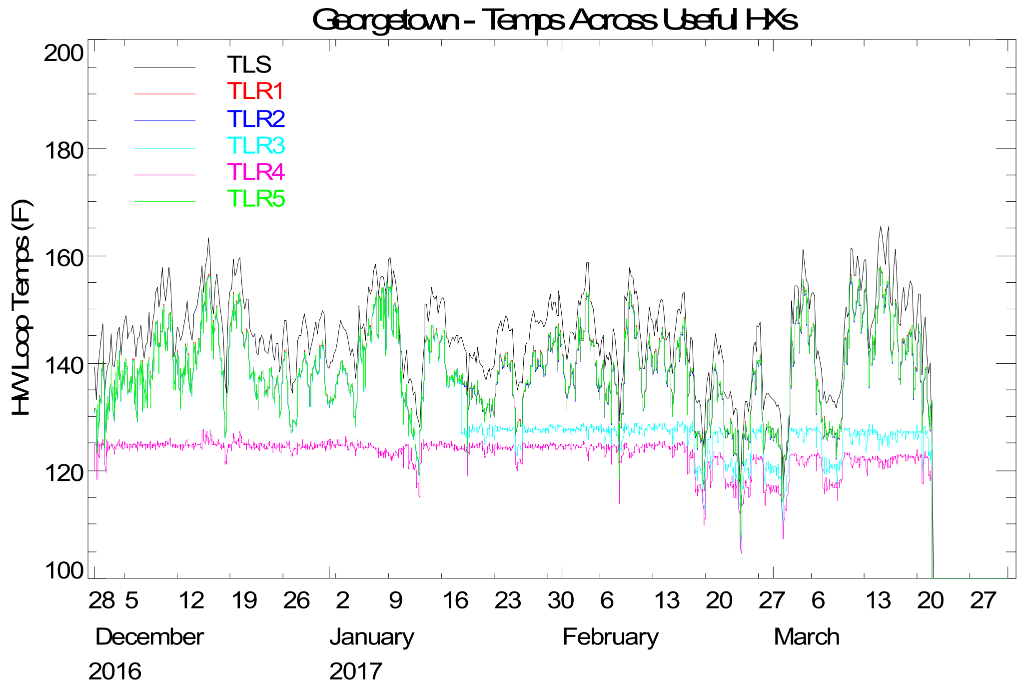
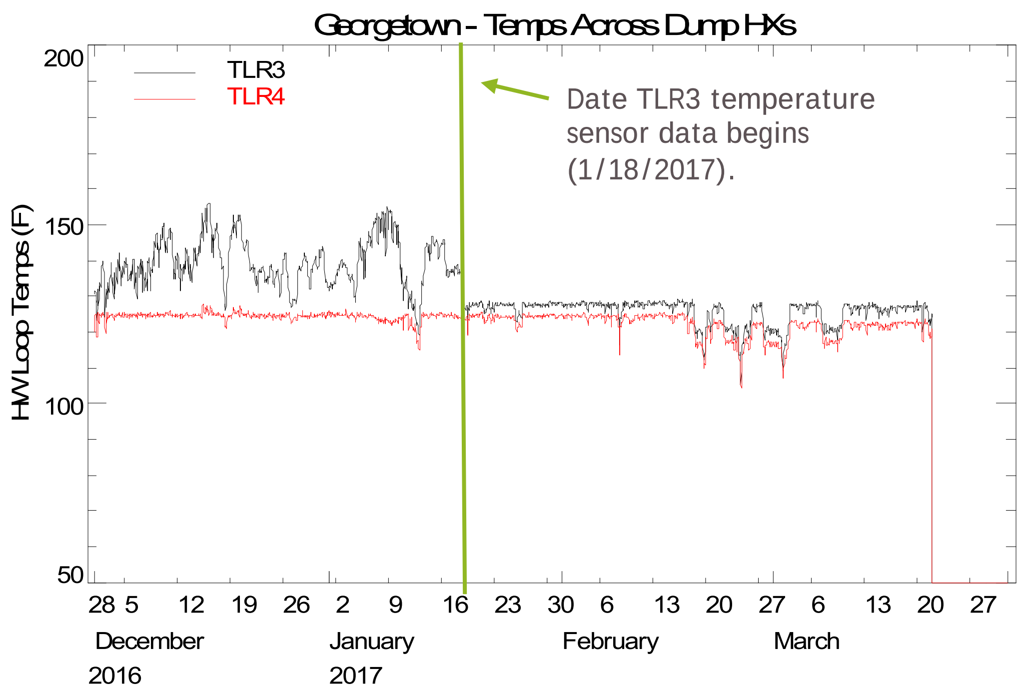
CDH was on site on January 18, 2017. The purpose of this visit was to determine the cause of low flow measurements. While on site the TLR3 temperature sensor, which was never wired, was found and wired. As of 1/18/2017 TLR3 is no longer stipulated as being equal to TLR2.



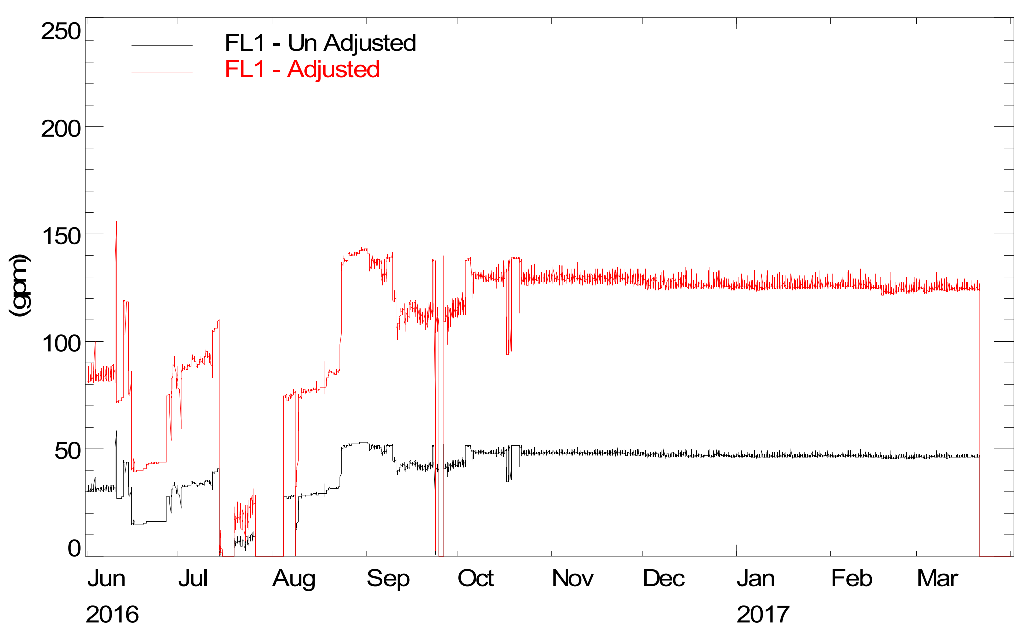


While on site the FL1 flow was verified using a Portaflow portable ultrasonic flow meter. The table below shows the Portaflow readings as compared to the readings on the Obvius from the installed Onicon FL1 flow meter.

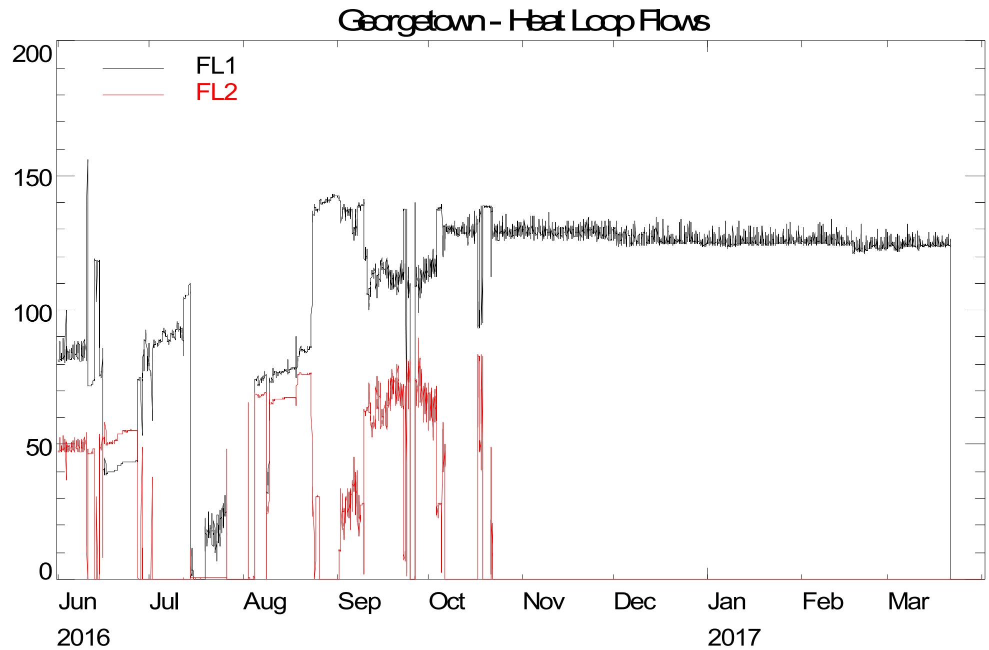
	Obvius Reading (gpm)	Portaflow Reading (gpm)
	88.0	127.4
	88.6	126.8
	89.9	127.0
	87.0	126.3
	87.5	126.9
Avg:	*88.2*	*126.9*

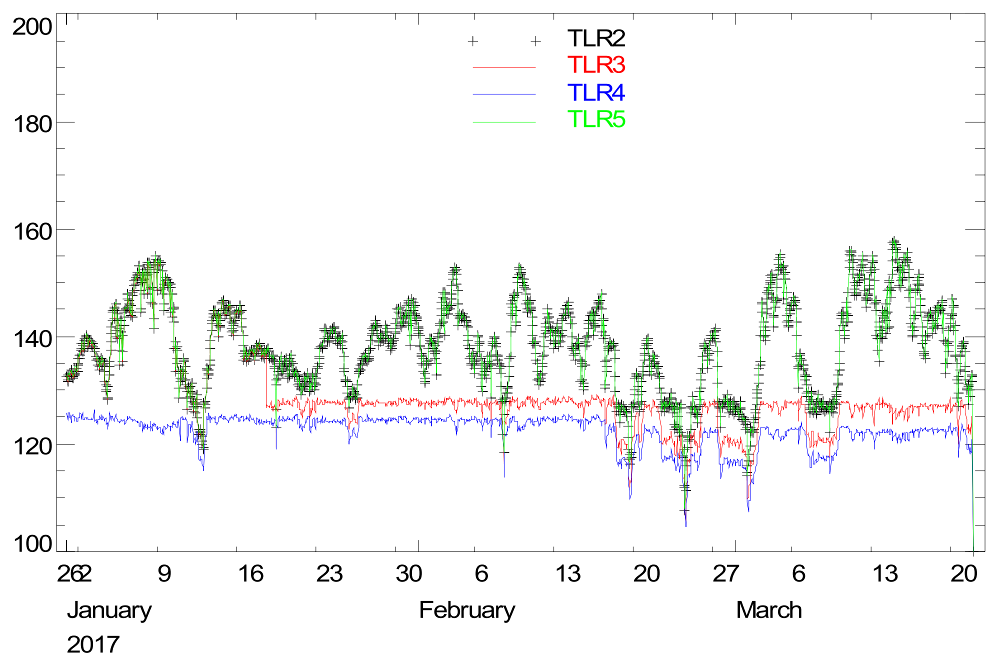
When the flow meter was last pulled from the pipe to be sent back to Onicon to be re-spanned, it was observed that the turbine and parts inserted into the flow were covered with a black oily substance. It is suspected that the difference in flow measurements in the table above is due to fouling of the meter, caused by the oil present in the heat recovery loop. To correct for this, the Onicon readings are being multiplied by the ratio of the observed flows. This correction is applied to the measured data in addition to correcting for the re-spanning of the flow meter which was changed from 0 – 80 gpm to 0 – 150 gpm.

$$FL1_{corrected} = FL1 * \left[{}^{150}/_{80}\right] * \left[{}^{126.9}/_{88.2}\right]$$

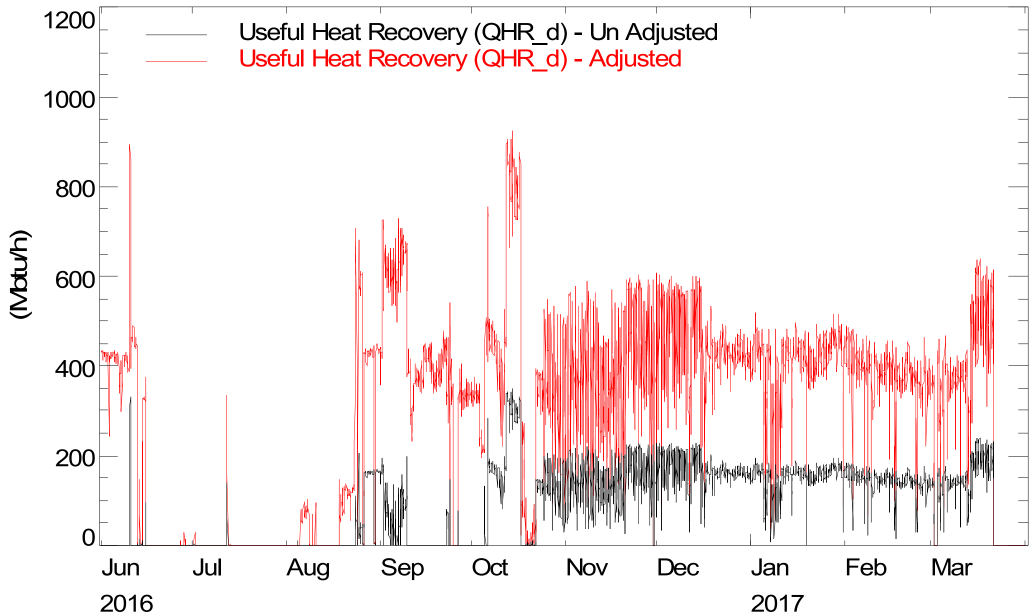


While on site FL2 was not verified due to the fact that there is no flow thru the dump radiator. We are confident that there is in fact no flow and that the FL2 flow meter is not working due to the recovered heat loop temperatures (since TLR3 was wired). The fact that TLR2 and TLR5 temperature measurements are identical, and TLR3 and TLR4 are much lower, indicates that flow is bypassing the dump radiator loop and FL2 flowmeter.

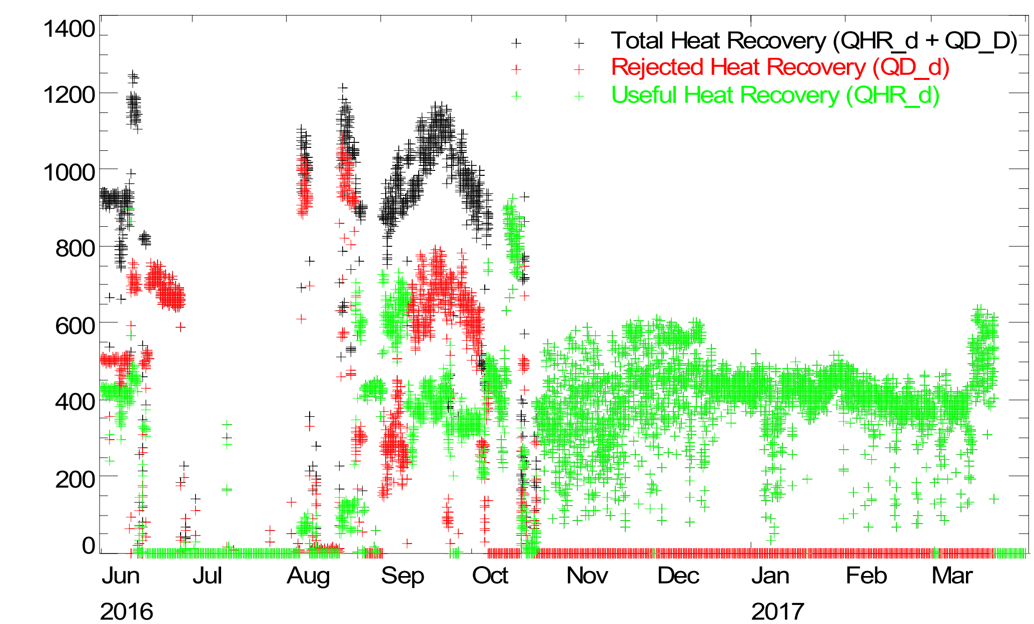




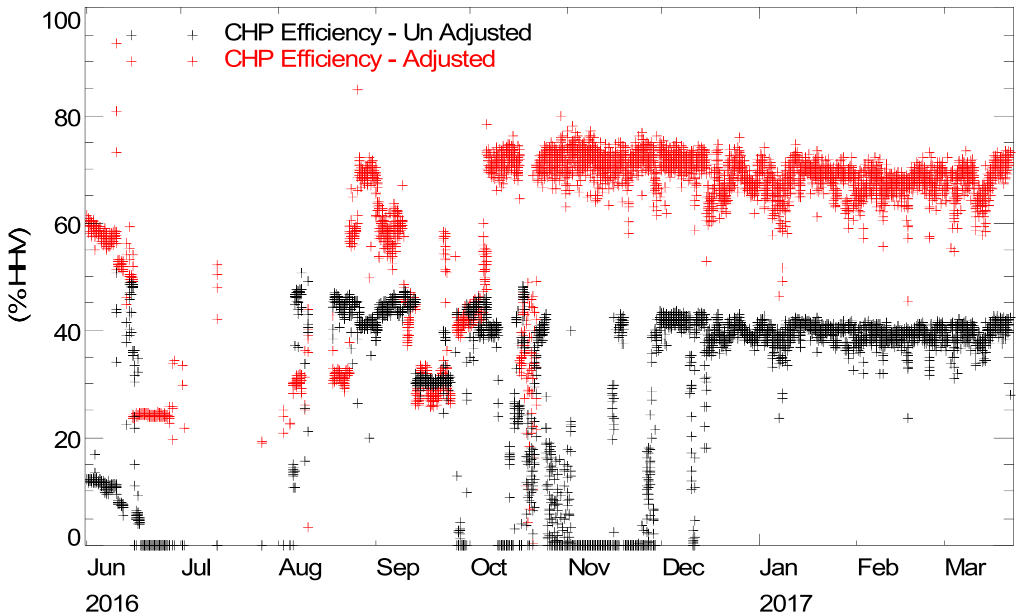
Adjusting the FL1 flow had a considerable effect on the heat recovery, effectively raising it by a factor of 2.7. The adjusted heat recovery values are still well within the engine ratings of 700 Mbtu/h from each engine or 1,400 Mbtu/hr for the system.

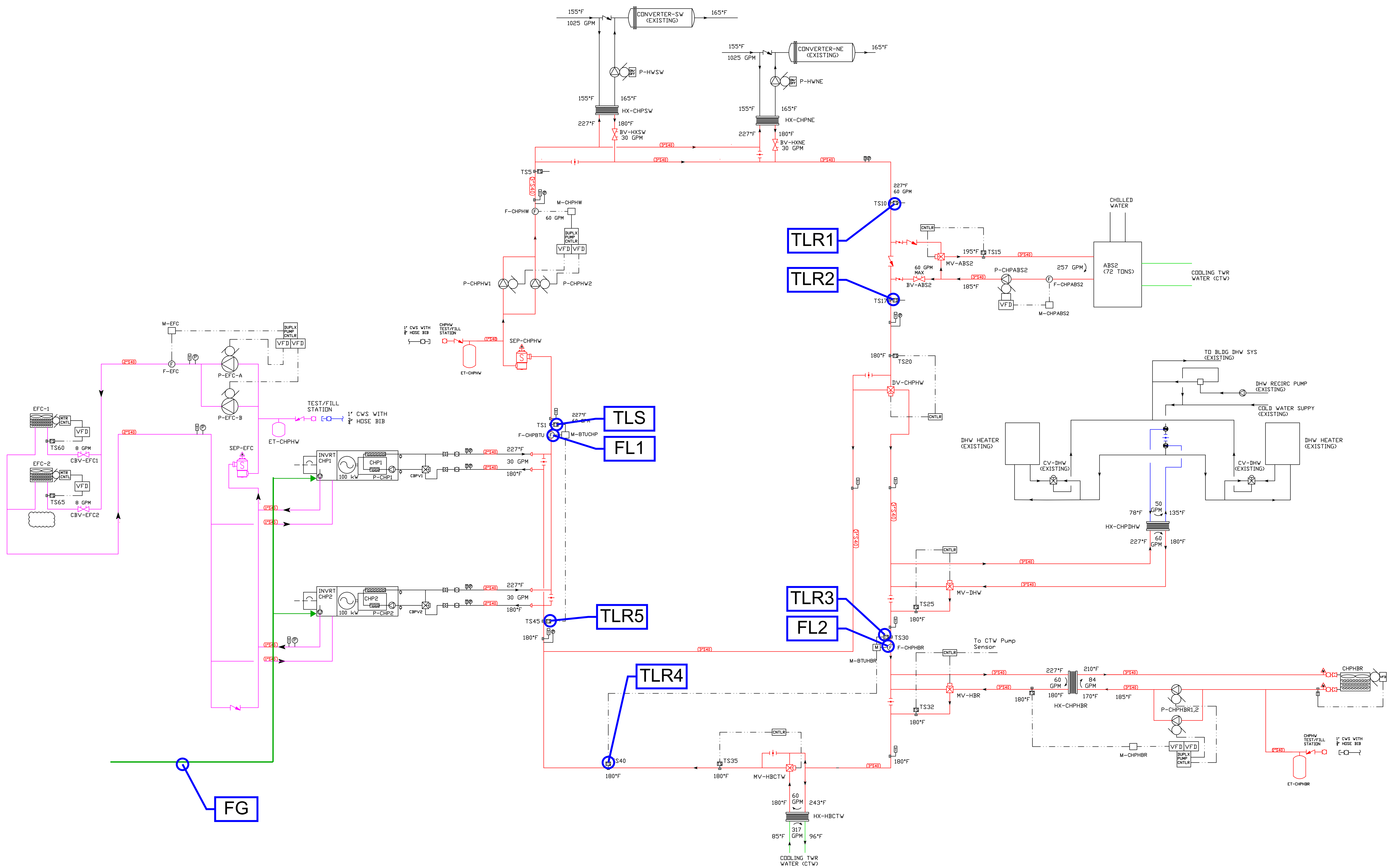


Previously, while stipulating TLR3 = TLR2, the calculated rejected heat was being artificially elevated. This is because useful heat recovered for DHW heating via HX-CHPDHW was being counted as rejected heat. When the FL2 loop bypass began in October 2016, all rejected heat recovery went to zero, so this was no longer an issue. Now that TLR3 is being properly measured the rejected heat recovery will be accurately calculated when heat is being rejected.



Adjusting the flow had a significant impact on the measured CHP efficiency. The collected data now is accurately reflecting the observed, on site, system performance and is in line with the INV-100 CHP efficiency rating of 82.4% HHV.





NOTES:

GENERAL NOTES:

1. DO NOT SCALE DRAWINGS
2. ALL DIMENSIONS AND LOCATIONS TO BE VERIFIED IN THE FIELD
3. DRAWINGS ARE PROVIDED FOR THE PURPOSE OF CONSTRUCTION. DRAWINGS ARE SUBJECT TO MODIFICATIONS AFTER FINAL FIELD MEASUREMENTS AS DIRECTED BY THE ENGINEER.
4. ALL CONSTRUCTION AND INSTALLATION TO BE DONE IN ACCORDANCE WITH ALL PROJECT DRAWINGS, SPECIFICATIONS, AND MANUFACTURER REQUIREMENTS WHERE APPLICABLE.

DRAWING NOTES:

1. DRAWING PROVIDES GENERAL SCHEMATIC SYSTEM INFORMATION. CHECK ALL PROJECT DRAWINGS AND PROJECT SPECIFICATION(S) FOR ADDITIONAL INSTALLATION DETAILS AND INFORMATION.
2. DETAILS FOR INSTALLATION OF COMPONENTS, PIPING, SYSTEM EQUIPMENT ARE NOT SHOWN IN THIS DRAWING.
3. CONTROL VALVES ARE REPRESENTED SCHEMATICALLY ONLY. PORT DESIGNATIONS AND OTHER DETAILS ARE NOT SHOWN. VERIFY PORT ORIENTATION FOR INDICATED SERVICE FROM MANUFACTURER DOCUMENTATION

NO.	REVISION DESCRIPTION	DATE
6		
5		
4		
3		
2	NEW EQUIPMENT ADDED	07/02/12
1	REM EFC3 TXT	3/28/12

Professional Seal

ISSUED FOR REVIEW
NOT FOR CONSTRUCTION

DSM Engineering Associates PC
"Low Carbon" Engineering Specialists
1363-26 Veterans Memorial Highway
Hauppauge, New York 11788
631-360-1208

WWW.DSMEA.COM

Project Name and Address

MECHANICAL SCHEMATIC
CHP 1-LINE SCHEMATIC

GEORGETOWN PLAZA
CHP/BOILER/CHILLER PROJECT

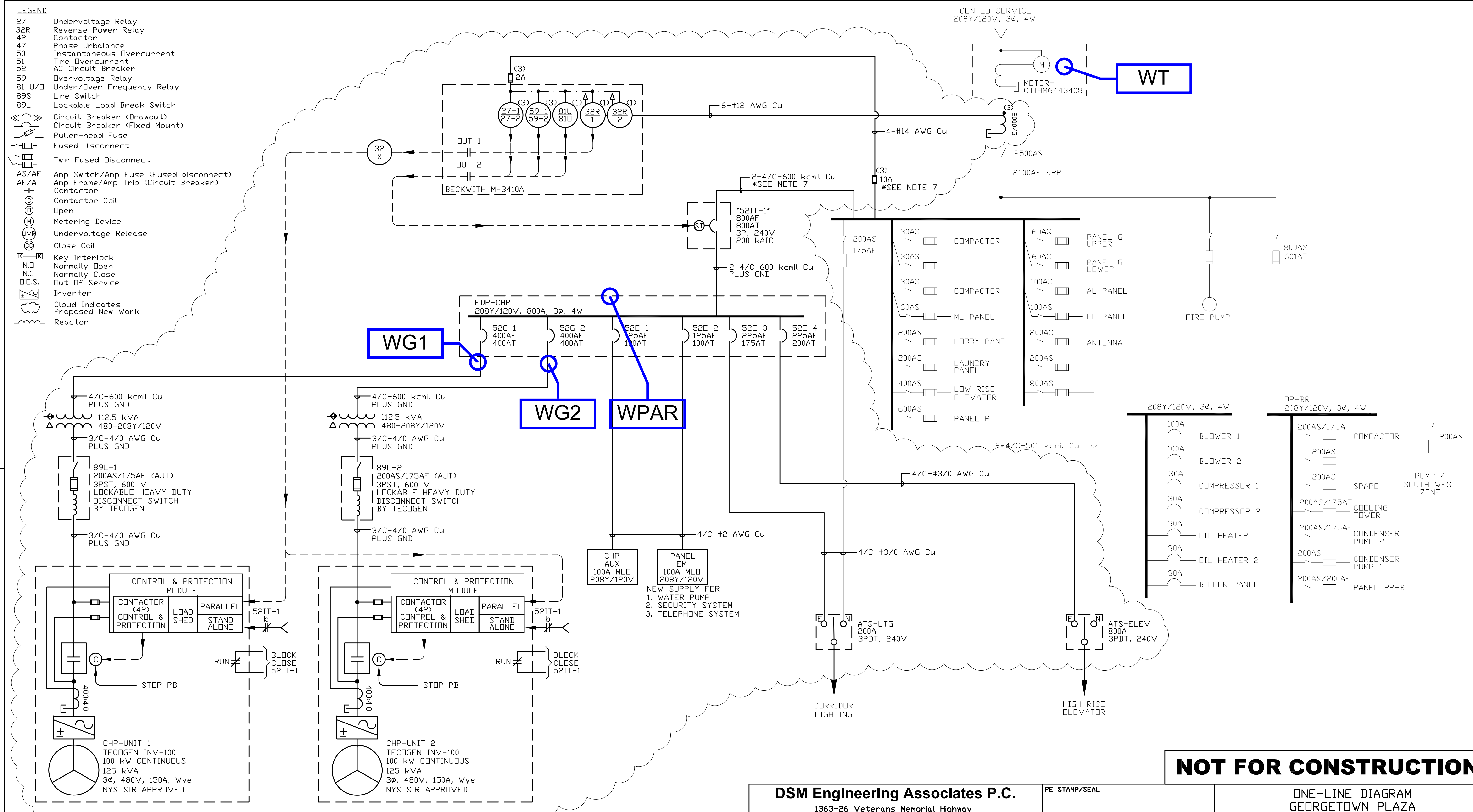
60 EAST 8TH STREET
NEW YORK, NY 10003

BLOCK: **00548** LOT: **7501**

Project No.:	Drawing Number:
Date: 01/26/12	**M-300.00**
Scale: NTS	
Drawn by: JA	Approved by:
Sheet #:	of

LEGEND

27	Undervoltage Relay
32R	Reverse Power Relay
42	Contactor
47	Phase Unbalance
50	Instantaneous Overcurrent
51	Time Overcurrent
52	AC Circuit Breaker
59	Overvoltage Relay
81 U/O	Under/Over Frequency Relay
89S	Line Switch
89L	Lockable Load Break Switch
	Circuit Breaker (Drawout)
	Circuit Breaker (Fixed Mount)
	Puller-head Fuse
	Fused Disconnect
	Twin Fused Disconnect
AS/AF	Amp Switch/Amp Fuse (Fused disconnect)
AF/AT	Amp Frame/Amp Trip (Circuit Breaker)
	Contactor
Ⓒ	Contactor Coil
Ⓞ	Open
Ⓜ	Metering Device
UVR	Undervoltage Release
CC	Close Coil
K—K	Key Interlock
N.O.	Normally Open
N.C.	Normally Close
O.O.S.	Out Of Service
	Inverter
	Cloud Indicates Proposed New Work
	Reactor



NOT FOR CONSTRUCTION

NOTES:
1. THIS PROJECT INSTALL TWO NEW 100 kW CHP MODULES AND ALL NECESSARY EQUIPMENT TO PROVIDE PARALLEL OPERATION WITH CON EDISON AND ISOLATED OPERATION IN THE EVENT OF A UTILITY OUTAGE.
2. ALL FUSES INDICATED WILL PROVIDE SELECTIVE COORDINATION, AND HAVE 200 kAIC RATING.
3. THE GENERATORS ARE TO BE INSTALLED IN ACCORDANCE WITH NEW YORK STATE STANDARD INTERCONNECTION REQUIREMENTS AND CON ED EO-2115. GENERATOR MAY RUN DURING UTILITY OUTAGE ONLY AFTER 52IT-1 IS IN THE OPEN POSITION.
4. UNLESS NOTED, ALL EQUIPMENT IS EXISTING, AND WILL REMAIN IN USE AND IS PREVIOUSLY APPROVED.
5. ALL ELECTRICAL CONSTRUCTION TO BE IN COMPLIANCE WITH 2008 NEC, AS AMENDED BY THE NYC DOB.
6. BOND XO BUSHING TO SERVICE ENTRANCE THROUGH NEUTRAL CONDUCTOR, DO NOT GROUND AT TRANSFORMER.
7. CABLE TAPS AND FUSING TO BE IN ACCORDANCE WITH SECTION 240 NFPA 70 (NEC).
8. TRANSFER LOAD, AS REQUIRED BY OWNER, TO PANEL EM.
9. REFER TO DRAWING E-1.0E FOR OPERATION DURING CON EDISON OUTAGE.

DSM Engineering Associates P.C.
1363-26 Veterans Memorial Highway
Hauppauge, NY. 11788

Rev No.	Date:	Description	By:
0	02/02/12	ISSUE FOR REVIEW AND COMMENTS	-

IT IS A VIOLATION OF PROFESSIONAL ENGINEERING LAW TO ALTER ANY ITEM IN ANY WAY CONTAINED ON THIS DRAWING, UNLESS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER.

PE STAMP/SEAL

ONE-LINE DIAGRAM
GEORGETOWN PLAZA
200 kW DISTRIBUTED GENERATION
60 EAST 8th STREET
NEW YORK, NY

CSA ENGINEERING SERVICES, LLC
15 TROWBRIDGE DRIVE, BETHEL, CT 06801
PHONE: (203) 798-0419 FAX: (203) 743-2325

Drawn By:	Scale:	
KT	NONE	E-1.0

InVerde® 100

Features & Benefits

- *100 kW Continuous/125 kW Peaking*
- *Standardized Interconnection*
- *Black-Start Grid-Independent Operation*
- *Microgrid compatible with licensed CERTS[1] power balancing control software*
- *Premium Quality Wave Form, Voltage and Power Factor for Special Applications (e.g. computer server farms or precision instrumentation)*
- *Power Boost for Demand-Side Response*
- *Enhanced Efficiency from Variable Speed Operation*
- *Simplified Inter-Unit Controls for either Mode of Operation (parallel or standby)*
- *ETL Listed - Labeled for compliance with UL 1741 - Utility Interactive; Inverters, Converters, Controllers and Interconnection System Equipment for Use with Distributed Energy Resources*
- ***Renewable Energy Compatible, a Clean Energy Solution for Today and Tomorrow***

[1]CERTS - Consortium for Electric Reliability Technology Solutions

UL 1741
Compliant

NYSIR
Certified

TECOGEN, Inc.

- Over 25 years experience in packaged cogeneration, chillers and refrigeration systems
- More than 1,400 operating units in the field
- Extensive service network with factory-trained technicians exclusively servicing Tecogen products

Tecogen products are covered under one or more of the following U.S. patents: 8,578,704 · 7,239,034 · 7,243,017 and other patents pending

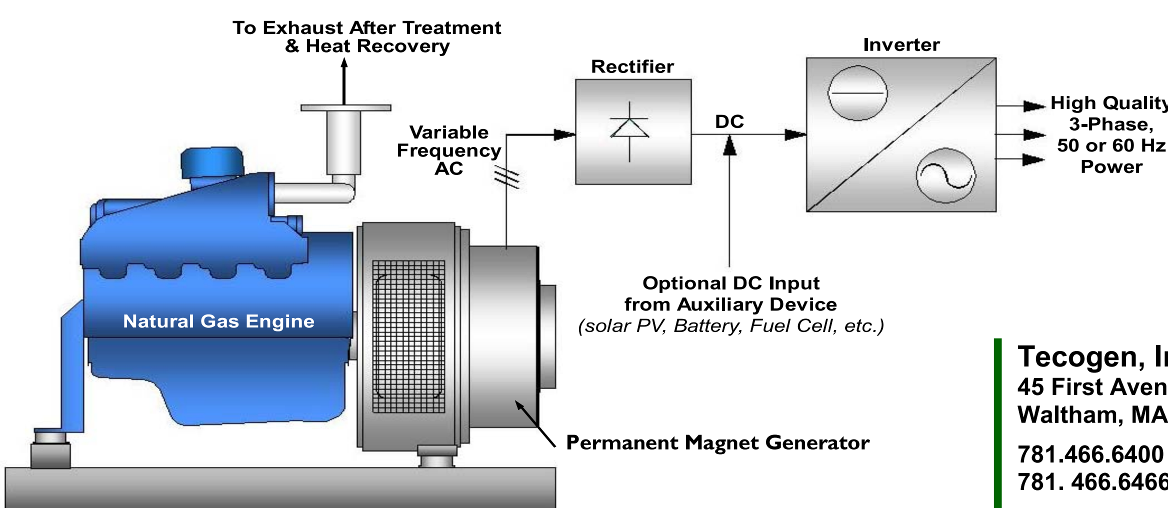
Specifications: [1]

Engine	*Proven Low-Emission Natural Gas V-8 Engine, 454 cid, 1000-3000 rpm*
Generator	*Water-Cooled Permanent Magnet Generator*
Inverter	*Customized Power Electronics with Patented Topology for Variable Speed and Standby Operation*
Controls	*TecoNet™ Microprocessor-Based System, Fully Automatic, Fault Monitoring, Lead/Lag Multiple Unit Control, Modbus Networking & Remote Telecommunications*

Electric Output	100 kW Continuous / 125 kW *Peaking* [2] 480 VAC / 3 PH / 60 Hz
Standalone Electric Capacity	125 kVA
Thermal Output **Engine** **Generator/Power Electronics**	 700,000 Btu/hr @ 230°F Max 27,000 Btu/hr @ 129°F Max
Electric Efficiency **@ LHV of 905 Btu/scf** **@ HHV of 1020 Btu/scf**	 30.4% 27.0%
System Efficiency [3] **@ LHV of 905 Btu/scf** **@ HHV of 1020 Btu/scf**	 92.9% 82.4%
Gas Input	1238 scfh 1625 scfh *Peaking*
Required Gas Pressure	10-28" wc
Hot Water **Maximum Leaving Water Temperature** **Maximum Entering Water Temperature**	30 gpm 230 °F 180 °
Air Emissions[5] • **NOx** • **CO** • **VOC**	 1.5 lb/MWh 2.0 lb/MWh 1.0 lb/MWh
Weight	3,850 lb
Dimensions	7'4"L x 4'W x 5'.9" H

ETL Listed - Labeled for compliance with UL 1741 - Utility Interactive; Inverters, Converters, Controllers and Interconnection System Equipment for Use with Distributed Energy Resources

1. *All specifications are +/- 5% and are subject to change without notice.*
2. *Peaking capacity is available for 100 hours per year only when grid connected.*
3. *Includes engine heat recovery only (not generator/power electronics heat).*
4. *Above performance data is valid up to 104 °F ambient temperature*
5. *Lower emissions options are available with the use of additional catalyst material.*



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