WGR INSTALLATION GUIDELINES

This document contains the steps that were taken and lessons learned during the 2019 WGR installations that occurred across the Duke Fleet. This is not a comprehensive list of activities but provides guidance on some activities that are not necessarily spelled out in the fleet specification for WGR installations, but that must be completed in order to have a successful installation.

1) Have site determine analog gauges where the WGRs would provide a benefit. Below are some considerations for choosing gauges:

   - Ensure analog gauge is not on a Trip Sensitive component or in a Stay Clear Zone……or have assurance that OPS will allow installation.
   - The analog gauge must have a clean glass face. If the lens is scratched up or covered with stickers then the WGR will not work properly.
   - If the analog gauge is greater than 4.6" in diameter, the gauge glass must be tight so that it will not rotate. This is because the WGR will be affixed to the glass with double sided tape and if the glass is loose and the WGR rotates, it will not read properly.
   - The analog gauge can't have more than one needle (or we need the ability to remove one of the needles in order to have the WGR work properly).
   - The analog gauge face must be relatively clean……meaning no rust, or stickers on it that can't be removed. The WGR must be able to distinguish between the needle color and background color.
   - The needle color needs to be different than the gauge face background color. If not, we need the ability to color the needle with a Sharpie or add some tape to the needle.
   - Due to cyber security rules, we are currently unable to use the WGRs for any regulatory required readings (such as during surveillance testing). So, any analog gauge that may be used for surveillance testing (or other regulatory required readings) must be accessible so that the WGR can be removed and the analog gauge used for the official readings. (This will likely not be an issue, however, we did remove one gauge off of the original list at HNP because it was very high in the air and OPS didn't want to have to get a ladder every time they needed to remove the WGR.)
   - The WGRs are weather proof, so they can be installed outdoors (which many at HNP are).

2) Have site personnel take pictures of the chosen analog gauges. Cypress requests at least 2 pictures of each gauge (see examples below).

   a. 1 picture with a straight-on view of the gauge. Ideally this picture would also show the equipment tag of the gauge. If this isn't possible, then a separate picture showing the equipment tag will be needed.
   b. 1 picture with a ruler in front of the gauge so that the gauge diameter can be determined.
   c. For gauges that have a non-linear scale, ensure there is a close-up, straight-on picture of the gauge that clearly shows the gauge markings. This information is needed for calibration preparation.

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Pictures should be stored somewhere that is accessible to the primary contact for the vendor (either project PM, responsible eng, responsible operator, etc). These pictures must be sent to Cypress as they use them to determine what type of adapter to use and also for input into the GBC configuring that is performed at the factory prior to being shipped to the site.

NOTE: Pictures should be sent at least 4 weeks prior to installation to allow adequate time for preparation by the vendor.

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3) It is helpful to show the approximate location of each proposed WGR on a layout drawing in order to determine which GBC it should be paired with. In some cases, a new GBC may be needed. An example is shown below.
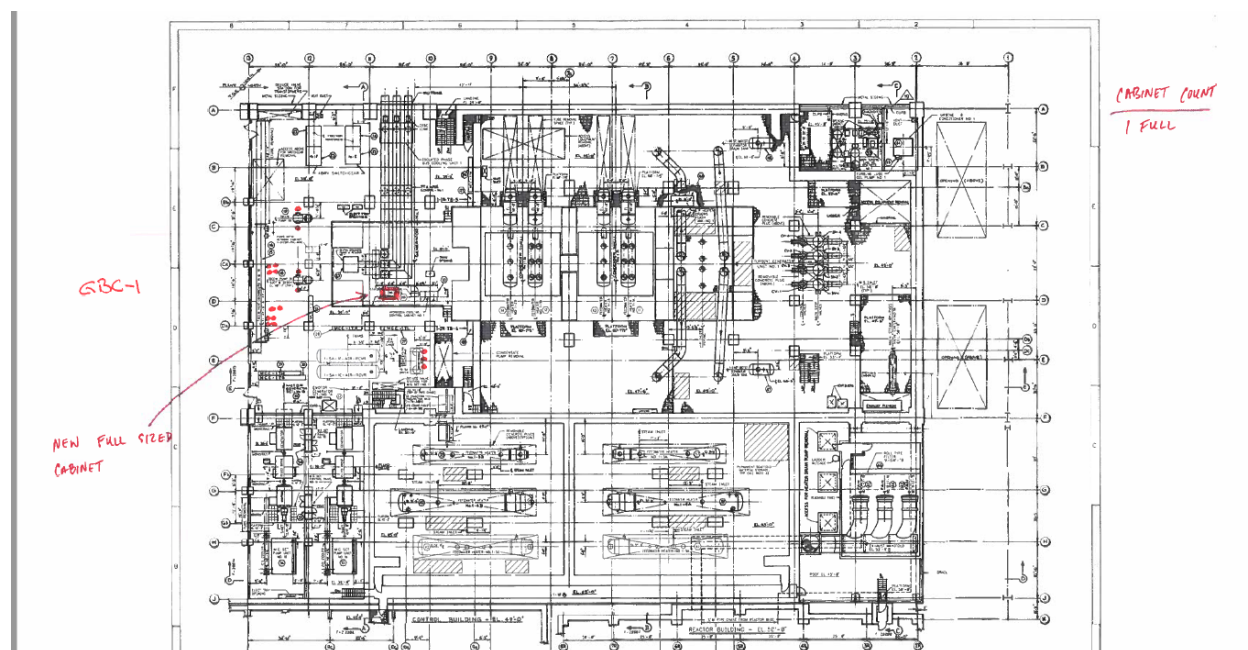
4) Determine which GBC each WGR should be paired with, including if any new GBCs/Blue Box combinations will be needed. This is usually based on experience but it may be helpful to conduct a survey with a spare GBC/Blue Box and a WGR that is paired with it.

   a. When selecting where to place a new GBC, consider that the upper temperature limit is 150°F. Do not place in an enclosure with other heat generating equipment if this temperature could be reached.

   b. For any new GBCs that are needed, assign a name using the following convention: {State abbreviation} - {Site} - {Cabinet or Location} - GBC - {Sequential Number}

      Examples: NC-HNP-GASYARD-GBC-01 or SC-ONS-U2TURB-AP12-GBC-02

   c. A listing of all currently installed GBCs, along with their respective IP addresses, is shown on Attachment 1 - Currently Installed GBCs.

5) Obtain the following network information from the Site IT Infrastructure Analyst for each new GBC. It is desired that this information be provided to Cypress as they are configuring any new GBCs. If not known, this information can be input into the GBCs later.

   • IP address
   • Subnet Mask
   • Default Gateway
   • DNS Server (preferred)
   • DNS Server (alternate)

6) Fill out info in a spreadsheet as shown on Attachment 2 - Site WGR List. Send spreadsheet to Cypress so they can configure the GBCs with the appropriate WGR info. If already known, send the network information for the GBCs that was gathered previously also.

NOTE: Spreadsheet should be sent at least 4 weeks prior to installation to allow adequate time for preparation by the vendor.

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7) Once Cypress configures any new GBC it will be sent to the MNS Island in order to be scanned. This scanning is required prior to connecting the GBC to the Duke business network. The scanning is performed by David Arndt's group.

   a. Note, an alternate form of scanning is being investigated and this step may change in the future.

8) Obtain the following information for the GBCs. This information is needed in order to update the "WGR Hardware Asset Inventory List" that is maintained by the IMAC group. Send this information to Wayne Lee and Adam Flora when compiled.

• Type and Model	• IP Address
• Serial Number	• MAC Address
• Physical Location (site, building, room/column line)	• User Name
• Host Name	• Date Device Was Scanned

9) Once new GBCs are verified to be clean they can be shipped to the respective site.

10) GBCs and Blue Boxes (or Gateways) can be installed once they arrive at the site.

11) WGRs and adapters will be shipped from Cypress directly to the respective site.

12) During the WGR installations, it is recommended to have a utility cart available to carry the WGRs, spare adapters, cleaning wipes, tools, etc. Ideally there would be at least one cart per unit.

13) Installation of the WGRs is performed by connecting the WGR to the appropriate analog gauge by using the most suitable adapter, or either affixing it to the gauge glass with double-sided tape. Once a WGR is installed then it must be calibrated. The calibration is performed by Cypress personnel at this point.

14) For WGRs that are being paired with an existing GBC, Cypress personnel will generate the security key that is necessary for this step. (Working with IT on a process for how to accomplish this……additional details to follow.)

15) Once all WGRs are installed, calibrated, and communicating with the Blue Boxes and GBCs, then perform a functional to ensure that the readings are consistent from the analog gauge all the way through the system to the GBC web application. A spreadsheet similar to Attachment 3 - Functional Sheet should be used to document this.

16) Inform all appropriate stakeholders that WGRs are installed and reading correctly. At this point in time, the data is not yet being passed to the OSI/PI servers, but the WGRs can be read locally.

17) Once all WGRs are verified to be reading correctly and transmitting data through the Blue Boxes and GBCs correctly, the OSI/PI interface needs to be set up. Fill out the information as shown in Attachment 4 - OSI/PI Tag Info, and forward to Nakib Hassan and Matthew Surles. The information can be determined as follows:

   a. Name: {SiteUnit}.{Equipment ID}.WGR.IMAC
   b. Instrument Tag: WGR{Part of Node ID from GBC Web Application}_{Another part of Node ID}.OPC.WGRReading

A couple of examples follow.

- Example for the 1A CW Pump Discharge Pressure at HNP (PI-01CW-1930A):
    o Using IP address for GBC-04 at HNP from Attachment 1, call up the GBC web application (shown below).
    o Name is: HNPU1.PI01CW1930A.WGR.IMAC
    o Instrument Tag is: WGR4001_0.OPC.WGRReading

NC-HNP-CWINTAKE-GBC-04

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Readings	Graph	Table	Alarm History	Status	Configuration	Site Settings	Help

Export | Alarm Status

WGR Readings: 3 Items

Timestamp	NodeID	Description	Reading	Units	LCL	UCL	Status
01/14/2020 08:25:49	3/1/4001/0/0/0	PI-01CW-1930A: CW Pump 1A Disch	28.6	PSI	0	100	OK
01/14/2020 08:26:48	3/1/4002/0/0/0	PI-01CW-1930B: CW Pump 1B Disch	28.6	PSI	0	100	OK
01/14/2020 08:27:50	3/1/4003/0/0/0	PI-01CW-1930C: CW Pump 1C Disch	18.9	PSI	0	100	OK

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- Example for the ONS Unit 1 Main Turbine Oil Tank Level (1TO-LG-0001):
  - Using IP address for GBC-01 at ONS from Attachment 1, call up the GBC web application (shown below).
  - Name is: ONSU1.1TOLG0001.WGR.IMAC
  - Instrument Tag is: WGR1003_1.OPC.WGRReading

18) Inform all appropriate stakeholders that WGR data is now being passed to the OSI/PI servers. Due to the naming convention used, the WGR data points can be easily found in PI Processbook by searching using "WGR*IMAC" in the Tag Mask field as shown below. This example is for HNP.

Attachment 1
Currently Installed GBCs

Site	GBC Name	IP Address
BNP	NC-BNP-U1TURB-45-GBC-01	10.5.121.185
	NC-BNP-U1TURB-20-GBC-02	10.5.121.186
	NC-BNP-U2TURB-45-GBC-04	10.5.123.185
	NC-BNP-U2TURB-20-GBC-05	10.5.123.186
	NC-BNP-U2TURB-EHC-GBC-06	10.5.123.187
CNS	SC-CNS-U1TURB-594-GBC-01	10.180.33.249
	SC-CNS-U1TURB-568-GBC-02	10.180.33.251
	SC-CNS-U2TURB-594-GBC-03	10.180.33.247
	SC-CNS-U2TURB-568-GBC-04	10.180.33.248
	SC-CNS-U1YARD-IAE-GBC-05	148.134.212.43
HNP	NC-HNP-GASYARD-GBC-01	10.6.105.234
	NC-HNP-U1TURB-314-GBC-02	10.6.111.230
	NC-HNP-U1TURB-261-GBC-03	10.6.111.229
	NC-HNP-CWINTAKE-GBC-04	10.6.137.243
MNS	NC-MNS-U1TURB-CAB003-GBC-02	10.178.41.32
	NC-MNS-U1TURB-CAB032-GBC-03	10.178.41.33
	NC-MNS-U2TURB-CAB004-GBC-04	10.178.42.31
	NC-MNS-U2TURB-CAB033-GBC-05	10.178.42.32
ONS	SC-ONS-U1TURB-AP04-GBC-01	10.182.73.4
	SC-ONS-U2TURB-AP12-GBC-02	10.182.73.12
	SC-ONS-U3TURB-AP13-GBC-03	10.182.73.13
RNP	SC-RNP-U2TURB-FB10-GBC-01	10.7.111.141
	SC-RNP-U2TURB-FB10-GBC-02	10.7.111.142

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Attachment 2
SITE WGR LIST

	Location	Equipment ID	Description	Lollipop Gauge?	Seismic?	Safety Related?	CSAT Concern?	Gauge diameter	Gauge Min Reading	Gauge Max Reading	Gauge Units (psi, gpm, etc)	GBC Name	Notes
	{Site} - WGR List												
1													
2													
3													

Note: The yellow highlighted info is what vendor needs in order to properly configure the WGRs and any new GBCs that may be needed.

Example spreadsheet with info filled out:

	Location	Equipment ID	Description	Lollipop Gauge?	Seismic?	Safety Related?	CSAT Concern?	Gauge diameter	Gauge Min Reading	Gauge Max Reading	Gauge Units (psi, gpm, etc)	GBC Name	Notes
	BNP - WGR List												
1	TB2 EL040 NN E/14	2-TCC-PI-550	TBCCW PMP 2A SUCT PRESS IND	Y	N	N	N	5"	0	60	psi	GBC-04	
2	TB2 EL020 EE G/21	2-COD-PI-33	COND STR PUMP 2B SUCTION HDR PRESS	N	N	N	N	5"	0	600	psi	GBC-05	
3													

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Attachment 3
FUNCTIONAL SHEET

	{Site} - Functional Sheet						
	Location	Equipment ID	Description	Time	Analog Gauge Reading	WGR Reading	Web App Reading	Notes
1								
2								
3								
4								
5								

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Attachment 4
OSI/PI TAG INFO

	{Site} - OSI/PI Tag Info				
	Name	Equipment ID	Description	Gauge Units (psi, gpm, etc)	Instrument Tag (Cypress OP tag, if avail)
1					
2					
3					

Example:

	BNP - OSI/PI Tag Info				
	Name	Equipment ID	Description	Gauge Units (psi, gpm, etc)	Instrument Tag (Cypress OP tag, if avail)
1	BNPU1.1CODPI34.WGR.IMAC	1-COD-PI-34	COND BSTR PMP 1C SUCTION HDR PRESS	psi	WGR2001_0.OPC.WGRReading
2	BNPU1.1CODPI36.WGR.IMAC	1-COD-PI-36	COND BSTR PMP 1B DISCHARGE HDR PRESS	psi	WGR2002_0.OPC.WGRReading
3	BNPU1.1CODPI37.WGR.IMAC	1-COD-PI-37	COND BSTR PMP 1C DISCHARGE HDR PRESS	psi	WGR2003_0.OPC.WGRReading
4	BNPU1.1CODPI33.WGR.IMAC	1-COD-PI-33	COND BSTR PMP 1B SUCTION HDR PRESS	psi	WGR2005_0.OPC.WGRReading
5	BNPU1.1HDPI96.WGR.IMAC	1-HD-PI-96	HTR DRN PMP A SUCTION PRESS IND	psi	WGR2007_0.OPC.WGRReading