	3.25766816	0	12.82033457
Annual Total		87.87267295	203.9	22.2	769764.615

Reliability

Assume 1 Prime Mover Down in Each Peak Period

Availability	95%
	KWh Penalty
Winter	$ 7,500
Summer	$ 6,500

Rikers Boiler Operation

Equipment Type	Boiler			
Manufacturer	Various			
Model	Rikers Boilers			
Type	Steam Boiler			
Description	70klbs/hr Boiler			
Count	Fuel Rate	Heat Rate/ Efficiency	Total Recoverable Thermal Output	Steam Output
100	92.10526316	0.76	70	70
75	70.94594595	0.74	52.5	52.5
50	50	0.7	35	35
25	29.16666667	0.6	17.5	17.5
Days Operation CA		0.32		
Days Operation CT		0.608		
Days Operation ATC		0.47		

Equipment Data Profiles

Taurus 60 Modeling

Equipment Type	Prime Mover
Manufacturer	Solar
Model	Taurus 60
Type	Gas Turbine
Description	Nominal 5.5MW Turbine w/HRSG

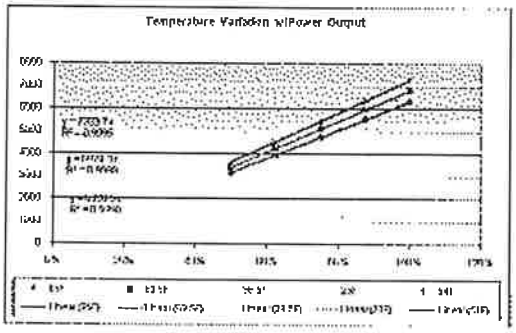
Temperature Used: 59 F

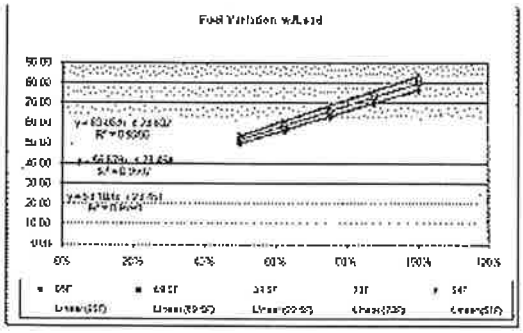
Load	Power Output (kW) (Iso)	Fuel Rate (MMbtu/hr)	Heat Rate/ Efficiency (btu/kW)	Total Recoverable Thermal Output (MMbtu/hr)	Steam Output (lbs/hr)
100%	5253	67	12670	29.19	29.19
75%	3940	55	13960	24.13	24.13
50%	2627	43	16370	19.08	19.08
25%	1313	31	23751	14.02	14.02

Turbine Curves vary on Temperature and Load

Coefficients	a	b	c
Power Output	0.00	-19.39	6397.00
Fuel Usage	0.00	-0.10	54.39
Heat Content	0.00	0.00	0.34

Coefficients	a	b	c
Power Output	0.00	0.00	0.00
Fuel Usage	0.00	-0.04	21.16
Heat Content	0.00	-0.09	4.87





Duct Burner Firing	Duct Burner Firing Taurus 60
Equipment Type	Solar
Manufacturer	Solar 60 Duct Burner
Model	Duct Burner
Type	

Load	Fuel Rate	Heat Rate/ Efficiency	Total Recoverable Thermal Output	Steam Output
100%	40.80	0.92	37.5	37.5
75%	30.60	0.91	27.8	27.8
50%	20.40	0.9	18.4	18.4
25%	10.20	0.89	9.1	9.1
Curve Coefficient A	(0.00)	0		1.292
Curve Coefficient B	32.30	0.04		28.424
Curve Coefficient C	(0.00)	0.88		-2E-13

Prime Mover	Taurus 70	Taurus 70	
Hours of Run/Time	0	-7	0
Load	95%	95%	0%
Heat Rate (btu/kW)	11,780	11,780	0

2 Taurus 60's without Duct Burners no Inlet Cooling

Utility Cost Averages	Purchased Electricity	Avg. Natural Gas Cost
Current	$ 0.11	$ 8.50
Future	$ 0.13	$ 8.07

Total Savings	$ 4,289,207

Reformatted Savings by Time Period

Month	Peak 8AM-6PM	Evening Peak 6PM-10PM	Off Peak 10PM-8AM, Weekends
Jan	$ 138,591	$ 56,179	$ 96,729
Feb	$ 232,554	$ 43,868	$ 61,792
Mar	$ 243,409	$ 48,518	$ 56,180
Apr	$ 213,491	$ 40,770	$ 14,492
May	$ 184,067	$ 35,542	$ (45,145)
Jun	$ 209,579	$ 73,425	$ 78,151
Jul	$ 272,131	$ 70,721	$ 88,492
Aug	$ 283,217	$ 76,975	$ 123,672
Sep	$ 295,374	$ 81,207	$ 133,407
Oct	$ 248,915	$ 55,540	$ 69,217
Nov	$ 229,423	$ 47,186	$ 40,817
Dec	$ 239,867	$ 47,668	$ 53,169

Total Costs

Description	Current	Future
Fuel Cost	$ 9,356,068	$ 13,024,462
Electricity Cost	$ 14,920,066	$ 6,381,234
Operations and Maintenance Costs	$ 250,000	$ 831,231
Other Costs	$ -	$ -
Total Cost	$ 24,526,135	$ 20,236,927

Electrical and Steam Demand Profiles from '06-'07

Electricity Demand	135,288,634	kWh
Steam Demand	769,765	klbs
% Electricity Profile Sensitivity	0%	
% Steam Profile Sensitivity	0%	

Environmental Calculations

	CO2e Factors from PlaNYC	CO2e Factors from PlaNYC	Tons CO2e
CO2 Emissions Electricity Current	985	lbs CO2e/MWh	66,632
CO2 Emissions Boiler Current (Oil)	117	lbs CO2e/MMbtu	61,740
CO2 Emissions Boiler Current (NG)	174	lbs CO2e/MMbtu	3,214
CO2 Current			131,585
CO2 Emissions Electricity Future	985	lbs CO2e/MWh	21,143
CO2 Emissions Gas Turbine and Boiler Fuel	117	lbs CO2e/MMbtu	94,617
Total Future			115,760
Delta Annual Emission CO2e Tons			15,825

For Summary Table

Case Description	2 Taurus 60's without Duct Burners no Inlet Cooling
Purchased Electricity Cost ($k/year)	$ 6,381,234
Differential O&M Costs ($k/year)	$ 581,231
Net Cost of Electricity ($/kWh)	$ 0.079
Net Operating Savings ($k/year)	$ 4,289,207
Estimated CO2e Reduction from PlaNYC	15,825

Electricity Tariff

Increases	19%	19%	33%

NYPA SC60	Energy Demand	Energy Commodity	Delivery Demand - Summer	Delivery Demand - Winter
8am-10pm	$ 10.0725	$ 0.1030	$ 24.9508	$ 5.2402
10pm-10pm	$ -	$ 0.1030	$ 24.9508	$ 5.2402
10pm-8am	$ -	$ 0.0503	$ 24.9508	$ 5.2402
Weekends	$ -	$ 0.0503	$ 24.9508	$ 5.2402

PASNY	Stand-by Delivery
Monthly Charge	$ 2,198.00
Tariff	$ 3.78
Contract Demand	26,490
% Used Daily Demand	
8HRS	$ 0.48840
8-10HRS	$ 0.22210
$20 PMOD	$ 0.23520

Gas Tariff

Increases	8%	8%
Turbine Fuel Discount	$	0.50

Month	Current	Future for Turbine
Jan	$ 7.649	$ 7.149
Feb	$ 8.517	$ 8.017
Mar	$ 9.249	$ 8.749
Apr	$ 8.991	$ 8.491
May	$ 9.164	$ 8.664
Jun	$ 9.206	$ 8.706
Jul	$ 8.427	$ 7.927
Aug	$ 7.431	$ 6.931
Sep	$ 6.864	$ 6.364
Oct	$ 5.711	$ 5.211
Nov	$ 9.244	$ 8.744
Dec	$ 9.610	$ 9.110

Electrical and Thermal Profiles

Current Electrical Profile

Month	Energy Demand	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Units	kW	kWh	kWh	kWh	kWh
Jan	25,411	4,224,001	1,740,190	8,277,591	14,241,782
Feb	26,490	4,417,448	1,811,521	8,754,538	14,983,507
Mar	25,911	3,960,616	1,675,202	8,055,923	13,691,741
Apr	20,149	3,254,513	1,352,341	6,516,572	11,123,425
May	15,397	2,741,570	1,109,999	5,207,931	9,059,499
Jun	17,245	2,962,879	1,110,294	5,034,634	9,107,807
Jul	17,300	3,229,278	1,236,694	5,582,709	10,048,681
Aug	17,669	3,285,175	1,254,444	5,668,856	10,208,475
Sep	16,766	2,923,241	1,117,272	5,009,757	9,050,270
Oct	17,057	2,854,787	1,222,082	5,742,021	9,818,890
Nov	19,353	3,155,484	1,334,353	6,285,986	10,775,823
Dec	24,463	3,852,045	1,625,008	7,701,590	13,178,733
Totals		40,861,038	16,589,489	77,838,107	135,288,634

Current Fuel Demand Profile

Month	Energy Demand	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Units	MMbtu/hr	MMbtu	MMbtu	MMbtu	MMbtu
Jan	279	46,121	18,637	86,557	151,315
Feb	266	44,730	17,716	84,084	146,530
Mar	254	40,193	16,290	76,363	132,777
Apr	217	32,157	13,438	60,529	106,124
May	153	17,394	6,629	29,221	53,244
Jun	88	13,825	5,635	24,166	43,625
Jul	80	13,499	5,336	23,347	42,182
Aug	88	13,313	5,378	23,317	42,008
Sep	94	12,600	5,191	22,884	40,675
Oct	163	21,177	8,646	39,020	68,843
Nov	197	29,496	12,023	55,446	96,965
Dec	268	38,005	15,985	74,311	129,292
Totals		323,430	130,904	599,245	1,053,579

Future Electrical Billing Profile

Month	Energy Demand	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Units	kW	kWh	kWh	kWh	kWh
Jan	20,818	1,743,058	747,888	3,361,149	5,852,095
Feb	14,274	2,102,701	885,685	4,180,462	7,168,849
Mar	13,816	1,513,859	696,599	3,201,451	5,411,910
Apr	9,010	959,764	434,557	1,950,797	3,345,118
May	5,865	540,961	217,778	744,013	1,472,752
Jun	14,458	867,122	272,158	841,660	1,980,941
Jul	7,975	1,097,543	384,182	1,298,516	2,780,241
Aug	8,540	1,147,349	399,493	1,375,712	2,922,554
Sep	7,391	820,693	275,885	821,425	1,917,403
Oct	6,170	561,132	303,455	1,174,413	2,039,000
Nov	8,214	880,751	424,581	1,756,391	3,061,723
Dec	12,663	1,429,655	656,248	2,891,163	4,977,066
Totals		13,633,988	5,698,512	23,597,152	42,929,652

Future Electrical Generation

Month	Energy Demand	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Units	kW	kWh	kWh	kWh	kWh
Jan	4,601	2,480,943	992,303	4,916,442	8,389,687
Feb	12,216	2,314,747	925,835	4,574,076	7,814,658
Mar	12,095	2,446,756	978,602	4,854,472	8,279,831
Apr	11,139	2,294,749	917,784	4,565,775	7,778,307
May	9,532	2,230,609	892,220	4,463,918	7,586,747
Jun	2,787	2,095,757	838,135	4,192,974	7,126,866
Jul	9,375	2,131,735	852,512	4,284,193	7,268,440
Aug	9,128	2,137,827	854,950	4,293,144	7,285,921
Sep	9,375	2,103,148	841,386	4,188,332	7,132,866
Oct	10,936	2,293,655	918,627	4,567,608	7,779,890
Nov	11,139	2,274,733	909,777	4,529,595	7,714,100
Dec	11,801	2,422,390	968,850	4,810,427	8,201,667
Totals		27,227,049	10,890,977	54,240,955	92,358,981

Future Total Fuel

Month	Energy Demand	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Units	MMbtu/hr	MMbtu	MMbtu	MMbtu	MMbtu
Jan	345	60,002	24,284	113,885	198,170
Feb	338	58,280	23,121	110,649	192,049
Mar	326	53,486	21,654	102,788	177,928
Apr	281	44,270	18,239	84,613	147,122
May	205	30,509	11,851	58,317	100,677
Jun	141	27,191	10,892	54,024	92,108
Jul	132	27,727	11,090	55,331	94,147
Aug	137	27,813	11,115	55,428	94,356
Sep	152	27,293	10,952	54,072	92,317
Oct	216	34,614	14,027	67,112	115,753
Nov	261	41,424	16,770	79,432	137,626
Dec	340	51,729	21,164	99,473	172,365
Totals		484,338	195,160	935,123	1,614,621

Future Turbine Fuel

Month	Energy Demand	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Units	MMbtu/hr	MMbtu	MMbtu	MMbtu	MMbtu
Jan	147	30,787	12,315	60,784	103,886
Feb	147	28,409	11,363	55,974	95,746
Mar	146	30,505	12,202	60,279	102,985
Apr	141	28,908	11,563	57,242	97,714
May	137	28,634	11,454	56,951	97,039
Jun	134	27,136	10,854	53,976	91,965
Jul	132	27,724	11,090	55,330	94,144
Aug	135	27,778	11,111	55,407	94,296
Sep	134	27,205	10,884	53,937	92,027
Oct	138	29,199	11,691	57,861	98,751
Nov	140	28,741	11,496	56,944	97,181
Dec	144	30,312	12,124	59,933	102,369
Totals		345,337	138,147	684,619	1,168,103

Future Boiler Fuel

Month	Energy Demand	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Units	MMbtu/hr	MMbtu	MMbtu	MMbtu	MMbtu
Jan	199	29,215	11,969	53,100	94,285
Feb	191	29,871	11,758	54,675	96,304
Mar	179	22,981	9,453	42,509	74,943
Apr	140	15,362	6,676	27,370	49,408
May	69	1,875	807	1,365	3,638
Jun	7	56	38	48	142
Jul	-	2	-	1	3
Aug	3	35	4	21	61
Sep	18	88	67	135	290
Oct	78	5,415	2,336	9,251	17,002
Nov	121	12,683	5,274	22,489	40,446
Dec	196	21,417	9,039	39,540	69,996
Totals		139,001	57,013	250,504	446,518

Future Cogeneration Steam Profile

Month	Max Steam Generated	Steam Recovered	Steam Unrecovered	Boiler Steam	Total
Units	MMbtu	MMbtu	MMbtu	MMbtu	MMbtu
Jan	44,167	44,167	-	66,386	110,554
Feb	40,200	40,200	-	66,857	107,057
Mar	44,026	44,026	-	52,983	97,009
Apr	42,303	42,285	17	35,251	77,536
May	43,126	36,778	6,348	2,122	38,901
Jun	41,419	31,800	9,618	73	31,873
Jul	42,703	30,817	11,885	2	30,819
Aug	42,720	30,661	12,058	31	30,692
Sep	41,377	29,569	11,807	148	29,718
Oct	43,300	38,715	4,584	11,583	50,298
Nov	42,221	42,221	-	28,624	70,845
Dec	43,924	43,924	-	50,539	94,463
Totals		455,165	56,319	314,599	769,765

Electrical and Thermal Cost Profiles

Current Electrical Cost Profiles

Month	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Jan	$ 746,353	$ 201,371	$ 472,166	$ 1,419,890
Feb	$ 779,503	$ 209,658	$ 498,537	$ 1,487,693
Mar	$ 725,372	$ 195,117	$ 462,101	$ 1,382,590
Apr	$ 582,044	$ 156,841	$ 372,030	$ 1,110,915
May	$ 470,990	$ 127,738	$ 295,779	$ 894,507
Jun	$ 658,051	$ 186,033	$ 432,718	$ 1,276,803
Jul	$ 686,607	$ 199,277	$ 460,879	$ 1,346,763
Aug	$ 699,916	$ 202,639	$ 469,052	$ 1,371,608
Sep	$ 644,165	$ 184,760	$ 426,485	$ 1,255,410
Oct	$ 504,060	$ 141,158	$ 327,363	$ 972,581
Nov	$ 562,089	$ 154,293	$ 358,684	$ 1,075,066
Dec	$ 696,446	$ 188,693	$ 441,103	$ 1,326,242
Total	$ 7,755,596	$ 2,147,577	$ 5,016,893	$ 14,920,086

Current Fuel Cost Profiles (NG)

Month	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Jan	$ 352,779	$ 142,553	$ 662,068	$ 1,157,400
Feb	$ 380,976	$ 150,890	$ 716,169	$ 1,248,036
Mar	$ 371,079	$ 150,667	$ 706,247	$ 1,227,988
Apr	$ 289,133	$ 120,820	$ 544,246	$ 954,708
May	$ 159,399	$ 60,750	$ 267,789	$ 487,938
Jun	$ 127,274	$ 51,875	$ 222,478	$ 401,626
Jul	$ 113,754	$ 44,964	$ 196,733	$ 355,451
Aug	$ 98,926	$ 39,962	$ 173,266	$ 312,154
Sep	$ 86,485	$ 35,629	$ 157,067	$ 279,181
Oct	$ 120,952	$ 49,382	$ 222,855	$ 393,189
Nov	$ 272,667	$ 111,142	$ 512,557	$ 896,365
Dec	$ 374,757	$ 153,628	$ 714,152	$ 1,242,533
Total	$ 2,748,180	$ 1,112,762	$ 5,095,627	$ 8,956,068

Current Fuel Cost Profiles (Oil)*

Month	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Jan	$ 28,085	$ 11,349	$ 52,708	$ 92,142
Feb	$ 27,238	$ 10,788	$ 51,202	$ 89,228
Mar	$ 24,433	$ 9,920	$ 46,501	$ 80,853
Apr	$ -	$ -	$ -	$ -
May	$ -	$ -	$ -	$ -
Jun	$ -	$ -	$ -	$ -
Jul	$ -	$ -	$ -	$ -
Aug	$ -	$ -	$ -	$ -
Sep	$ -	$ -	$ -	$ -
Oct	$ -	$ -	$ -	$ -
Nov	$ 17,961	$ 7,371	$ 33,764	$ 59,046
Dec	$ 23,746	$ 9,734	$ 45,251	$ 78,731
Total	$ 121,463	$ 49,112	$ 229,425	$ 400,000

Current Maintenance Cost Profiles*

Month	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Jan	$ 10,944	$ 4,422	$ 20,539	$ 35,905
Feb	$ 10,614	$ 4,204	$ 19,952	$ 34,770
Mar	$ 9,521	$ 3,865	$ 18,120	$ 31,506
Apr	$ 7,630	$ 3,189	$ 14,363	$ 25,182
May	$ 4,127	$ 1,573	$ 6,934	$ 12,634
Jun	$ 3,280	$ 1,337	$ 5,734	$ 10,352
Jul	$ 3,203	$ 1,266	$ 5,540	$ 10,009
Aug	$ 3,159	$ 1,276	$ 5,533	$ 9,968
Sep	$ 2,990	$ 1,232	$ 5,430	$ 9,652
Oct	$ 5,025	$ 2,052	$ 9,259	$ 16,336
Nov	$ 6,999	$ 2,853	$ 13,157	$ 23,009
Dec	$ 9,253	$ 3,793	$ 17,633	$ 30,679
Total	$ 76,746	$ 31,062	$ 142,193	$ 250,000

* Distributed on a Boiler Usage Basis

Future Electrical Cost Profile

Month	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Jan	$ 475,124	$ 111,424	$ 211,417	$ 797,965
Feb	$ 453,594	$ 178,521	$ 252,660	$ 834,775
Mar	$ 380,045	$ 105,727	$ 203,378	$ 689,150
Apr	$ 258,926	$ 72,485	$ 140,422	$ 471,833
May	$ 169,471	$ 45,535	$ 79,674	$ 294,679
Jun	$ 328,264	$ 65,362	$ 84,589	$ 478,215
Jul	$ 297,379	$ 81,175	$ 107,587	$ 486,141
Aug	$ 311,678	$ 84,141	$ 111,473	$ 507,292
Sep	$ 250,484	$ 65,046	$ 83,570	$ 399,100
Oct	$ 180,208	$ 55,559	$ 101,339	$ 337,107
Nov	$ 240,408	$ 70,512	$ 130,636	$ 441,556
Dec	$ 355,708	$ 99,955	$ 187,759	$ 643,421
Totals	$ 3,701,288	$ 985,443	$ 1,694,503	$ 6,381,234

Future Gas Cost Profile

Month	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Jan	$ 443,556	$ 179,590	$ 840,705	$ 1,463,851
Feb	$ 482,180	$ 191,248	$ 914,440	$ 1,587,868
Mar	$ 479,415	$ 194,171	$ 920,494	$ 1,594,080
Apr	$ 383,600	$ 158,213	$ 732,166	$ 1,273,979
May	$ 265,272	$ 102,882	$ 505,952	$ 874,106
Jun	$ 236,764	$ 94,850	$ 470,178	$ 801,992
Jul	$ 219,780	$ 87,903	$ 438,589	$ 746,271
Aug	$ 192,787	$ 77,039	$ 384,171	$ 653,998
Sep	$ 173,731	$ 69,729	$ 344,168	$ 587,627
Oct	$ 183,094	$ 74,270	$ 354,370	$ 611,734
Nov	$ 368,559	$ 149,277	$ 705,816	$ 1,223,653
Dec	$ 481,975	$ 197,327	$ 926,001	$ 1,605,303
Totals	$ 3,910,714	$ 1,576,500	$ 7,537,248	$ 13,924,462

Future Maintenance Costs

Month	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Jan	$ 30,890	$ 12,502	$ 58,629	$ 102,021
Feb	$ 30,003	$ 11,903	$ 56,964	$ 98,870
Mar	$ 27,535	$ 11,148	$ 52,917	$ 91,600
Apr	$ 22,791	$ 9,390	$ 43,560	$ 75,741
May	$ 15,705	$ 6,101	$ 30,022	$ 51,830
Jun	$ 13,998	$ 5,607	$ 27,812	$ 47,418
Jul	$ 14,274	$ 5,709	$ 28,485	$ 48,468
Aug	$ 14,319	$ 5,722	$ 28,535	$ 48,576
Sep	$ 14,051	$ 5,638	$ 27,837	$ 47,526
Oct	$ 17,870	$ 7,221	$ 34,550	$ 59,592
Nov	$ 21,326	$ 8,633	$ 40,893	$ 70,852
Dec	$ 26,631	$ 10,895	$ 51,210	$ 88,736
Totals	$ 249,344	$ 100,471	$ 481,415	$ 831,231

Equipment Data Profiles

Taurus 70 Modeling

Equipment Type	Prime Mover
Manufacturer	Solar
Model	Taurus 70
Type	Gas Turbine
Description	Nominal 7.5MW Turbine w/HRSG

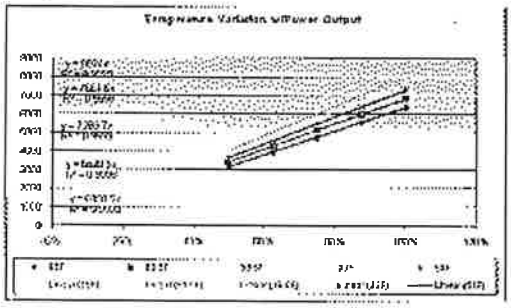
Temperature (F)	59 F

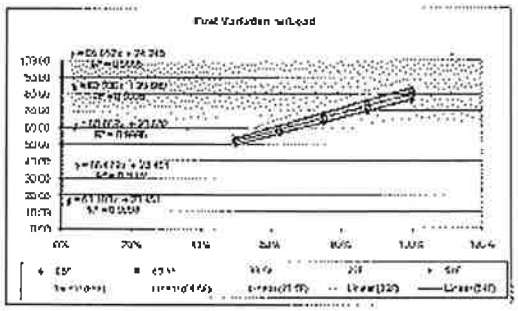
Load	Power Output (kW) (Iso)	Fuel Rate (MMbtu/hr)	Heat Rate/ Efficiency (btu/kW)	Total Recoverable Thermal Output (MMbtu/hr)	Steam Output (lbs/hr)
100%	7090.2	82.4	11620.0	35.9	35.9
80%	5672.1	70.7	12466.1	30.1	30.1
60%	4254.1	58.9	13849.0	24.4	24.4
50%	3545.1	53.1	14964.5	21.5	21.5

Turbine Curves vary on Temperature and Load

	a	b	c
Fuel Coefficients	0	-27.741	8697.4
Power Output	0	-0.2023	70.611
Fuel Input	0.000002	-0.0001	0.4901
Steam Output			

	a	b	c
Load Coefficients	0	0	0
Power Output	0.0003	-0.0404	25.052
Fuel Input	0	0.0746	-8.9859
Steam Output			





Duct Burner Firing	Duct Burner Firing Taurus 70
Equipment Type	Solar
Manufacturer	Solar 70 Duct Burner
Model	Duct Burner
Type	

Load	Fuel Rate	Heat Rate/ Efficiency	Total Recoverable Thermal Output	Steam Output
100%	38	0.92	34.96	34.96
75%	28.5	0.91	25.935	25.935
50%	19	0.9	17.1	17.1
25%	9.5	0.89	8.455	8.455
Curve Coefficients	-1.9002	0		0
Output Coefficients	45.364	0.04		40
Input Coefficients	0.0141	0.88		-1E-13

Prime Mover	Taurus 60	Taurus 60		
Mechanical Drive	8677	8672	0	
Load	100%	100%	#DIV/0!	
Heat Rate (btu/kW)	12,647	12,647	#DIV/0!	

Weather Data

Heating Degree Days

Month	Avg	Max	Min	Total
January	25.92794468	48.87712069	0	19290.39084
February	34.96428571	51.56426724	15.76496067	23496
March	22.09245894	47.98140518	0	16436.78945
April	14.25759773	31.85857587	0	10265.47036
May	2.897595993	18.42279312	0	2155.811419
June	0.454274578	8.569922428	0	327.077696
July	0.054680694	4.092344843	0	40.68243651
August	0.413386555	11.25706898	0	307.5595972
September	0.506310858	9.465637945	0	364.5481379
October	7.254745002	22.00565518	0	5397.530951
November	11.66400954	26.48423277	0	8398.518866
December	19.37207034	40.81568104	0	14417.82033
Annual Total	87.87267295	203.9	22.2	769764.615

Cooling Degree Days

Month	Avg	Max	Min	Total
January	0.055110243	6.616602659	0	41.00707071
February	0	0	0	0
March	0.027947809	4.376646326	0	20.78944987
April	0.590931059	13.32847166	0	425.4703627
May	4.833079864	26.75670966	0	3595.811419
June	9.654274578	28.99416599	0	6951.077696
July	13.02242263	30.11314416	0	9688.682437
August	12.70370914	32.35110049	0	9451.559597
September	8.772983525	26.75620966	0	6316.548138
October	1.448794289	20.04234066	0	1077.530951
November	0.29794287	7.733580826	0	214.5188663
December	0.017231637	3.257666816	0	12.82033457
Annual Total	87.87267295	203.9	22.2	769764.615

Reliability

Assume 1 Prime Mover Down in Each Peak Period

Availability	99%
	kWh Penalty
Winter	$ 7,500
Summer	$ 6,500

Rikers Boiler Operation

Equipment Type	Boiler
Manufacturer	Various
Model	Rikers Boilers
Type	Steam Boiler
Description	70klbs/hr Boiler

Fuel Rate	Heat Rate/ Efficiency	Total Recoverable Thermal Output	Steam Output
92.10526316	0.76	70	70
70.94594595	0.74	52.5	52.5
50	0.7	35	35
29.16666667	0.6	17.5	17.5
	-0.37		
	0.608		
	0.47		

Equipment Data Profiles

Taurus 60 Modeling

Equipment Type	Prime Mover
Manufacturer	Solar
Model	Taurus 60
Type	Gas Turbine
Description	Nominal 5.5MW Turbine w/HRSG

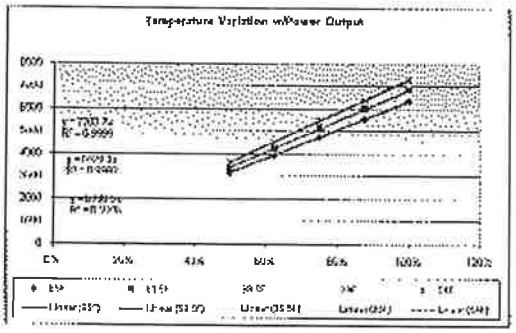
Regeneration Case: 59 F

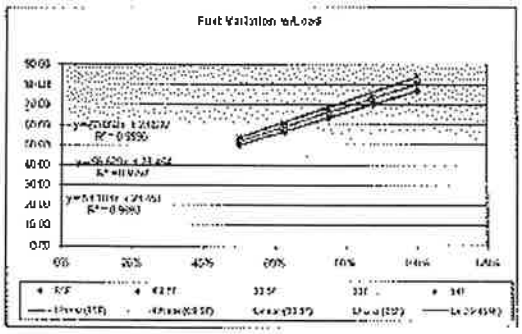
Load	Power Output (kW) (Iso)	Fuel Rate (MMbtu/hr)	Heat Rate/ Efficiency (btu/kW)	Total Recoverable Thermal Output (M Mbtu/hr)	Steam Output (lbs/hr)
100%	5253	67	12679	29.19	29.19
75%	3940	55	13910	24.13	24.13
50%	2627	43	16370	19.08	19.08
25%	1313	31	23751	14.02	14.02

Turbine Curves vary on Temperature and Load

a Coefficients	a	b	c
Power Output	0.00	-10.39	6397.00
Fuel Use	0.00	-0.10	54.39
Steam Output	0.00	0.00	0.34

b Coefficients	a	b	c
Power Output	0.00	0.00	0.00
Fuel Use	0.00	-0.04	22.16
Steam Output	0.00	-0.09	4.87





Duct Burner Firing	Duct Burner Firing Taurus 60
Equipment Type	Solar
Manufacturer	Solar 60 Duct Burner
Model	Duct Burner
Type	

Load	Fuel Rate	Heat Rate/ Efficiency	Total Recoverable Thermal Output	Steam Output
100%	32.30	0.92	29.7	29.7
75%	24.23	0.91	22.0	22.0
50%	16.15	0.9	14.5	14.5
25%	8.08	0.89	7.2	7.2
Curve Coefficient A	(0.00)	0		1.292
Curve Coefficient B	32.30	0.04		28.424
Curve Coefficient C	(0.00)	0.88		2E-13

Prime Mover	Taurus 60	Taurus 60	
Hours of Run Time	0	0	0
% Load	100%	100%	0%
Heat Rate (btu/kW)	12,647	12,647	0

2 Taurus 60's with Duct Burners no Inlet Cooling

Utility Cost Averages	Purchased Electricity	Avg. Natural Gas Cost
Current	$ 0.11	$ 8.50
Future	$ 0.13	$ 8.04

Total Savings	$ 4,944,116

Reformatted Savings by Time Period

Month	Peak 8AM-6PM	Evening Peak 6PM-10PM	Off Peak 10PM-8AM, Weekends
Jan	$ 223,333	$ 70,887	$ 161,560
Feb	$ 273,838	$ 60,131	$ 136,715
Mar	$ 278,894	$ 62,941	$ 122,079
Apr	$ 238,742	$ 50,159	$ 60,641
May	$ 189,393	$ 36,729	$ (41,794)
Jun	$ 709,115	$ 73,305	$ 76,977
Jul	$ 271,434	$ 70,438	$ 87,087
Aug	$ 287,679	$ 76,707	$ 122,334
Sep	$ 294,955	$ 81,139	$ 132,457
Oct	$ 250,325	$ 58,777	$ 82,695
Nov	$ 253,975	$ 57,089	$ 87,148
Dec	$ 271,497	$ 60,688	$ 113,303

Total Costs

Description	Current	Future
Fuel Cost	$ 9,356,068	$ 12,369,553
Electricity Cost	$ 14,920,066	$ 6,381,234
Operation and Maintenance Costs	$ 250,000	$ 831,231
Other Costs	$ -	$ -
Total Cost	$ 24,526,135	$ 19,582,018

Electrical and Steam Demand Profiles from '06-'07

Electricity Demand	135,288,634	kWh
Steam Demand	769,765	klbs
% Electricity Profile Sensitivity	0%	
% Steam Profile Sensitivity	0%	

Environmental Calculations

	CO2e Factors from PlaNYC	CO2e Factors from PlaNYC	Tons CO2e
CO2 Emissions Electricity Current	985	lbs CO2e/MWh	66,631
CO2 Emissions Boiler Current (CI)	117	lbs CO2e/MMbtu	61,740
CO2 Emissions Boiler Current (NG)	174	lbs CO2e/MMbtu	3,214
Total CO2e in			131,585
CO2 Emissions Electricity Future	985	lbs CO2e/MWh	21,143
CO2 Emissions Gas Turbine and Boiler Future	117	lbs CO2e/MMbtu	90,160
Total Future			111,303
Differential Emissions CO2e (Tons)			20,282

For Summary Table

Case Description	2 Taurus 60's with Duct Burners no Inlet Cooling
Purchased Electricity Cost ($k/year)	$ 6,381,234
Differential O&M Costs ($k/Year)	$ 581,231
Net Cost of Electricity ($/KWh)	$ 0.074
Net Operating Savings ($k/Year)	$ 4,944,116
Estimated CO2e Reduction from Plan (Tons)	20,282

Electricity Tariff

Increases	19%	19%	33%

NYPA 100	Energy Demand	Energy Commodity	Delivery Demand - Summer	Delivery Demand - Winter
8am-10pm	$ 10.0725	$ 0.1030	$ 24.9508	$ 5.2402
10pm-8am	$ -	$ 0.1030	$ 24.9508	$ 5.2402
10pm-8am	$ -	$ 0.0503	$ 24.9508	$ 5.2402
Weekend	$ -	$ 0.0503	$ 24.9508	$ 5.2402

ASNY-1	Stand-by Delivery
Month Charge	$ 1,198.00
Power	$ 3.78
Contract Demand	76,490
Ratchet Percent	
[illegible]	$ 0.48840
[illegible]	$ 0.22210
[illegible]	$ 0.21520

Gas Tariff

Increases	8%	8%
Turbine Fuel Discount	$	0.50

Month	Current	Future for Turbine
Jan	$ 7.649	$ 7.149
Feb	$ 8.517	$ 8.017
Mar	$ 9.249	$ 8.749
Apr	$ 8.991	$ 8.491
May	$ 9.164	$ 8.664
Jun	$ 9.206	$ 8.706
Jul	$ 8.427	$ 7.927
Aug	$ 7.431	$ 6.931
Sep	$ 6.864	$ 6.364
Oct	$ 5.711	$ 5.211
Nov	$ 9.744	$ 8.744
Dec	$ 9.610	$ 9.110

Electrical and Thermal Profiles

Current Electrical Profile

Month	Energy Demand	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Units	kW	kWh	kWh	kWh	kWh
Jan	25,411	4,224,001	1,740,190	8,277,591	14,241,782
Feb	26,490	4,417,448	1,811,521	8,754,538	14,983,507
Mar	25,911	3,960,616	1,675,202	8,055,923	13,691,741
Apr	20,149	3,754,513	1,352,341	6,516,572	11,123,425
May	15,397	2,741,570	1,109,999	5,207,931	9,059,499
Jun	17,245	2,962,879	1,110,284	5,034,634	9,107,807
Jul	17,300	3,229,278	1,236,694	5,582,709	10,048,681
Aug	17,609	3,285,175	1,254,444	5,668,856	10,208,475
Sep	16,766	2,923,241	1,117,272	5,009,757	9,050,270
Oct	17,057	2,854,787	1,222,082	5,742,021	9,818,890
Nov	19,353	3,155,484	1,334,353	6,285,986	10,775,823
Dec	24,463	3,852,045	1,625,098	7,701,590	13,178,733
Totals		40,861,038	16,589,489	77,838,107	135,288,634

Current Fuel Demand Profile

Month	Energy Demand	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Units	MMbtu/hr	MMbtu	MMbtu	MMbtu	MMbtu
Jan	279	46,121	18,637	86,557	151,315
Feb	266	44,730	17,716	84,084	146,530
Mar	254	40,123	16,290	76,363	132,777
Apr	217	32,157	13,438	60,529	106,124
May	153	17,394	6,629	29,221	53,244
Jun	88	13,825	5,635	24,166	43,625
Jul	80	13,499	5,336	23,347	42,182
Aug	88	13,313	5,378	23,317	42,008
Sep	94	12,600	5,191	22,884	40,675
Oct	163	21,177	8,646	39,020	68,843
Nov	197	29,496	12,023	55,446	96,965
Dec	268	38,995	15,985	74,311	129,292
Totals		373,430	130,904	599,245	1,053,579

Future Electrical Billing Profile

Month	Energy Demand	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Units	kW	kWh	kWh	kWh	kWh
Jan	20,810	1,743,058	747,888	3,361,149	5,852,095
Feb	14,274	2,102,701	885,685	4,180,462	7,168,849
Mar	13,816	1,513,859	696,599	3,201,451	5,411,910
Apr	9,010	959,764	434,557	1,950,797	3,345,118
May	5,865	510,961	217,778	744,013	1,472,752
Jun	14,458	867,122	272,158	841,660	1,980,941
Jul	7,975	1,097,543	384,182	1,298,516	2,780,241
Aug	8,540	1,147,349	399,493	1,375,712	2,922,554
Sep	7,391	820,003	275,885	821,425	1,917,403
Oct	6,120	561,132	303,455	1,174,413	2,039,000
Nov	8,214	880,751	424,581	1,756,391	3,061,723
Dec	12,663	1,429,655	666,248	2,891,163	4,977,066
Totals		13,633,988	5,698,512	23,597,252	42,929,652

Future Electrical Generation

Month	Energy Demand	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Units	kW	kWh	kWh	kWh	kWh
Jan	4,601	2,480,943	992,303	4,916,442	8,389,687
Feb	12,216	2,314,747	925,835	4,574,076	7,814,658
Mar	12,095	2,446,756	978,602	4,854,472	8,279,831
Apr	11,139	2,294,749	917,784	4,565,775	7,778,307
May	9,532	2,230,609	892,270	4,463,918	7,586,747
Jun	2,787	2,095,757	838,135	4,192,974	7,126,866
Jul	9,325	2,131,735	852,512	4,284,193	7,268,440
Aug	9,128	2,137,827	854,950	4,293,144	7,285,921
Sep	9,375	2,103,148	841,386	4,188,332	7,132,866
Oct	10,936	2,293,655	928,627	4,557,608	7,779,890
Nov	11,189	2,274,733	909,772	4,529,595	7,714,100
Dec	11,801	2,422,390	968,850	4,810,427	8,201,667
Totals		27,227,049	10,890,977	54,240,055	92,358,981

Future Total Fuel

Month	Energy Demand	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Units	MMbtu/hr	MMbtu	MMbtu	MMbtu	MMbtu
Jan	332	55,573	22,413	105,614	183,600
Feb	317	53,558	21,261	102,066	176,885
Mar	297	49,722	20,125	95,788	165,635
Apr	259	41,503	17,205	79,545	138,253
May	192	29,880	11,698	57,819	99,397
Jun	135	27,168	10,876	54,004	92,048
Jul	132	27,776	11,080	55,331	94,146
Aug	135	27,798	11,113	55,419	94,330
Sep	145	27,756	10,924	54,015	92,194
Oct	203	33,288	13,452	64,715	111,455
Nov	242	38,807	15,714	74,491	129,012
Dec	319	48,485	19,828	93,299	161,612
Totals		460,764	185,699	892,104	1,538,567

Future Turbine Fuel

Month	Energy Demand	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Units	MMbtu/hr	MMbtu	MMbtu	MMbtu	MMbtu
Jan	147	30,787	12,315	60,784	103,886
Feb	147	28,409	11,363	55,074	95,746
Mar	146	30,505	12,202	60,279	102,985
Apr	141	28,908	11,563	57,242	97,714
May	137	28,634	11,454	56,951	97,039
Jun	134	27,136	10,854	53,976	91,965
Jul	132	27,724	11,090	55,330	94,144
Aug	135	27,778	11,111	55,407	94,296
Sep	134	27,205	10,884	53,937	92,027
Oct	138	29,199	11,691	57,861	98,751
Nov	140	28,741	11,496	56,944	97,181
Dec	144	30,312	12,124	59,933	102,369
Totals		345,337	138,147	684,619	1,168,103

Future Boiler Fuel

Month	Energy Demand	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Units	MMbtu/hr	MMbtu	MMbtu	MMbtu	MMbtu
Jan	185	24,786	10,099	44,830	79,714
Feb	170	25,149	9,898	46,092	81,139
Mar	150	19,217	7,923	35,509	62,650
Apr	117	17,595	5,642	22,303	40,540
May	55	1,246	744	867	2,857
Jun	2	32	22	28	82
Jul		1	-	0	2
Aug		20	2	12	34
Sep	11	51	39	78	167
Oct	64	4,089	1,761	6,854	12,704
Nov	103	10,066	4,218	17,547	31,831
Dec	174	18,174	7,704	33,366	59,243
Totals		115,426	47,552	207,485	370,464

Future Cogeneration Steam Profile

Month	Max Steam Generated	Steam Recovered	Steam Unrecovered	Boiler Steam	Total
Units	MMbtu	MMbtu	MMbtu	MMbtu	MMbtu
Jan	44,167	44,167	-	66,386	110,554
Feb	40,200	40,200	-	66,857	107,057
Mar	44,026	44,026	-	52,983	97,009
Apr	42,303	42,285	17	35,251	77,536
May	43,126	36,778	6,348	2,122	38,901
Jun	41,419	31,800	9,618	73	31,873
Jul	42,703	30,817	11,885	2	30,819
Aug	42,720	30,661	12,058	31	30,692
Sep	41,377	29,560	11,807	148	29,718
Oct	43,300	38,715	4,584	11,583	50,298
Nov	42,221	42,221	-	28,624	70,845
Dec	43,924	43,924	-	50,539	94,463
Totals		455,165	56,319	314,599	769,765

Electrical and Thermal Cost Profiles

Current Electrical Cost Profiles

Month	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Jan	$ 746,353	$ 201,371	$ 472,166	$ 1,419,890
Feb	$ 779,503	$ 209,658	$ 408,532	$ 1,487,693
Mar	$ 725,372	$ 195,317	$ 462,101	$ 1,382,590
Apr	$ 582,044	$ 156,841	$ 372,030	$ 1,110,915
May	$ 470,990	$ 127,738	$ 295,779	$ 894,507
Jun	$ 658,051	$ 186,033	$ 432,718	$ 1,276,803
Jul	$ 686,607	$ 199,277	$ 460,879	$ 1,346,763
Aug	$ 699,916	$ 202,630	$ 469,062	$ 1,371,608
Sep	$ 644,165	$ 184,760	$ 426,485	$ 1,255,410
Oct	$ 504,060	$ 141,358	$ 327,363	$ 972,581
Nov	$ 562,089	$ 154,293	$ 358,684	$ 1,075,066
Dec	$ 696,446	$ 188,693	$ 441,103	$ 1,326,242
Totals	$ 7,755,596	$ 2,147,577	$ 5,016,893	$ 14,920,066

Current Fuel Cost Profiles (NG)

Month	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Jan	$ 352,779	$ 142,553	$ 662,068	$ 1,157,400
Feb	$ 380,976	$ 150,890	$ 716,169	$ 1,248,036
Mar	$ 371,079	$ 150,662	$ 706,247	$ 1,227,988
Apr	$ 289,133	$ 120,829	$ 544,246	$ 954,708
May	$ 159,399	$ 60,750	$ 267,789	$ 487,938
Jun	$ 127,274	$ 51,875	$ 222,478	$ 401,626
Jul	$ 113,754	$ 44,964	$ 196,733	$ 355,451
Aug	$ 98,926	$ 39,962	$ 173,266	$ 312,154
Sep	$ 86,485	$ 35,629	$ 157,067	$ 279,181
Oct	$ 120,952	$ 49,382	$ 222,855	$ 393,189
Nov	$ 272,667	$ 111,142	$ 512,557	$ 896,365
Dec	$ 374,757	$ 153,625	$ 714,152	$ 1,242,533
Totals	$ 2,748,180	$ 1,112,262	$ 5,095,627	$ 8,956,068

Current Fuel Cost Profiles (Oil)*

Month	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Jan	$ 28,085	$ 11,349	$ 52,708	$ 92,142
Feb	$ 27,238	$ 10,788	$ 51,202	$ 89,228
Mar	$ 24,433	$ 9,920	$ 46,501	$ 80,853
Apr	$ -	$ -	$ -	$ -
May	$ -	$ -	$ -	$ -
Jun	$ -	$ -	$ -	$ -
Jul	$ -	$ -	$ -	$ -
Aug	$ -	$ -	$ -	$ -
Sep	$ -	$ -	$ -	$ -
Oct	$ -	$ -	$ -	$ -
Nov	$ 17,961	$ 7,324	$ 33,764	$ 59,046
Dec	$ 23,746	$ 9,734	$ 45,251	$ 78,731
Totals	$ 121,463	$ 49,112	$ 229,425	$ 400,000

Current Maintenance Cost Profiles*

Month	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Jan	$ 10,944	$ 4,422	$ 20,539	$ 35,905
Feb	$ 10,614	$ 4,204	$ 19,952	$ 34,770
Mar	$ 9,521	$ 3,865	$ 18,170	$ 31,556
Apr	$ 7,630	$ 3,189	$ 14,363	$ 25,182
May	$ 4,127	$ 1,573	$ 6,934	$ 12,634
Jun	$ 3,280	$ 1,337	$ 5,734	$ 10,352
Jul	$ 3,203	$ 1,266	$ 5,540	$ 10,009
Aug	$ 3,159	$ 1,276	$ 5,533	$ 9,968
Sep	$ 2,990	$ 1,237	$ 5,430	$ 9,652
Oct	$ 5,025	$ 2,052	$ 9,259	$ 16,336
Nov	$ 6,999	$ 2,853	$ 13,157	$ 23,009
Dec	$ 9,253	$ 3,793	$ 17,633	$ 30,679
Totals	$ 76,746	$ 31,062	$ 142,193	$ 250,000

* Distributed on a Boiler Usage Basis

Future Electrical Cost Profile

Month	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Jan	$ 475,124	$ 111,424	$ 211,417	$ 797,965
Feb	$ 453,594	$ 178,571	$ 252,660	$ 884,775
Mar	$ 380,045	$ 105,727	$ 203,378	$ 689,150
Apr	$ 256,926	$ 72,485	$ 140,427	$ 471,838
May	$ 169,471	$ 45,535	$ 79,674	$ 294,679
Jun	$ 328,264	$ 65,362	$ 84,589	$ 478,215
Jul	$ 297,379	$ 81,175	$ 107,587	$ 486,141
Aug	$ 311,678	$ 84,141	$ 111,473	$ 507,292
Sep	$ 250,484	$ 65,046	$ 83,570	$ 399,100
Oct	$ 180,208	$ 55,559	$ 101,339	$ 337,107
Nov	$ 240,408	$ 70,512	$ 130,636	$ 441,556
Dec	$ 355,708	$ 99,955	$ 187,759	$ 643,421
Total	$ 3,701,288	$ 985,443	$ 1,694,503	$ 6,381,234

Future Gas Cost Profile

Month	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Jan	$ 409,681	$ 165,280	$ 777,444	$ 1,352,405
Feb	$ 441,984	$ 175,402	$ 841,338	$ 1,458,704
Mar	$ 444,602	$ 180,023	$ 855,761	$ 1,480,386
Apr	$ 358,717	$ 148,919	$ 686,601	$ 1,194,238
May	$ 259,510	$ 101,476	$ 501,386	$ 862,372
Jun	$ 736,549	$ 94,701	$ 470,188	$ 801,438
Jul	$ 219,771	$ 87,903	$ 438,585	$ 746,259
Aug	$ 192,675	$ 77,025	$ 384,104	$ 653,804
Sep	$ 173,475	$ 69,534	$ 343,773	$ 586,782
Oct	$ 175,520	$ 70,986	$ 340,679	$ 587,186
Nov	$ 344,367	$ 139,518	$ 660,133	$ 1,144,018
Dec	$ 450,802	$ 184,490	$ 866,671	$ 1,501,963
Total	$ 3,707,633	$ 1,495,258	$ 7,166,663	$ 12,369,553

Future Maintenance Costs

Month	8AM-6PM Peak	6PM-10PM Peak2	10PM-8AM &Wknd	Total
Jan	$ 30,024	$ 12,109	$ 57,059	$ 99,192
Feb	$ 28,935	$ 11,486	$ 55,142	$ 95,564
Mar	$ 26,863	$ 10,873	$ 51,751	$ 89,487
Apr	$ 22,423	$ 9,295	$ 42,975	$ 74,693
May	$ 16,143	$ 6,320	$ 31,237	$ 53,700
Jun	$ 14,678	$ 5,876	$ 29,176	$ 49,730
Jul	$ 14,979	$ 5,991	$ 29,893	$ 50,864
Aug	$ 15,018	$ 6,004	$ 29,941	$ 50,963
Sep	$ 14,725	$ 5,902	$ 29,182	$ 49,809
Oct	$ 17,984	$ 7,268	$ 34,963	$ 60,215
Nov	$ 20,966	$ 8,490	$ 40,245	$ 69,700
Dec	$ 26,195	$ 10,712	$ 50,406	$ 87,313
Total	$ 248,934	$ 100,326	$ 481,971	$ 831,231

Equipment Data Profiles

Taurus 70 Modeling

Equipment Type	Prime Mover
Manufacturer	Solar
Model #	Taurus 70
Type	Gas Turbine
Description	Nominal 7.5MW Turbine w/HRSG

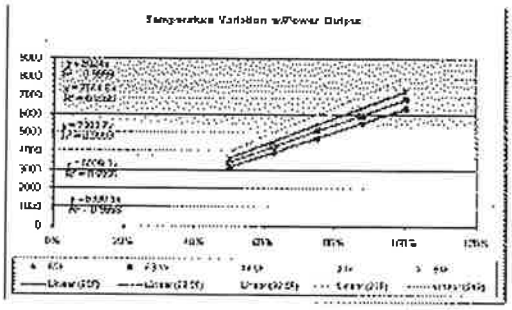
Temperature Case	59 F

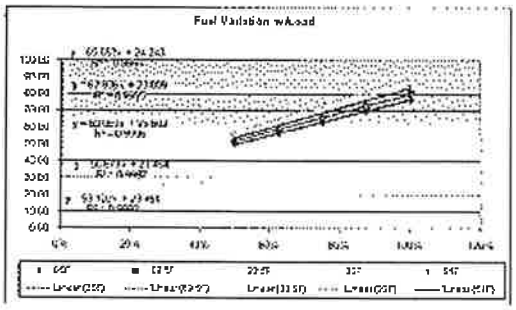
Load	Power Output (kW) (iso)	Fuel Rate (MMbtu/hr)	Heat Rate/ Efficiency (btu/kW)	Total Recoverable Thermal Output (MMbtu/hr)	Steam Output (lbs/hr)
100%	7090.2	82.4	11620.0	35.9	35.9
80%	5672.1	70.7	12456.1	30.1	30.1
60%	4254.1	58.9	13849.6	24.4	24.4
50%	3545.1	53.1	14964.5	21.5	21.5

Turbine Curves vary on Temperature and Load

Coefficients	a	b	c
Fuel Rate	0	-27.241	8697.4
Heat Rate	0	-0.2023	70.611
Steam Output	0.000002	-0.0001	0.4901

Coefficients	a	b	c
Power Output	0	0	0
Heat Rate	0.0003	-0.0404	25.052
Steam Output	0	0.0746	-8.9859





Duct Burner Firing	Duct Burner Firing Taurus 70
Equipment Type	Solar
Manufacturer	Solar 70 Duct Burner
Model #	Duct Burner
Type	

Load	Fuel Rate	Heat Rate/ Efficiency	Total Recoverable Thermal Output	Steam Output
100%	38	0.92	34.96	34.96
80%	28.5	0.91	25.935	25.935
60%	19	0.9	17.1	17.1
50%	9.5	0.89	8.455	8.455
Curve Coefficient A	-1.9002	0		0
Curve Coefficient B	45.364	0.04		40
Curve Coefficient C	0.0141	0.88		-1E-13

Prime Mover	Taurus 60	Taurus 60	---
Hours in Month	8677	8677	0
Load	100%	100%	#DIV/0!
Heat Rate (btu/kW)	12,647	12,647	#DIV/0!

Weather Data

Heating Degree Days

Month	Avg	Max	Min	Total	
January		75.92794468	48.87712069	0	19290.39084
February		34.96428571	51.56426724	15.76496067	23496
March		22.09245894	47.98140518	0	16436.78945
April		14.25759773	31.85852587	0	10265.47036
May		2.897595993	18.42279312	0	2155.811419
June		0.454274578	8.569922428	0	327.077696
July		0.054680694	4.091344843	0	40.68243651
August		0.413386555	11.25706898	0	307.5595972
September		0.506316858	9.465637945	0	364.5481379
October		7.254745902	22.00565518	0	5397.530951
November		11.66460954	26.48423277	0	8398.518866
December		19.37707034	40.81568104	0	14417.87033
Annual Total		87.87267295	203.9	22.2	769764.615

Cooling Degree Days

Month	Avg	Max	Min	total	
January		0.055110243	6.614602659	0	41.00202071
February		0	0	0	0
March		0.027942809	4.376646326	0	20.78944987
April		0.590931069	13.37847166	0	425.4703627
May		4.833079864	26.75620966	0	3595.811419
June		9.654274578	28.99410599	0	6951.077696
July		13.02242263	30.11314416	0	9688.682437
August		12.70370914	37.35110049	0	9451.559597
September		8.772983525	26.75620966	0	6316.548138
October		1.448294289	20.04234065	0	1077.530951
November		0.2979428?	7.733580826	0	214.5188663
December		0.017231632	3.25766816	0	12.82033457
Annual Total		87.87267295	203.9	22.2	769764.615

Reliability

Assume 1 Prime Mover Down in Each Peak Period

Availability	99%
	kWh Penalty
Winter	$ 7,500
Summer	$ 6,500

Rikers Boiler Operation

Equipment Type	Boiler
Manufacturer	Various
Model #	Rikers Boilers
Type	Steam Boiler
Description	70klbs/hr Boiler

Load	Fuel Rate	Heat Rate/ Efficiency	Total Recoverable Thermal Output	Steam Output
100%	92.10526316	0.76	70	70
75%	70.94594595	0.74	52.5	52.5
50%	50	0.7	35	35
25%	29.16666667	0.6	17.5	17.5
curve Coefficient A		-0.32		
curve Coefficient B		0.608		
curve Coefficient C		0.47		

Equipment Data Profiles

Taurus 60 Modeling

Equipment Type	Prime Mover
Manufacturer	Solar
Model #	Taurus 60
Type	Gas Turbine
Description	Nominal 5.5MW Turbine w/HRSG

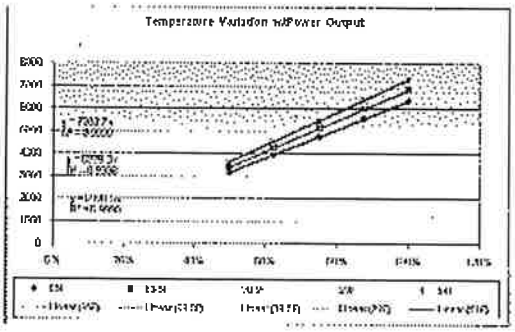
Temperature (°F)	59 F

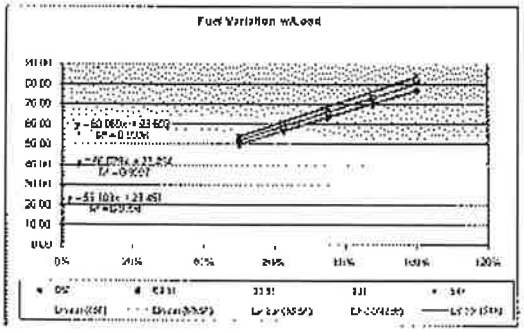
Load	Power Output (kW) (Iso)	Fuel Rate (MMbtu/hr)	Heat Rate/ Efficiency (btu/kW)	Total Recoverable Thermal Output (MMbtu/hr)	Steam Output (lbs/hr)
100%	5253	67	12679	29.19	29.19
75%	3940	55	13910	24.13	24.13
50%	2627	43	16370	19.08	19.08
	1313	31	23751	14.02	14.02

Turbine Curves vary on Temperature and Load

	a	b	c
Efficiency			
Power Output	0.00	-19.39	6397.00
Fuel Input	0.00	-0.10	54.39
Steam Output	0.00	0.00	0.34

	a	b	c
Efficiency			
Power Output	0.00	0.00	0.00
Fuel Input	0.00	-0.04	21.16
Steam Output	0.00	-0.09	4.87





Duct Burner Firing	Duct Burner Firing Taurus 60
Equipment Type	Solar
Manufacturer	Solar 60 Duct Burner
Model #	Duct Burner
Type	

Load	Fuel Rate	Heat Rate/ Efficiency	Total Recoverable Thermal Output	Steam Output
100%	32.30	0.92	29.7	29.7
75%	24.23	0.91	22.0	22.0
50%	16.15	0.9	14.5	14.5
25%	8.08	0.89	7.2	7.2
Curve Coefficient A	(0.00)	0		1.797
Curve Coefficient B	32.30	0.01		28.424
Curve Coefficient C	(0.00)	0.88		-2E-13

Prime Mover	Taurus 60	Taurus 60	
Load Distribution	0	0	0
Load	100%	100%	0%
Heat Rate (Btu/kW)	12,647	12,647	0

Appendix B

STATE OF NEW YORK
RAMON LI
No. 060857
LICENSED PROFESSIONAL ENGINEER

Rikers Island Cogeneration Modeling Summary

Main Methodology

1. Model Major Equipment Gas Turbines, Gas Compressors, and Heat Recovery Steam Generators
2. Model Process at different loading and ambient temperatures
3. Create Curves for each Gas Turbine Model to be used in Economic Model
4. Run Hourly Economic Model

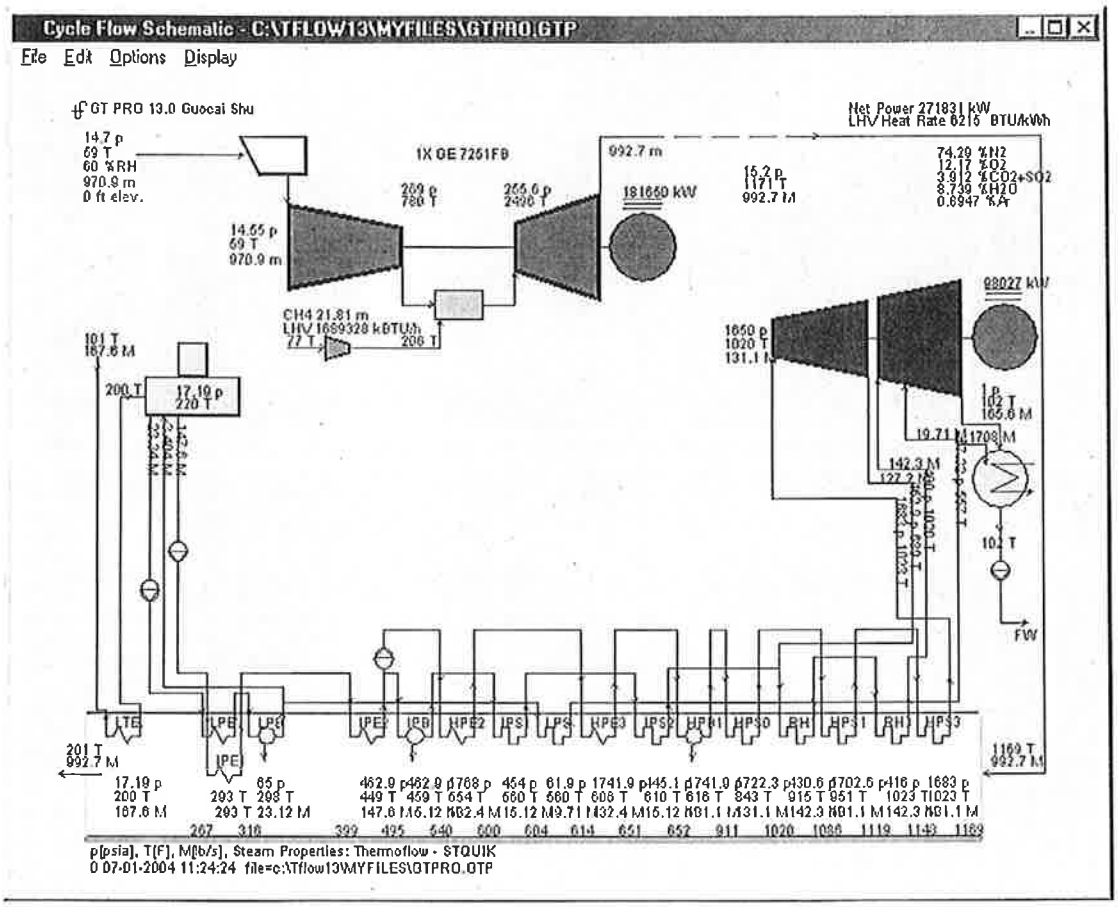
Main Computer Programs Utilized

- **GT/Pro –** Gas Turbine and Heat Recovery Generator Simulation Software
- **Thermoflex –** Process Simulation Software
- **Excel –** Curve Modeling, and Extensive Hourly Cogeneration Operational Model with Macros Programmed in Visual Basic

GT/Pro

Description: ***GT PRO*** automates the process of designing a combined cycle or gas turbine cogeneration plant. GT PRO is particularly effective for creating new designs and finding their optimal configuration and design parameters. The user inputs design criteria and assumptions and the program computes heat and mass balance, system performance, and component sizing. The scope and level of detail in GT PRO has been continuously growing since 1988, to the point that the 2008 version has over 2700 user-adjustable inputs. Most key inputs are automatically created by intelligent design procedures that help the user identify the best design with minimal time and effort, while allowing the flexibility to make any changes or adjustments. GT PRO is truly easy to use, typically requiring only a few minutes to create a new plant design. It normally computes a heat balance and simultaneously designs the required equipment in under five seconds.

www.thermoflow.com



Thermoflex

Description: ***THERMOFLEX*** is a modular program with a graphical interface that allows you to assemble a model from icons representing over one hundred different components. The program covers both design and off-design simulation, and models all types of power plants, including combined cycles, conventional steam cycles, and repowering. It can also model general thermal power systems and networks. It answers the need of some customers for a single, "jack-of-all-trades" program.

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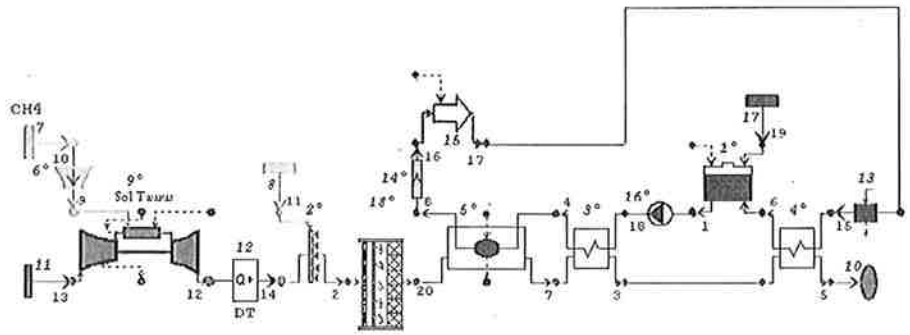
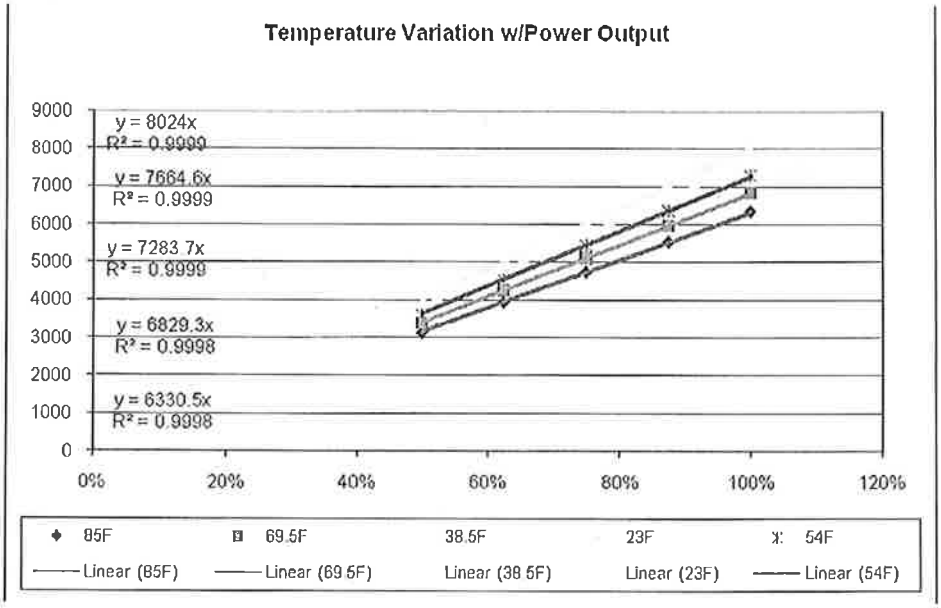
Gross power	5882	kW
Net power	5757	kW
Net electric efficiency(LHV)	17.34	%
Net heat rate(LHV)	19681	BTU/kWh
Net fuel input(LHV)	113308	kBTU/h
Net process output	79788	kBTU/h
Plant auxiliary	124.5	kW

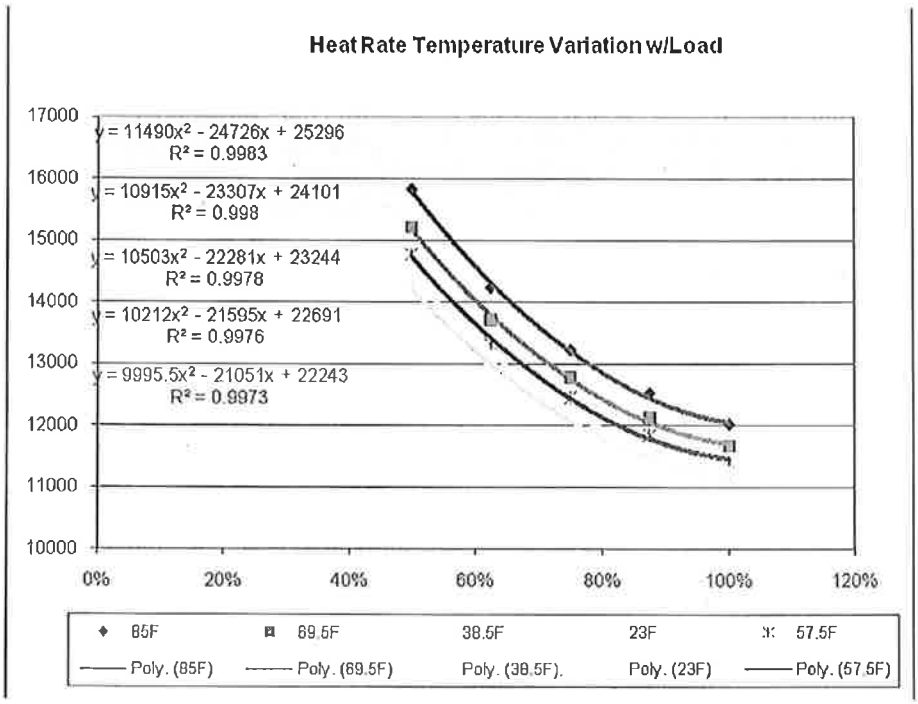


Modeling of Turbine Input Curves

Description: Output of Turbine and Heat Recovery varies based on different variables: Power, Fuel, Steam, Enthalpy, Inlet Air Temperature, and Supplemental Firing

Example Graphs:





Turbine Curve Results:

Temperature	Power		Fuel		Steam		Enthalpy		DB
x	m	b	m	b	m	b	m	b	m
85	6330.5	0	53.103	23.451	0.4993	-2.586	24.901	19.862	89.5
69.5	6829.3	0	56.679	23.454	0.4949	-3.8413	26.349	19.106	92.8
54	7283.7	0	60.069	23.602	0.4919	-5.0269	27.691	18.498	95.8
38.5	7664.6	0	62.936	23.889	0.4899	-6.1239	28.916	17.922	98.3
23	8024	0	65.652	24.248	0.4891	-7.2224	30.032	17.414	100.32
Regression Equation Coefficients									
a	0	0	0	0.0003	2.00E-06	0	0	0	-0.0009
b	-27.241	0	-0.2023	-0.0404	-0.0001	0.0746	-0.0828	0.0392	-0.0768
c	8697.4	0	70.611	25.052	0.4901	-8.9859	32.047	16.442	102.58

Coefficients for equations that vary based on Temperature and Load

Example: Power Equation

Power = m*(% Load)+b

where:

m=a*(temp^2)+b*(temp)+c

b=a*(temp^2)+b*(temp)+c

Hourly Economic Modelling

Description:

Economic Model Inputs

- Hourly Electrical Profile – From Con Ed Interval Metering Data
- Hourly Thermal Profile – From Powerhouse Control System
- Hourly Weather Profile – From LGA Data
- Turbine and HRSG Curve Information – From GT Pro/Thermoflex and Regressions
- Current Boiler Curve Information – From Powerhouse Data
- Electric Tariff – From NYPA, see Table below
- Gas Tariff – As currently negotiated
- Operational Options – # of Turbines, Duct Burner Firing, # of Boilers, Electrical Match, Thermal Match, Optimal Match, Baseload Operation, Inlet cooling etc.

Economic Model Outputs

- Hourly Fuel Usage
- Hourly Equipment Profile
- New Electrical Profile (Purchase and Sales)
- New Thermal Profile (Boilers vs. HRSG)
- New Electric Bill
- New Fuel Bill

Model Algorithm

1. Inputs hourly loads, weather data, and operational scenario to determine at what capacity turbine will run
2. Calculates heat rate, fuel requirements, thermal output, and final electrical output based on operation mode and input curves
3. Electricity Bill and Fuel Bill calculated based on new hourly profiles and tariff inputs

Cogeneration Electrical Tariff
Energy Production (NYPA Tariff 100, Service Classification 91, same as current)
On-Peak Demand: $8.50/kW-month
On Peak Energy: $0.08689/kWh
Off Peak Energy: $0.0428/kWh

Delivery Production (PASNY 4 Tariff, Service Classification IV)
Customer Charge: $1,198/month
Delivery Service Contract Charge: $3.78/kW Contract Demand of 26,490kW
As-Used Daily Demand Charge Period 1: $0.2663/kW of Daily Peak Demand
As-Used Daily Demand Charge Period 2: $0.2221 or $0.2152/kW of Daily Peak Demand Varying Seasonally

Gas Tariff
Currently same as current Keyspan Tariff
Prices vary Monthly
Ability to separate Boiler Firing from Gas Turbine Fuel
Expect new Tariff to be negotiated

Example Output:
Electricity Bill

Electricity Bill - Future

Account #	New	Meter #											
Rate Class				On Peak Demand Demand		Cost		On Peak Usage Demand		Cost			
Total Annual Bill	$ 1,281,858			First	kW	8.5	$/kW	First	kWh	0.0869	$/kWh		
Total Usage	312,277	kWh		Intermediate	kW		$/kW	Intermediate	kWh		$/kWh		
Max Peak	1,712.13	kW		Intermediate	kW		$/kW	Intermediate	kWh		$/kWh		
				Intermediate	kW		$/kW	Intermediate	kWh		$/kWh		
Utility Peak	Start	Finish		Last	kW		$/kW	Last	kWh		$/kWh		
Sunday	1	0:00	0:00										
Monday	2	8:00	23:00	Off Peak Demand Demand		Cost		Off Peak Usage Demand		Cost			
Tuesday	3	8:00	23:00	First	kW	18.78	$/kW	First	kWh	0.04248	$/kWh		
Wednesday	4	8:00	23:00	Intermediate	kW	3.54	$/kW	Intermediate	kWh		$/kWh		
Thursday	5	8:00	23:00	Intermediate	kW		$/kW	Intermediate	kWh		$/kWh		
Friday	6	8:00	23:00	Intermediate	kW		$/kW	Intermediate	kWh		$/kWh		
Saturday	7	0:00	0:00	Last	kW		$/kW	Last	kWh		$/kWh		

Bill Data

Off Peak Usage Information	From	To	Off Peak (kWh)	Off Peak (kW)	Demand Charges ($)	Commodity Charges ($)	Off Peak Usage ($/kWh)	Off Peak Demand ($/kW)					
Jan			82656.1	678.6		$ 556.28							
Feb			94219.0	1656.5		$ 2,303.23					266503	112317	95332	104544
Mar			20233.0	575.3		$ 662.47							
Apr			10216.2	28.6		$ 423.55							
May			8475.1	22.2		$ 360.19					126174.0356		
Jun			8708.9	24.2		$ 369.87							
Jul			5776.4	24.6		$ 415.22							
Aug			9832.6	28.2		$ 409.16							
Sept			8815.6	25.4		$ 375.72							
Oct			5152.7	23.5		$ 228.60							
Nov			9518.2	25.7		$ 417.08							
Dec			32332.1	484.0		$ 966.55							

On Peak Usage Information	From	To	Peak (kWh)	Peak (kW)	Energy Demand Charges ($)	Commodity Charges ($)	Peak Usage ($/kWh)	Peak Demand ($/kW)	Ratchet Charges ($)	Standby Charges ($)	Standard Monthly Charges ($)	Sales Tax (%)	Total Bill ($)
Jan			5327.7	778.6	$ 6,618.24	$ 830.93		$ 426.04	$ 1,198.00	$ 103,122.58	$ 0.245		$ 103,854.83
Feb			63552.6	1712.1	$ 14,553.05	$ 5,522.73		$ 3,012.20	$ 1,198.00	$ 103,122.58	$ 0.153		$ 105,524.23
Mar			17291.5	1255.2	$ 11,009.45	$ 1,502.63		$ 1,042.55	$ 1,198.00	$ 103,122.58	$ 0.253		$ 104,350.45
Apr			4945.6	28.7	$ 227.61	$ 429.85		$ 145.81	$ 1,198.00	$ 103,122.58	$ 0.072		$ 103,370.62
May			4705.2	24.1	$ 205.17	$ 405.23		$ 131.41	$ 1,198.00	$ 103,122.58	$ 0.074		$ 103,238.67
Jun			4579.6	27.7	$ 235.85	$ 432.72		$ 326.85	$ 1,198.00	$ 103,122.58	$ 0.072		$ 103,500.07
Jul			5548.6	27.7	$ 235.13	$ 452.02		$ 361.69	$ 1,198.00	$ 103,122.58	$ 0.074		$ 103,637.03
Aug			5916.7	28.6	$ 244.52	$ 514.18		$ 365.67	$ 1,198.00	$ 103,122.58	$ 0.075		$ 103,670.84
Sept			4703.5	28.6	$ 226.20	$ 408.77		$ 324.68	$ 1,198.00	$ 103,122.58	$ 0.075		$ 103,455.28
Oct			4558.4	23.7	$ 201.67	$ 404.81		$ 135.03	$ 1,198.00	$ 103,122.58	$ 0.072		$ 103,283.28
Nov			5025.8	25.9	$ 220.24	$ 423.63		$ 143.23	$ 1,198.00	$ 103,122.58	$ 0.072		$ 103,350.74
Dec			5410.1	32.1	$ 252.67	$ 474.42		$ 284.34	$ 1,198.00	$ 103,122.58	$ 0.083		$ 103,533.85

Model Summary
See Appendix A

Appendix C

Case 1 Electrical and Thermal Profiles

Electrical Demand	DOW	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
January 1, 2007	2	16310	16012	16357	16170	16107	16090	15771	15476	15690	15310	15026	14680	14088	14002	14045	14073	14704	16036	15154	15420	15480	15481	15760	15605
January 2, 2007	3	15565	15590	15404	16367	16775	17480	18040	18300	18604	18831	18572	18134	17848	17616	17454	17455	17800	18703	18355	18330	18124	18167	18321	17850
January 3, 2007	4	17480	17270	17135	17125	17294	18110	18142	17922	18280	18548	18338	17820	17212	19308	16710	16365	17178	17855	17607	17701	17592	17402	17593	17070
January 4, 2007	5	16440	16344	16490	16502	16830	17435	17542	17549	17729	17720	17435	16784	15820	15484	15244	15243	15945	16434	16389	16210	16180	16067	16030	15656
January 5, 2007	6	15220	15071	14651	14466	14520	14864	14750	14055	14707	14894	14694	14777	14572	14640	14206	13910	14446	14577	14280	14115	14091	14442	14702	14162
January 6, 2007	7	13681	13532	13380	13245	13012	13414	13964	13228	12967	12545	11680	11508	11400	11513	11904	11809	12726	13502	13784	14031	14403	14604	14020	14736
January 7, 2007	1	14503	14707	14862	15023	15471	16480	16527	16000	16137	15882	15316	14683	13962	13751	14019	14350	16014	16734	16956	16678	16738	16070	17142	16890
January 8, 2007	2	15925	15654	15446	16065	16309	16147	16142	16201	16270	16474	16092	16431	17075	16887	16753	16300	16614	18106	18806	16830	14875	18864	16033	18804
January 9, 2007	3	18360	18330	18079	18023	18323	18922	19000	19074	18344	18328	18332	18732	18548	18628	18102	17746	18374	19275	19178	19208	19120	19108	19358	19149
January 10, 2007	4	18786	18706	18567	18859	18902	19819	19810	19859	20105	20507	20417	20179	20201	20097	20134	19933	20139	21166	21237	21097	21002	20960	21127	20489
January 11, 2007	5	20214	19868	19647	19821	20221	20642	20850	20175	20752	20218	19741	19132	18423	18575	18923	18901	19920	20045	20481	20480	20191	20182	20139	19612
January 12, 2007	6	18782	18421	18258	17846	18008	18318	18478	18522	18645	18977	18891	18080	18336	17887	16838	16524	17310	17597	18048	18061	17849	17730	17725	17208
January 13, 2007	7	16080	16302	15898	15073	15522	15713	15827	15459	15923	15065	15042	15322	15228	15305	15012	14088	14993	15500	15844	16001	16179	16171	16854	16780
January 14, 2007	1	16597	16874	16890	16088	15945	16517	16775	16884	16813	17252	17251	17154	16832	16639	16632	16409	17140	17542	17806	17429	17481	17720	17886	17570
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Electrical Demand	DOW	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
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April 25, 2007	4	12341	11729	11729	11670	12428	13300	13374	12903	13169	13292	13088	13424	11909	12110	12007	13007	12997	13700	14306	14708	14089	14097	14571	14102
April 26, 2007	5	13504	13011	13250	13120	13702	14593	14604	14488	14172	13497	12990	12493	12507	12646	12800	13062	13270	13513	13862	14343	14577	14026	14508	14253
April 27, 2007	6	13620	13067	13665	13816	14393	14308	14640	14037	14203	14584	15593	14878	15270	14636	14404	14053	14243	14050	14462	14021	14571	14301	12917	13750
April 28, 2007	7	13078	12701	12605	12612	12244	12400	12622	12084	11671	11582	11308	11397	11202	11321	11229	11036	11136	11755	12127	12411	12902	12717	12497	12417
April 29, 2007	1	11865	11743	11815	11653	11869	11952	11907	11781	12047	12324	12309	11925	11978	11252	11014	11158	11100	11503	11504	12237	12770	12858	13731	12873
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May 7, 2007	2	13652	13600	13351	13205	13629	14223	14074	13400	13702	13564	13211	12817	12328	12141	11922	11402	11626	11716	12073	13253	13723	13936	13097	13831
May 8, 2007	3	13307	13064	12862	12797	12206	13877	13691	13292	12864	12574	12461	12068	11851	11601	11642	11218	11341	11464	11910	12473	13051	13181	13154	12643
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May 13, 2007	1	11604	11202	11051	10635	11073	11350	11434	11120	11267	11406	11100	11168	10764	10550	10779	10547	10677	10803	11180	11356	11782	12034	12107	11855
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May 15, 2007	3	11387	11240	11150	11027	11503	11653	11657	11605	11607	11534	11681	11703	12101	12078	12413	12197	12362	12258	12001	11722	11735	11820	11705	11282
May 16, 2007	4	10501	10535	10004	9999	10705	10877	10817	11310	11962	12031	13130	13274	13185	13222	13270	13174	12085	12750	12052	12486	12702	12519	12272	11772
May 17, 2007	5	11387	11122	10905	10818	10991	11340	11212	11750	11490	10801	11001	10981	11260	11737	11913	11318	11534	11029	11877	12309	12051	12078	12716	12319
May 18, 2007	6	11794	11724	11691	11713	12306	13403	13405	13863	14406	14500	14757	14514	14271	13862	13510	13294	13251	13342	13480	13717	13854	13892	13051	13311
May 19, 2007	7	12850	12417	12270	12933	12044	12192	12181	12052	11962	12023	11940	12001	12387	12001	12344	12370	12416	12020	13303	13428	13008	13025	13080	13269
May 20, 2007	1	12098	12113	11871	11824	11931	12007	11812	11451	11781	11531	11230	11131	10908	11004	11050	10760	10582	10815	11300	11937	11412	11072	11905	11647
May 21, 2007	2	11040	11046	11067	11148	11527	12000	12003	11730	11060	11981	11951	11887	11817	11776	11700	11676	11036	11602	11401	11403	11712	11038	11957	11676
May 22, 2007	3	11322	11181	11167	11084	11434	11756	11624	11425	11572	11951	12014	12001	11993	11976	11980	11761	11817	11644	11042	11646	12003	12294	12310	11726
May 23, 2007	4	11291	10062	10880	10827	11036	11105	11446	11175	11343	11303	12105	12750	12011	12070	12031	12741	12125	11615	11579	11692	11786	11898	11803	11307
May 24, 2007	5	10791	10462	10362	10267	10552	10479	10921	10920	11163	11290	11640	12161	12908	13500	13707	13025	13858	13800	13225	12632	12401	12452	12205	11835
May 25, 2007	6	11136	10705	10554	10344	10553	10927	10666	11042	11674	12464	13781	14726	14960	14964	14918	14913	14916	14680	14238	13930	13882	13244	13138	12660
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May 27, 2007	1	11031	11283	10075	10730	10640	10602	10601	10907	11033	12257	12607	12612	13145	13048	12760	13707	13215	13224	12015	12797	12195	12223	12372	11931
May 28, 2007	2	11354	10609	10585	10426	10448	10631	10616	11002	11051	12451	12617	13178	13261	13614	13407	13458	13845	13602	13804	13126	12790	12730	12653	12501
May 29, 2007	3	11552	11223	10905	10838	11043	11181	11246	11592	12219	12847	13063	13624	13931	13927	13478	13707	13318	13992	13479	12613	12430	12423	12359	11904
May 30, 2007	4	11124	10705	10441	10218	10618	10836	11074	11930	12550	13241	12606	13572	14160	14343	14412	14077	14148	13540	13846	12909	12542	12503	12409	12006
May 31, 2007	5	11459	11151	10805	10720	11000	11476	11700	12550	13461	14410	15031	15750	15307	15282	14847	15204	15086	14802	14164	13272	12934	12707	12877	12340
June 1, 2007	6	11540	10690	10643	10650	10963	11050	11268	11721	13121	14036	15094	15512	15511	15807	15647	15203	14040	14340	14202	13691	13425	13155	12994	12636
June 2, 2007	7	11075	11466	11088	10704	10029	11064	11162	11635	12079	13277	14013	14379	14389	14941	14431	14175	14207	13914	13086	13017	13254	13222	13169	12680
June 3, 2007	1	11824	11361	11110	10017	10036	11143	11117	11296	11009	12002	13361	13244	13562	13142	12078	12521	12329	12611	12716	12044	12030	12062	12104	11707
June 4, 2007	2	11010	10684	10554	10536	10781	11261	11354	11584	11005	12342	12657	12704	12560	12511	12415	12145	12234	12295	12215	11862	11974	12185	12172	11593
June 5, 2007	3	10869	10711	10550	10007	10086	10099	11269	12051	13121	14210	14868	15102	15007	15297	14738	14426	14358	14192	13880	13177	12633	12744	12913	11896
June 6, 2007	4	11089	10082	10287	10101	10456	10090	11070	11254	11413	11730	12426	12079	12077	13316	13459	12944	12765	12529	12297	12002	11803	11851	11850	11733
June 7, 2007	5	10682	10071	10207	10014	10301	10731	10068	11313	11526	12100	12095	13001	13477	14146	13827	13403	13225	13130	12636	12139	12030	12240	12226	11961
June 8, 2007	6	11234	10900	10634	10307	10606	10799	11069	11571	12725	13033	14567	14622	15113	15418	15407	14903	14719	14247	13784	13167	12004	12009	12708	12062
June 9, 2007	7	11456	11207	10404	10472	10477	10035	10721	11082	11814	12868	13020	13887	13262	13006	13534	13105	12694	12549	12179	12053	12003	11848	11805	11470
June 10, 2007	1	10029	10504	10271	10008	10184	10201	10201	10301	10735	11120	11456	11763	12384	12282	12154	12041	12279	11002	11600	11503	11028	11741	11866	11521
June 11, 2007	2	10634	10721	10102	9980	10350	10723	10080	11427	12267	13502	14150	14648	14607	14026	14693	14371	14369	14126	12946	12404	12453	12567	12488	11730
June 12, 2007	3	11066	10884	10484	10327	10580	10807	11309	11060	12298	14225	14881	15122	15332	15104	14712	14304	13909	14085	13285	12721	12270	12340	12320	11846
June 13, 2007	4	11112	10723	10590	10505	10710	10002	11087	11449	12253	12590	12641	12758	12737	13023	12547	12177	12194	12138	12004	11601	11405	11520	11471	11033
June 14, 2007	5	10342	10122	10005	9774	10034	10344	10489	10867	11214	11501	11646	11976	11926	11900	11044	11074	11709	11756	11672	11531	11512	11701	11748	11409
June 15, 2007	6	10560	10137	9917	9790	10024	10308	10432	10900	11478	12094	12419	12617	12920	13471	13516	13205	13219	12748	12294	11600	11283	11691	11698	11115
June 16, 2007	7	10446	10170	9956	9796	9771	9770	9705	10202	11088	11880	12538	13014	13213	13430	13238	12743	12483	12416	12485	12110	12072	12170	12015	11502
June 17, 2007	1	10440	10615	10161	10018	10104	10107	10226	10755	11733	12940	13410	13472	14010	14008	14005	13048	14147	14231	14160	13878	13700	13004	13020	13125
June 18, 2007	2	12443	11068	11468	11304	11430	11815	12308	13059	13899	14966	15348	15648	15708	15604	15411	14095	14736	14049	14132	13235	12860	13090	12921	12512
June 19, 2007	3	11710	11497	11030	11031	11111	11702	11932	12701	13708	14526	15470	15742	15940	15854	15506	15005	15010	14703	14307	13408	13471	13403	12712	13087
June 20, 2007	4	12067	12026	11872	11572	11813	12332	12504	12901	13917	14270	13842	14274	14320	14615	15000	14521	14773	14510	14340	13745	13256	13075	12640	12007
June 21, 2007	5	11208	10870	10421	10237	10531	10422	11151	11039	12532	13432	14228	14786	15118	15414	15548	15142	15220	14974	14006	13553	12957	12054	12701	11765
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June 23, 2007	7	10490	10202	10155	10025	10541	10216	9849	10034	10774	11319	11744	11926	12175	12550	12780	12804	12900	13037	12948	12210	11813	11009	11752	11221
June 24, 2007	1	10626	10205	10065	9844	9832	9680	9700	9922	10671	11027	12326	12735	13170	13475	13644	13561	13776	13924	13880	13243	12694	12000	12722	12357
June 25, 2007	2	11035	11259	10968	10721	10840	11229	11570	12042	14032	15204	15741	15987	16462	15019	15543	15208	14900	14330	14290	13044	13764	13465	13240	12090
June 26, 2007	3	12352	11088	11086	11513	11904	12250	12606	13791	14037	15041	16800	17052	16774	16009	16770	16294	16417	15993	15871	15263	14905	15116	15120	14577
June 27, 2007	4	13700	13430	12048	12779	13001	13030	13700	14495	15098	16373	16031	17227	17245	17102	16797	16311	16710	15263	15274	15000	15100	14362	14042	13641
June 28, 2007	5	12925	12677	12058	12184	12379	12555	12797	12547	14517	16302	15235	15749	16819	16221	16401	16256	16153	16035	15901	14429	14128	14114	14058	13427
June 29, 2007	6	12701	12253	12034	11819	11955	12257	12193	12048	13480	13509	13608	13514	13671	14402	14595	14273	14292	13919	13426	13007	12808	12072	12008	12049
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July 1, 2007	1	11571	10743	10015	10281	10306	10371	10452	10622	11023	11060	12287	12577	12644	13041	13207	12800	12578	12940	12942	12310	12051	12108	11062	11037
July 2, 2007	2	10001	10404	10170	10014	10313	10637	10790	11218	12088	12742	13307	13675	13730	13480	13053	13207	13058	13097	13308	12035	12300	12330	12284	11971
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July 4, 2007	4	11337	11002	10454	10401	10475	10522	10077	10944	11604	11026	12458	12048	12717	12750	12039	12371	12304	12232	12333	12005	12470	12543	12367	12026
July 5, 2007	5	11472	10909	10707	10550	10945	11301	11502	12237	13545	14565	14856	15005	15410	15401	15274	15071	14874	14704	14413	13471	13712	13132	13430	12063
July 6, 2007	6	12062	11497	11380	11192	11434	11682	11018	12600	13007	14738	15281	15007	15072	15201	15580	15150	16090	14830	14583	13971	13216	13050	12784	12306
July 7, 2007	7	11700	11304	11097	10799	10726	10718	10042	11555	12507	13130	13914	14255	14400	14025	14003	14220	14294	14340	14101	14043	14016	14009	13969	13543
July 8, 2007	1	12727	12384	12067	11776	11608	11589	11025	11941	12023	13443	14436	14700	15005	15106	15084	14847	14987	15036	14814	14627	14633	14548	14407	14258
July 9, 2007	2	13480	13640	12700	12011	12761	13002	12631	13320	14104	15203	15708	16074	16023	16221	16051	16320	16354	16115	15995	15510	15204	15129	15043	14056
July 10, 2007	3	13701	13237	13196	12010	13059	13630	13057	14001	15488	16208	16013	17166	17300	17110	17042	16543	16299	16010	15348	15136	16012	14830	14628	14002
July 11, 2007	4	13202	12545	12623	12547	12701	13043	13274	13747	14600	15310	12772	16220	16200	16052	16121	15910	15522	14001	13600	13744	14022	14478	14310	13848
July 12, 2007	5	12409	12163	11767	11516	11810	12092	12010	12070	13221	14112	14802	15135	15101	15303	15315	15009	15301	15048	14717	14100	13815	13788	13031	13072
July 13, 2007	6	12454	12000	12003	11735	11908	12100	12470	12955	14091	14981	15400	15003	15730	15847	15201	14777	14515	14093	13604	13477	13000	13091	13717	13034
July 14, 2007	7	12217	11600	11390	10900	10812	10460	11046	11302	12341	13191	13442	14234	14376	14408	14507	14301	14255	14163	13013	13608	13246	13815	13623	13171
July 15, 2007	1	12020	12300	12110	11780	11771	11788	11935	12109	12645	13793	14382	14788	14913	15182	15152	14902	14008	14006	14733	14452	14034	14651	14497	14228
July 16, 2007	2	13510	12427	12320	12009	12112	12375	12410	13010	13837	14451	14893	15022	15207	15301	15236	14517	14558	14525	14407	13824	13410	13486	13426	13108
July 17, 2007	3	12402	12023	11627	11470	11727	12008	12206	12745	13093	14905	15590	15048	16137	16207	16070	15706	15600	15514	16125	14547	14200	14510	14217	13747
July 18, 2007	4	13011	12602	12452	12470	12723	13242	13160	13012	13489	14007	14311	14616	14548	14790	15175	14763	14814	14160	13951	13647	13820	13858	13590	13040
July 19, 2007	5	12390	12089	11965	11755	11862	12229	12442	13146	12834	12655	13238	13730	15191	15500	15230	15228	14885	15040	14787	14584	14477	14507	14249	13905
July 20, 2007	6	12596	12060	12026	12540	12647	12964	12900	13221	14044	14744	15094	15220	15077	15071	14400	14233	14408	14268	13028	13085	13005	12866	12869	12108
July 21, 2007	7	11411	11142	10027	10791	10597	10692	10637	10724	11575	12574	13104	13423	13750	13872	14034	13401	13030	13032	13142	13540	13187	13108	13066	12563
July 22, 2007	1	12061	11762	11225	10767	10704	10857	10813	10905	11007	12588	13300	13542	13648	14042	14040	13010	13041	13108	13000	13257	13111	13177	12875	12500
July 23, 2007	2	12058	11082	11284	11031	11095	11273	11641	11800	12248	12804	13234	13212	12978	13103	13213	12041	13092	13112	12940	13003	12540	12412	12284	11803

Electrical Demand	DOW	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
July 24, 2007	3	11110	10829	10638	10478	10765	11026	11137	11601	12025	13268	14091	14622	15046	15326	15268	15010	14868	14022	14192	13486	13625	13745	13300	12004
July 25, 2007	4	12202	11830	11527	11405	11007	12006	12242	12714	13665	14612	15364	15552	15013	15613	15601	15542	15001	15234	14884	14326	14173	14077	13350	13257
July 26, 2007	5	12004	12310	12192	12045	12107	12453	12018	13118	13980	14748	15581	16114	15067	16176	16250	15072	15792	15405	14772	14467	14066	14529	14438	13049
July 27, 2007	6	13144	12884	12744	12551	12711	12707	13049	13503	13447	14130	14743	15200	15281	16372	16405	14838	14049	16250	14624	14557	14712	14644	14530	14164
July 28, 2007	7	13275	12916	12266	12064	12257	12644	12615	12454	12317	14220	14575	14600	14700	14950	15118	14911	14775	14701	14694	14350	14390	14325	14308	13757
July 29, 2007	1	13321	12761	12515	12347	12378	12446	12350	12427	13247	14047	14442	14444	14261	13848	13405	13061	13240	13338	13561	13400	13454	13407	13536	13321
July 30, 2007	2	12007	12300	12117	11887	12183	12480	12775	13103	14305	15328	16031	16240	16488	16887	16917	16101	15615	15348	14828	14750	14704	14615	14531	14186
July 31, 2007	3	13149	12474	12210	12085	12305	12773	12701	13425	14475	15503	16040	16070	16004	16349	16432	16144	16110	15681	15067	15050	14710	14520	14518	14806
August 1, 2007	4	13159	12616	12475	12906	12363	12711	12654	13064	15224	15633	16416	16626	16845	17261	16821	16692	16670	16440	16229	15921	15370	15143	14956	14614
August 2, 2007	5	13737	13340	13105	12874	12970	13194	13434	14134	15207	15708	16100	16231	16335	16788	17169	16045	16063	16055	16344	15905	15749	15545	15499	15030
August 3, 2007	6	14118	13799	13490	13142	13274	13577	13613	14105	15266	16224	16407	17102	17206	17481	17221	16629	16429	16352	15800	15809	15919	15489	14955	13933
August 4, 2007	7	12807	12622	12641	12372	12185	12372	12134	12427	13414	14473	15071	15431	15691	15616	15867	15747	15666	15343	15262	14868	14657	14498	14206	13759
August 5, 2007	1	13066	12670	12788	11815	11700	11590	11401	11041	12102	13045	13713	14000	14147	14657	14578	14570	14744	14251	14032	13050	13639	13767	13094	13442
August 6, 2007	2	12763	12406	12391	12298	12414	13018	13125	13800	14404	15223	15786	15671	16063	16284	16500	15787	15582	15578	15510	15130	15458	15283	15124	14703
August 7, 2007	3	13029	12637	13409	13372	13362	13084	13018	14478	15522	16423	17166	16603	16695	17034	16066	16341	16121	15646	15545	15145	14064	15168	15177	14746
August 8, 2007	4	14247	13966	13610	13432	13088	14277	14147	14430	15538	16511	17101	17426	17580	17097	17604	17402	17451	17231	16610	16440	16454	16231	15960	15184
August 9, 2007	5	14155	13425	13040	12743	12705	13308	13351	13002	14410	14980	15923	16117	16408	16003	16013	16063	14314	14922	14448	14305	14274	14190	14785	13049
August 10, 2007	6	12874	12494	12104	12008	12277	12512	12509	12705	13572	14256	14107	13748	13400	13053	12718	12201	12200	11019	11927	11950	12101	12155	12081	11730
August 11, 2007	7	11117	10730	10491	10336	10263	10362	10145	10224	11584	11004	13501	13116	13460	13497	14027	14121	14380	14310	14211	13408	13544	13465	13388	13227
August 12, 2007	1	12364	12174	11736	11438	11391	11510	11379	11830	12917	13407	14370	14703	14031	14733	14002	15107	15048	15264	15090	14407	14364	14325	14053	13700
August 13, 2007	2	12999	12901	12721	12518	12790	12025	13007	13212	14428	15773	16108	16254	16582	16850	16850	16280	16359	16147	15758	15224	15161	14871	14444	13076
August 14, 2007	3	12670	12581	11736	11503	11545	11050	12025	12537	13616	14578	15328	15623	15666	16400	15624	16636	15681	15340	14744	14164	14061	13046	13614	13016
August 15, 2007	4	12512	12521	11650	11466	11800	12418	12307	12929	13705	15065	15411	16074	16330	16361	16209	16121	16092	15670	15447	15404	15471	15290	15110	14641
August 16, 2007	5	13733	13329	12703	12502	12743	13388	13392	13745	14517	15732	16134	16322	16306	16218	16172	16264	16505	16400	15498	15650	15409	15495	15570	15148
August 17, 2007	6	14172	13630	13420	13222	13447	13065	13448	13433	14353	15108	15483	15019	15911	16076	16029	15490	14720	13861	13542	13187	13309	13320	13201	12781
August 18, 2007	7	11629	11218	10438	10708	10172	10851	10464	10440	10605	11208	11827	12400	12616	13214	13446	13400	13479	13423	13196	12607	12605	12577	12087	11974
August 19, 2007	1	11546	11584	10709	10504	10000	10807	10005	10571	11242	12022	12292	12728	12620	12787	12027	12300	12207	12313	12232	12104	12101	12042	12088	11063
August 20, 2007	2	11030	10821	10413	10420	10742	11242	11327	11435	12183	12647	13023	13100	13504	13133	12914	12500	12476	12302	12107	12201	12105	12054	11967	11032
August 21, 2007	3	10805	10614	10023	10110	10311	10458	11133	11164	11520	12121	12538	12403	12310	12373	12277	11868	11741	11747	11804	11424	11032	11790	11767	11254
August 22, 2007	4	10004	10527	10333	10113	10098	11018	10985	10915	11000	12222	12527	12743	12301	12202	12090	11840	11994	12074	11074	11813	11050	11791	11400	11166
August 23, 2007	5	10505	10030	10106	10033	10228	10005	10708	11089	11712	12014	12700	13306	13700	14293	14376	13018	13633	14004	13847	13122	13073	12730	12390	11752
August 24, 2007	6	10874	10676	10473	10000	10501	10708	11134	11618	13133	14452	15227	15703	15882	16087	16186	15051	15706	15310	14665	14400	14022	14510	14130	13587
August 25, 2007	7	13033	12840	12640	12370	12241	12356	12064	12406	13096	13326	14430	14752	15203	15350	16024	16445	15660	15306	15190	14732	14070	14808	14986	14709
August 26, 2007	1	13701	13100	12901	12090	12780	12800	12000	12534	12993	13500	14108	13905	14280	14266	14274	14103	14425	14421	14092	13915	13839	13738	12508	13006
August 27, 2007	2	12382	11851	11410	11233	11481	11078	12148	12807	13764	14861	15623	15016	15010	16037	16003	16004	15660	15348	14757	14240	14233	13905	12501	13172
August 28, 2007	3	12306	11850	11707	11537	11008	12225	12276	12030	14246	15046	15902	16708	16176	16010	15839	14837	14780	14447	13844	13704	13721	13275	13180	12598
August 29, 2007	4	11749	11290	11094	11080	11300	11816	11840	12250	13908	14757	15538	16008	16104	16091	16230	16874	15750	15294	14461	13958	13005	13748	13443	13012
August 30, 2007	5	12176	11708	11341	11190	11470	11017	12057	12076	13720	14856	15450	16001	16202	16224	16342	16053	15806	15306	14687	14430	14319	13857	13040	13171
August 31, 2007	6	12502	12042	11856	11730	11811	12233	12083	12725	13475	13500	14251	14458	15303	15755	15427	16173	15127	14588	14105	14053	13604	13720	13337	12849
September 1, 2007	7	11867	11392	11010	10661	10477	10570	10675	10401	11372	12208	12981	13537	13630	13801	13024	13052	14163	13675	13547	12966	12637	12484	12300	11643
September 2, 2007	1	11140	10691	10220	10005	10005	10170	10003	10051	10780	11570	12243	12700	13088	13455	13808	13805	13856	13046	12800	12807	12529	12343	12351	11607
September 3, 2007	2	11290	11317	10724	10411	10491	10632	10013	10761	11564	12425	13140	13688	14206	14477	14572	14302	14462	14483	14254	14153	14280	14120	13905	12717
September 4, 2007	3	12924	12415	12047	11636	11804	12256	12314	12454	14310	14414	15410	15786	15836	15840	15605	15613	15493	15200	14640	14470	14359	13851	13435	13000
September 5, 2007	4	11860	11429	11107	10870	11210	11458	11064	11054	12571	13405	14133	14537	14435	14272	14244	14014	14363	14042	13504	13376	13377	13271	13103	12028
September 6, 2007	5	11772	11358	11013	10478	11183	11713	11024	12232	13337	13901	15032	15310	15487	15733	15503	15350	15110	14006	14134	13885	13807	13828	13077	13269
September 7, 2007	6	12616	12340	12121	11882	12130	12372	12552	12970	14227	15214	15016	15515	16016	16766	16611	16227	16060	15711	15204	15055	15031	14576	14246	13681
September 8, 2007	7	12922	12500	12430	12125	11867	12074	12025	12019	12720	13440	14073	15264	15522	15850	15701	16430	15449	15197	14736	14848	14027	14347	14207	13757
September 9, 2007	1	12013	12314	12008	11772	11843	11800	11807	12004	12780	13043	14506	14847	15361	15316	16089	14032	14655	14885	14540	14502	14538	14443	14200	13900
September 10, 2007	2	13314	13011	12842	12532	12000	13370	13329	13501	14150	14076	15436	15708	16856	16405	16244	16348	15050	14670	14122	14294	14107	14226	14181	13063
September 11, 2007	3	12828	12552	12207	12033	12347	12066	13343	13541	14210	14781	15207	15338	15240	14616	14330	14203	14282	14000	13843	13900	14005	14032	13770	13010
September 12, 2007	4	11707	11330	11044	10770	11080	11217	11414	11512	12200	12930	13345	13710	13069	14130	14272	14059	14052	13566	13924	12757	12084	12370	12122	11043
September 13, 2007	5	10075	10644	10440	10250	10405	10033	10086	11100	11550	11901	12043	13261	13084	13015	14207	13005	13764	13333	12807	12664	12648	12612	12251	11697
September 14, 2007	6	10866	10001	10334	10163	10078	10637	11140	11250	12272	13071	13707	14144	13864	13077	13721	13260	13002	12843	12848	13025	12488	12655	12265	11462
September 15, 2007	7	11054	10407	10219	9383	9941	10264	10282	10247	10900	11116	11047	11228	11075	11620	11049	11659	11745	11510	11297	11162	11141	11103	11126	10807
September 16, 2007	1	10716	10106	9311	9404	9980	10232	10137	9811	10034	10403	10774	11105	11260	11374	11600	11500	11036	11300	11501	10803	11102	10917	10948	10833
September 17, 2007	2	9873	9432	8725	8618	9068	10406	10082	10578	11172	11842	12232	12514	12510	12241	12524	12425	12353	12024	10975	10457	10860	10780	11030	10757
September 18, 2007	3	10027	9820	8965	8407	9063	10302	10387	10402	11029	11717	12232	12405	12554	12798	12663	12418	12437	12003	11445	11416	11291	11210	11195	10831
September 19, 2007	4	10151	9770	8506	8428	9777	10718	10284	10387	11199	11908	12504	12109	13120	13250	13430	13207	13140	12025	12736	11866	11764	11102	11107	10029
September 20, 2007	5	10202	9786	8820	8432	9708	10325	10475	10856	11662	11076	12600	13070	13074	14060	14771	14405	14110	13645	13050	12073	12420	12258	12076	11030
September 21, 2007	6	10909	10627	10365	10118	10294	10725	11141	11277	12293	13467	14328	14851	15110	15378	15284	14939	14702	14349	13067	13475	12900	12431	12249	11614
September 22, 2007	7	11017	10618	10290	10104	10517	10414	10009	10232	11264	11017	12084	12024	12036	12258	12571	12544	12557	13009	12681	13144	13007	12774	12714	12750
September 23, 2007	1	11755	11244	11004	10731	10116	10554	10427	10170	10826	11605	12422	12563	12072	13082	13102	13072	13189	13053	12862	12828	12130	12673	11992	11387
September 24, 2007	2	10492	10240	10048	10418	10417	10826	10417	10826	11727	12184	13012	14209	14263	14023	14583	14121	12944	13357	12538	12417	12243	11764	11737	11267
September 25, 2007	3	10013	10203	9963	9701	10054	10060	11029	11159	12315	13662	14351	15007	15405	15599	15505	15306	15260	14011	14540	14011	14333	13805	13097	12845
September 26, 2007	4	11005	11672	11216	10313	11123	11462	11725	12251	13463	14400	15270	15958	16178	16032	16041	16025	14551	15426	14586	15030	14771	14667	14580	13051
September 27, 2007	5	13150	12501	12000	11707	11157	12373	12705	13081	13440	14022	14501	14510	15501	16164	16120	15315	14255	14605	14541	14514	14197	14270	13526	13315
September 28, 2007	6	12579	12170	12101	11103	12106	12093	12264	12313	12606	12412	13004	14694	14400	14420	14340	13975	12602	13332	12642	12007	12350	12631	11723	11143
September 29, 2007	7	10503	10131	9311	9588	9721	9910	9958	9721	10024	10003	11350	12080	12186	12705	12745	12600	12510	12188	11958	11022	11975	11640	11376	10754
September 30, 2007	1	10180	9821	8674	8487	9546	9777	9870	10546	10004	10061	11346	11617	12002	12290	12025	11972	11003	11529	11504	11027	11320	11222	11148	10587
October 1, 2008	[illegible]	8801	8804	8507	8682	8417	8170	8086	8464	9250	9540	9625	9257	8893	8446	8035	8651	8901	9164	9228	9562	9616	9772	9810	9704
October 2, 2008	[illegible]	9529	9421	9348	9517	9378	10291	10481	10417	11104	12034	11776	11577	11408	11729	11595	11552	11342	11478	11661	12021	11020	11943	11874	11412
October 3, 2008	[illegible]	11201	10082	10730	11073	11764	11913	11884	11811	11856	12120	12808	12227	12471	12623	12488	12202	11098	11780	11920	11706	11061	11551	11307	10314
October 4, 2008	[illegible]	10451	10210	10080	10310	11416	11162	12312	11707	12131	12331	12646	12646	12695	12522	12302	12332	12312	12178	12242	12113	11827	11645	11404	11002
October 5, 2008	[illegible]	10708	10503	10460	10670	11418	11879	12318	12520	12580	12903	13227	11606	11805	11754	11658	11506	11751	12273	11645	12696	12091	13073	12784	12391
October 6, 2008	[illegible]	12100	11301	11850	12112	12442	12512	12805	13316	13503	14270	13772	13329	12240	13186	12965	12758	12864	13005	13103	13251	13316	13342	13376	12954
October 7, 2008	[illegible]	12803	12108	12310	12080	12666	12869	12010	12742	12479	12650	12341	11825	11480	11267	10838	10857	11434	12111	12641	12752	12606	12325	12764	12279
October 8, 2008	[illegible]	12047	12132	12017	12114	12462	12586	12193	11513	10880	10726	10657	10021	10096	10663	10510	10626	10629	11363	11871	11709	12008	12126	12146	11552
October 9, 2008	[illegible]	11429	11309	11146	11220	11050	11721	11940	12064	10411	10921	12060	10947	11020	11350	11075	11059	10066	11141	11524	11449	11377	11136	11138	10711
October 10, 2008	[illegible]	10871	10537	10550	10759	11470	11812	12020	12025	11745	12016	11803	11755	12025	11857	11779	11543	11430	11050	11095	11081	11090	11960	11676	11135
October 11, 2008	[illegible]	10419	10326	10980	11130	11598	11903	12002	12416	12590	12820	12788	12654	12444	12231	12164	12678	12462	13264	13260	13457	13104	12544	12712	12152
October 12, 2008	[illegible]	11851	11515	11168	11120	11078	11831	12012	12001	12142	12362	12000	11857	11702	11738	11592	11571	11512	11907	12022	12022	12850	13547	13605	13059
October 13, 2008	[illegible]	13007	10377	14670	14873	15331	15748	15602	15732	15204	14730	13644	12488	12705	12916	12927	12910	13367	14323	14703	14770	14008	14732	14066	14214
October 14, 2008	[illegible]	14066	13701	13400	14126	14134	14345	14044	13452	12787	12440	11645	11757	13170	11813	11787	12504	13120	14048	14813	15140	15153	15112	14086	14716
October 15, 2008	[illegible]	14644	14550	14580	14450	14566	14625	14330	13750	12226	12606	12241	12059	11037	11092	11743	12409	13016	14103	14402	14398	14437	14407	14084	13787
October 16, 2008	[illegible]	13752	12508	13600	12956	14503	14708	14624	14107	13433	12920	12407	11857	11041	11729	11713	12043	12745	13437	13590	13520	13478	13423	13207	12787
October 17, 2008	[illegible]	12342	12208	12161	12341	12403	12063	12264	12420	13700	14036	14287	14408	14491	14525	14609	14403	14474	14472	14390	13933	13261	13214	12067	12340
October 18, 2008	[illegible]	11815	11524	11190	11240	11737	11906	12087	11960	11050	11707	11744	11737	11552	11752	11446	11655	11648	11815	12048	12025	11895	12034	11926	11337
October 19, 2008	[illegible]	11481	11244	11053	11129	12072	12483	12461	12659	12510	12112	11997	11958	11071	11097	11712	11749	11014	12028	12018	11919	11895	12034	11926	11476
October 20, 2008	[illegible]	11247	11158	10240	11007	11503	11745	11030	12135	12504	12505	12466	12427	12283	12319	12736	13548	14145	14607	15208	15252	15316	15344	15166	14877
October 21, 2008	[illegible]	14629	14313	14121	14185	14466	14544	14544	14053	13753	13433	13032	13458	12442	12936	13384	12475	13207	14154	14201	14459	14536	14425	14418	14034
October 22, 2008	[illegible]	13795	13407	13475	13560	13839	14116	14030	13342	12934	12207	11409	11505	11709	12082	12340	12540	12650	13146	13499	13432	13412	13341	12979	12574
October 23, 2008	[illegible]	12868	12730	12573	13409	14270	14000	14193	14129	14443	14402	14260	14029	14015	13049	14243	14613	15171	15629	15505	15450	15558	15888	15630	15400
October 24, 2008	[illegible]	15482	15508	15537	15750	16220	16043	16710	16790	17057	16060	16001	15175	15065	15766	15779	16049	16625	16227	16548	16458	16440	16490	16205	15799
October 25, 2008	[illegible]	15796	15421	15725	15133	16487	16536	16626	16871	16621	16401	15376	15113	14534	14531	14678	15221	15565	16545	16682	16067	16817	16712	16064	16244
October 26, 2008	[illegible]	16063	15917	15630	16175	16585	16008	17131	16805	16445	16131	15907	15008	15304	15129	14807	15195	15693	16787	17292	17327	17400	17302	17102	16775
October 27, 2008	[illegible]	16640	16530	16380	16552	17080	17440	17543	17215	16431	15784	15082	14552	14224	14475	14857	15263	15560	15841	16054	16059	16154	15231	15302	15423
October 28, 2008	[illegible]	15225	15104	14835	14340	14155	13984	13870	13871	13900	13508	12949	12000	11962	12027	12201	13215	14196	15444	16182	16324	16541	15860	15734	16473
October 29, 2008	[illegible]	15570	16183	16015	16755	16185	16577	16018	15871	15424	15925	15261	15147	14833	14692	14807	14863	14811	16782	17122	16877	16105	15844	17103	16974
October 30, 2008	[illegible]	16050	15470	15473	15421	16185	16804	16877	16790	15457	15218	14507	13006	13007	13203	13077	13112	13858	14073	14873	14806	14031	14056	14035	14807
October 31, 2008	[illegible]	14234	13607	13703	13779	14147	14721	14645	14539	14488	13753	13326	12570	12291	12633	12145	12046	12795	13197	13004	13140	12006	12777	12741	12464
November 1, 2008	[illegible]	11637	11527	11490	11784	11089	12405	12680	12080	12405	12300	12216	12104	12094	12221	12132	11630	12395	13290	13491	13281	13406	13421	13402	13271
November 2, 2008	[illegible]	12597	12253	12251	12644	14280	15034	15873	16409	16402	16042	15937	15091	14873	13457	14120	14424	15592	16420	16620	16007	16880	16739	16083	16937

Electrical Demand	DOW	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
November 3, 2008	6	16291	16259	16034	17017	17430	18034	18405	18167	17967	17508	16847	16206	15410	15413	15345	15729	16678	17109	17459	17342	17377	17852	17852	17823
November 4, 2008	7	17542	17405	17514	17527	17420	17420	17998	17518	17269	16775	15404	15272	14951	14584	14629	14356	15258	17049	17541	17530	17481	17518	17518	17503
November 5, 2008	1	16719	16525	16326	15963	15993	16174	16398	15971	15625	15121	14754	14301	13710	13569	13747	14262	15701	16586	17169	17029	16991	16902	16962	16934
November 6, 2008	2	15581	15709	15920	15927	15823	15993	16905	16254	15715	15212	14748	14148	13789	13726	13762	13980	15280	16214	16764	16923	15951	15901	15719	15249
November 7, 2008	3	14726	14552	14320	14191	14259	15015	14944	14693	14029	13934	13497	12970	12953	13024	13458	13571	13948	14222	14419	14337	14227	14174	14297	14378
November 8, 2008	4	13577	13328	13224	13081	13229	13584	13943	14313	14791	15399	15792	15992	15962	15917	14813	14284	14293	14209	14751	14458	14107	13801	13612	13634
November 9, 2008	5	13152	12969	13071	12980	13094	13578	13533	13318	13567	13319	12958	12913	12429	12499	12241	12307	13002	13598	13603	13599	13469	13491	13500	13487
November 10, 2008	6	12977	13076	12982	12962	13058	13410	12967	13095	14103	13986	13528	13429	12566	12684	12699	12623	13002	14187	14572	14457	14541	14574	14709	14854
November 11, 2008	7	14118	13932	14056	13957	13962	14269	14192	13515	12764	12429	12213	11878	11516	11521	11831	12198	13075	13436	13781	13619	13542	13497	13105	12901
November 12, 2008	1	12139	11806	11759	11696	11719	12118	12118	12367	12369	12447	12783	12506	12353	12587	13683	14591	15249	15481	15537	15564	15594	15524	14758	14107
November 13, 2008	2	13456	13115	13048	13143	13553	14179	14563	14762	15036	15031	15139	14953	14548	14459	14052	14156	14267	14523	14698	14644	14579	14508	14418	14122
November 14, 2008	3	13464	13203	13094	13015	13249	13642	14109	14275	14016	14727	14378	14212	13457	13546	13041	13226	13394	13484	13753	13623	12547	12415	12584	13524
November 15, 2008	4	12958	12856	12848	12886	13059	13448	13804	13387	13872	13837	13657	13597	13457	13189	12228	13183	13462	13742	13491	13582	12306	12548	12149	12711
November 16, 2008	5	12064	11855	11721	11859	12245	12993	12734	12557	12902	13213	12587	12637	12718	12977	12118	12788	13258	13378	13503	13650	12742	12609	13049	12660
November 17, 2008	6	12213	12124	11947	11805	12419	13171	13538	13583	13241	13192	12916	12905	12714	12958	13210	13177	13940	14552	14586	14621	14474	15179	15564	15419
November 18, 2008	7	16083	15838	15693	14986	14694	14813	15232	14647	14201	13777	13421	13619	13373	13375	14173	14348	14786	15251	15535	15814	15415	15607	15606	15661
November 19, 2008	1	14913	14980	15082	15123	14926	15229	15210	15627	15143	14843	15283	15259	14872	14740	14845	14958	15402	15853	15527	15364	15239	15346	15340	15624
November 20, 2008	2	16560	16372	16210	16127	16464	17347	17489	17565	16250	14708	14077	13705	13729	13883	13524	13841	17540	18077	18324	18301	18177	18411	18606	18301
November 21, 2008	3	17429	17361	17135	17497	18037	18757	19052	19025	18481	18021	18043	17112	15671	15225	15364	15636	17962	18178	18661	18801	18129	18862	18107	17813
November 22, 2008	4	17322	16852	16925	16902	17462	17977	18109	18242	18020	17853	18178	18397	18481	18747	18477	18725	19583	18439	19153	19062	18038	18456	18456	18067
November 23, 2008	5	17429	17434	17487	17148	17169	17916	18189	18025	18135	18130	17656	17460	18179	18184	18136	17824	18094	18085	18022	18088	18721	18709	18530	18187
November 24, 2008	6	17479	16563	16346	16125	16179	16764	17186	16887	16707	16308	16056	15915	14662	14858	14641	14798	15842	16046	17662	17811	17884	16963	17211	17053
November 25, 2008	7	16687	16622	16758	16671	16756	17075	17052	16729	16544	15777	15363	14756	14266	14252	14558	15161	16329	16579	16782	16709	16725	16568	16731	16572
November 26, 2008	1	15960	15918	15415	15285	15468	15634	15104	15125	15180	15013	14403	13959	13347	13218	13215	13629	14799	15084	15731	15918	15342	15337	15912	15281
November 27, 2008	2	14914	14480	14484	14508	15102	15719	15841	15980	15287	14981	14229	13681	13157	13304	13365	13357	14154	14534	14459	14489	14473	14467	14467	14281
November 24, 2008	3	13921	13830	13843	13812	14019	14675	14850	14962	15118	15031	14136	14025	13142	13046	14701	14948	15278	15479	15617	15365	15165	15117	15237	14817
November 29, 2008	4	14563	14110	14067	14082	14495	15247	15267	15826	15811	15758	15176	14883	14842	14865	14504	14571	14806	15203	15227	15204	14769	14682	14687	14288
November 30, 2008	5	13487	13214	13077	13046	13213	13681	13781	13937	14048	14243	14129	13784	13130	12807	12837	13081	13611	14014	14861	13955	13265	13218	13459	13113
December 1, 2008	6	12187	11981	11814	12021	12518	12803	13262	13586	13901	14031	14181	13981	13962	14204	14393	13996	13874	13962	13240	13059	12461	12404	12672	12616
December 2, 2008	7	15618	15703	15661	15917	16081	16203	16297	16181	16350	16199	15958	15512	15204	15302	15810	16057	17229	17640	17934	18175	18092	18117	18203	18271
December 3, 2008	1	17819	17687	17650	17537	17981	17775	18016	17723	17629	18259	18515	18227	18386	18576	18405	18411	18415	17812	17849	17540	17582	17659	17258	16997
December 4, 2008	2	16260	15940	15660	15544	15736	17486	18209	18019	19452	20003	19530	19177	19457	19549	19578	19348	20159	20405	20804	20704	20187	20051	20338	19729
December 5, 2008	3	19478	19490	19429	19273	19714	20215	20542	20828	21041	21060	20921	20146	20086	19448	19524	19583	20317	20667	20837	20704	20443	20370	20303	19934
December 6, 2008	4	19230	18883	18852	18838	18978	19414	20115	19918	19758	19378	18858	18067	17475	17338	16904	17255	18091	18614	18468	18309	18227	17729	17609	16758
December 7, 2008	5	16160	15879	15987	15647	15918	16658	16615	16721	16864	16648	15881	15208	15290	15821	16703	17319	18139	18042	19451	19541	20405	21309	21735	21491
December 8, 2008	6	21371	21122	21296	21422	21900	22545	22648	23037	24158	24162	24314	24158	23885	23524	23174	22834	23046	23464	23422	22860	22154	22773	22595	22334
December 9, 2008	7	22030	21751	21667	21459	21958	22648	22813	21942	21701	21258	20569	19773	19372	19263	19142	19403	20195	20739	20838	20772	20674	20503	20799	20240
December 10, 2008	1	19465	19652	19458	19284	19321	19487	19334	19288	18962	18719	17855	17061	16275	15689	15546	15920	16820	17836	18030	17940	17489	17558	17598	17457
December 11, 2008	2	16747	16481	16421	16449	16722	17348	17524	17054	17248	17247	16149	15403	15362	15108	15142	15701	16326	17108	17691	17503	17320	17324	17748	17534
December 12, 2008	3	16974	16899	16675	16425	16420	17540	17883	18231	16400	16128	16018	17535	17626	17719	17902	17775	17905	18211	18193	18071	17539	17564	17529	16972
December 13, 2008	4	16084	15849	15594	15311	15297	15875	16367	16131	16342	16223	16813	16927	16777	16780	16938	16154	18454	18755	18649	18535	16847	16818	18829	16788
December 14, 2008	5	15907	15625	15520	15564	15954	16697	16941	17830	18058	18078	17527	16726	14362	14522	15058	16015	17034	17554	17580	17538	17173	17127	17210	17204
December 15, 2008	6	15754	15486	16246	16180	16487	16799	17146	17862	17303	17295	16481	15342	15484	15633	15775	15609	16071	16936	16883	16493	16972	17032	17514	17514
December 16, 2008	7	17292	17259	16981	16702	16835	17529	17270	16931	16258	16401	15153	14749	14299	14449	14833	15247	16495	17379	16159	16150	16153	16107	16029	17827
December 17, 2008	1	17340	17096	17058	16907	16992	17295	17570	17586	16962	16534	15976	15298	14697	14810	14764	14808	15718	16264	16176	16079	15835	15762	15978	15817
December 18, 2008	2	14342	14527	14314	14251	14220	14761	15329	15546	15409	15343	15300	15235	14548	15259	15384	15980	16409	17264	17454	17463	17735	18089	18343	18073
December 19, 2008	3	17398	17302	17219	17265	17520	18014	18251	18787	18874	18958	18924	17649	17290	17251	17584	18227	19137	19907	20201	19802	19784	19862	19830	19726
December 20, 2008	4	19248	19014	19069	19054	19236	20004	20577	19940	20079	19424	18696	17757	17525	17588	17975	18322	18497	19487	19815	19485	19457	19576	19622	19419
December 21, 2008	5	19478	19564	19345	19283	19342	19824	19783	19258	18802	18462	18144	17494	17282	16912	16754	16418	17565	17953	18379	18626	17959	17916	18173	18362
December 22, 2008	6	17532	17422	17419	17749	17913	18258	18675	18780	18764	18821	18834	18439	18264	18250	17982	17607	18264	18582	18892	18877	18573	18434	18125	17990
December 23, 2008	7	18448	18078	18273	18018	18012	18409	18312	18152	18042	18761	18480	18403	18098	18344	18491	18811	18884	18781	18921	18753	17818	17335	17473	17257
December 24, 2008	1	16647	16257	16274	16252	16337	16401	16978	16640	16721	16826	16822	16305	15998	15865	15874	15160	17120	17987	17988	17877	17702	17364	18021	18133
December 25, 2008	2	17502	17483	17149	17287	17367	17786	17962	17820	17395	16942	16461	17213	17213	17307	17954	17981	17945	18084	18425	18445	18287	18048	18247	18294
December 26, 2008	3	17958	17823	17312	17181	17080	17185	17295	17290	17425	17741	17569	18098	18043	18294	18423	18178	18647	17543	17985	17806	18251	18339	18470	18228
December 27, 2008	4	17804	17809	17572	17513	17840	18332	18735	18963	19119	19278	18683	18417	18537	19010	19099	18688	19193	19910	19977	20069	19883	20030	20013	19629
December 28, 2008	5	18618	18897	18883	18819	18956	19021	19151	19419	19022	18643	18332	18149	17895	17931	17993	17767	18011	17993	17767	17599	17542	17410	17294	17098
December 29, 2008	6	16654	16544	16549	16576	16701	17058	16631	16315	16537	16114	15826	15644	15429	15483	15674	17414	17948	18420	19230	19250	19234	19231	19495	19424
December 30, 2008	7	18054	18285	18504	18615	18751	18638	18474	17919	17972	17998	17582	17791	17720	17904	18049	18079	18375	18427	18786	18453	18221	17951	17627	17481
December 31, 2008	1	18004	18012	18721	18726	18901	19044	19034	19252	19045	18905	18795	18943	18965	19148	18724	17148	18375	18427	18786	18453	18221	17951	17627	17481

Steam Demand	DOW	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
January 1, 2006	1	113.5	117.8	119.3	114.5	126.5	118.3	119.0	109.5	112.4	111.4	124.9	122.7	121.6	120.6	121.2	121.9	114.4	113.2	118.9	113.4	123.5	119.4	119.1	109.4
January 2, 2006	2	107.8	110.0	108.7	110.1	118.8	117.5	123.6	128.3	137.5	141.8	142.9	135.1	135.7	137.6	132.5	136.4	128.7	136.4	139.3	138.3	137.2	139.5	129.5	131.5
January 3, 2006	3	119.3	120.9	121.2	117.0	121.6	127.8	134.6	128.5	128.4	144.0	144.6	134.4	137.1	135.8	133.8	129.2	128.5	130.2	139.1	139.1	136.6	140.2	140.2	133.9
January 4, 2006	4	118.1	119.2	119.2	120.9	130.9	126.3	134.5	128.5	128.9	145.7	142.8	138.7	123.0	134.0	131.5	133.2	118.3	124.5	122.2	125.8	122.2	124.5	123.3	118.3
January 5, 2006	5	114.8	111.5	114.1	108.5	111.6	114.3	112.4	108.2	110.0	108.2	115.0	109.2	115.3	104.2	104.8	103.0	99.5	109.4	113.0	112.2	107.5	110.7	107.3	104.0
January 6, 2006	6	98.7	101.4	96.2	99.5	100.3	96.1	99.7	94.7	96.7	104.2	107.9	99.5	107.3	108.9	102.4	99.2	90.3	102.5	102.6	107.7	105.4	106.5	111.6	103.0
January 7, 2006	7	100.2	95.6	98.7	102.6	101.6	108.5	110.3	116.7	115.4	119.7	128.5	118.4	125.2	123.7	127.7	117.7	110.8	121.3	129.6	128.9	126.9	127.1	130.1	117.4
January 8, 2006	1	108.7	106.2	112.2	108.8	107.8	114.5	119.1	125.7	125.3	121.6	122.7	114.6	124.0	121.2	123.1	121.8	119.2	123.8	140.8	138.6	135.0	138.8	141.3	129.1
January 9, 2006	2	123.4	122.2	124.5	120.1	125.2	130.4	135.2	136.9	137.3	149.6	149.9	143.6	150.1	138.7	142.3	131.7	137.4	136.5	140.9	149.3	146.6	142.8	150.4	136.8
January 10, 2006	3	125.3	134.1	132.6	133.6	136.5	143.5	144.4	145.7	147.5	150.0	159.1	156.3	155.5	161.6	160.8	154.6	149.6	162.8	156.3	162.7	156.7	154.7	160.7	151.2
January 11, 2006	4	144.0	152.0	145.1	144.1	152.8	153.4	155.4	152.6	158.7	161.8	170.2	157.1	154.0	154.8	160.5	153.1	148.4	151.5	157.0	156.9	151.2	159.4	157.0	154.4
January 12, 2006	5	141.9	143.4	137.9	137.5	135.3	145.8	144.8	141.5	148.9	148.3	152.7	151.1	147.9	145.6	148.7	136.7	134.9	142.9	138.1	138.4	143.1	143.4	141.0	134.2
January 13, 2006	6	121.6	121.9	121.0	129.9	127.2	121.5	132.3	116.0	118.1	130.3	138.6	130.1	128.3	131.3	133.6	121.9	115.5	125.1	122.2	130.3	133.8	137.7	137.5	128.2
January 14, 2006	7	123.9	122.1	123.2	122.0	126.9	126.6	128.8	131.5	137.0	130.9	143.1	142.8	140.5	137.5	142.5	135.5	132.1	136.6	136.4	139.0	139.2	140.0	139.2	134.8
January 15, 2006	1	123.0	126.7	128.1	128.5	129.0	128.6	127.3	124.1	130.5	135.6	140.9	144.8	145.2	144.3	139.8	137.7	130.7	138.5	136.7	142.3	136.8	142.0	131.9	128.5
January 16, 2006	2	122.3	122.2	109.3	112.8	113.3	120.7	124.6	136.1	142.3	146.0	159.0	149.0	150.2	152.6	163.5	157.9	157.0	164.3	154.2	165.4	170.9	162.8	169.6	162.3
January 17, 2006	3	160.2	165.5	166.1	166.1	159.5	161.1	166.5	170.8	177.8	200.9	191.5	182.6	178.8	183.3	180.4	179.6	178.1	175.6	182.4	181.9	181.6	186.8	178.6	169.6
January 18, 2006	4	161.6	161.7	166.8	164.1	160.0	173.5	172.0	173.0	174.2	171.4	187.7	179.4	156.2	157.7	162.7	170.4	156.1	165.1	168.5	172.3	159.7	165.1	164.3	152.0
January 19, 2006	5	141.1	144.3	142.7	142.4	140.0	152.8	153.1	153.3	155.1	171.3	162.5	175.4	160.7	162.9	163.7	161.1	161.1	170.5	159.2	160.6	161.1	167.3	160.3	158.3
January 20, 2006	6	157.3	149.3	148.2	156.5	152.8	158.1	159.5	161.4	161.7	167.3	166.4	177.2	170.6	176.5	172.8	179.3	161.8	164.8	177.0	180.6	183.1	186.7	182.9	174.8
January 21, 2006	7	162.9	164.6	166.8	175.9	172.6	168.4	170.4	176.7	173.7	175.0	180.9	179.9	179.4	179.4	170.2	181.9	170.3	161.2	165.8	167.5	165.9	171.0	167.2	166.0	162.2
January 22, 2006	1	152.8	156.6	154.6	154.3	155.4	165.9	161.2	175.6	161.0	167.3	161.9	174.4	165.8	178.2	167.4	168.5	161.0	168.6	174.5	158.9	166.5	162.6	159.1	164.0
January 23, 2006	2	150.8	141.9	155.5	149.1	156.4	161.7	172.8	161.9	164.9	165.3	166.3	166.6	165.5	167.8	161.8	169.5	157.3	168.6	174.7	170.0	165.5	169.8	167.4	159.3
January 24, 2006	3	151.3	150.5	154.3	152.2	152.2	159.1	165.8	161.2	164.5	172.6	168.5	165.4	169.1	161.5	167.3	161.8	157.4	154.2	162.2	164.2	165.7	164.0	166.1	159.4
January 25, 2006	4	145.7	151.0	150.0	148.5	148.5	160.6	159.3	160.2	166.5	176.2	172.6	175.1	173.8	171.3	176.3	172.0	165.0	180.2	185.0	186.1	181.0	182.0	189.5	183.7
January 26, 2006	5	180.3	174.8	189.1	178.7	178.1	188.0	188.3	183.2	189.8	203.9	201.5	203.5	191.0	199.1	196.7	191.2	184.7	185.8	192.5	190.6	190.2	197.6	194.1	187.5
January 27, 2006	6	173.0	173.4	170.3	173.4	169.8	172.4	171.9	168.9	166.4	177.1	185.4	178.7	172.1	176.4	174.0	163.5	156.7	161.0	168.0	165.5	164.5	165.9	169.2	155.2
January 28, 2006	7	147.2	148.0	149.8	142.8	145.1	146.2	145.9	152.4	152.9	156.7	164.4	161.5	160.8	158.2	156.0	156.5	151.1	155.2	164.9	161.5	164.4	152.0	162.8	154.1
January 29, 2006	1	151.1	157.0	156.2	153.0	159.8	167.6	163.4	165.3	175.1	159.3	187.2	179.1	174.9	177.8	176.0	180.5	165.0	178.3	168.3	184.5	175.9	182.1	178.3	177.8
January 30, 2006	2	166.0	169.9	162.7	164.5	159.0	168.4	169.7	172.5	174.8	183.0	185.7	178.3	187.3	179.6	184.1	172.6	164.2	167.3	167.9	166.4	163.4	168.3	173.4	163.7
January 31, 2006	3	152.0	153.0	150.3	151.7	151.9	165.1	161.8	165.8	172.1	174.2	187.8	182.7	185.5	180.8	181.3	175.2	166.1	176.4	180.2	178.2	176.1	175.0	172.8	170.4
February 1, 2006	4	143.2	144.9	145.5	143.9	142.5	150.8	149.3	153.6	154.4	159.7	171.1	165.8	161.4	162.2	161.0	154.5	152.7	155.0	158.0	161.1	160.8	154.4	151.8	155.5
February 2, 2006	5	137.1	132.6	135.0	131.0	135.4	142.8	148.3	142.7	145.5	146.3	158.6	154.4	152.9	152.3	152.8	148.6	142.0	150.3	151.8	154.2	146.7	148.3	154.1	147.8
February 3, 2006	6	142.8	135.7	138.0	136.8	142.3	143.3	145.7	147.4	157.9	167.0	164.5	161.1	162.8	167.7	159.6	165.3	154.9	158.3	161.9	173.7	165.5	174.5	165.3	157.3
February 4, 2006	7	143.8	152.3	148.9	150.5	153.1	154.9	151.3	158.6	161.7	161.6	173.9	170.3	170.9	162.5	170.4	160.4	156.2	169.4	170.4	172.7	167.7	164.4	158.4	162.5
February 5, 2006	1	161.3	164.5	167.1	166.5	165.4	173.7	189.5	173.9	178.8	183.7	189.3	184.1	191.8	187.5	185.7	184.2	174.5	186.6	184.1	190.8	183.3	178.7	186.2	177.2
February 6, 2006	2	176.2	171.9	171.5	169.7	168.9	175.4	174.4	181.5	182.1	185.5	190.8	188.9	184.4	181.9	184.1	180.9	173.6	178.9	176.0	184.4	176.1	177.3	185.0	180.2
February 7, 2006	3	171.8	170.7	167.9	162.5	163.6	166.1	172.7	174.1	173.1	179.6	184.8	185.1	180.6	183.4	179.7	179.7	173.6	176.0	170.9	120.8	151.6	157.7	163.7	163.8
February 8, 2006	4	158.6	155.1	159.4	160.0	158.4	162.2	164.7	168.8	162.4	168.0	170.3	180.5	181.9	179.6	170.3	175.5	167.6	173.7	167.0	176.0	174.6	176.5	170.7	169.5
February 9, 2006	5	163.3	167.5	162.6	160.8	160.1	164.8	167.0	167.2	174.1	178.5	184.2	181.0	172.9	172.8	172.4	176.4	164.4	174.8	173.2	171.2	171.4	173.4	172.3	166.8
February 10, 2006	6	156.0	158.0	156.8	155.4	154.3	155.3	157.6	154.6	159.8	173.4	170.8	176.0	163.7	169.6	165.2	162.7	153.9	160.6	163.8	170.2	166.0	170.0	169.3	166.8
February 11, 2006	7	152.7	154.0	157.4	152.7	155.5	154.6	155.2	157.8	165.6	168.8	175.9	174.4	167.2	164.5	163.4	159.8	143.3	152.8	155.2	152.5	154.4	155.3	152.4	158.8
February 12, 2006	1	140.6	147.1	143.1	147.5	151.6	152.6	148.8	148.7	152.9	164.4	168.4	158.9	151.6	145.2	145.3	153.1	142.2	147.6	153.2	156.8	154.9	155.3	160.5	149.5
February 13, 2006	2	141.8	142.3	141.8	143.1	145.3	148.1	150.2	152.0	159.0	164.8	162.3	164.1	156.4	165.9	169.5	168.1	159.7	158.6	160.9	158.9	161.7	163.0	165.9	159.8
February 14, 2006	3	151.7	151.9	150.7	152.2	151.6	157.1	157.5	160.7	161.5	173.3	182.7	175.2	175.2	175.5	174.5	172.9	169.0	172.4	173.6	175.7	169.3	171.9	176.6	170.1
February 15, 2006	4	163.3	159.8	154.0	163.4	157.0	164.8	171.6	175.3	174.5	188.7	188.8	173.4	175.6	175.1	177.6	176.0	180.0	174.9	177.8	182.3	175.3	183.8	176.8	
February 16, 2006	5	172.0	166.3	165.9	166.4	166.8	172.5	170.9	180.0	176.7	181.6	194.5	191.2	177.2	175.6	180.5	177.3	170.6	174.5	176.6	181.4	176.0	185.5	172.7	167.6
February 17, 2006	6	165.8	164.0	165.2	161.9	161.1	162.7	166.9	166.1	172.4	175.1	182.2	177.3	171.5	168.9	170.3	163.1	158.5	164.0	169.4	171.5	163.6	165.2	165.4	160.0
February 18, 2006	7	146.0	158.7	152.8	148.7	149.7	155.8	151.6	152.1	153.9	163.0	173.5	172.4	167.8	162.5	168.6	160.7	155.5	163.3	165.9	170.7	168.6	173.6	175.5	173.3
February 19, 2006	1	164.7	166.7	162.8	162.9	167.3	166.8	166.6	169.5	172.6	175.0	187.3	179.7	183.2	185.4	177.9	173.9	167.0	173.0	174.7	180.6	177.3	172.3	178.2	167.8
February 20, 2006	2	156.2	153.1	151.8	151.7	153.0	157.0	161.5	158.0	157.1	152.1	166.0	159.7	154.1	144.7	142.6	140.9	135.0	136.7	143.9	146.5	146.9	149.7	144.5	144.9
February 21, 2006	3	137.1	140.0	133.2	138.6	134.5	140.4	134.5	142.2	136.5	140.2	143.1	147.0	141.4	137.2	148.0	141.4	145.5	139.5	143.8	150.4	143.5	145.1	143.4	140.9
February 22, 2006	4	139.4	135.3	133.4	139.5	134.7	139.3	147.1	142.2	143.5	156.2	151.1	149.7	154.3	146.1	146.8	145.2	141.5	147.4	143.7	145.0	147.9	142.2	142.6	141.1
February 23, 2006	5	136.9	137.7	134.2	133.7	136.9	138.4	138.6	143.2	145.0	152.6	166.8	161.7	162.5	154.4	161.7	164.3	160.2	155.5	159.8	161.0	165.8	162.5	165.2	161.1
February 24, 2006	6	158.4	150.0	153.5	150.2	151.1	151.7	149.7	156.7	160.5	172.4	167.9	172.7	164.4	162.7	159.8	149.6	145.3	146.3	150.6	156.7	158.7	152.5	158.5	158.0
February 25, 2006	7	146.0	143.2	144.0	142.3	143.5	145.8	152.2	149.8	148.5	155.6	160.3	158.7	156.3	158.8	155.0	152.8	148.1	154.4	157.4	157.5	159.2	152.6	152.6	146.3
February 26, 2006	1	142.6	141.6	138.6	140.1	139.3	148.5	149.9	148.7	158.9	153.4	161.0	150.5	151.0	150.8	149.9	151.7	144.9	150.5	147.5	149.1	149.0	144.3	149.3	143.5
February 27, 2006	2	138.7	134.5	135.4	135.6	137.0	141.4	141.8	140.6	143.5	144.1	145.1	146.5	142.7	147.1	145.9	145.3	144.0	143.5	145.1	141.8	144.3	142.5	142.3	140.9
February 28, 2006	3	128.9	129.2	126.2	131.0	132.7	137.4	139.2	136.7	139.0	142.0	145.3	147.0	144.8	145.0	146.6	143.6	136.4	139.5	140.8	143.0	141.2	142.8	142.9	142.8
March 1, 2006	4	134.6	131.5	133.3	131.2	132.6	138.3	138.6	143.0	143.1	146.0	153.5	154.0	154.0	154.0	154.0	154.0	154.0	154.0	154.0	154.0	154.0	154.0	154.0	154.0
March 2, 2006	5	154.0	154.0	154.0	154.0	154.0	154.0	154.0	154.0	154.0	154.0	154.0	154.0	154.0	154.0	154.0	154.0	154.0	127.0	130.7	132.0	130.9	129.2	134.6	131.1
March 3, 2006	6	117.8	120.6	116.6	123.8	122.0	123.4	128.0	133.2	130.1	130.3	136.8	132.8	124.6	130.7	125.7	128.3	126.3	125.4	131.4	131.4	133.1	129.1	134.0	128.4

Steam Demand		DOW	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
	March 4, 2006	7	126.6	123.4	125.5	126.3	128.7	128.9	131.5	132.8	132.5	133.7	137.7	144.0	145.6	148.1	140.3	140.3	141.5	138.3	144.3	150.8	139.4	146.4	148.4	140.0
	March 5, 2006	1	136.4	140.1	133.8	138.7	136.0	141.9	139.2	138.4	144.5	147.2	154.4	160.8	155.5	146.9	150.0	157.1	147.4	158.2	151.9	159.8	158.8	157.5	171.8	160.2
	March 6, 2006	2	151.1	152.7	149.4	154.1	154.0	157.5	168.6	172.1	173.8	178.5	185.2	182.8	183.2	180.0	184.1	181.3	178.0	178.2	177.2	178.4	177.5	179.2	182.1	181.4
	March 7, 2006	3	176.5	172.8	171.9	170.6	170.9	172.7	176.5	177.9	178.2	182.9	184.6	185.1	184.1	182.6	181.2	176.1	177.1	180.5	179.0	179.5	174.5	172.3	174.4	172.5
	March 8, 2006	4	164.5	163.0	163.9	159.8	160.9	165.5	159.4	171.1	173.6	177.2	178.4	179.7	168.8	175.0	178.1	167.2	166.0	169.7	173.3	178.5	173.3	172.9	175.6	166.6
	March 9, 2006	5	161.7	160.6	160.7	160.9	158.6	164.4	169.8	170.0	172.1	174.6	174.1	178.5	170.4	168.6	159.9	174.4	160.7	164.4	165.9	165.1	164.4	158.9	165.4	156.9
	March 10, 2006	6	149.4	145.1	147.7	139.7	141.9	146.1	150.5	146.8	148.9	150.5	164.9	155.8	147.9	144.0	144.5	139.0	138.2	139.6	138.7	145.5	143.0	144.5	137.3	138.0
	March 11, 2006	7	132.8	129.3	125.1	127.3	127.5	128.6	124.3	127.6	128.3	134.1	133.1	133.8	134.5	135.0	120.2	116.0	121.8	132.9	131.9	140.0	134.9	140.9	135.3	131.5
	March 12, 2006	1	125.0	121.6	121.1	121.4	136.2	133.2	137.9	134.3	130.1	130.4	130.0	122.2	124.9	123.9	117.3	116.4	126.9	139.3	130.0	122.9	129.7	132.9	126.4	115.5
	March 13, 2006	2	117.2	115.5	116.2	116.5	120.5	125.9	123.3	123.5	123.8	128.9	126.5	119.0	122.3	125.1	124.6	116.9	119.2	124.2	131.5	126.8	123.3	127.9	118.5	115.0
	March 14, 2006	3	108.5	107.8	101.7	104.1	110.0	107.7	106.2	105.9	102.5	120.6	114.6	109.5	119.4	107.9	108.5	98.6	101.1	103.1	107.6	127.5	119.3	112.0	113.0	105.3
	March 15, 2006	4	98.3	99.6	98.3	96.2	104.7	104.9	104.8	102.1	105.4	109.2	110.1	102.4	116.1	122.0	118.5	106.9	127.6	126.6	139.4	129.1	131.9	131.3	124.4	130.3
	March 16, 2006	5	117.5	113.0	124.3	118.0	129.3	132.7	139.1	139.3	139.8	149.7	150.4	146.5	146.6	151.7	160.1	146.2	155.2	153.2	155.7	152.2	154.4	160.7	155.6	147.3
	March 17, 2006	6	145.7	148.5	144.0	145.1	150.9	149.3	145.9	144.5	151.1	157.6	151.7	153.3	149.1	154.9	148.0	140.5	150.8	148.1	153.5	149.9	156.3	157.1	150.9	141.8
	March 18, 2006	7	142.9	147.2	145.0	149.0	142.2	143.5	148.1	146.7	154.4	154.6	151.8	155.0	149.1	149.9	152.5	148.3	143.6	151.7	155.8	151.6	161.6	151.6	145.6	145.8
	March 19, 2006	1	142.2	150.8	143.5	143.1	146.9	146.2	144.7	148.7	153.0	153.4	147.8	147.9	145.6	148.2	153.1	142.2	148.9	144.6	150.4	143.8	143.5	148.7	139.9	139.7
	March 20, 2006	2	125.6	124.0	123.0	123.1	137.5	132.9	128.9	133.8	136.5	138.2	139.8	138.5	134.6	138.4	136.3	138.2	138.1	134.9	134.1	137.6	144.2	145.5	140.3	133.8
	March 21, 2006	3	133.3	135.6	130.5	132.8	140.0	145.2	147.2	141.4	154.8	151.4	157.9	155.7	143.8	146.7	138.3	134.2	139.2	141.7	140.2	139.3	137.9	137.8	134.1	127.0
	March 22, 2006	4	121.3	122.0	120.3	120.5	128.5	129.1	132.2	131.6	135.3	137.5	134.0	131.5	125.1	128.1	116.8	108.2	120.6	119.0	119.4	121.0	117.5	125.0	114.6	105.3
	March 23, 2006	5	101.1	103.8	103.3	103.0	108.5	105.4	98.7	100.3	99.1	95.3	96.8	95.3	106.3	105.0	101.6	95.0	100.0	112.6	106.1	107.7	100.3	98.5	100.6	95.2
	March 24, 2006	5	92.6	92.9	91.3	95.8	97.4	97.8	104.0	99.8	108.1	107.4	107.9	110.0	109.0	104.9	106.9	97.2	107.0	113.9	109.4	117.4	114.9	113.0	110.3	104.5
	March 25, 2006	7	102.5	98.1	99.9	100.1	111.2	112.6	104.3	105.0	107.8	115.6	109.6	107.2	108.1	106.6	104.3	98.8	105.4	111.0	118.8	113.0	115.2	111.8	110.2	102.5
	March 26, 2006	1	99.8	99.2	99.8	98.8	106.7	108.6	112.1	108.9	110.6	119.7	115.4	107.3	108.1	114.7	109.2	101.5	108.8	108.7	113.5	104.9	104.1	110.5	96.2	91.5
	March 27, 2006	2	87.8	88.0	90.5	84.5	88.7	92.1	90.2	87.7	99.0	97.4	89.6	85.5	85.9	88.1	87.5	77.6	83.5	89.2	82.6	85.5	86.8	84.8	83.2	80.2
	March 28, 2006	3	77.9	78.8	78.2	77.6	79.8	85.7	86.3	82.6	87.7	98.9	90.2	97.5	94.9	96.8	89.6	79.3	84.0	97.1	91.3	97.2	99.7	96.8	96.3	86.4
	March 29, 2006	4	88.0	89.9	89.7	90.5	100.3	99.6	106.9	106.9	105.4	107.7	105.9	108.4	105.4	106.9	102.2	95.1	123.8	122.3	125.9	125.3	126.5	126.9	119.9	117.7
	March 30, 2006	5	114.2	112.5	114.5	116.2	119.7	122.6	125.3	117.5	105.9	113.4	103.5	101.3	102.9	101.8	92.3	81.6	86.8	94.1	97.9	93.7	97.0	98.1	91.5	89.0
	March 31, 2006	5	90.0	88.9	88.3	90.5	95.0	93.2	97.4	99.1	111.2	110.3	107.4	99.5	102.4	102.8	98.6	90.4	103.2	111.0	115.2	112.6	115.5	113.3	106.4	105.9
	April 1, 2006	7	100.0	98.8	98.1	101.0	105.6	103.6	108.2	110.1	123.6	122.6	119.3	110.6	113.8	114.2	109.5	100.4	114.7	123.3	128.0	125.1	128.3	125.9	118.2	117.7
	April 2, 2006	1	100.0	98.8	98.1	101.0	105.6	103.6	108.2	110.1	123.6	122.6	119.3	110.6	113.8	114.2	109.5	100.4	114.7	123.3	128.0	125.1	128.3	125.9	118.2	117.7
	April 3, 2006	2	100.0	98.8	98.1	101.0	105.6	103.6	108.2	110.1	123.6	122.6	119.3	110.6	113.8	114.2	109.5	100.4	114.7	123.3	128.0	125.1	128.3	125.9	118.2	117.7
	April 4, 2006	3	100.0	98.8	98.1	101.0	105.6	103.6	108.2	110.1	123.6	122.6	119.3	110.6	113.8	114.2	109.5	100.4	114.7	123.3	128.0	125.1	128.3	125.9	118.2	117.7
	April 5, 2006	4	100.0	98.8	98.1	101.0	105.6	103.6	108.2	110.1	123.6	122.6	119.3	110.6	113.8	114.2	109.5	100.4	114.7	123.3	128.0	125.1	128.3	125.9	118.2	117.7
	April 6, 2006	5	100.0	98.8	98.1	101.0	105.6	103.6	108.2	110.1	123.6	122.6	119.3	110.6	113.8	114.2	109.5	100.4	114.7	123.3	128.0	125.1	128.3	125.9	118.2	117.7
	April 7, 2006	6	100.0	98.8	98.1	101.0	105.6	103.6	108.2	110.1	123.6	122.6	119.3	110.6	113.8	114.2	109.5	100.4	114.7	123.3	128.0	125.1	128.3	125.9	118.2	117.7
	April 8, 2006	7	100.0	98.8	98.1	101.0	105.6	103.6	108.2	110.1	123.6	122.6	119.3	110.6	113.8	114.2	109.5	100.4	114.7	123.3	128.0	125.1	128.3	125.9	118.2	117.7
	April 9, 2006	1	100.0	98.8	98.1	101.0	105.6	103.6	108.2	110.1	123.6	122.6	119.3	110.6	113.8	114.2	109.5	100.4	114.7	123.3	128.0	125.1	128.3	125.9	118.2	117.7
	April 10, 2006	2	100.0	98.8	98.1	101.0	105.6	103.6	108.2	110.1	123.6	122.6	119.3	110.6	113.8	114.2	109.5	100.4	114.7	123.3	128.0	125.1	128.3	125.9	118.2	117.7
	April 11, 2006	3	133.2	123.6	122.4	123.6	123.0	134.6	134.7	135.2	131.5	144.6	141.3	144.8	131.0	132.6	129.9	125.4	120.4	132.6	131.0	138.6	133.9	139.7	133.8	129.3
	April 12, 2006	4	126.6	122.3	116.4	125.2	123.7	131.2	132.3	133.1	136.3	144.1	153.2	158.4	150.2	152.7	152.6	155.2	136.6	146.2	148.1	158.3	150.3	149.4	156.0	147.8
	April 13, 2006	5	135.6	133.3	129.8	129.8	130.2	137.8	136.9	143.5	137.4	147.8	146.3	139.1	142.0	137.2	143.5	134.2	127.7	141.2	139.1	150.2	141.1	145.6	135.5	137.8
	April 14, 2006	6	131.3	125.0	121.8	122.3	125.0	131.4	140.6	131.3	133.0	132.6	142.3	137.2	137.0	137.4	133.3	130.9	128.0	128.7	136.5	148.4	142.0	143.7	143.6	137.2
	April 15, 2006	7	126.4	135.1	127.0	124.5	127.8	133.0	127.9	129.3	132.5	134.7	147.6	145.8	151.0	152.7	152.8	147.2	140.6	142.0	137.5	141.9	144.6	134.9	134.6	139.5
	April 16, 2006	1	135.3	137.3	128.2	129.8	121.2	121.6	129.6	129.2	130.8	143.3	149.6	141.9	150.0	151.0	146.2	142.8	131.9	135.2	134.5	140.1	134.9	136.5	136.4	129.8
	April 17, 2006	2	118.4	117.2	118.7	118.6	122.0	126.6	128.9	137.6	131.6	141.3	139.2	136.1	132.6	132.5	137.3	128.3	125.7	126.3	130.7	135.6	133.8	133.3	135.1	127.7
	April 18, 2006	3	122.6	122.4	128.1	119.3	123.6	126.6	131.4	124.5	124.5	136.0	137.7	136.6	134.1	133.9	126.4	133.2	122.5	129.3	125.8	128.4	129.7	130.6	133.3	119.5
	April 19, 2006	4	119.3	112.5	111.5	107.3	111.7	115.7	119.7	114.2	115.4	132.5	130.7	122.9	118.0	122.7	111.6	110.0	99.8	106.4	113.0	119.6	118.9	125.0	118.2	116.5
	April 20, 2006	5	103.1	103.7	103.3	100.6	105.5	108.1	107.4	111.7	104.7	117.7	119.4	108.1	103.7	106.0	100.9	99.7	90.9	95.4	108.5	108.6	109.1	114.0	112.3	108.1
	April 21, 2006	6	97.9	96.0	96.6	97.1	95.3	101.4	100.7	101.3	97.9	104.5	102.8	100.2	95.1	98.8	96.6	94.3	90.7	92.0	99.5	100.9	105.2	98.4	101.6	97.6
	April 22, 2006	7	95.4	91.8	90.4	84.8	88.6	90.4	87.4	86.0	85.2	94.4	94.1	92.3	94.3	101.1	98.2	95.1	82.8	92.5	99.5	96.5	98.7	98.4	101.5	94.3
	April 23, 2006	1	86.4	84.2	86.5	84.4	81.6	88.4	90.8	87.0	81.6	74.2	73.4	66.1	65.0	73.3	76.2	61.7	61.8	69.1	64.9	69.1	66.0	68.6	66.9	58.1
	April 24, 2006	2	59.1	54.2	54.8	54.9	53.1	61.7	52.9	64.2	61.2	68.2	69.6	73.5	73.2	65.2	72.6	71.0	61.0	63.0	67.5	68.4	67.8	73.4	73.9	67.9
	April 25, 2006	3	59.3	58.8	59.3	57.4	60.8	65.0	67.9	74.1	68.8	77.2	86.7	82.0	73.1	69.5	70.6	79.2	68.0	72.9	81.6	82.6	78.1	76.9	82.5	78.2
	April 26, 2006	4	70.1	66.1	65.9	64.7	66.4	71.3	71.0	76.9	74.2	84.2	83.8	80.1	73.4	76.7	75.5	81.4	81.5	83.4	88.0	85.4	86.8	89.9	89.6	80.8
	April 27, 2006	5	73.6	73.3	78.9	70.6	71.7	78.4	76.5	80.5	83.1	99.1	99.7	96.8	101.7	90.7	91.6	90.4	83.0	89.6	88.7	94.2	89.7	88.4	96.7	84.0
	April 28, 2006	6	77.7	79.5	76.6	79.7	74.7	75.3	77.8	78.2	77.7	82.7	91.3	78.3	76.0	83.7	81.1	78.9	71.5	77.1	75.8	77.1	83.3	78.8	77.9	74.7
	April 29, 2006	7	67.5	68.7	68.9	68.9	66.5	70.1	72.5	71.6	75.0	80.1	83.2	80.4	78.1	79.9	78.8	79.0	68.9	75.2	81.3	81.1	82.3	83.3	84.3	79.3
	April 30, 2006	1	71.7	69.9	71.5	69.7	73.8	75.5	75.8	76.3	76.4	81.6	80.2	83.7	74.4	65.3	80.8	73.6	62.3	73.4	67.2	81.3	66.9	77.5	69.0	69.2
	May 1, 2006	2	61.5	67.3	63.9	62.6	62.7	69.2	71.2	74.1	67.9	79.0	71.9	75.0	66.6	70.4	71.8	68.0	62.3	66.0	69.7	70.5	68.3	64.5	64.4	63.7
	May 2, 2006	3	59.5	60.5	58.9	57.2	55.3	62.1	62.6	62.8	59.8	69.6	74.5	69.5	74.1	69.1	78.9	66.1	61.4	64.2	63.5	68.2	63.4	62.7	63.1	61.4
	May 3, 2006	4	56.8	57.1	55.2	55.9	54.5	60.3	62.5	67.5	63.8	70.6	72.3	63.1	60.6	63.9	72.0	67.1	60.8	63.2	70.7	66.6	73.1	64.1	72.1	63.5
	May 4, 2006	5	62.3	58.1	56.7	52.7	53.0	60.5	59.1	63.2	66.8	68.3	81.2	70.5	67.4	70.9	65.5	63.4	63.7	61.5	67.0	67.9	75.1	71.4	68.5	61.2

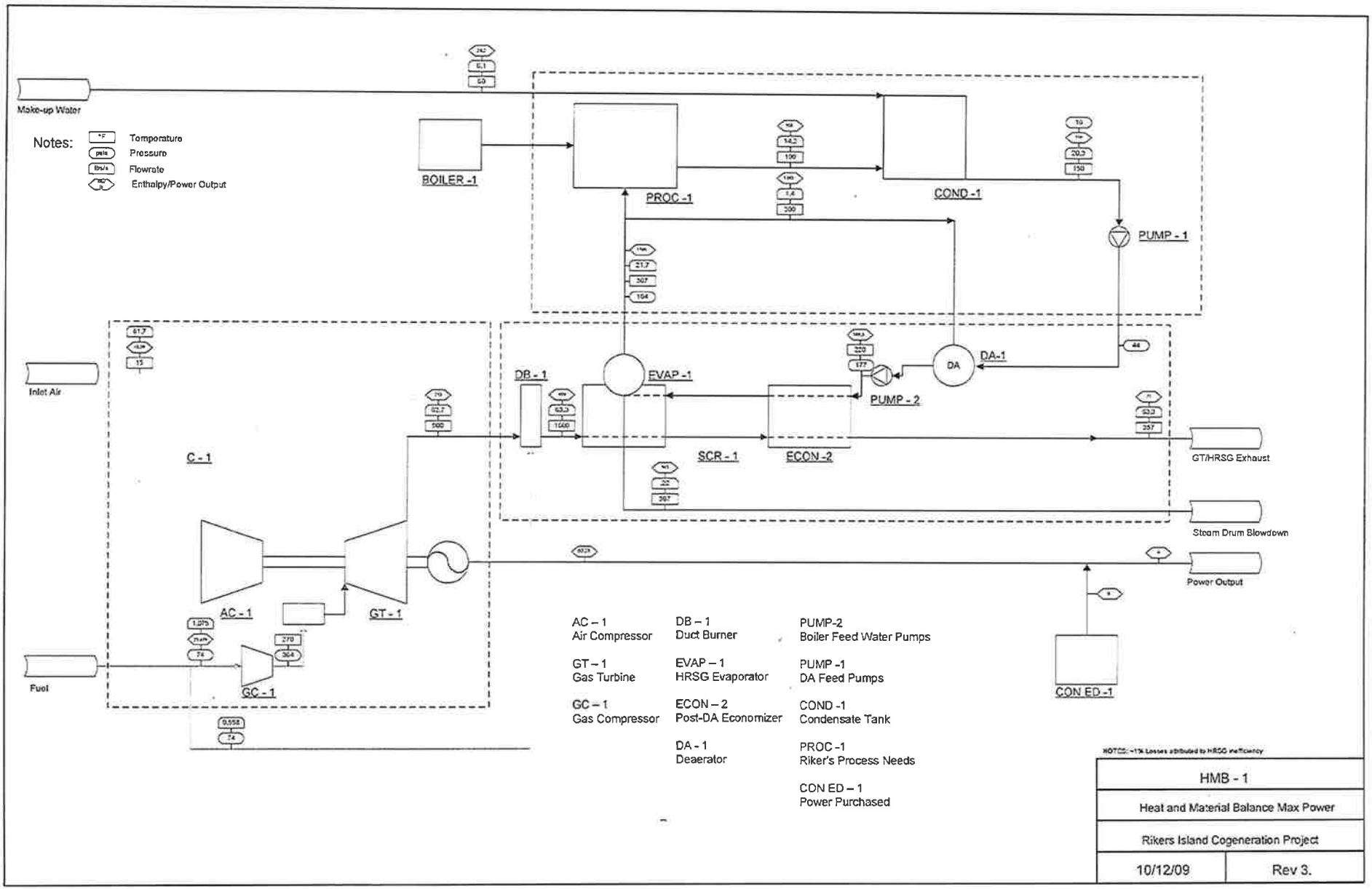
Steam Demand		DOW	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
	May 5, 2006	6	57.1	54.6	54.5	49.8	53.2	58.2	57.5	56.4	58.9	63.6	66.1	67.4	63.8	58.3	65.3	61.5	52.7	57.7	62.7	64.9	64.8	65.8	65.1	59.9
	May 6, 2006	7	51.4	53.9	53.4	54.3	52.5	56.9	56.3	62.0	60.0	70.4	70.9	67.5	68.5	64.2	67.5	64.1	55.0	66.3	71.9	69.6	65.4	66.7	64.0	61.2
	May 7, 2006	1	55.5	57.4	53.9	55.8	54.5	60.0	59.9	60.4	65.8	70.8	79.9	71.4	75.4	67.1	69.8	68.3	56.9	61.5	68.6	73.2	69.0	65.0	69.2	68.0
	May 8, 2006	2	62.7	61.2	59.5	59.1	54.1	64.5	65.5	63.9	61.7	65.7	73.9	72.4	68.0	71.4	70.2	59.1	53.8	56.5	57.8	64.4	64.9	66.3	66.0	57.9
	May 9, 2006	3	53.4	52.7	51.6	46.2	49.2	51.1	51.5	55.7	53.0	64.2	67.1	77.8	64.3	66.6	79.8	61.7	53.6	58.4	58.2	59.1	61.9	57.1	55.5	59.4
	May 10, 2006	4	51.3	48.4	46.4	47.5	48.5	53.1	51.2	49.4	48.7	55.4	57.5	57.0	54.7	59.8	59.1	55.4	40.4	43.4	41.2	41.2	41.8	41.4	49.6	41.4
	May 11, 2006	5	32.0	29.4	34.8	32.7	29.3	38.6	37.9	35.7	43.4	44.4	64.3	64.8	50.6	45.2	41.8	44.5	39.7	56.0	45.1	51.1	47.3	46.9	42.6	36.3
	May 12, 2006	6	29.9	30.9	28.3	28.9	28.4	33.2	32.0	30.1	31.3	39.9	42.2	41.3	44.3	37.5	44.4	39.2	33.5	39.7	42.6	46.1	42.6	45.8	41.2	39.1
	May 13, 2006	7	34.2	35.3	32.6	30.2	27.4	31.2	32.7	35.1	37.9	45.1	51.3	41.7	48.6	48.0	42.9	40.8	36.5	43.2	41.4	43.6	47.9	41.4	49.1	35.5
	May 14, 2006	1	33.4	30.8	32.6	28.9	32.4	37.6	39.0	38.4	39.3	47.0	52.6	50.3	58.2	54.1	58.6	50.4	45.1	51.0	50.1	48.1	54.5	51.4	54.8	45.7
	May 15, 2006	2	37.5	38.2	36.3	33.5	32.3	37.0	39.8	39.0	54.4	55.3	82.2	88.0	85.4	82.7	87.7	57.7	47.9	50.6	50.7	54.3	51.9	57.1	57.9	47.5
	May 16, 2006	3	45.9	43.8	48.1	48.3	36.2	43.7	48.8	40.9	73.8	89.6	90.2	85.6	80.1	46.5	49.6	50.6	40.4	43.8	55.4	52.6	48.4	46.8	50.3	44.1
	May 17, 2006	4	39.5	36.5	39.6	40.6	39.4	43.1	42.2	47.5	58.4	62.3	67.5	71.8	77.0	83.3	80.3	65.8	49.1	50.6	54.4	51.5	49.5	54.0	47.7	45.7
	May 18, 2006	5	40.8	40.0	33.8	35.5	37.2	42.0	43.1	60.6	72.6	89.2	99.4	94.4	100.7	112.1	62.3	50.7	47.1	52.6	58.1	57.5	63.8	55.2	52.7	48.5
	May 19, 2006	6	43.2	40.6	38.5	42.6	37.1	44.4	43.5	42.3	41.2	51.2	59.3	53.6	55.2	55.0	56.1	52.1	47.5	48.2	54.1	58.3	51.8	51.6	58.1	50.4
	May 20, 2006	7	45.0	41.9	35.0	35.5	35.1	37.5	42.4	37.9	41.8	51.8	54.5	55.1	52.4	54.8	45.7	49.0	41.7	46.7	50.0	57.0	49.0	49.9	55.1	45.9
	May 21, 2006	1	42.1	39.4	39.3	36.6	37.4	42.9	41.2	45.5	58.7	62.0	65.8	66.3	72.2	86.4	82.7	51.8	48.8	50.4	52.9	51.7	51.7	57.2	55.8	48.9
	May 22, 2006	2	44.4	38.5	32.6	32.8	35.8	40.0	40.7	39.2	47.5	53.5	60.2	65.3	77.3	80.5	76.8	73.5	51.4	48.1	48.6	53.0	50.2	50.4	51.4	44.0
	May 23, 2006	3	39.1	39.5	38.8	37.1	36.7	41.8	43.2	40.4	42.7	49.3	50.6	49.5	41.7	48.6	55.1	49.0	40.2	50.2	46.3	51.5	48.5	48.9	50.4	44.8
	May 24, 2006	4	36.7	34.0	37.4	32.8	35.4	40.6	41.6	37.5	46.4	51.9	47.0	49.7	46.8	52.1	51.4	47.8	44.7	45.5	44.5	53.7	45.1	44.6	46.7	49.3
	May 25, 2006	5	41.4	45.5	36.6	32.9	36.9	38.5	40.5	46.2	34.7	52.3	53.6	46.4	44.7	52.7	51.3	44.9	43.8	48.8	47.9	50.4	43.4	47.1	54.7	48.7
	May 26, 2006	6	41.0	41.1	42.4	38.2	41.5	40.5	39.5	35.6	36.8	47.1	47.9	47.0	51.1	50.4	47.8	45.4	35.4	43.2	49.4	51.7	43.0	46.6	51.1	42.3
	May 27, 2006	7	39.5	36.8	34.4	33.2	34.1	41.4	39.4	36.0	38.5	48.7	53.4	51.5	50.9	49.7	52.0	45.2	37.9	46.4	46.5	51.2	47.4	48.3	53.3	43.7
	May 28, 2006	1	41.3	34.3	37.1	35.9	39.9	41.0	47.1	39.2	38.9	41.4	50.5	52.9	45.7	44.8	55.6	50.9	36.9	41.4	46.2	55.9	54.8	47.1	50.5	45.4
	May 29, 2006	2	43.1	39.1	35.9	36.6	35.2	44.6	42.6	43.8	57.8	46.0	49.9	52.9	45.2	49.3	47.4	46.7	45.9	43.0	47.7	42.4	51.0	49.7	50.3	40.1
	May 30, 2006	3	41.4	41.8	38.6	34.6	36.9	42.7	38.0	42.1	45.0	48.6	51.0	55.0	45.8	52.1	51.7	50.2	46.4	55.8	46.7	50.9	50.9	49.2	58.8	51.2
	May 31, 2006	4	41.0	45.2	41.7	43.9	42.8	39.0	43.9	47.4	51.2	54.3	55.5	65.0	60.4	52.4	62.4	52.2	56.1	54.5	59.1	58.0	55.2	53.7	54.0	54.6
	June 1, 2006	5	47.1	43.9	45.2	48.8	43.1	48.9	51.8	48.8	54.3	64.1	55.5	64.2	61.5	52.1	56.9	61.0	52.4	57.2	51.1	62.2	61.6	64.4	60.7	54.0
	June 2, 2006	6	49.7	51.9	53.0	50.9	46.1	48.5	51.7	54.3	53.8	63.5	48.5	40.4	48.8	48.2	51.8	47.3	41.9	46.5	45.0	50.7	48.6	45.7	47.8	42.9
	June 3, 2006	7	42.3	35.8	34.7	37.0	36.6	41.7	37.9	38.8	49.3	43.2	49.1	46.9	52.0	49.3	50.0	45.6	42.3	48.5	51.7	52.4	50.9	49.3	47.8	44.5
	June 4, 2006	1	40.1	37.1	36.6	37.3	36.5	39.3	44.5	46.1	45.2	52.1	47.1	50.3	47.3	50.1	53.9	48.0	43.5	48.0	51.7	50.6	54.3	46.7	47.6	40.6
	June 5, 2006	2	39.2	34.3	35.2	34.5	34.2	37.3	40.2	41.0	41.6	45.1	45.2	46.7	45.6	42.7	47.9	46.2	40.6	44.7	47.8	51.3	48.9	56.0	52.5	43.7
	June 6, 2006	3	44.5	36.8	37.9	37.7	39.8	45.0	42.4	42.6	46.9	50.5	52.5	48.0	41.4	51.4	51.2	52.1	48.3	52.1	53.6	49.4	51.5	52.9	52.8	46.4
	June 7, 2006	4	44.2	42.8	40.3	38.4	37.5	46.4	43.6	45.8	47.4	47.6	51.9	53.1	52.9	51.0	64.3	49.5	43.9	48.0	48.6	49.7	52.3	47.1	49.6	47.5
	June 8, 2006	5	38.1	44.0	38.4	37.4	35.2	43.0	43.3	47.0	43.1	49.6	58.4	54.5	53.0	45.8	54.3	48.8	45.5	43.3	45.7	48.2	49.5	51.7	45.1	44.4
	June 9, 2006	6	39.5	39.9	37.1	35.4	34.0	37.0	37.9	37.1	41.5	42.1	52.1	49.8	44.6	41.6	51.8	53.9	43.6	49.0	49.3	54.7	47.7	52.7	50.2	44.5
	June 10, 2006	7	39.1	40.9	35.2	35.7	35.6	39.2	41.1	40.4	39.0	46.4	50.7	55.5	51.3	53.2	46.9	45.6	42.5	47.1	50.0	47.7	52.1	50.7	59.8	45.8
	June 11, 2006	1	42.0	42.5	38.9	37.6	34.3	42.7	44.5	42.0	43.3	51.2	52.2	47.2	55.3	58.3	52.5	46.6	52.2	47.3	46.3	46.7	59.5	51.5	55.5	39.4
	June 12, 2006	2	44.7	36.8	40.8	33.7	36.2	44.7	40.2	42.9	48.4	48.8	48.5	47.0	49.3	47.0	46.8	54.4	37.8	49.2	48.7	52.0	54.6	52.4	48.6	51.0
	June 13, 2006	3	40.3	39.2	37.4	36.9	37.5	39.6	41.4	43.2	42.1	49.4	53.9	49.4	50.2	49.9	50.6	49.0	40.6	41.7	43.7	48.0	51.0	46.4	44.3	41.6
	June 14, 2006	4	36.8	37.5	33.5	35.1	36.5	42.0	41.6	39.9	41.8	39.6	42.8	47.2	51.4	48.2	48.4	47.5	44.9	44.1	46.7	46.1	49.0	47.9	46.4	46.2
	June 15, 2006	5	35.2	34.4	34.4	35.2	35.1	36.4	38.0	42.1	41.9	45.1	55.8	58.5	45.0	52.1	50.0	46.7	48.0	43.2	45.0	46.1	50.7	44.5	44.7	43.8
	June 16, 2006	6	33.5	34.0	38.4	31.1	34.8	33.9	37.0	35.6	44.8	46.0	47.8	44.4	51.1	43.5	40.6	43.9	33.9	45.9	44.4	48.3	43.1	48.1	41.5	45.8
	June 17, 2006	7	34.2	40.2	39.5	32.9	34.3	39.4	41.4	35.1	43.3	38.1	42.1	50.6	46.1	43.3	51.9	45.8	31.7	44.9	47.7	43.9	45.2	43.4	47.7	43.5
	June 18, 2006	1	39.5	32.1	29.2	38.7	31.5	35.3	39.7	48.3	40.9	49.2	49.4	44.5	51.8	44.4	59.5	46.3	39.7	41.6	47.7	47.3	49.4	42.8	41.8	38.6
	June 19, 2006	2	36.2	37.6	38.7	34.6	34.2	35.4	40.1	41.5	44.0	42.0	49.9	56.6	45.5	49.1	47.9	55.1	42.8	44.8	47.7	49.9	52.3	48.0	49.9	40.4
	June 20, 2006	3	45.2	30.1	38.2	30.5	35.7	32.8	45.2	40.9	48.2	45.0	42.3	44.4	38.4	52.8	53.2	46.7	43.3	42.8	40.6	37.4	36.6	42.5	48.4	41.1
	June 21, 2006	4	37.4	41.5	29.5	29.7	30.1	41.0	40.3	43.3	40.8	43.6	49.4	49.9	42.7	44.6	45.0	43.6	45.8	51.0	34.2	47.0	45.4	42.7	42.5	43.4
	June 22, 2006	5	35.7	32.1	31.2	30.5	32.1	41.2	41.4	41.6	42.5	49.3	55.4	52.4	52.5	50.2	45.5	41.9	34.9	38.2	41.9	45.0	50.9	45.0	44.3	43.8
	June 23, 2006	6	40.8	35.2	33.2	33.6	33.6	33.5	39.3	36.6	43.5	41.3	45.5	47.2	50.6	43.1	46.8	43.2	31.3	44.5	46.7	47.9	50.5	44.5	49.5	39.0
	June 24, 2006	7	42.8	36.8	36.9	36.0	29.6	34.9	38.3	35.9	37.2	42.1	43.4	41.0	43.4	46.1	45.1	46.6	45.2	38.6	48.8	45.7	44.9	43.1	46.7	38.2
	June 25, 2006	1	33.1	36.6	38.1	28.1	39.9	42.4	34.5	42.6	40.7	50.7	51.0	50.5	44.9	47.4	49.3	44.6	40.3	50.1	50.6	47.8	44.9	51.9	46.6	43.0
	June 26, 2006	2	34.3	38.6	37.6	42.2	36.1	35.3	43.1	44.0	45.1	49.0	51.7	42.7	50.3	45.6	46.5	46.4	39.4	45.4	40.6	43.3	44.7	49.2	44.5	45.4
	June 27, 2006	3	33.8	37.8	35.2	36.2	34.4	43.1	38.0	39.7	38.4	46.9	52.1	40.6	51.1	56.2	44.2	46.6	44.1	43.4	45.0	47.3	48.0	43.2	44.8	44.1
	June 28, 2006	4	31.4	41.5	32.1	36.2	31.9	38.9	37.7	41.5	39.1	48.1	47.0	47.6	42.8	48.0	56.3	50.1	37.2	48.6	46.2	44.7	41.9	43.4	42.2	36.9
	June 29, 2006	5	33.5	39.7	36.4	25.8	31.3	38.9	35.4	42.2	39.9	39.2	50.0	48.2	45.4	48.5	42.8	48.2	45.4	43.0	42.6	42.8	50.1	41.7	43.2	38.3
	June 30, 2006	6	38.3	36.8	39.2	35.8	32.5	32.8	34.7	35.8	37.2	42.1	50.3	52.0	43.3	42.1	43.6	43.6	39.9	39.5	41.7	49.7	43.2	42.7	42.5	38.5
	July 1, 2006	7	33.7	40.7	30.8	37.1	31.4	34.2	39.3	39.4	36.3	41.5	43.5	44.5	44.0	40.5	39.9	38.7	37.3	44.5	47.2	41.4	45.8	41.6	41.8	41.0
	July 2, 2006	1	37.9	39.1	34.9	30.7	31.8	37.3	42.5	43.9	45.7	49.5	46.1	45.6	44.5	54.2	57.7	54.7	41.8	46.7	45.2	44.7	39.3	50.0	49.7	43.0
	July 3, 2006	2	40.3	33.4	33.3	35.2	31.3	39.8	41.4	34.1	43.6	44.2	46.7	46.1	44.5	47.4	51.7	45.4	43.6	41.8	53.1	45.7	47.6	43.1	47.9	44.3
	July 4, 2006	3	31.0	35.5	29.1	28.9	31.1	33.0	37.2	36.5	41.7	42.7	44.6	42.0	39.5	44.0	44.0	43.8	36.7	45.7	48.4	45.9	47.3	47.1	44.1	41.1
	July 5, 2006	4	40.2	31.6	32.3	33.8	32.5	41.0	40.9	40.8	38.6	38.6	49.7	51.8	48.7	48.6	54.0	48.1	47.4	45.5	47.0	43.0	47.3	44.2	51.3	36.3

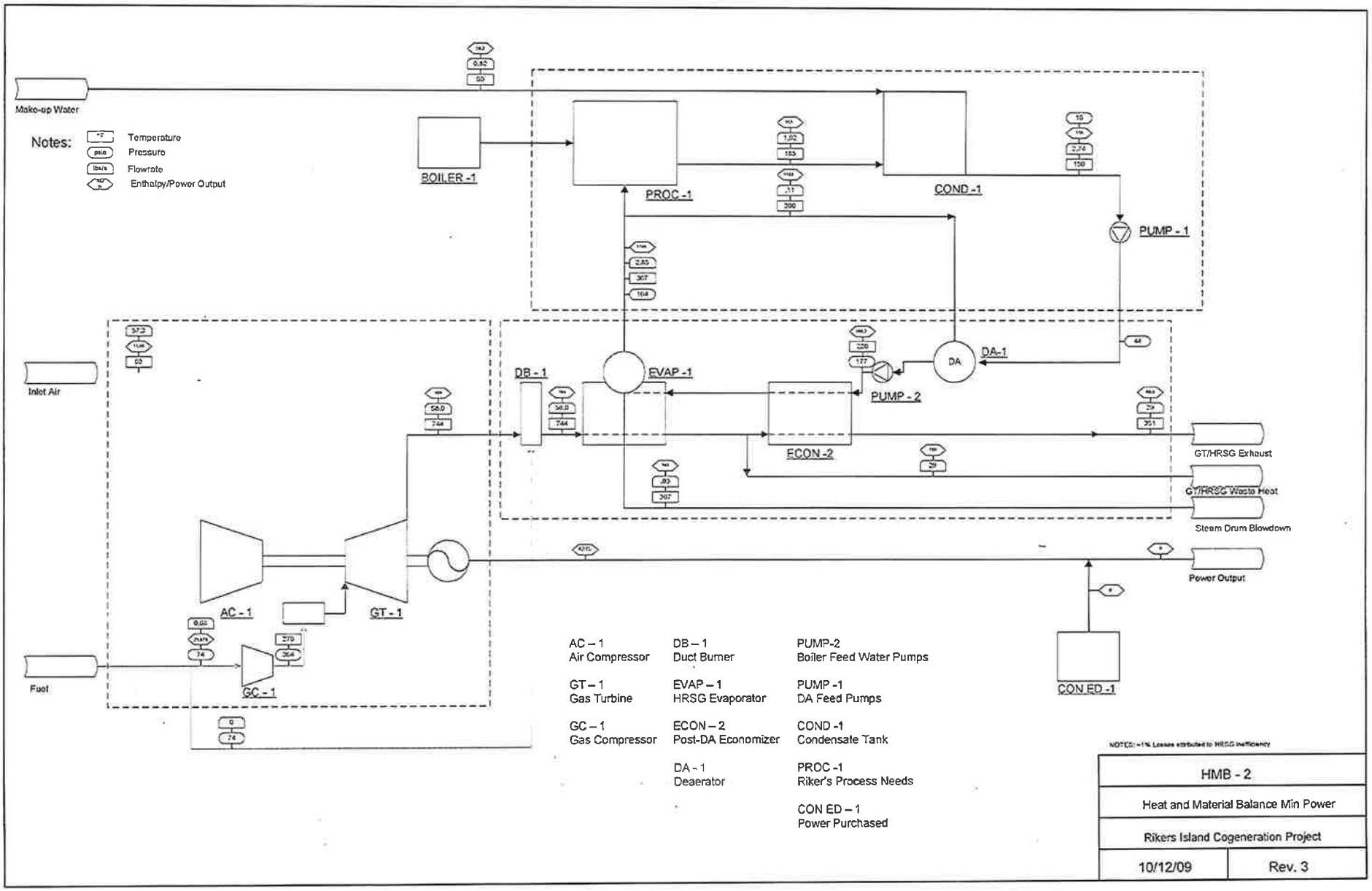
Steam Demand	DOW	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
July 6, 2006	5	32.4	32.7	30.6	35.7	31.7	37.4	36.0	34.7	36.8	45.4	55.5	50.8	44.4	52.5	53.7	44.1	38.8	41.6	42.5	52.6	41.0	41.7	45.0	36.5
July 7, 2006	6	32.1	36.3	29.8	39.1	37.6	40.2	37.1	34.9	40.1	42.9	48.8	45.6	45.7	45.3	44.7	42.6	28.8	42.9	43.9	47.9	40.3	45.6	47.1	38.4
July 8, 2006	7	29.6	36.7	32.3	36.0	30.1	34.5	31.1	34.7	30.5	45.2	46.0	47.2	40.9	49.8	44.4	39.1	33.3	40.8	34.5	47.4	42.3	38.4	46.2	45.0
July 9, 2006	1	29.2	31.7	39.0	25.4	29.6	29.1	34.9	35.7	39.7	44.1	47.7	45.6	43.9	52.8	52.0	44.8	41.0	46.4	48.5	48.1	49.2	40.2	48.6	39.9
July 10, 2006	2	29.0	42.4	29.1	30.5	42.3	30.0	39.2	42.4	41.4	47.5	50.1	49.0	42.3	50.9	49.6	43.8	42.9	44.4	36.5	47.8	46.7	47.2	47.6	41.7
July 11, 2006	3	39.8	37.4	35.4	32.3	37.5	37.2	39.2	42.3	37.6	42.1	49.5	47.6	42.9	45.8	45.2	43.6	42.2	45.6	43.8	47.1	41.7	45.0	38.8	40.2
July 12, 2006	4	34.1	34.0	33.6	29.1	33.2	35.7	38.6	39.3	39.0	41.5	42.1	47.7	45.5	43.3	42.0	45.3	44.0	49.9	37.0	43.2	38.2	43.9	42.4	41.3
July 13, 2006	5	38.4	32.9	40.1	29.8	26.9	42.6	36.8	39.5	42.2	41.1	45.1	49.3	52.3	57.0	44.0	41.7	39.2	40.7	44.6	35.8	42.8	45.0	54.0	35.3
July 14, 2006	6	33.7	37.9	28.7	41.0	33.5	35.9	31.4	40.8	37.9	42.8	47.0	41.5	45.3	38.2	41.3	40.1	35.2	29.9	42.1	46.1	43.9	43.9	42.7	46.4
July 15, 2006	7	38.6	37.1	27.6	31.0	27.9	29.2	35.6	39.1	34.1	39.1	47.9	41.5	48.1	47.0	41.9	40.2	38.4	45.8	42.5	45.3	44.6	37.7	42.5	40.1
July 16, 2006	1	35.3	33.0	42.3	29.9	36.5	35.9	45.1	40.0	41.8	47.2	49.0	46.8	49.7	47.3	48.1	49.1	44.2	44.2	47.2	44.2	46.2	44.2	44.5	39.1
July 17, 2006	2	37.4	36.7	32.2	32.1	33.1	39.0	43.2	41.2	41.3	43.6	44.7	43.5	42.1	52.9	53.0	47.6	39.5	42.8	42.5	43.5	44.4	43.8	45.6	47.6
July 18, 2006	3	43.2	35.6	33.7	37.8	31.0	44.3	43.2	41.7	47.1	45.0	51.9	48.5	44.8	48.1	51.1	50.6	46.0	45.1	45.7	43.3	44.9	41.8	48.7	43.9
July 19, 2006	4	40.7	39.1	36.2	34.1	32.6	46.4	42.9	38.9	39.4	42.8	48.5	46.0	43.7	48.5	52.8	41.9	42.4	45.1	45.8	43.8	44.2	34.6	47.7	36.2
July 20, 2006	5	35.6	36.5	37.6	35.5	34.0	36.7	36.9	31.6	47.4	40.1	58.8	52.9	39.0	40.6	47.4	33.6	45.0	35.5	48.6	34.8	43.4	39.0	49.3	40.5
July 21, 2006	6	46.1	28.2	32.7	30.9	32.7	34.7	44.3	39.0	35.1	47.6	48.6	39.4	37.0	36.5	25.2	49.4	33.1	46.6	45.5	38.6	44.6	41.3	39.0	38.5
July 22, 2006	7	30.2	33.6	29.8	41.5	26.9	37.5	34.4	31.6	50.0	33.1	49.8	48.4	46.5	37.3	43.6	41.0	29.7	33.2	46.2	47.0	47.1	43.2	46.4	36.5
July 23, 2006	1	32.1	35.2	36.0	32.9	39.2	35.1	39.7	43.9	43.4	46.2	46.2	49.8	45.9	49.3	48.2	42.5	42.4	43.4	46.0	47.4	41.3	45.3	45.3	44.3
July 24, 2006	2	33.4	35.3	34.1	32.9	34.0	38.0	38.3	42.5	37.4	46.5	52.8	45.2	45.7	44.9	49.6	42.7	42.6	46.9	50.8	44.0	45.9	46.0	43.3	43.2
July 25, 2006	3	36.2	42.0	38.3	36.0	32.9	42.8	44.8	40.2	42.2	48.5	53.3	46.9	46.8	47.2	46.2	44.4	37.5	41.5	41.5	41.6	44.8	44.1	50.2	36.9
July 26, 2006	4	41.3	39.5	31.1	27.8	34.1	40.6	43.1	40.2	43.4	43.9	49.4	47.7	44.9	45.6	46.0	44.9	41.5	44.2	47.7	46.0	45.5	46.4	45.0	42.0
July 27, 2006	5	41.8	41.8	39.8	29.4	38.8	35.2	37.3	42.6	45.9	43.3	51.7	50.5	45.1	53.0	43.6	42.8	41.4	43.1	41.2	45.1	41.6	43.3	48.9	41.3
July 28, 2006	6	42.8	30.3	31.2	34.4	36.5	33.5	40.8	41.4	38.0	41.8	47.6	46.7	46.1	47.2	43.8	42.8	36.5	43.6	40.6	39.9	46.1	45.4	41.1	41.3
July 29, 2006	7	37.0	26.9	27.9	33.8	34.6	34.2	33.1	38.8	41.3	45.9	48.2	43.9	41.9	42.5	44.9	39.2	37.0	42.0	45.3	44.8	42.8	43.8	46.0	43.3
July 30, 2006	1	30.9	30.4	35.7	33.4	37.1	34.6	39.9	44.3	37.6	47.4	53.2	47.7	44.9	45.6	48.1	46.0	40.8	45.2	48.4	42.0	43.6	39.3	42.3	37.1
July 31, 2006	2	31.9	35.7	31.5	26.9	28.9	37.2	35.5	32.7	42.2	44.1	50.4	46.2	45.6	50.7	49.3	51.0	44.6	41.1	45.0	44.6	34.6	46.4	50.3	39.0
August 1, 2006	3	37.1	33.2	30.8	37.9	36.8	35.9	42.7	42.5	41.2	46.6	45.1	45.5	40.4	37.9	41.1	45.2	42.2	42.3	47.0	40.2	49.2	41.0	39.7	41.4
August 2, 2006	4	41.1	37.0	39.0	27.1	40.8	39.7	35.3	34.5	45.5	43.5	48.1	44.7	42.8	42.4	48.1	49.0	47.8	40.7	45.0	49.8	41.0	46.6	52.9	45.5
August 3, 2006	5	37.4	36.8	39.2	31.3	33.4	38.5	40.2	36.1	44.9	48.6	42.0	49.9	40.0	48.5	42.9	41.5	41.9	45.4	41.0	46.4	44.1	44.8	42.3	42.8
August 4, 2006	6	33.9	40.0	32.9	36.7	27.1	30.0	32.0	35.0	35.5	42.2	42.7	42.1	37.0	39.0	39.8	44.3	36.7	38.8	41.2	41.3	38.8	45.4	44.5	44.2
August 5, 2006	7	40.4	35.5	31.6	37.3	27.3	35.4	37.3	36.0	34.0	41.6	46.9	44.0	45.8	42.7	40.6	48.1	40.8	42.2	43.0	42.0	47.5	43.8	46.3	37.2
August 6, 2006	1	35.7	34.1	37.2	33.1	36.0	36.5	38.1	40.2	39.5	45.8	45.7	45.3	42.3	43.8	50.8	48.2	38.1	40.9	43.4	43.7	48.4	44.9	43.0	38.4
August 7, 2006	2	37.6	30.6	38.3	31.2	31.0	39.9	39.6	41.3	40.4	39.5	46.9	46.8	44.2	49.5	44.7	44.9	43.3	40.5	40.5	43.0	45.1	39.8	41.8	37.1
August 8, 2006	3	33.5	35.6	36.2	35.7	32.4	35.1	38.2	37.6	34.7	40.5	38.7	39.3	41.7	41.2	43.1	48.9	40.0	43.4	43.3	45.4	42.9	41.1	41.8	39.4
August 9, 2006	4	30.2	30.2	36.4	32.6	33.7	41.1	37.2	34.6	43.3	43.1	47.3	46.5	48.4	45.0	42.6	49.0	39.5	40.2	42.4	46.2	46.5	41.3	40.8	42.2
August 10, 2006	5	36.5	36.3	34.2	29.9	36.1	37.5	36.9	37.1	37.5	41.5	42.8	47.1	44.3	48.9	44.4	40.4	37.7	42.4	40.5	40.0	44.0	40.8	40.1	38.0
August 11, 2006	6	33.6	34.7	34.2	32.8	33.0	35.6	34.0	32.0	38.8	43.8	46.6	40.1	38.8	43.8	46.1	42.1	37.4	39.7	36.2	45.8	40.7	43.8	41.3	40.1
August 12, 2006	7	35.9	38.6	36.7	36.0	38.3	37.7	33.5	38.7	38.3	36.5	41.5	43.1	41.6	41.1	38.9	42.9	33.9	42.7	40.7	46.3	43.3	45.4	45.0	38.4
August 13, 2006	1	33.0	32.4	37.3	35.6	30.4	40.0	35.3	34.2	41.2	42.9	45.6	43.0	42.3	40.4	50.5	45.8	37.0	46.7	42.3	40.9	40.2	42.5	39.7	36.6
August 14, 2006	2	34.6	37.0	36.0	38.2	31.7	29.6	42.2	30.9	32.7	40.5	41.2	43.4	46.7	42.0	39.0	45.0	31.3	35.2	40.8	39.9	38.4	45.0	40.9	34.7
August 15, 2006	3	39.1	32.2	35.0	38.1	33.8	42.4	35.2	42.6	45.3	53.7	46.1	40.0	35.6	48.2	38.1	44.7	31.3	35.2	34.2	41.3	37.3	38.1	35.9	35.8
August 16, 2006	4	36.3	29.2	37.2	35.2	34.3	39.8	37.2	38.9	39.4	46.0	48.7	42.7	40.1	42.3	47.7	44.5	42.9	38.1	39.2	38.8	34.6	37.9	43.2	36.3
August 17, 2006	5	32.2	37.6	30.4	39.9	34.1	36.9	35.8	32.0	41.2	36.0	47.3	43.0	42.7	51.6	57.3	41.7	36.6	42.9	37.9	42.5	49.8	39.2	41.4	37.8
August 18, 2006	6	34.5	33.4	32.3	33.5	32.4	33.1	36.8	36.0	37.1	40.7	43.6	40.4	45.5	45.0	41.1	41.2	39.9	40.2	48.6	47.1	57.2	45.8	45.0	38.0
August 19, 2006	7	34.8	35.7	37.4	30.7	31.6	35.5	34.3	37.6	33.9	39.5	45.4	42.9	43.3	45.2	43.1	38.0	35.9	38.0	43.7	45.3	43.6	43.8	43.4	37.9
August 20, 2006	1	34.0	32.6	35.9	35.6	35.1	37.1	40.6	40.9	37.7	44.9	46.3	46.5	45.0	47.2	49.7	47.9	39.5	42.3	41.8	42.9	46.3	43.2	46.9	40.6
August 21, 2006	2	34.6	33.1	36.7	32.4	34.1	38.9	40.2	37.8	44.7	46.8	48.7	41.1	46.1	43.8	45.8	46.5	40.7	41.9	46.0	48.5	46.5	48.1	43.5	44.0
August 22, 2006	3	34.6	35.0	36.8	32.7	33.9	38.1	39.9	40.1	39.1	50.1	50.8	50.8	48.7	51.1	44.8	42.9	41.8	43.7	51.5	47.6	44.5	43.4	46.8	39.4
August 23, 2006	4	34.6	34.4	34.2	32.0	33.4	37.7	38.4	40.0	40.5	40.1	54.6	56.5	57.8	55.1	59.8	57.0	49.5	50.7	55.2	51.2	59.0	54.0	51.8	51.5
August 24, 2006	5	47.7	45.1	47.3	44.6	45.8	47.2	49.3	57.7	48.9	50.1	62.8	59.4	54.7	61.7	64.0	57.4	59.7	45.3	53.9	58.7	56.9	55.9	59.9	49.5
August 25, 2006	6	43.5	31.1	38.5	34.7	34.6	39.0	29.5	38.4	39.2	35.4	45.9	42.3	41.6	40.3	44.6	41.5	35.6	41.6	45.5	39.1	42.8	42.0	45.7	37.8
August 26, 2006	7	41.8	36.9	34.3	33.3	28.5	37.9	35.0	35.6	36.8	36.9	38.5	46.4	43.5	41.4	44.4	44.6	37.5	40.3	44.3	43.0	43.0	46.9	48.2	41.2
August 27, 2006	1	34.1	36.8	34.8	36.1	32.2	38.9	38.6	38.2	46.3	43.7	43.1	47.2	41.9	47.7	45.2	50.7	40.8	39.3	45.7	48.6	41.1	46.8	40.8	40.1
August 28, 2006	2	34.7	39.0	35.1	34.3	30.4	36.7	38.9	39.4	43.7	42.3	45.8	48.0	45.2	53.6	42.0	45.2	46.9	50.9	46.2	39.0	49.3	45.8	41.0	43.7
August 29, 2006	3	43.2	38.9	35.0	33.1	30.2	36.8	35.3	37.0	41.7	44.9	46.5	48.9	50.7	49.5	47.6	48.9	45.2	47.3	43.1	45.1	47.4	46.2	45.5	39.6
August 30, 2006	4	37.3	34.9	35.6	32.8	33.2	37.3	39.1	41.4	43.0	50.7	50.2	45.6	50.5	48.1	50.3	48.5	40.3	37.5	46.9	43.5	43.8	43.2	42.5	41.4
August 31, 2006	5	34.4	34.3	33.7	33.8	34.5	37.9	40.1	41.4	41.3	45.7	41.1	45.7	46.2	39.3	42.2	45.6	36.9	47.7	41.2	48.4	44.3	47.0	45.4	38.1
September 1, 2006	6	33.9	26.8	32.6	31.1	25.4	27.3	36.5	29.2	31.1	33.1	44.6	37.0	38.6	38.5	40.5	38.8	29.2	41.7	39.7	40.2	40.9	36.8	44.3	35.9
September 2, 2006	7	29.3	35.7	28.4	28.4	28.3	32.3	32.8	30.1	36.7	39.1	34.1	35.3	37.7	38.5	35.5	37.9	35.6	36.3	37.3	43.0	42.9	40.4	35.4	36.6
September 3, 2006	1	32.0	35.6	35.6	28.9	28.2	37.4	37.6	34.9	35.6	33.6	42.3	42.2	41.1	37.7	36.6	40.7	35.5	40.3	41.2	45.1	37.2	42.9	44.0	41.2
September 4, 2006	2	34.1	36.1	39.3	32.2	29.6	36.2	38.5	37.2	39.2	41.2	46.9	45.1	42.1	43.5	41.8	40.2	35.7	49.7	45.5	44.9	48.8	39.8	43.7	41.4
September 5, 2006	3	39.5	33.9	30.5	36.3	36.0	39.5	37.4	37.7	33.8	42.7	49.7	48.9	46.4	41.3	48.4	46.0	39.3	35.0	40.5	42.1	41.7	41.0	43.6	38.3

Steam Demand	DOW	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
September 6, 2006	4	36.5	35.8	32.9	27.2	34.2	39.6	33.6	34.2	36.9	45.6	41.7	42.2	39.5	41.5	43.5	45.1	38.4	39.2	41.1	47.0	35.7	38.1	40.5	38.0
September 7, 2006	5	34.4	34.7	32.7	34.4	28.1	34.0	33.5	41.1	33.5	35.7	42.1	42.6	41.3	44.0	43.1	41.5	33.6	43.0	38.1	40.1	42.6	44.6	41.8	34.7
September 8, 2006	6	33.0	35.6	31.0	30.4	32.7	33.1	30.8	32.0	35.4	39.7	40.2	39.7	40.0	38.1	40.1	34.8	32.0	35.2	33.7	37.3	43.5	37.8	37.1	36.5
September 9, 2006	7	31.0	30.9	32.9	31.7	31.8	31.2	31.0	31.8	33.0	38.1	39.4	41.0	38.6	35.6	35.9	36.3	35.2	41.0	36.9	37.4	34.2	39.1	43.7	36.8
September 10, 2006	1	31.3	31.4	31.1	31.2	30.1	32.3	37.8	37.2	42.5	38.3	43.7	40.1	43.0	39.2	46.1	41.9	34.5	39.9	45.2	42.7	37.4	40.1	43.7	37.9
September 11, 2006	2	33.5	32.0	35.7	33.9	34.3	35.4	38.4	35.0	35.6	36.4	43.1	42.5	42.5	42.0	40.7	45.3	36.9	39.4	45.9	46.8	42.4	38.4	41.2	42.4
September 12, 2006	3	34.7	35.3	32.1	32.8	29.0	37.4	32.9	31.2	39.6	36.6	44.3	44.0	42.2	39.6	37.5	45.0	49.1	42.4	47.0	44.9	43.7	37.7	38.1	39.4
September 13, 2006	4	36.4	37.7	35.2	30.1	34.9	41.3	36.1	41.0	40.6	38.6	44.2	48.7	48.3	47.2	52.1	49.3	41.5	44.8	44.9	47.4	44.7	41.8	43.9	41.8
September 14, 2006	5	35.8	36.7	41.0	34.8	35.9	42.1	41.9	39.4	39.8	43.5	48.5	49.3	46.8	49.2	43.7	51.4	49.4	45.2	43.4	45.0	46.9	43.1	48.6	43.9
September 15, 2006	6	42.1	45.4	36.8	43.6	40.4	39.6	40.2	44.8	47.7	52.1	55.5	56.7	53.3	55.5	58.0	44.5	40.2	51.7	58.5	50.3	59.0	59.0	58.0	50.3
September 16, 2006	7	49.1	44.6	52.2	42.3	47.0	46.9	52.6	47.0	53.0	53.2	56.2	56.2	58.3	51.2	52.0	58.9	48.2	59.2	58.2	62.6	61.7	59.7	61.9	55.8
September 17, 2006	1	51.5	48.5	50.2	44.8	46.9	49.5	58.6	55.4	57.2	68.9	63.7	60.1	61.7	60.1	59.0	59.9	55.9	58.4	65.2	62.2	64.4	67.3	62.3	63.3
September 18, 2006	2	60.1	58.4	58.1	53.6	52.8	57.2	59.0	64.3	37.0	37.6	38.0	49.1	41.0	42.9	45.1	40.2	36.6	34.0	40.2	43.8	41.9	32.8	40.1	36.5
September 19, 2006	3	28.4	32.0	29.1	32.8	32.0	34.7	33.8	32.0	34.4	36.8	38.0	31.1	41.0	32.2	38.7	32.9	30.5	32.9	35.5	41.7	48.3	44.2	48.2	37.7
September 20, 2006	4	32.3	34.1	32.0	30.2	31.9	32.7	37.7	38.3	39.4	41.1	40.1	44.6	40.3	38.0	37.5	41.1	32.1	42.6	41.2	49.3	37.9	43.9	42.8	37.6
September 21, 2006	5	35.6	34.8	32.7	30.1	33.0	36.3	40.2	44.5	39.2	50.0	50.9	52.7	52.9	52.4	48.4	51.1	50.2	46.5	48.9	53.1	53.6	52.0	55.4	56.1
September 22, 2006	6	46.6	48.9	49.8	47.9	45.6	49.9	48.6	45.8	53.5	54.5	55.4	58.0	60.6	58.3	62.3	52.7	54.5	51.7	57.2	55.6	58.0	61.7	59.2	52.4
September 23, 2006	7	47.6	54.2	49.3	54.2	49.1	51.8	51.7	48.1	55.6	50.8	63.6	60.4	57.2	60.7	61.1	49.5	56.2	54.1	50.1	56.5	59.8	54.2	63.2	51.3
September 24, 2006	1	54.5	45.1	49.6	47.4	52.7	50.3	54.8	56.8	56.9	54.3	38.8	38.9	45.7	40.5	42.7	36.4	39.2	32.3	40.2	36.0	33.4	32.2	35.5	34.6
September 25, 2006	2	29.7	27.7	31.3	30.5	29.4	34.6	31.9	40.3	38.8	34.4	36.9	41.0	42.2	45.0	43.1	41.2	35.3	33.1	39.3	37.5	41.7	33.1	40.0	37.6
September 26, 2006	3	36.5	27.0	31.5	26.5	32.7	34.7	32.7	32.9	41.6	40.8	40.2	40.0	39.2	38.6	44.6	40.0	32.2	43.2	38.8	42.4	35.4	38.6	43.4	34.2
September 27, 2006	4	31.1	33.1	30.3	32.2	29.0	30.0	32.6	32.2	30.5	33.8	37.4	41.0	37.6	41.0	43.0	44.8	33.7	36.5	40.2	43.4	38.4	40.7	40.3	34.1
September 28, 2006	5	31.1	34.3	30.1	29.5	32.9	36.2	28.2	31.7	38.0	33.7	43.9	42.4	38.6	34.5	33.8	40.3	39.9	40.1	33.5	43.1	39.4	44.3	38.2	37.0
September 29, 2006	6	37.1	35.6	31.2	29.3	31.3	34.2	34.9	34.8	37.4	35.1	36.6	41.4	40.6	37.8	38.0	36.4	35.1	35.6	35.4	46.7	38.9	35.5	41.2	33.3
September 30, 2006	7	34.3	30.8	29.6	34.5	29.8	28.0	37.7	28.4	33.0	39.0	43.1	37.7	42.3	38.5	41.0	37.7	35.0	35.6	41.6	38.3	37.3	37.4	40.2	35.7
October 1, 2006	1	32.2	34.5	31.6	33.7	32.2	35.5	33.8	38.1	39.2	39.4	46.9	43.9	44.3	47.0	47.2	39.1	32.1	41.6	42.5	45.8	46.5	41.9	45.5	37.2
October 2, 2006	2	33.5	33.6	38.3	29.8	28.4	37.5	33.5	43.3	40.2	43.9	39.2	53.2	47.7	46.2	52.4	44.9	30.8	40.6	40.3	41.0	49.4	37.7	45.2	42.5
October 3, 2006	3	33.2	32.3	34.7	29.8	34.9	35.3	39.1	40.7	39.9	38.5	42.3	38.6	39.8	38.7	37.4	37.1	39.9	36.5	34.2	34.1	42.6	28.3	31.8	28.2
October 4, 2006	4	23.6	28.8	22.2	33.9	33.7	38.8	41.0	27.6	39.6	26.9	30.2	32.9	37.7	35.7	33.0	37.3	28.6	33.7	39.2	33.2	42.7	35.2	36.4	32.4
October 5, 2006	5	25.8	30.1	27.0	23.0	33.4	34.9	39.2	37.8	37.0	48.5	47.4	39.4	44.3	45.3	44.6	43.1	44.0	43.2	43.9	43.4	43.3	43.9	51.7	44.5
October 6, 2006	6	33.5	32.0	34.6	32.3	35.2	38.9	37.3	46.0	47.2	51.8	52.1	56.5	58.6	49.6	50.2	52.9	37.9	42.6	44.9	51.4	53.0	45.3	53.1	41.7
October 7, 2006	7	39.8	37.0	42.8	34.6	34.5	36.5	45.1	45.0	45.6	52.0	51.0	57.0	49.8	51.7	47.9	44.0	33.5	44.4	47.5	44.5	46.9	47.9	47.4	41.5
October 8, 2006	1	45.3	42.7	43.3	41.4	36.7	41.9	42.3	42.1	41.3	44.1	50.7	50.7	51.4	53.5	45.8	45.2	38.7	42.5	46.3	48.2	46.8	44.4	49.1	44.8
October 9, 2006	2	40.1	34.0	39.3	38.0	32.1	41.6	39.5	38.8	39.0	49.5	48.9	52.8	45.9	42.9	44.6	42.8	42.3	47.1	43.0	44.7	42.5	38.9	47.7	39.7
October 10, 2006	3	32.7	33.8	32.8	33.8	30.0	37.1	40.2	44.9	46.0	50.9	50.9	46.1	44.8	45.4	44.5	39.2	44.1	43.7	42.9	42.6	52.0	47.1	45.7	43.6
October 11, 2006	4	37.3	35.7	36.2	34.7	36.8	42.3	41.7	42.0	41.6	50.8	53.4	54.7	56.7	57.6	47.8	49.2	60.3	53.2	56.2	51.3	61.9	53.6	52.3	49.5
October 12, 2006	5	47.1	45.8	42.9	42.2	39.9	45.1	47.5	45.5	44.5	52.9	41.8	51.5	45.1	43.6	45.0	43.3	40.8	50.4	48.0	53.0	49.1	54.7	58.3	61.5
October 13, 2006	6	60.8	60.6	61.3	68.0	73.2	70.1	73.0	70.2	78.2	80.0	85.5	81.7	78.9	74.9	77.9	65.4	70.0	67.1	65.2	74.4	77.3	77.2	73.3	69.9
October 14, 2006	7	65.2	62.1	63.6	63.7	62.8	64.2	65.9	65.5	68.5	67.4	80.5	79.7	74.3	73.9	73.9	66.0	68.6	75.5	79.1	81.8	81.7	83.1	82.1	80.4
October 15, 2006	1	74.1	75.4	75.4	74.6	54.6	62.5	65.2	62.7	59.9	65.4	71.4	63.2	66.9	68.8	81.0	76.4	74.8	80.1	82.3	83.2	81.1	77.9	85.9	81.5
October 16, 2006	2	74.3	74.0	69.5	71.2	67.1	73.1	75.9	75.1	80.2	85.5	90.7	77.2	80.0	80.9	81.2	83.6	87.3	84.8	82.0	84.2	82.0	80.4	78.6	74.4
October 17, 2006	3	70.0	68.6	69.9	67.0	67.8	72.8	72.5	69.7	80.5	77.0	78.2	80.8	75.9	76.0	79.3	79.4	74.0	80.5	81.0	81.0	81.6	83.5	93.7	73.8
October 18, 2006	4	69.2	68.5	65.3	66.2	66.1	72.8	74.7	64.7	61.2	69.6	66.5	67.6	65.8	63.0	61.9	62.5	58.8	60.8	61.3	60.7	69.0	69.2	68.1	62.8
October 19, 2006	5	56.9	56.6	62.5	55.7	56.6	64.9	55.7	58.1	61.2	58.2	58.9	62.7	57.6	55.9	57.4	57.4	53.7	58.4	58.6	58.4	61.8	59.2	56.7	53.8
October 20, 2006	6	49.2	51.2	51.3	51.6	51.6	54.7	52.0	52.3	49.0	65.2	64.2	69.0	64.2	65.6	61.3	58.1	59.5	69.9	69.3	71.9	78.7	73.9	73.2	73.3
October 21, 2006	7	66.5	67.3	64.3	66.4	68.0	71.8	73.4	77.4	62.9	68.6	73.2	74.0	80.1	68.0	74.6	65.6	65.1	70.0	71.9	75.4	75.7	73.4	74.5	78.1
October 22, 2006	1	65.1	64.2	64.1	63.4	63.1	58.6	58.6	62.8	60.2	79.8	79.2	80.9	71.7	82.4	83.6	74.5	71.3	76.6	78.2	79.1	79.1	78.8	79.8	71.2
October 23, 2006	2	71.9	66.3	64.3	69.2	69.2	72.3	74.2	78.6	83.5	93.1	87.9	93.7	91.2	97.9	101.7	96.8	92.8	96.4	95.1	95.2	94.5	93.7	92.0	91.8
October 24, 2006	3	83.3	84.5	86.7	83.8	87.6	91.0	93.9	90.2	93.9	113.4	104.8	107.0	93.5	91.5	96.3	98.0	103.6	101.3	102.1	102.3	106.0	101.4	104.5	97.6
October 25, 2006	4	91.6	90.7	89.4	86.9	94.6	97.1	100.0	89.3	99.0	108.1	111.5	106.4	104.7	107.8	104.3	105.1	102.9	106.8	103.1	112.5	111.5	110.4	113.8	103.4
October 26, 2006	5	95.2	98.6	97.4	96.0	103.2	102.5	105.1	105.2	112.8	116.7	102.7	108.1	111.9	112.8	113.6	101.8	93.3	97.8	102.9	104.6	99.5	104.5	110.1	106.8
October 27, 2006	6	98.9	104.9	99.2	98.3	104.2	105.6	106.8	111.3	112.3	114.4	115.7	119.0	112.8	117.4	113.3	111.5	105.6	105.1	110.4	106.6	107.5	104.5	108.8	104.7
October 28, 2006	7	98.6	95.2	94.6	94.4	91.1	92.7	97.6	94.7	92.6	93.7	96.0	97.7	100.5	95.2	89.8	88.2	86.6	98.0	100.2	107.9	108.7	103.3	105.5	102.0
October 29, 2006	1	99.3	98.9	95.6	86.4	86.9	90.8	89.9	88.1	106.2	115.9	115.0	111.1	110.1	110.4	110.0	104.4	101.5	106.9	111.3	112.6	111.4	110.4	107.1	106.5
October 30, 2006	2	102.8	99.8	99.3	101.4	96.8	103.0	105.1	100.7	104.7	117.5	109.3	110.3	102.2	99.8	98.1	103.7	94.9	101.1	100.7	99.1	98.1	98.1	106.5	95.2
October 31, 2006	3	85.6	86.7	85.8	84.3	80.2	96.3	95.4	97.8	98.7	99.9	98.6	91.8	85.2	91.1	97.0	85.2	84.8	87.8	85.8	91.6	86.9	88.2	89.5	82.6
November 1, 2006	4	76.4	78.5	74.5	73.5	80.9	84.0	79.8	84.8	82.6	88.3	88.4	83.5	83.5	91.3	87.8	78.0	72.9	84.0	82.3	79.6	79.5	81.4	88.6	77.5
November 2, 2006	5	72.9	69.3	72.6	69.6	75.7	84.1	84.7	104.8	98.8	118.1	113.5	117.7	108.2	108.8	106.8	107.5	102.9	103.7	104.3	108.5	110.5	113.9	108.6	102.1
November 3, 2006	6	96.5	99.8	101.3	102.4	107.2	110.0	111.5	116.4	114.7	124.5	122.2	125.1	117.9	118.5	123.5	118.2	109.1	113.6	115.8	122.9	122.3	117.9	124.3	117.5
November 4, 2006	7	110.6	110.4	111.0	113.3	113.4	114.2	115.7	114.4	116.5	122.8	119.2	115.0	115.0	121.1	120.2	114.7	111.0	117.6	115.5	124.1	119.1	118.0	116.9	114.4
November 5, 2006	1	112.7	109.4	110.5	109.9	107.5	107.0	109.8	111.8	110.6	118.0	118.9	121.2	112.1	108.4	112.7	110.1	106.9	109.6	114.8	112.9	114.9	109.8	111.7	107.4
November 6, 2006	2	104.8	107.6	103.4	101.6	104.5	107.7	111.4	103.4	108.6	107.4	110.1	104.3	101.1	100.8	103.3	99.3	91.0	96.7	97.8	101.3	103.8	105.9	100.2	92.7

Steam Demand	DOW	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
November 7, 2006	3	89.3	92.1	90.7	89.4	88.3	90.8	91.1	89.0	92.3	98.3	97.9	92.6	93.1	99.0	94.2	93.0	86.4	94.0	94.6	100.5	98.9	97.4	99.2	91.8
November 8, 2006	4	88.4	85.0	82.7	84.3	82.1	89.7	88.8	81.9	76.2	87.1	90.0	86.5	92.7	93.3	96.5	82.3	77.3	100.3	85.0	83.6	79.5	84.6	87.2	78.4
November 9, 2006	5	78.1	78.2	77.1	77.6	79.4	81.7	84.2	77.6	76.1	83.2	78.4	80.3	74.2	75.6	79.2	75.5	70.7	73.1	82.8	83.8	78.5	81.2	85.3	74.7
November 10, 2006	6	73.6	73.7	72.7	74.2	73.9	75.3	78.9	78.7	82.1	86.8	94.9	89.6	88.0	89.8	83.7	81.5	75.7	81.7	83.0	91.3	89.4	89.4	88.7	86.5
November 11, 2006	7	76.0	78.5	76.6	77.4	78.6	79.4	81.7	82.0	82.8	88.2	88.5	80.8	82.6	85.1	80.7	79.4	77.3	78.5	81.7	87.8	80.2	88.2	82.7	75.3
November 12, 2006	1	72.4	70.9	69.7	68.3	71.8	73.0	72.0	72.7	75.2	80.4	84.9	83.1	89.2	85.1	82.6	84.8	85.8	89.3	91.1	98.6	90.3	92.5	94.2	81.8
November 13, 2006	2	82.0	79.6	74.1	76.1	74.5	83.8	88.0	85.0	87.3	92.4	99.4	95.5	94.3	96.2	91.3	87.2	85.0	89.3	87.4	96.4	92.9	92.4	91.7	87.0
November 14, 2006	3	79.5	81.8	78.8	77.9	79.2	81.4	84.6	83.1	85.4	99.3	96.2	92.2	95.7	88.4	99.1	85.5	84.9	82.0	80.6	92.9	89.1	86.6	89.8	102.1
November 15, 2006	4	86.0	85.1	83.9	80.6	80.6	85.4	87.0	83.0	80.6	75.4	77.0	86.8	92.4	91.8	88.7	84.1	77.6	83.9	84.8	87.0	79.5	78.9	86.6	77.7
November 16, 2006	5	75.1	75.6	73.5	71.9	74.9	73.9	81.6	74.5	79.5	79.4	71.8	75.6	75.3	68.3	69.9	77.3	68.5	74.9	90.9	82.8	79.8	72.0	71.3	67.7
November 17, 2006	6	63.6	68.5	71.1	66.7	64.3	73.1	73.4	77.5	72.6	83.4	82.7	82.7	81.1	81.0	82.8	78.7	79.4	81.0	82.3	85.2	84.9	86.0	90.4	79.0
November 18, 2006	7	77.3	77.5	77.7	75.7	76.7	81.4	90.1	84.0	90.7	95.2	93.5	93.6	97.5	99.1	89.2	92.0	89.2	95.5	92.6	99.9	103.5	102.9	99.3	97.3
November 19, 2006	1	93.3	93.3	91.1	91.1	85.0	92.9	87.2	91.3	102.2	101.7	109.8	102.0	100.2	103.8	104.3	105.4	101.3	107.4	105.9	109.8	109.5	109.3	110.6	102.4
November 20, 2006	2	100.4	99.4	100.8	100.0	100.9	97.5	105.2	110.9	114.3	110.2	113.4	112.6	126.0	117.1	114.9	111.7	109.8	118.0	119.6	123.5	124.5	116.5	122.2	114.7
November 21, 2006	3	112.7	114.1	105.8	104.8	109.5	111.4	112.2	118.4	92.6	122.1	142.9	143.3	142.5	133.5	136.0	131.5	123.7	131.5	130.2	130.0	134.2	128.1	129.6	125.9
November 22, 2006	4	123.8	117.8	120.2	121.2	118.7	121.7	130.5	131.7	132.5	130.1	137.0	134.7	137.2	136.1	141.3	134.0	127.5	125.3	128.3	135.9	127.4	131.9	130.4	130.1
November 23, 2006	5	112.8	120.0	120.3	122.3	118.4	122.5	122.0	125.1	125.7	128.1	130.1	129.6	128.6	118.7	130.9	119.2	121.0	125.9	131.6	131.4	132.4	130.1	126.2	124.6
November 24, 2006	6	119.5	116.8	116.7	113.7	114.4	117.9	111.3	105.9	108.0	119.7	127.2	132.8	137.4	128.2	119.1	115.9	106.0	106.5	121.1	125.0	120.7	121.4	121.0	117.3
November 25, 2006	7	112.0	112.5	111.2	112.8	113.9	113.6	116.9	114.5	116.9	115.4	128.7	123.0	123.5	123.1	117.7	120.9	111.7	117.4	121.1	122.9	120.7	121.5	120.5	109.0
November 26, 2006	1	107.9	111.0	105.3	107.8	105.5	106.7	107.0	102.3	98.9	104.8	107.9	108.6	108.4	105.1	105.2	107.6	101.1	95.0	103.5	114.3	105.5	103.9	106.9	104.8
November 27, 2006	2	93.8	88.5	84.7	98.3	99.1	106.8	97.6	97.8	105.3	101.9	109.8	107.8	102.1	104.5	103.9	92.1	83.9	85.7	83.5	98.4	99.0	93.6	95.3	87.9
November 28, 2006	3	84.4	85.8	83.2	86.4	84.3	95.3	96.1	87.0	93.6	103.2	106.3	97.4	99.5	105.7	99.8	102.3	96.1	107.1	98.9	106.8	108.6	107.9	110.8	102.7
November 29, 2006	4	95.4	98.2	90.8	94.1	95.6	100.3	100.6	95.2	106.4	105.7	104.0	103.7	109.0	95.6	106.3	106.6	103.3	108.6	104.2	108.4	107.1	107.6	98.5	99.5
November 30, 2006	5	90.2	90.3	89.8	91.5	89.4	94.2	94.1	86.4	92.1	82.7	94.9	95.4	85.5	87.8	98.0	82.9	86.1	82.2	91.9	92.5	96.2	98.1	96.2	87.0
December 1, 2006	6	82.0	85.6	84.5	81.5	84.1	80.1	78.8	83.8	83.4	90.2	91.8	90.0	82.6	84.1	92.0	100.2	91.3	94.2	95.0	98.7	95.7	97.5	91.8	102.1
December 2, 2006	7	98.8	95.4	100.8	103.9	105.2	108.5	101.0	102.6	107.1	109.7	117.5	121.9	128.5	124.4	122.3	116.3	114.4	116.7	127.6	129.1	123.5	126.2	124.1	125.4
December 3, 2006	1	118.0	117.7	119.1	115.4	123.1	121.8	115.8	124.2	125.4	123.9	134.0	133.1	135.6	135.8	124.7	127.2	121.2	126.5	131.4	133.5	128.9	125.9	122.6	120.2
December 4, 2006	2	114.3	113.0	114.4	116.2	113.5	125.0	126.5	126.2	133.4	135.9	146.4	143.4	149.4	146.9	144.9	143.0	141.5	141.2	143.0	145.9	136.7	139.3	145.5	133.1
December 5, 2006	3	130.8	122.8	134.2	126.8	136.1	135.6	146.8	145.6	142.7	143.7	144.4	149.7	147.7	154.3	145.9	150.0	145.1	141.7	142.0	141.5	143.6	147.1	153.1	150.3
December 6, 2006	4	139.7	141.4	138.5	134.3	133.6	143.6	134.3	139.4	135.7	142.3	148.4	139.9	147.3	124.6	129.3	127.9	130.1	130.2	126.6	132.3	126.4	130.9	130.6	130.2
December 7, 2006	5	116.5	117.1	116.2	115.2	124.1	117.1	119.0	115.9	128.5	115.5	117.2	118.3	118.0	119.1	136.1	130.2	124.3	135.9	138.5	142.7	139.4	148.3	147.0	147.3
December 8, 2006	6	140.0	143.8	144.2	145.2	145.2	151.0	152.7	158.2	157.7	182.2	196.1	181.2	183.2	176.8	176.9	168.2	157.2	162.0	160.4	161.3	162.6	156.0	154.7	153.4
December 9, 2006	7	144.5	146.4	150.5	146.9	151.3	157.1	158.3	156.3	148.0	148.8	175.3	168.0	153.7	152.5	147.3	149.7	152.3	153.4	155.7	155.5	160.6	157.1	157.3	158.1
December 10, 2006	1	143.2	141.9	138.7	139.4	144.2	142.9	146.8	131.0	138.1	133.4	136.9	151.9	146.2	152.1	131.4	129.7	113.0	126.1	134.3	131.8	135.1	135.0	136.9	128.1
December 11, 2006	2	128.4	118.1	120.4	115.8	123.5	130.0	129.2	124.6	128.2	118.8	125.7	115.1	123.1	120.9	130.9	117.5	119.4	121.7	124.8	125.2	128.2	128.1	131.5	131.2
December 12, 2006	3	113.4	116.9	113.7	114.8	120.5	122.5	122.2	120.4	124.1	129.4	133.2	120.5	121.2	123.2	125.5	122.4	119.0	123.8	137.9	134.0	130.6	127.1	124.1	123.8
December 13, 2006	4	117.1	113.2	111.5	119.1	110.1	117.5	115.8	108.1	112.8	112.9	121.0	126.5	117.0	123.3	121.0	113.2	117.0	112.3	114.5	121.7	114.3	118.0	117.4	113.4
December 14, 2006	5	109.0	105.1	104.4	102.9	103.3	107.4	110.7	105.1	118.7	121.5	114.8	115.0	119.9	113.2	111.5	111.6	112.8	121.3	120.4	117.8	123.1	113.6	121.7	113.1
December 15, 2006	6	106.1	105.3	105.7	103.5	111.9	110.5	117.5	112.7	121.2	115.7	119.5	122.7	120.0	122.2	114.7	110.5	113.9	110.8	113.0	117.4	116.7	114.4	115.7	117.6
December 16, 2006	7	116.8	109.7	111.0	107.0	115.9	110.1	115.3	114.0	112.2	119.0	122.3	126.1	116.9	123.9	125.0	112.6	111.8	114.0	117.5	126.7	123.3	120.9	121.5	125.6
December 17, 2006	1	112.9	120.8	116.6	115.9	117.9	111.5	111.9	115.1	121.8	115.8	128.2	122.0	125.1	116.1	113.4	110.2	115.8	118.3	119.2	118.3	120.2	117.0	114.7	112.9
December 18, 2006	2	113.5	105.3	98.7	107.4	99.4	101.5	105.2	99.6	102.6	109.0	111.1	113.5	114.1	115.2	123.9	122.3	113.1	118.3	126.7	126.5	128.8	128.7	133.7	124.4
December 19, 2006	3	117.2	111.9	113.0	121.6	119.3	122.0	127.5	130.9	130.9	141.8	129.4	128.5	137.4	125.7	128.9	130.4	127.7	131.2	136.1	146.4	145.6	142.1	140.8	134.8
December 20, 2006	4	128.4	134.1	125.6	125.6	125.5	129.4	129.4	141.2	136.5	144.5	146.2	148.0	142.0	133.9	125.7	124.7	123.4	131.6	131.3	134.9	133.5	132.6	128.3	126.6
December 21, 2006	5	121.7	123.8	122.2	121.4	125.2	133.8	129.0	130.3	127.1	124.8	127.4	129.5	128.8	132.4	127.4	124.4	121.9	124.4	125.6	132.5	137.4	127.3	133.8	129.3
December 22, 2006	6	121.1	117.7	116.6	117.7	129.0	126.0	124.9	136.3	130.9	130.9	130.9	130.8	117.5	124.7	133.4	131.0	125.3	129.6	134.5	135.6	137.8	132.6	131.2	121.6
December 23, 2006	7	113.4	114.4	110.2	112.7	108.8	114.2	104.4	101.7	108.7	107.2	113.3	113.0	116.9	121.6	119.6	118.0	104.9	124.4	125.9	124.2	123.2	127.7	127.8	119.5
December 24, 2006	1	114.4	117.3	108.4	108.4	112.4	113.0	116.3	121.1	118.8	120.9	133.8	129.3	129.3	129.3	133.5	122.7	115.5	130.0	128.4	127.5	129.8	129.0	126.0	126.1
December 25, 2006	2	117.2	115.0	119.7	118.0	118.3	119.9	126.0	124.8	124.2	127.6	137.3	127.9	128.9	137.3	136.1	132.3	125.7	127.6	139.4	135.5	135.7	132.6	131.3	125.1
December 26, 2006	3	122.1	127.3	118.2	115.8	117.1	116.7	127.8	123.8	126.7	127.9	122.6	133.8	124.3	122.3	122.7	123.5	114.0	126.7	124.4	126.5	139.8	136.0	131.5	126.4
December 27, 2006	4	120.9	115.4	116.9	118.8	127.2	124.4	124.0	126.0	130.5	140.0	138.5	132.6	137.4	133.1	136.2	136.9	124.4	133.3	135.0	140.8	135.2	139.5	145.5	137.1
December 28, 2006	5	130.3	127.8	124.0	123.5	128.1	131.2	130.8	127.6	135.9	134.6	133.7	147.5	136.6	132.8	129.1	128.4	128.7	127.0	127.4	134.0	125.5	123.8	117.9	116.4
December 29, 2006	6	119.1	108.7	111.8	113.5	113.1	124.7	121.2	115.0	118.2	120.4	125.0	130.3	131.7	126.9	126.6	131.0	119.6	123.5	128.0	141.0	138.7	147.9	142.0	142.0
December 30, 2006	7	142.0	142.0	142.0	142.0	142.0	142.0	142.0	142.0	142.0	142.0	142.0	142.0	142.0	142.0	142.0	142.0	142.0	142.0	142.0	142.0	142.0	142.0	142.0	142.0
December 31, 2006	1	142.0	142.0	142.0	142.0	142.0	142.0	142.0	142.0	142.0	143.3	140.3	135.9	143.6	133.9	127.2	129.0	122.7	136.6	137.3	143.0	138.7	136.0	133.5	122.5

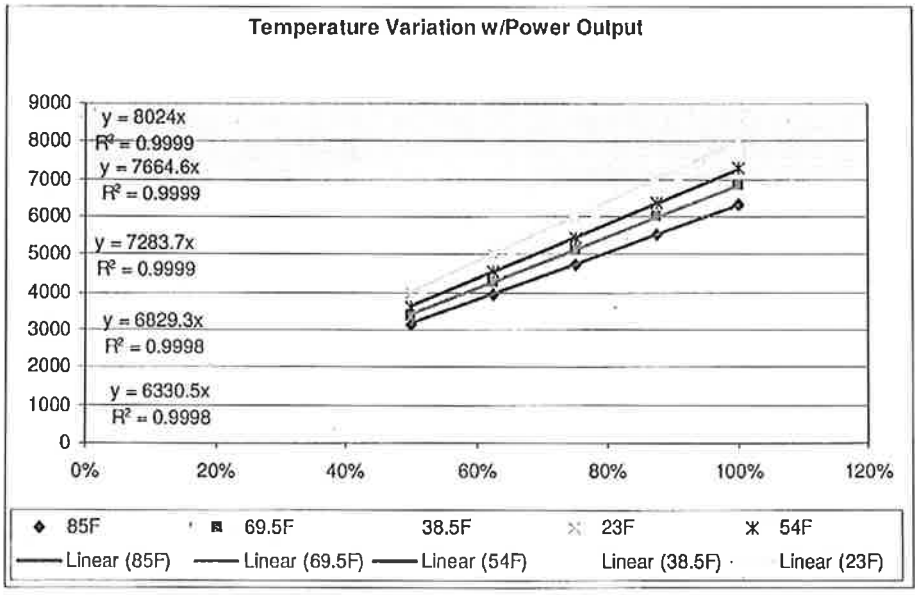
Appendix D

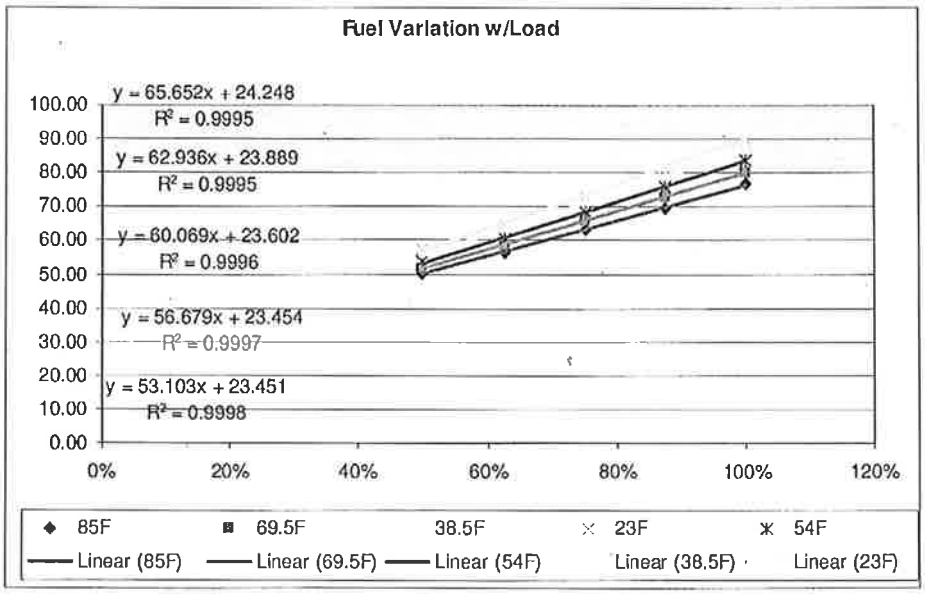

Make-up Water
Notes:
Temperature
Pressure
Flowrate
Enthalpy/Power Output
BOILER -1
PROC -1
COND -1
PUMP - 1
Inlet Air
C - 1
DB - 1
EVAP -1
PUMP - 2
DA
DA-1
SCR - 1
ECON -2
GT/HRSG Exhaust
Steam Drum Blowdown
Power Output
AC - 1
GT - 1
GC - 1
Fuel
CON ED -1
AC – 1
Air Compressor
GT – 1
Gas Turbine
GC – 1
Gas Compressor
DB – 1
Duct Burner
EVAP – 1
HRSG Evaporator
ECON – 2
Post-DA Economizer
DA - 1
Deaerator
PUMP-2
Boiler Feed Water Pumps
PUMP -1
DA Feed Pumps
COND -1
Condensate Tank
PROC -1
Riker's Process Needs
CON ED – 1
Power Purchased
HMB - 1
Heat and Material Balance Max Power
Rikers Island Cogeneration Project
10/12/09
Rev 3.

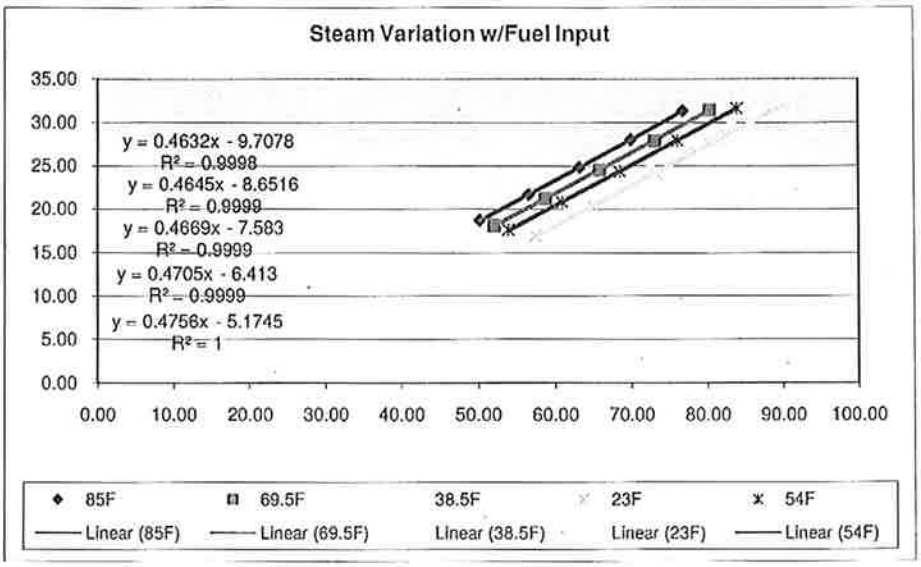

Make-up Water
Notes:
Temperature
Pressure
Flowrate
Enthalpy/Power Output
BOILER -1
PROC -1
COND -1
PUMP - 1
Inlet Air
DB - 1
EVAP -1
DA
DA-1
PUMP - 2
ECON -2
GT/HRSG Exhaust
GT/HRSG Waste Heat
Steam Drum Blowdown
Power Output
AC - 1
GT - 1
GC - 1
Fuel
CON ED -1
AC – 1
Air Compressor
GT – 1
Gas Turbine
GC – 1
Gas Compressor
DB – 1
Duct Burner
EVAP – 1
HRSG Evaporator
ECON – 2
Post-DA Economizer
DA - 1
Deaerator
PUMP-2
Boiler Feed Water Pumps
PUMP -1
DA Feed Pumps
COND -1
Condensate Tank
PROC -1
Riker's Process Needs
CON ED – 1
Power Purchased
NOTES: -1% Losses attributed to HRSG inefficiency
HMB - 2
Heat and Material Balance Min Power
Rikers Island Cogeneration Project
10/12/09
Rev. 3

Appendix E Prime Mover Curves

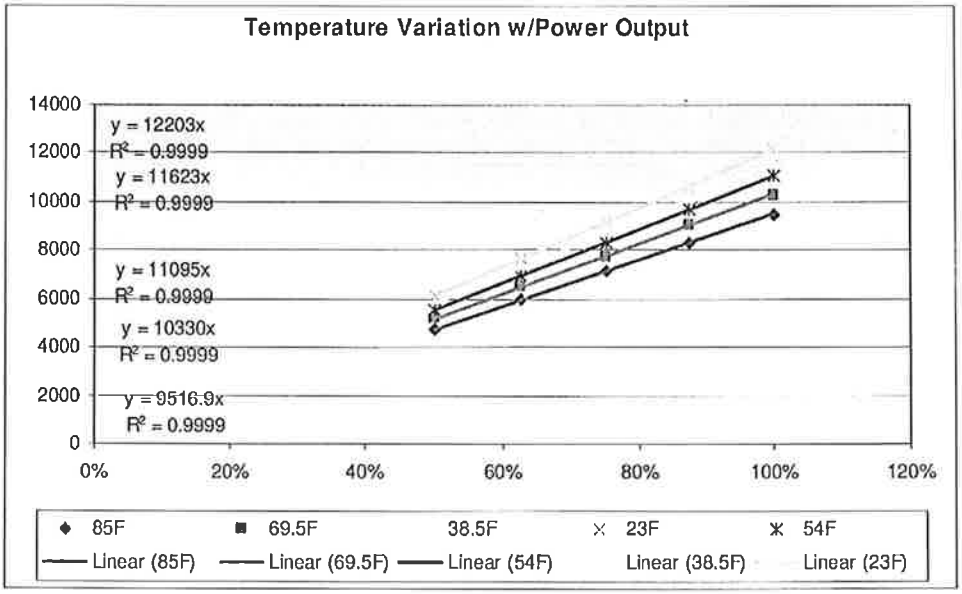
Taurus 70 Curves

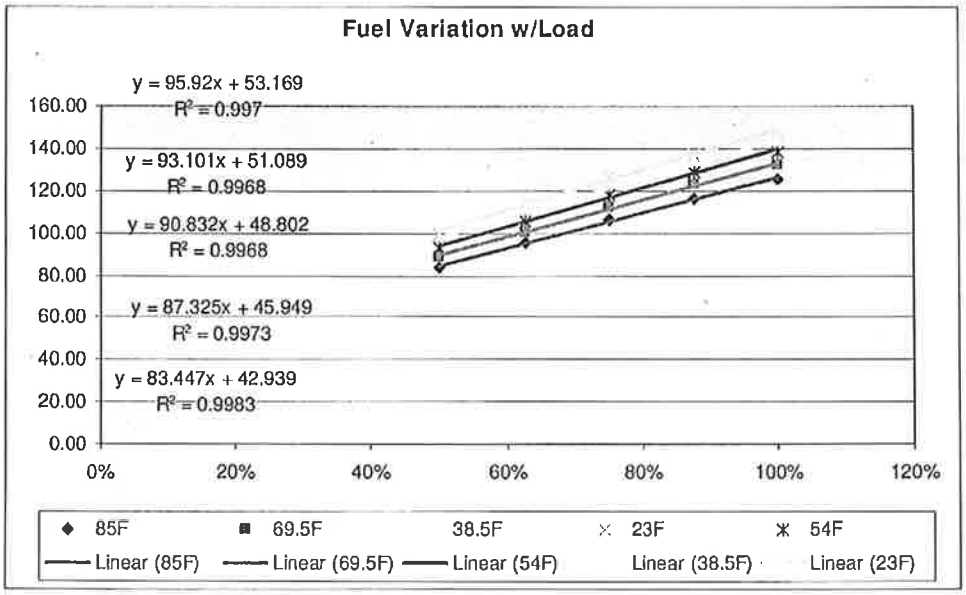


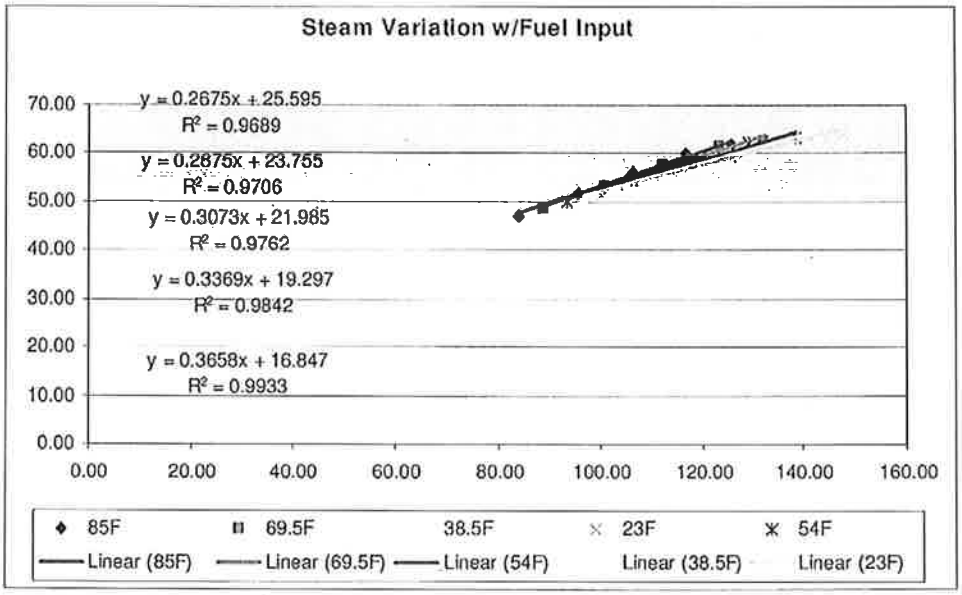



Steam Variation w/Fuel Input
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
y = 0.4632x - 9.7078
R² = 0.9998
y = 0.4645x - 8.6516
R² = 0.9999
y = 0.4669x - 7.583
R² = 0.9999
y = 0.4705x - 6.413
R² = 0.9999
y = 0.4756x - 5.1745
R² = 1
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
85F
69.5F
38.5F
23F
54F
Linear (85F)
Linear (69.5F)
Linear (38.5F)
Linear (23F)
Linear (54F)

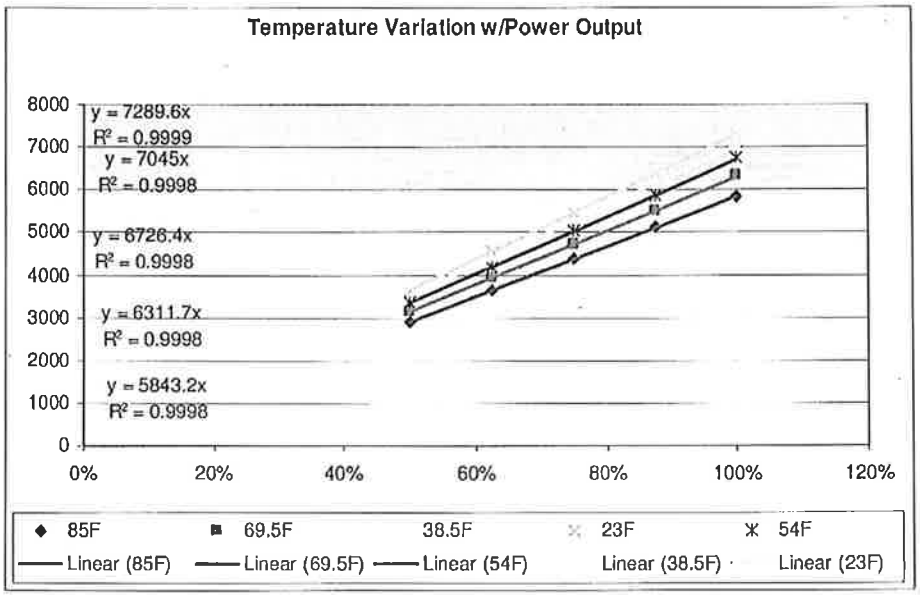
GE -10 Curves

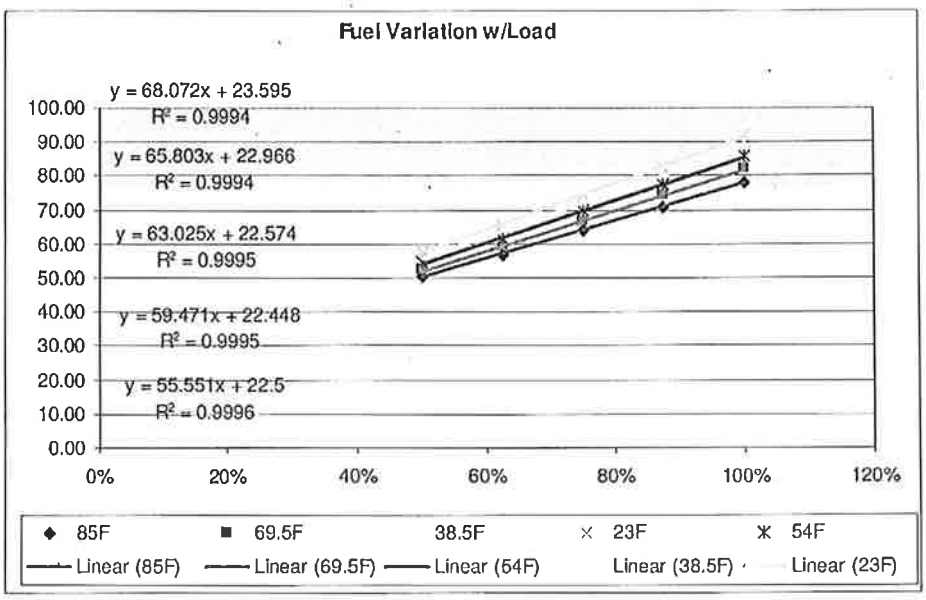

Temperature Variation w/Power Output
14000
12000
10000
8000
6000
4000
2000
0
y = 12203x
R² = 0.9999
y = 11623x
R² = 0.9999
y = 11095x
R² = 0.9999
y = 10330x
R² = 0.9999
y = 9516.9x
R² = 0.9999
0%
20%
40%
60%
80%
100%
120%
85F
69.5F
38.5F
23F
54F
Linear (85F)
Linear (69.5F)
Linear (54F)
Linear (38.5F)
Linear (23F)

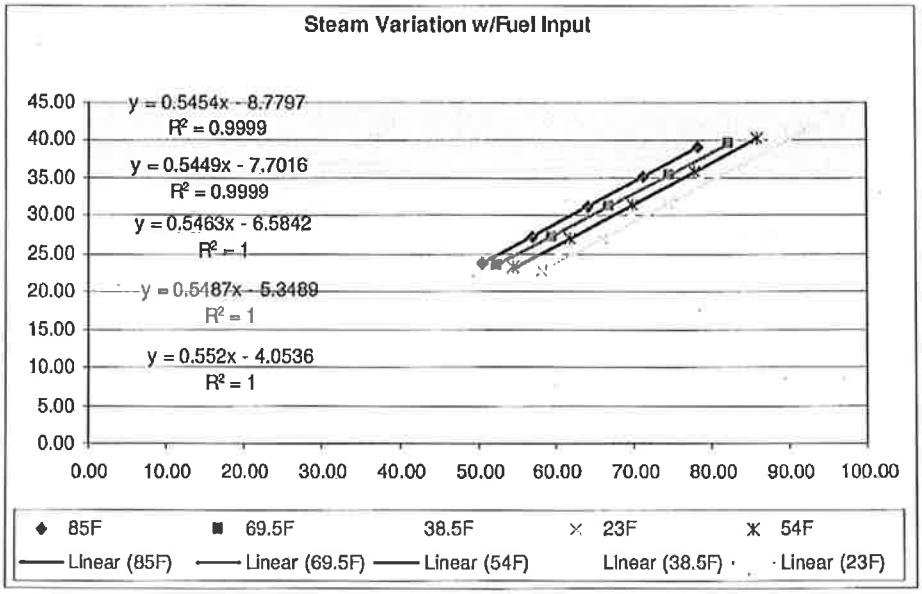

Fuel Variation w/Load
160.00
140.00
120.00
100.00
80.00
60.00
40.00
20.00
0.00
y = 95.92x + 53.169
R² = 0.997
y = 93.101x + 51.089
R² = 0.9968
y = 90.832x + 48.802
R² = 0.9968
y = 87.325x + 45.949
R² = 0.9973
y = 83.447x + 42.939
R² = 0.9983
0%
20%
40%
60%
80%
100%
120%
85F
69.5F
38.5F
23F
54F
Linear (85F)
Linear (69.5F)
Linear (54F)
Linear (38.5F)
Linear (23F)


Steam Variation w/Fuel Input
y = 0.2675x + 25.595
R² = 0.9689
y = 0.2875x + 23.755
R² = 0.9706
y = 0.3073x + 21.985
R² = 0.9762
y = 0.3369x + 19.297
R² = 0.9842
y = 0.3658x + 16.847
R² = 0.9933
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
85F
69.5F
38.5F
23F
54F
Linear (85F)
Linear (69.5F)
Linear (54F)
Linear (38.5F)
Linear (23F)

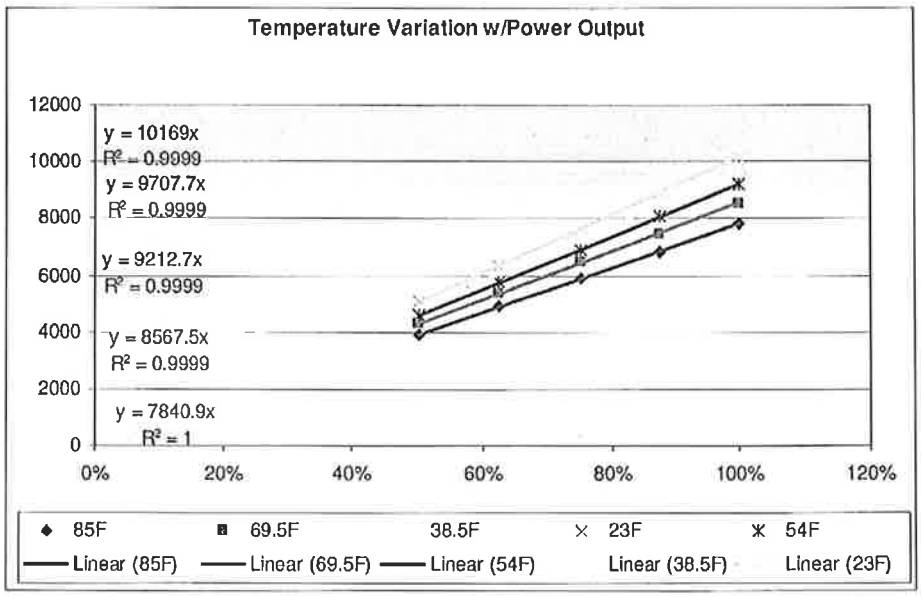
Kawasaki GPB70 Curves

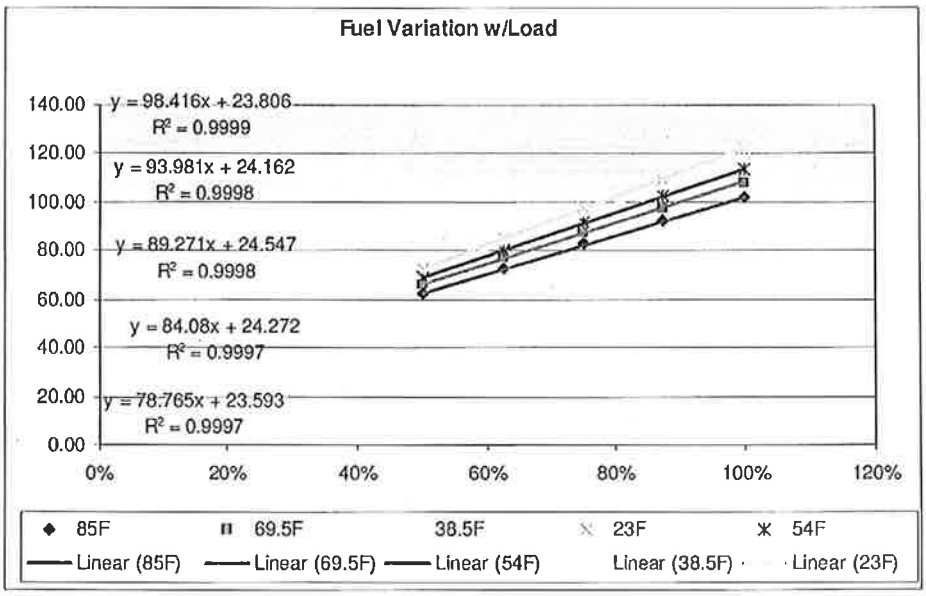


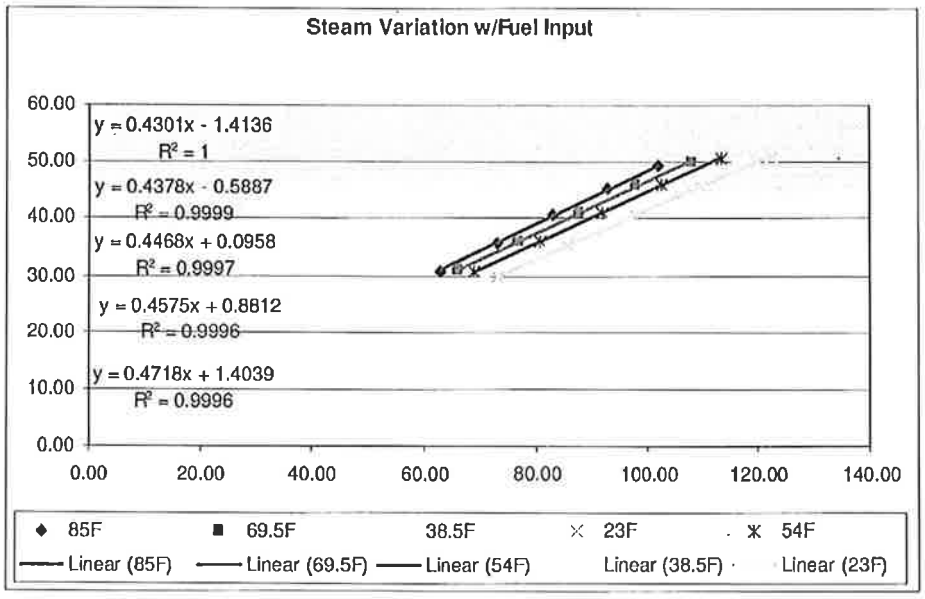



Steam Variation w/Fuel Input
y = 0.5454x - 8.7797
R² = 0.9999
y = 0.5449x - 7.7016
R² = 0.9999
y = 0.5463x - 6.5842
R² = 1
y = 0.5487x - 5.3489
R² = 1
y = 0.552x - 4.0536
R² = 1
45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
85F
69.5F
38.5F
23F
54F
Linear (85F)
Linear (69.5F)
Linear (54F)
Linear (38.5F)
Linear (23F)

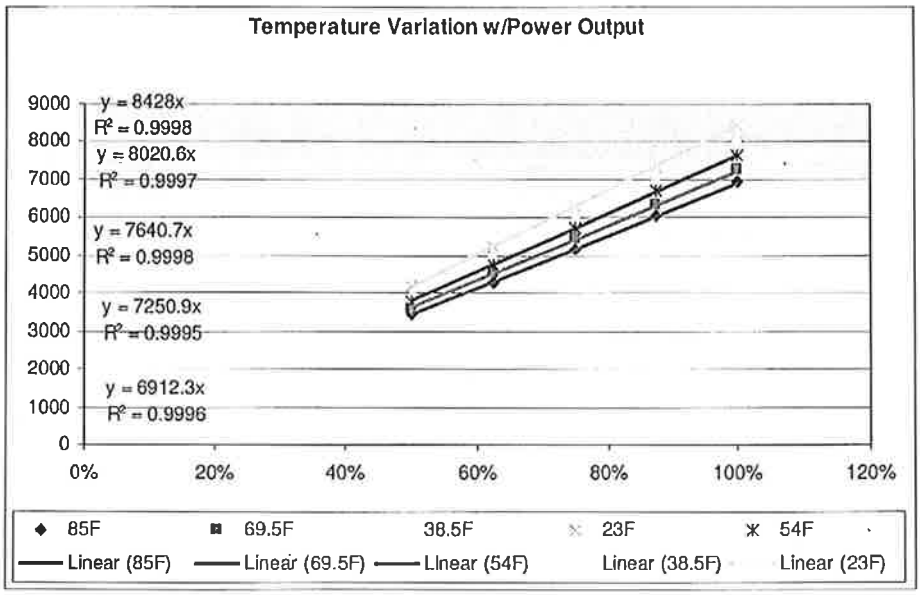
Mars 90 Curves

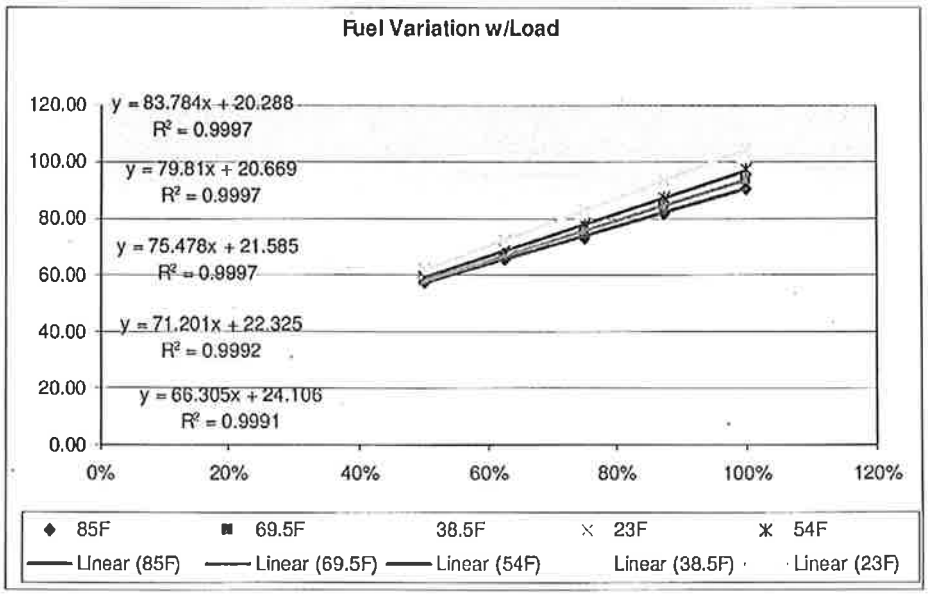


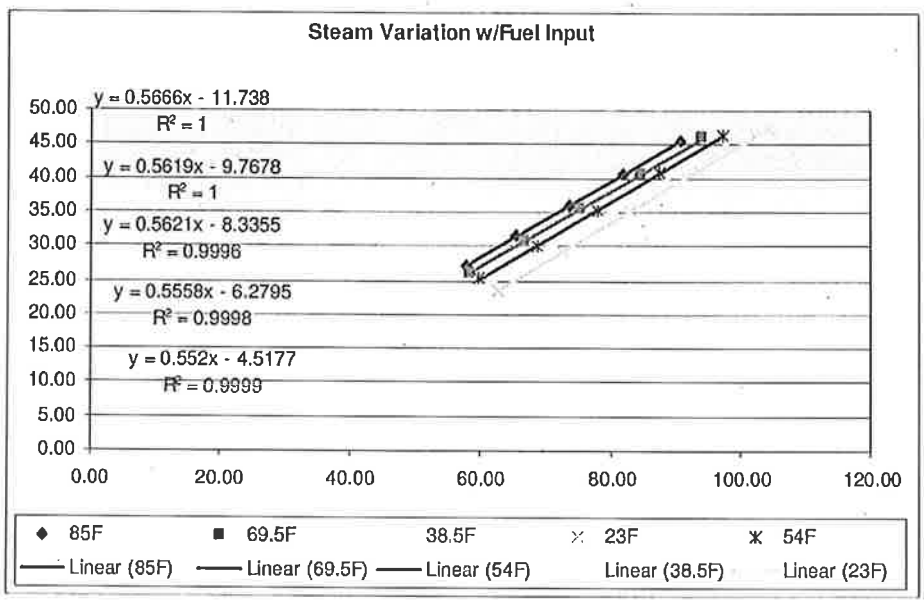



Steam Variation w/Fuel Input
60.00
50.00
40.00
30.00
20.00
10.00
0.00
y = 0.4301x - 1.4136
R² = 1
y = 0.4378x - 0.5887
R² = 0.9999
y = 0.4468x + 0.0958
R² = 0.9997
y = 0.4575x + 0.8812
R² = 0.9996
y = 0.4718x + 1.4039
R² = 0.9996
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
85F
69.5F
38.5F
23F
54F
Linear (85F)
Linear (69.5F)
Linear (54F)
Linear (38.5F)
Linear (23F)

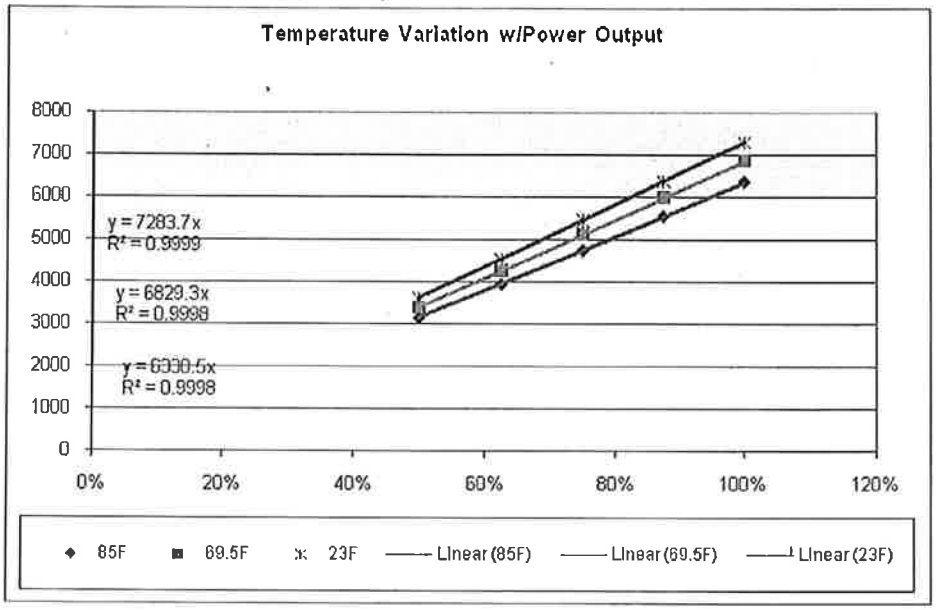
Siemens SGT300 Curves

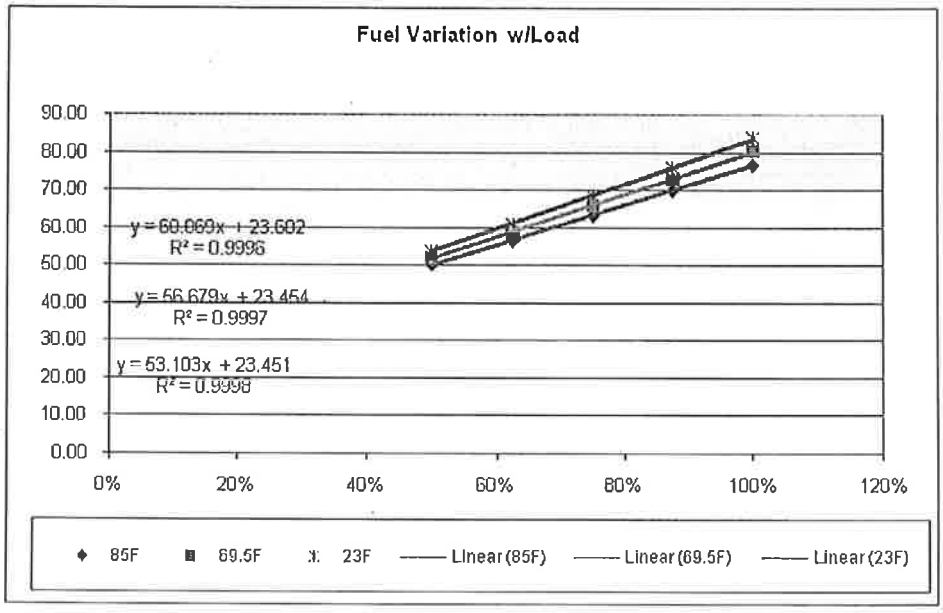


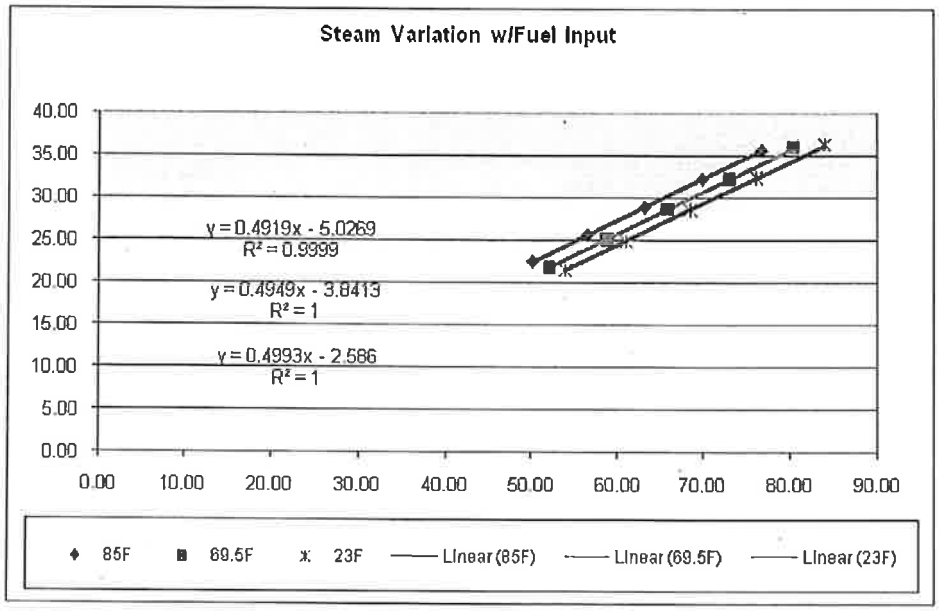



Steam Variation w/Fuel Input
y = 0.5666x - 11.738
R² = 1
y = 0.5619x - 9.7678
R² = 1
y = 0.5621x - 8.3355
R² = 0.9996
y = 0.5558x - 6.2795
R² = 0.9998
y = 0.552x - 4.5177
R² = 0.9999
50.00
45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
0.00
20.00
40.00
60.00
80.00
100.00
120.00
85F
69.5F
38.5F
23F
54F
Linear (85F)
Linear (69.5F)
Linear (54F)
Linear (38.5F)
Linear (23F)

Solar Taurus 60 Curves





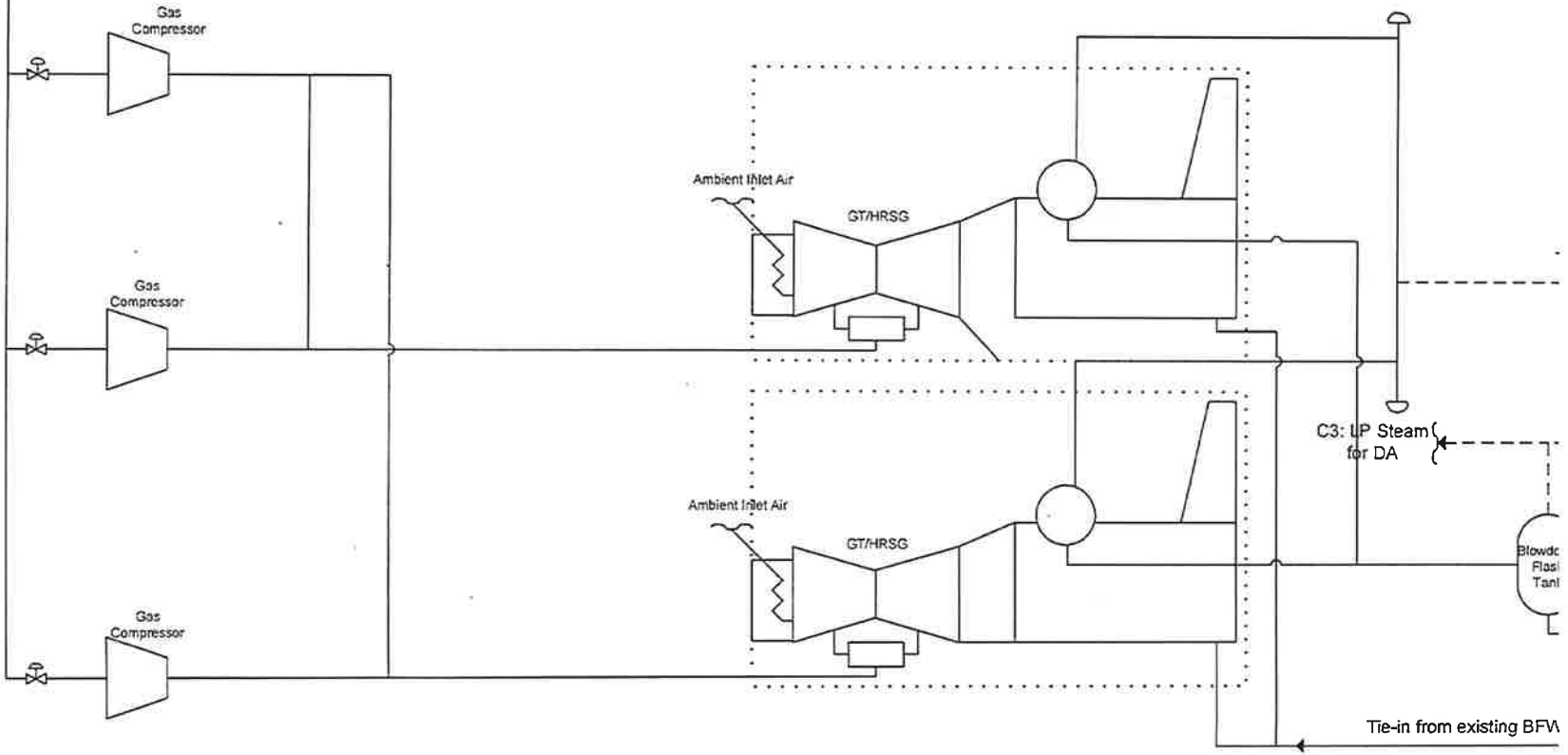

Steam Variation w/Fuel Input
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
y = 0.4919x - 5.0269
R² = 0.9999
y = 0.4949x - 3.8413
R² = 1
y = 0.4993x - 2.586
R² = 1
85F
69.5F
23F
Linear (85F)
Linear (69.5F)
Linear (23F)

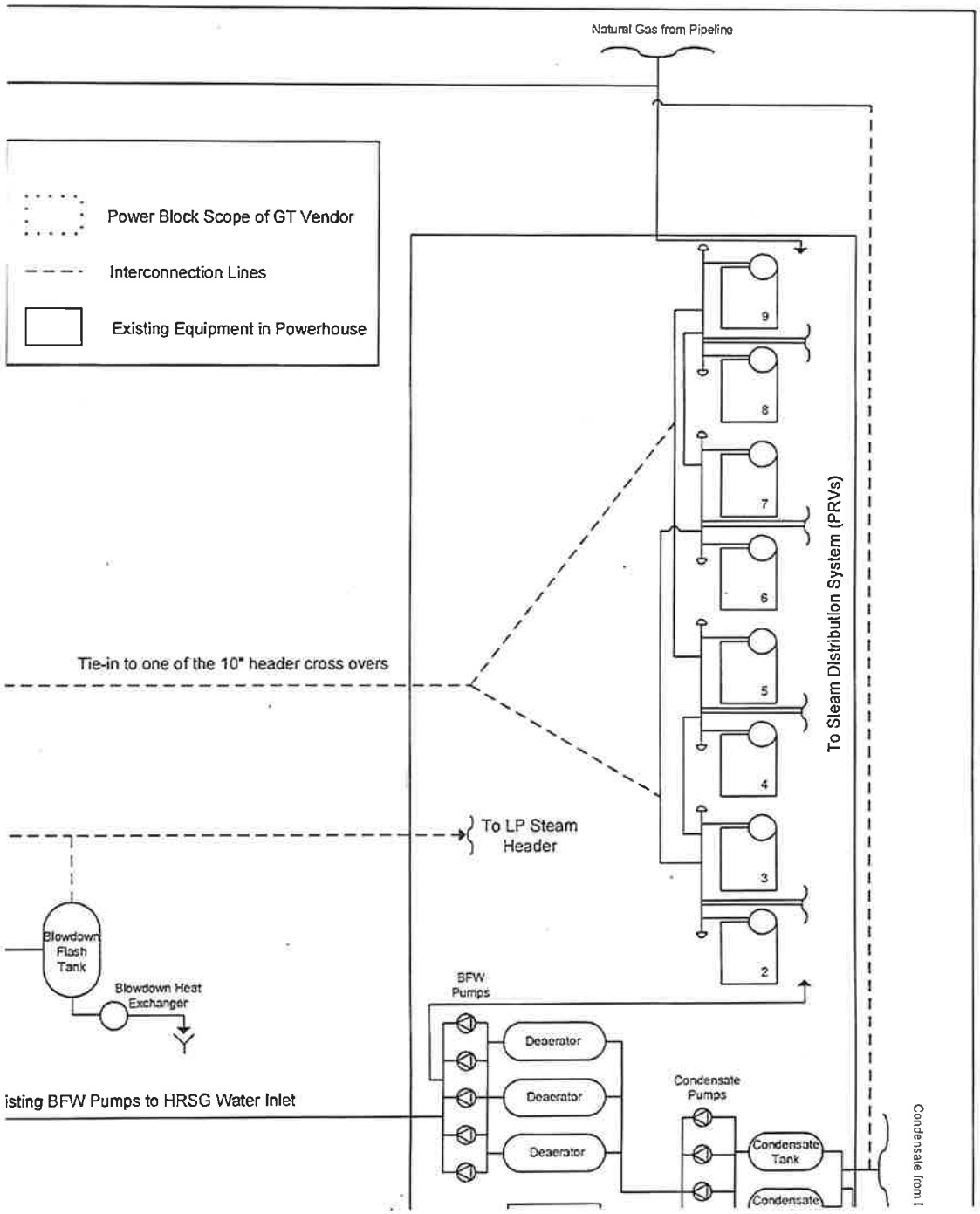
Appendix F

Rikers Island Cogeneration Facility
Site Location

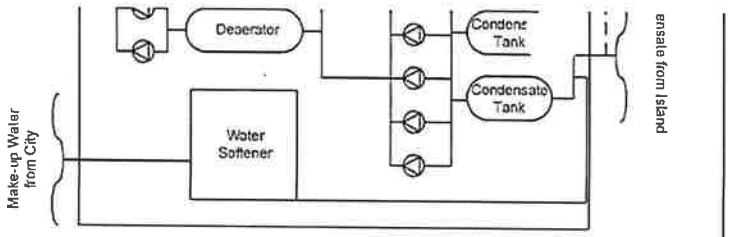
Appendix G

Future Equipment Information Summary
Gas Compressors: 3 @ 100%, 1 Meets 1 Gas Turbine Fuel Requirements
GT/HRSG: 2 @ 7MW, HRSG, Min Stack Temp 250°F
Blow Down Flash Tank: 1@100% of 5% Blowdown
Blow Down Heat Exchanger: 1@100% of 2% Blowdown



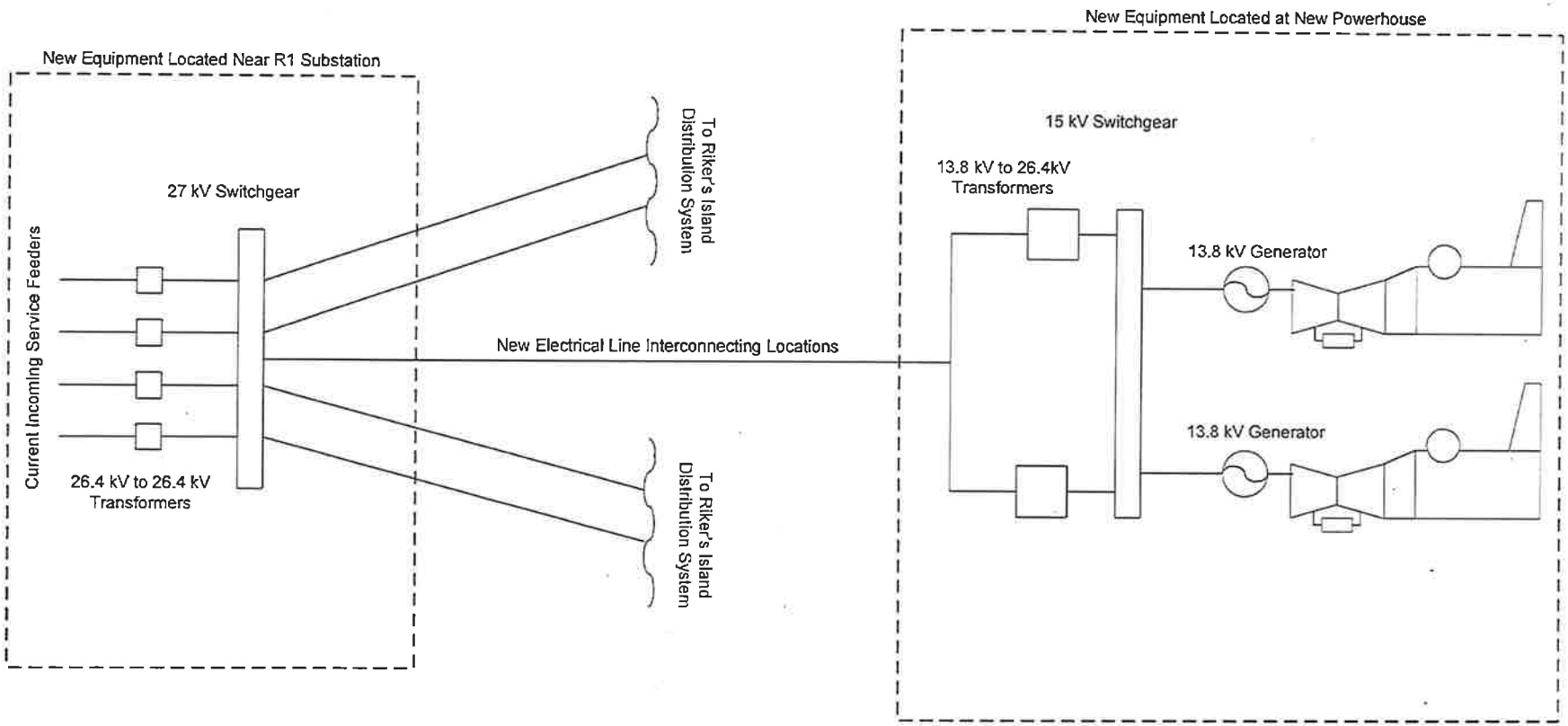

Natural Gas from Pipeline
Power Block Scope of GT Vendor
Interconnection Lines
Existing Equipment in Powerhouse
9
8
7
6
5
4
3
2
To Steam Distribution System (PRVs)
Tie-in to one of the 10" header cross overs
To LP Steam Header
Blowdown Flash Tank
Blowdown Heat Exchanger
BFW Pumps
Deaerator
Deaerator
Deaerator
Condensate Pumps
Condensate Tank
Condensate
isting BFW Pumps to HRSG Water Inlet
Condensate from I

Existing Equipment Information Summary
Condensate Tanks: 2 @ 6000 gallons, Caustic injection
Condensate Pumps: 5 @ 80klbs/hr, 20hp, 75-100psi
Water Softener: 3 Cation Beds, 1 Run , 2 Stand-by
BFW Pumps: 5 @ 80klbs/hr, 60hp, 210-250 psi
Deaerators: 3 @ 288klbs/hr, 10 psi, 220°F
Chemical Treatment: Caustic, Sulfite, and Tri-sodium Phosphate



PROC - 1	
Future and Existing Process Equipment	
Rikers Island Cogeneration Project	
10/12/09	Rev. 3

Appendix H



PROC - 2	
Future and Existing Electrical Equipment	
Rikers Island Cogeneration Project	
12/10/08	Rev. 2

Appendix I

Rikers Island Cogeneration Operational Control Diagram without Economic Dispatch

Inputs
Grid Frequency Signal (External/Internal)
Main Meter kW
Manual Gas Turbine Production Signal
HRSG Production Curve based on GT Input
Pressure Demand

Outputs
Gas Turbine Production Signal
Bypass Valve Control Signal
Duct Burner Firing Temperature
Boiler Firing Control Signal
Boiler Feed Water Control Signal

Gas Turbine Operation

Is the Utility Power Grid Available?

Yes

Is Electrical Demand > Gas Turbine Capacity?

- **Yes**
  - Gas Turbines sync with Grid
  - Gas Turbines run to max production signal
  - Grid makes up remainder of electrical demand
- **No**
  - Gas Turbines sync with Grid
  - Gas Turbines run to load signal based on Main Meter kW Information
  - Some grid power purchased

No

Is Electrical Demand > Gas Turbine Capacity?

- **Yes**
  - Grid circuit breakers open
  - Lead Gas Turbine provides synchronization signal running in frequency control
  - Gas Turbines run to max production signal
  - Load Shed or emergency diesel back-up for remaining load
- **No**
  - Grid circuit breakers open
  - Lead Gas Turbine provides synchronization signal running in frequency control
  - Gas Turbines run to frequency signal

Heat Recovery Steam Generator Operation

Is Thermal Demand > Gas Turbine Exhaust HRSG Steam Capacity?

- **Yes**
  - Run Boilers as needed to steam pressure demand signal
- **No**
  - Control hot gas by-pass to meet steam pressure demand signal

CONT -1	
Control Diagram 1	
Rikers Island Cogeneration Project	
12/9/08	Rev. 2