Solar Turbines
A Caterpillar Company

SITE ACTIVITY REPORT

Customer Name	SOENERGY INTERNATIONAL INC	FE Name	Cesar Jimenez
Site Name	WEST TEXAS	W.O. Nr.	W1061439239
Contact Name	Javier Londono	W.O. Start / Finish	9/23/2019 to 9/27/2019
PO / Contract Nr.		Report Date	10/30/2019

Package Information

PD Number	Customer Tag	Package SN	Package Hours	Package Starts	Engine SN	Engine Hours	Engine Starts
59731	UNIT 4	TG01137	24988	1332	1060T	6038	348
70741	UNIT 5	TG01951	17753	939	OHE19-T0489	10	11
unknown	DO NOT UPDATE THIS DOC. SEE COMMENTS BELOW,	TG01051	0	0	1099T	0	0

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SITE ACTIVITY REPORT

WO Number: W1061439239
Customer: SOENERGY INTERNATIONAL INC | Site: WEST TEXAS

SECTION 1 – PURPOSE OF VISIT

The purpose of this visit was to assist the customer with the engine exchange of the TG01951 Unit.

SECTION 2 – SUMMARY OF VISIT

During this visit, the old engine was removed and new engine was installed along with all necessary new components. Enclosure had to be opened from the top to do this and reconstructed to test it.

SECTION 3 – RECOMMENDATIONS

This is only related to the engine exchange all work after the new engine was installed was directed by FSR James Kroll, refer to his report.

SECTION 4 – ACTION ITEMS

Created Date	Due Date	Package S/N	Description	Responsible Party	Status

SECTION 5 – TASK SUMMARY

Customer Tag: UNIT 5
Package S/N: TG01951

Task Name	Finish Date	Status
Alignment - Laser Method	10/30/2019	Completed
Enclosure - Doors and Panels - Remove and Install	10/30/2019	Completed
Enclosure - Utility Electrical and Lighting - Maintain	10/30/2019	Completed
Engine - Exchange - C40 C50 T60 - GS	10/30/2019	Completed
Major Component - Exchange - General Reference	10/30/2019	Completed
Upgrade - Package Instrumentation and Rewiring	10/30/2019	Completed
Vibration - Thrust Probes - Setup and Calibrate for Commissioning or Major Component Exchange	10/30/2019	Completed
Vibration System - Maintain and Troubleshoot - BN2201	10/30/2019	Completed

SECTION 6 – DAILY SITE SUMMARY

Background:

During a previous visit, Unit TG01951 was inspected and it was found to be in critical condition. Solar Engineering requested an engine exchange in order to continue supporting this unit. This report documents the engine exchange. Important to note that due to availability, the old dual-fuel SoloNOx engine had to be replaced with a gas-only SoloNOx.

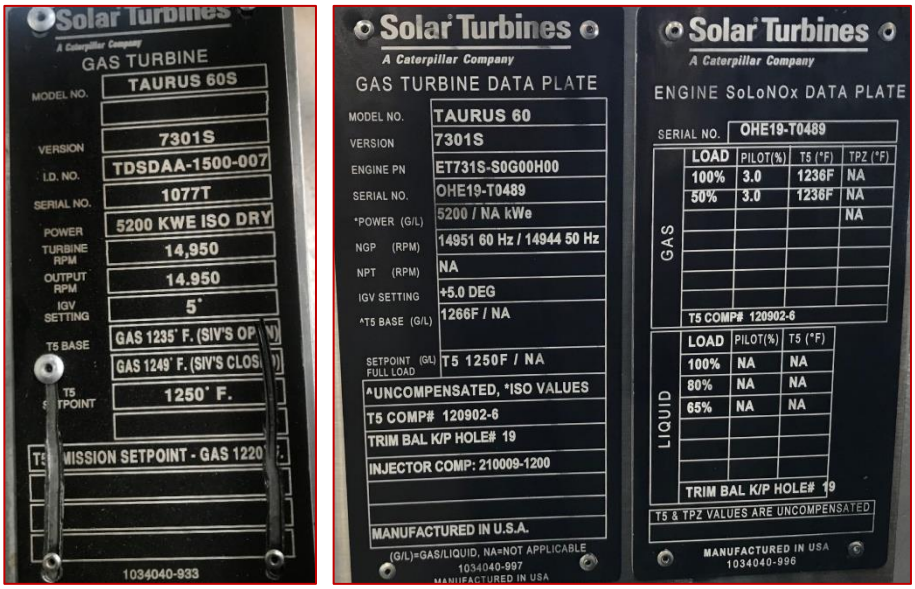

Figure 1. Engine tags of engine to be removed (left) and new engine (right).

Monday September 23, 2019

- Drove from El Paso to Houston to prepare for engine exchange the following day.

Tuesday September 24, 2019

- Engine exchange was postponed, and this was a standby day.

Wednesday September 25, 2019

- Drove to the ElectroQuip facility to meet with customer, Justin Brown, and Matt Deom.
- WHA was validated and JSA was completed.
- Trailer was already inside the building where the engine was going to be removed. Crane and lifting equipment were rated for 50 tons and certifications were up to date.
- The ceiling on the trailer needed to be removed because the engine was going to be removed from the top.
- For this the following tasks were completed:
    - Inlet collector needed to be unbolted from the bellow as shown in image. All devices connected to the ceiling also needed to be removed. These devices were secured from fixed structures ensuring all electrical lines were not affected.

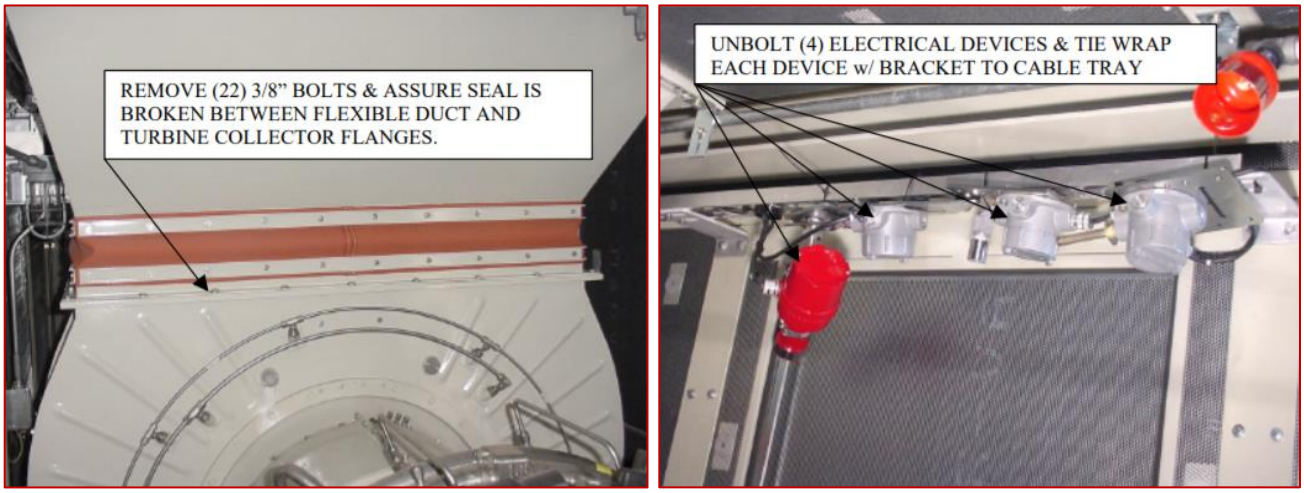

Figure 2. Enclosure internal preparations for ceiling removal.

- Ceiling bolts were removed as shown in images below.

Figure 3. Exterior preparations.

- Lastly, covers on top were removed to install eye bolts for lifting.

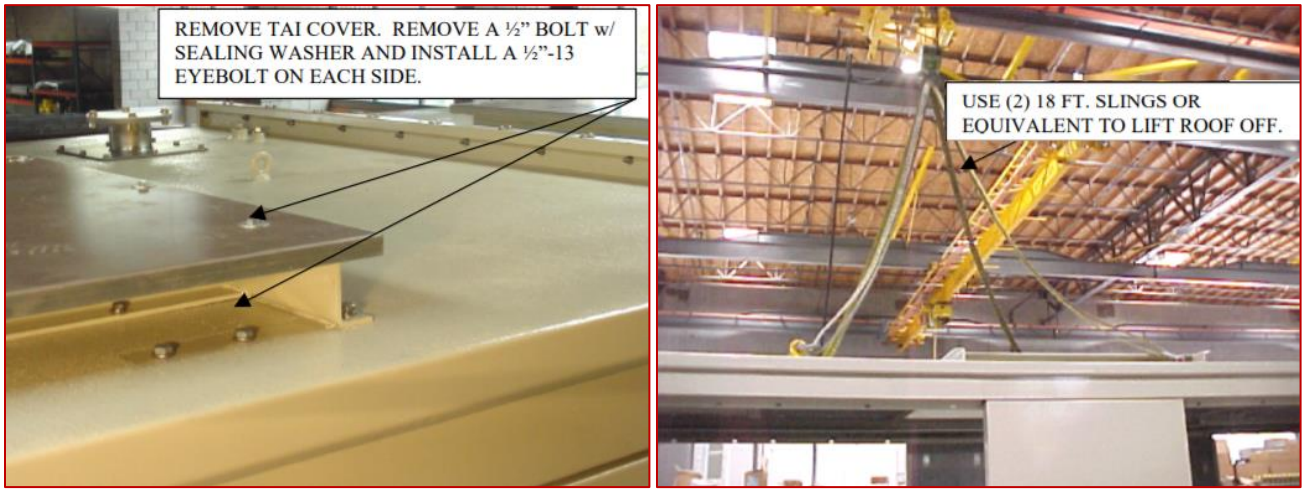

Figure 4. Ceiling lifting preparations.

- Once ceiling had been removed, engine tubing connections and electrical lines were disconnected to prepare for engine removal.
- Exhaust collector was removed to create more space for the engine removal.
- Engine was removed using field tool FT21609, shown in image, for single point lifting.

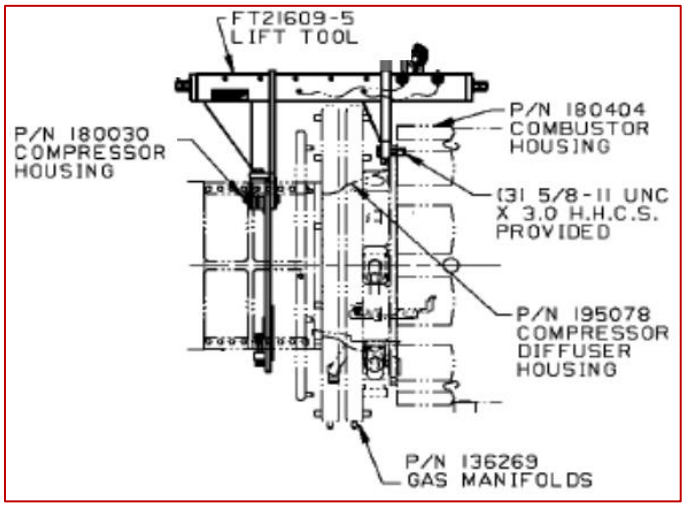

Figure 5. Engine single point lift tool, FT21609.

- Once the lifting tool had been mounted and some tensioning was applied, the engine bolts to the RGB were removed and POGO stick was loosened. Engine was then lifted out of the enclosure as shown in image.

Figure 6. Engine lifting method.

- Engine was secured on the shipping stand and all fittings were transferred to the new engine. Inlet collector was also transferred using new hardware. Mating surfaces were sealed using RTV.
- While inspecting the new engine to prepare for installation, it was realized that the new engine came with newest vibration system probes. This was going to be an issue because the unit was using the old Metrix vibration system, which was incompatible.

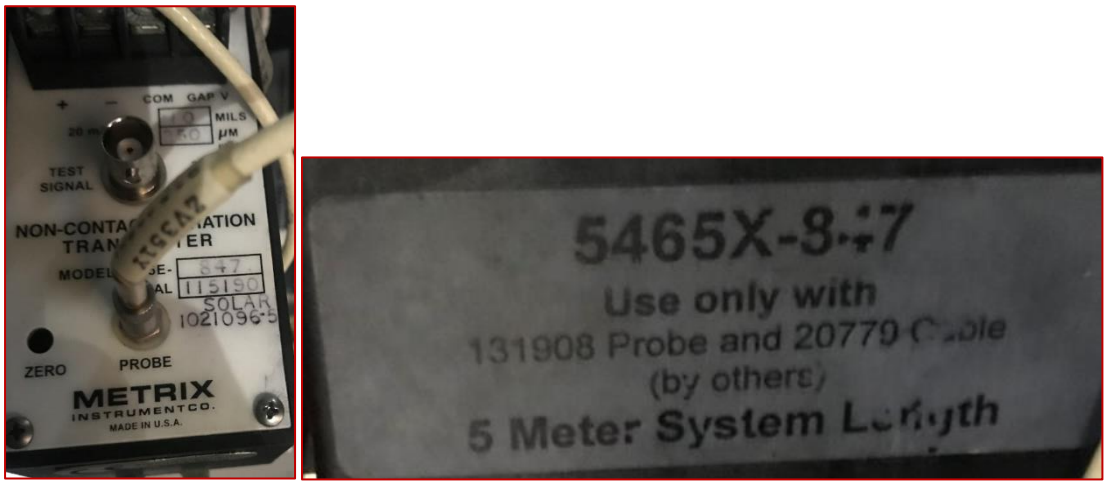

Figure 7. Old vibration system.

- According to Tech Letter TL5.4/124B. The Metrix system was obsoleted and had been displaced by a CEC vibration monitoring system. This is shown in image below.

TYPE TRANSMITTER	Old Transmitter Solar Part No. (Metrix)	Transducer (Probe) Type	System Length (meters)	Target Material	Filter Range	Range	NEW Solar Part No. (CEC)
RADIAL	1021096-1		5	4140 Steel	5-5000 Hz	0 to 5 mils	1077723-8
	1021096-2		5	Incoloy 901		0 to 10 mils	1077723-9
	1021096-3		9	4140 Steel		0 to 5 mils	1077723-10
	1021096-4		9	Incoloy 901			1077723-11
	1021096-5	7200 (note 2)	5				1077723-12
	1021096-6		9	4140 Steel	4-4000 Hz	0 to 10 mils	1077723-13
	New requirement. No old part to replace		14				1077723-14

Figure 8. Image of table from TL5.4/124B.

- After following the new part number presented here it was discovered that it had been displaced by a newer model, which is shown in image below. For the 5-meter system being used for bearing 1, the new transmitter was PN 1086387-202 with extension cable PN 190816-30. For bearings 2 and 3, the new transmitters were PN1086387-302 with extension cable PN 190816-70 (shown as 2 of each in image.

PART NO.	DESCRIPTION	QTY.	INDEX NO.
1057444-1	DWG,INSTR	1	1
1086387-202	TRANSMITTER,VIBRATION	1	
1086387-302	TRANSMITTER,VIBRATION	2	
190816-30	CABLE,VIB PROBE EXTENSION	1	
190816-70	CABLE,VIB PROBE EXTENSION	2	

Figure 9. Current vibration transmitter model used by Solar.

- With the new transmitters, some wiring modifications needed to be made because a power cable was required for the new models. This is shown in Figure 10.

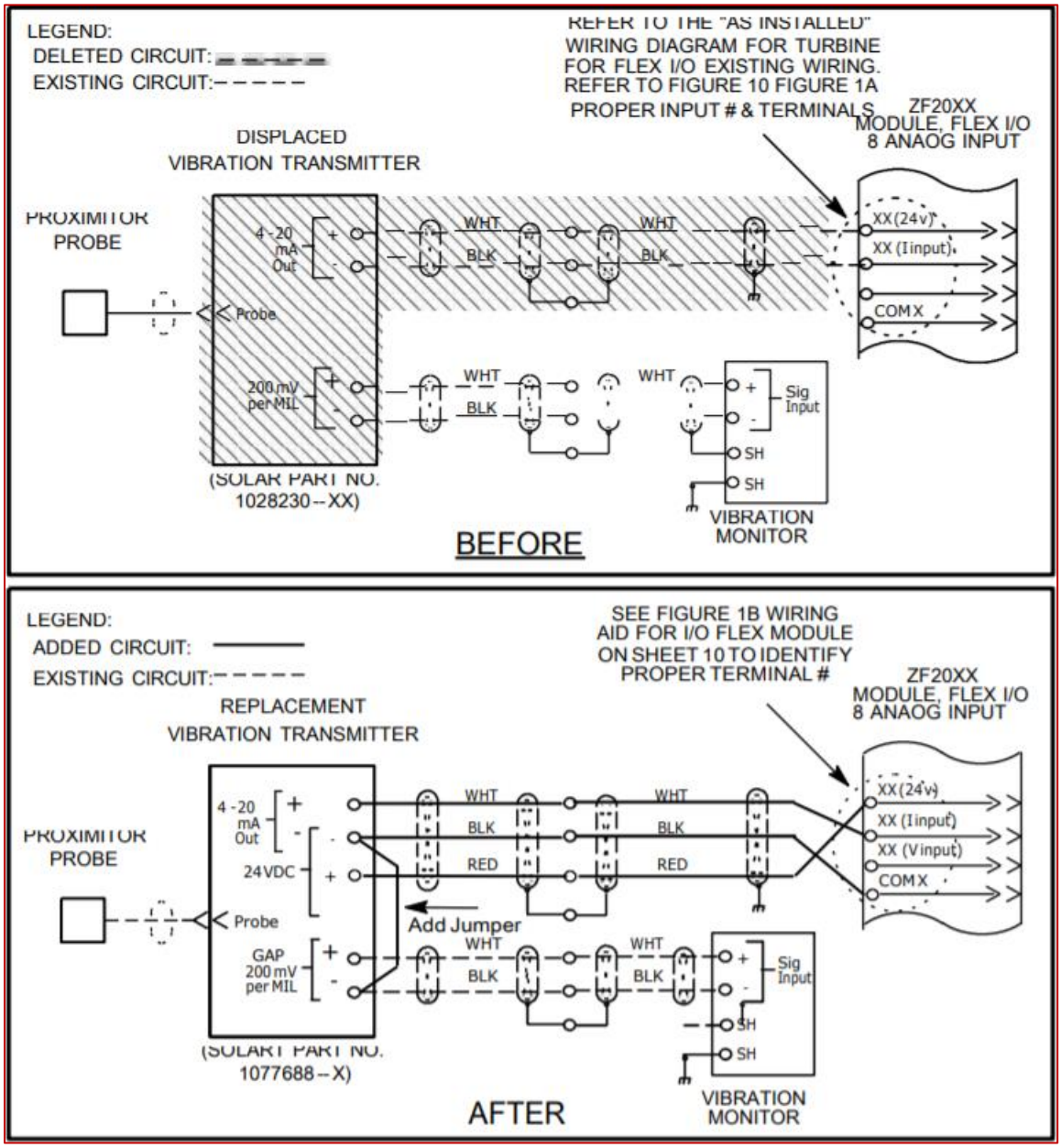

Figure 10. Wiring modifications necessary for the new vibration transmitters.

- Customer was informed about this to place an order for the new components to have them ready for installation after the new engine had been installed. These would most likely be needed in 2 days (Friday 27).
- The installation of the new engine was going to take place the following day. Working area was cleaned up and tools were gathered.

Thursday September 26, 2019

- Drove to the ElectroQuip facility to meet with customer, James Kroll, Justin Brown, and Matt Deom.
- WHA was validated and JSA was completed.
- Work on new engine installation was resumed.
- Engine lift tool was transferred to the new engine. New engine was ready to be installed.

- Crane was hooked to the new engine and after placing it under some tension the engine was unbolted from the stand.
- New O-rings in transfer tubes and RGB were installed; the transfer tubes were mounted on the RGB to ease insertion. Aft engine stand spring loading was confirmed using SB 8.0/174C.
- New engine was moved in using the same lifting method as for removal. To provide correct gear engagement between RGB and engine, the turbine blades were rotated in the engine aft since 3rd stage blades were exposed. This assisted the installation. Vibration probe, bearing temperature sensors, and speed sensor wires were guided through RGB holes as the unit was moving in. Once installed, new hardware was used to secure the engine. The aft stand was also secured.
- Engine lift tool was removed, and exhaust collector was remounted.
- Tubing and electrical sensor lines were reconnected to the engine.
- Ceiling was then reinstalled and secure using the same method as for removal. All instrumentation was remounted where they were.
- Package was left ready to be moved outside the building, where top filtration structures could be remounted for testing.
- Package with new vibration components were going to be delivered by end of day next day.
- Working area was cleaned up and tools were gathered. Project was handed over to James, who would finish the unit's commissioning. Refer to his report for alignment and startup information.

Friday September 27, 2019

- Drove from Houston to El Paso.

SECTION 7 – TIMESHEET

Summary
Contract Hours Per Day:

Date	Travel	Work	Daily Total
Monday, September 23, 2019	11	1	12
Tuesday, September 24, 2019	0	8	8
Wednesday, September 25, 2019	1	12.5	13.5
Thursday, September 26, 2019	1	13	14
Friday, September 27, 2019	11	1	12
Total	**24**	**35.5**	**59.5**

Field Employee Comments

SECTION 8 – TASK REPORTS

Customer Name	**Javier Londono**	**Date**	**10/30/2019**
Customer Email		**FE Name**	**Cesar Jimenez**
Customer Signature		**FE Signature**	

Name	Package SN	Description