TECHNICAL PRESENTATION ON PPUC NEW RADIATOR SYSTEM

TOPIC: CONVERSION OF COOLING TOWER SYSTEM OF NIIGATA ENGINES INTO A RADIATOR SYSTEM

Speaker: Engr. Tito Cabunagan
PGD Manager
PPUC

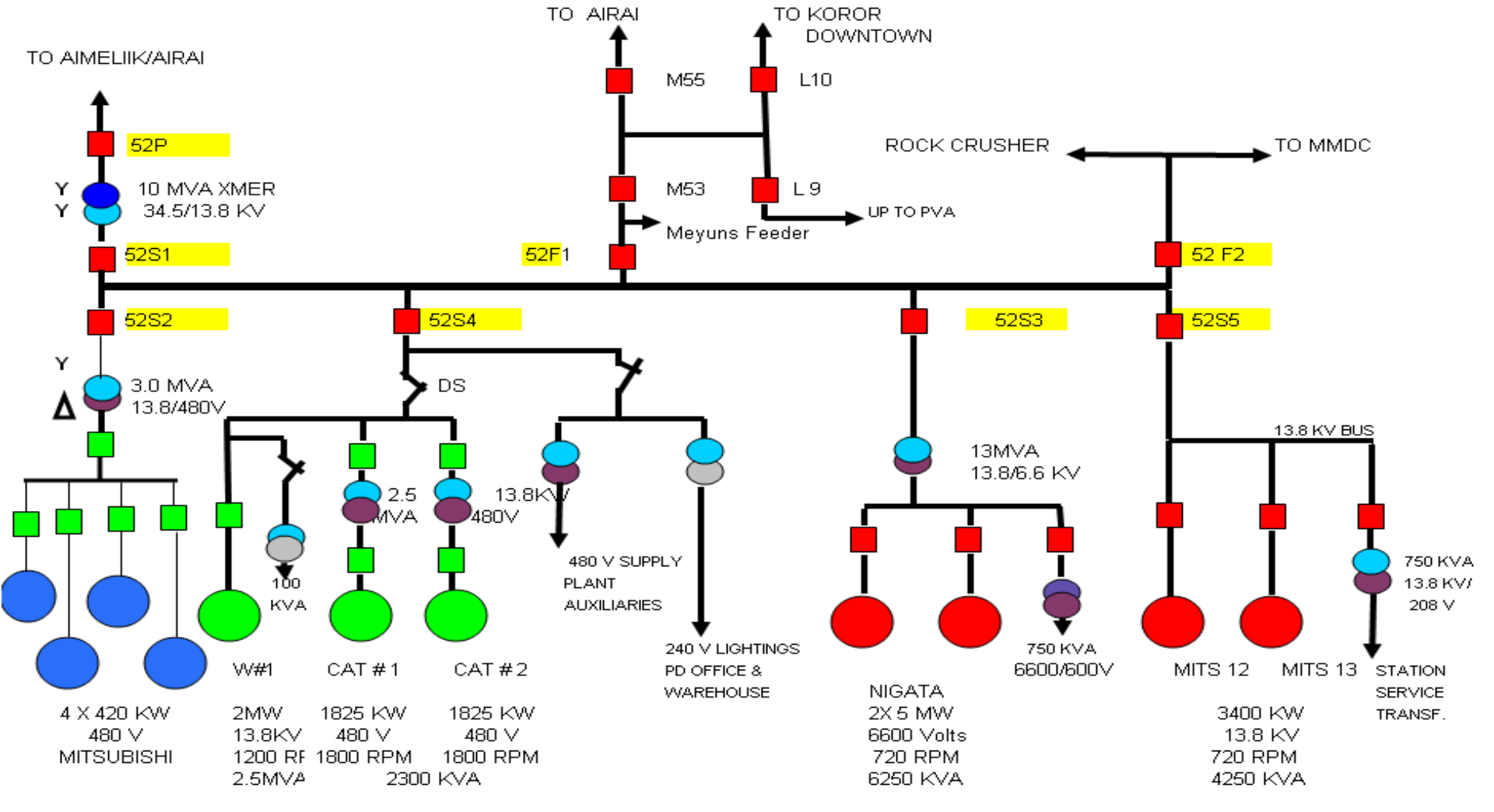
Background:

PPUC has a total installed capacity of 34.8 MW with 24.8 MW coming from Malakal Power Station and 10.0 MW from the newly constructed Aimeliik Power Station which was donated by the Japan Government.

The peak load of 12.0 MW for the main island of Koror and Babeldaob. The main Transmission line that links the two major power plants is rated at 34.5 KV while the main Distribution lines is rated at 13.8 KV.

ONE LINE DIAGRAM OF MALAKAL

MALAKAL POWER PLANT SINGLE LINE DIAGRAM-NEW



MALAKAL POWER STATION

MALAKAL POWER STATION

MALAKAL POWER STATION has the following units installed with their corresponding present capacity:

Nigata 14	–	5.0 MW	-	2011
Nigata 15	–	5.0 MW	-	2011
Mitsubishi 12	–	3.4 MW	-	1997
Mitsubishi 13	–	3.4 MW	-	1997
Wartsila	–	2.0 MW	-	1996
CAT 1	–	2.0 MW	-	2007
CAT 2	–	2.0 MW	-	2007
Mitsubishi 16	–	0.5 MW	-	2013
Mitsubishi 17	–	0.5 MW	-	2013
Mitsubishi 18	–	0.5 MW	-	2013
Mitsubishi 19	–	0.5 MW	-	2013

TOTAL		24.8 MW		

MALAKAL POWER STATION derated capacity:

Nigata 14	–	5.0 MW	-	2011
Nigata 15	–	5.0 MW	-	2011
Mitsubishi 12	–	2.5 MW	-	1997
Mitsubishi 13	–	2.8 MW	-	1997
Wartsila	–	1.2 MW	-	1996
CAT 1	–	1.2 MW	-	2007
CAT 2	–	1.2 MW	-	2007
Mitsubishi 16	–	0.5 MW	-	2013
Mitsubishi 17	–	0.5 MW	-	2013
Mitsubishi 18	–	0.5 MW	-	2013
Mitsubishi 19	–	0.5 MW	-	2013

TOTAL		20.9 MW		

NIGATA 14 & 15 – 5.0 MW each

COOLING TOWER FOR NIIGATA 14 & 15

TECHNICAL SPECIFICATIONS:

COOLING TOWER

MADE: KUKEN COOLING TOWER

COOLING PERFORMANCE:

INLET TEMPERATURE – 40.0 DEG C.

OUTLET TEMPERATURE – 35.0 DEG C.

VOLUME OF WATER CONSUMPTION;

PER DAY	-	35,000.00 GALS
PER MONTH	-	1,050,000.00 GALS

TECHNICAL SPECIFICATIONS:

RADIATOR:

CAPACITY – CW = 215 cu.m./hr

JW=100 cu.m/hr

Lube Oil = 110 cu.m./hr

COOLING PERFORMANCE – CW= 48.8 – 45 deg.C

JW= 92.5-77.6 deg. C

LO = 69.1-55 deg C

VOLUME OF WATER- CW= 106 gals/bay;

JW=96 gals/bay

LO = 111 gals/bay

PROJECT CONCEPT:

1. MINOR REVISION ON THE PIPING SYSTEMS.
2. THE CONSTRUCTION WILL BE ONE ENGINE AT A TIME INORDER NOT TO AFFECT THE PLANT AVAILABILITY.

AUXILIARIES OF NIIGATA 14 & 15

BRAND OF NEW RADIATOR FOR NIIGATA 14 & 15

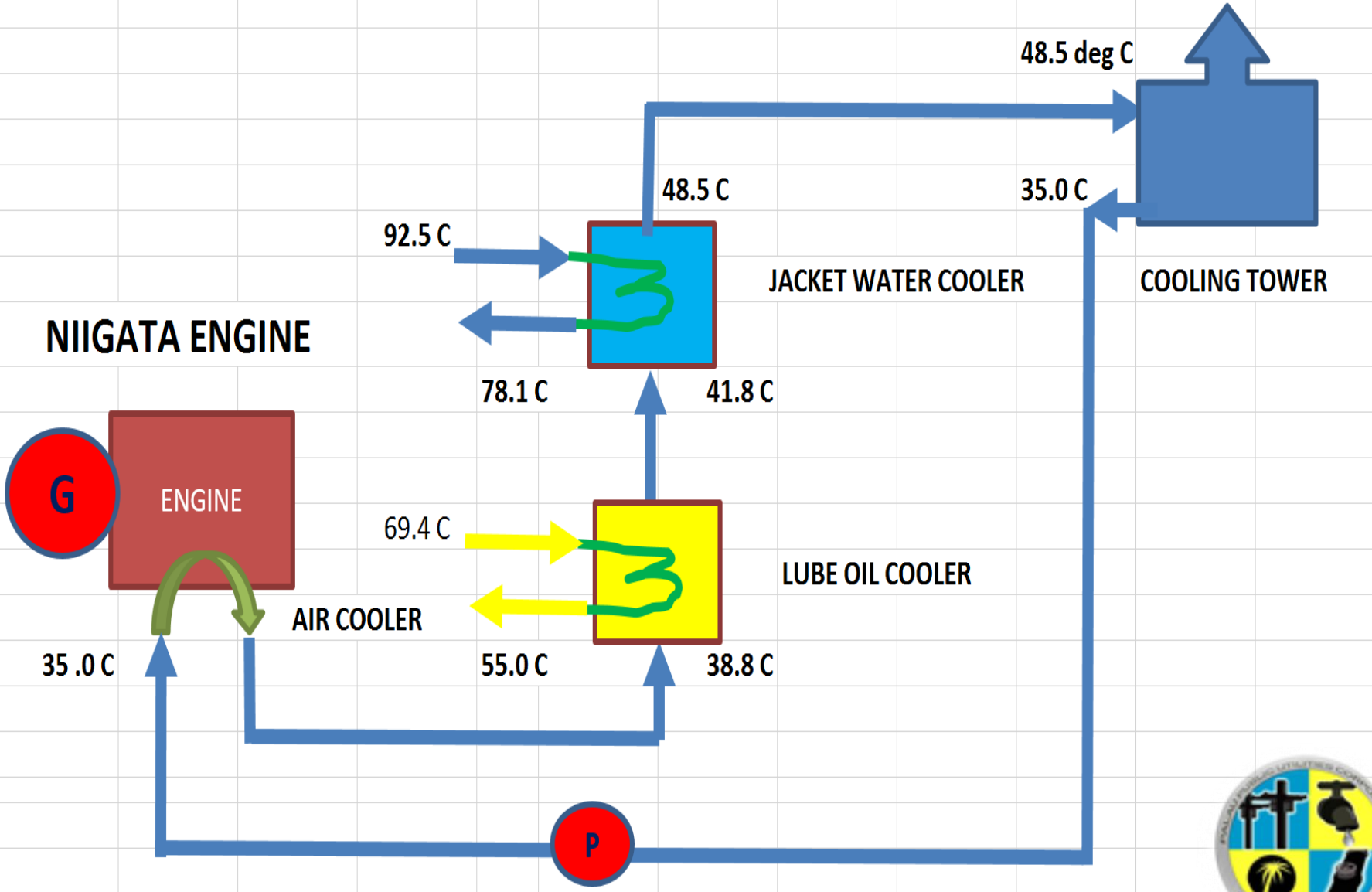
ECODYNE

UET SWITZERLAND Inc.

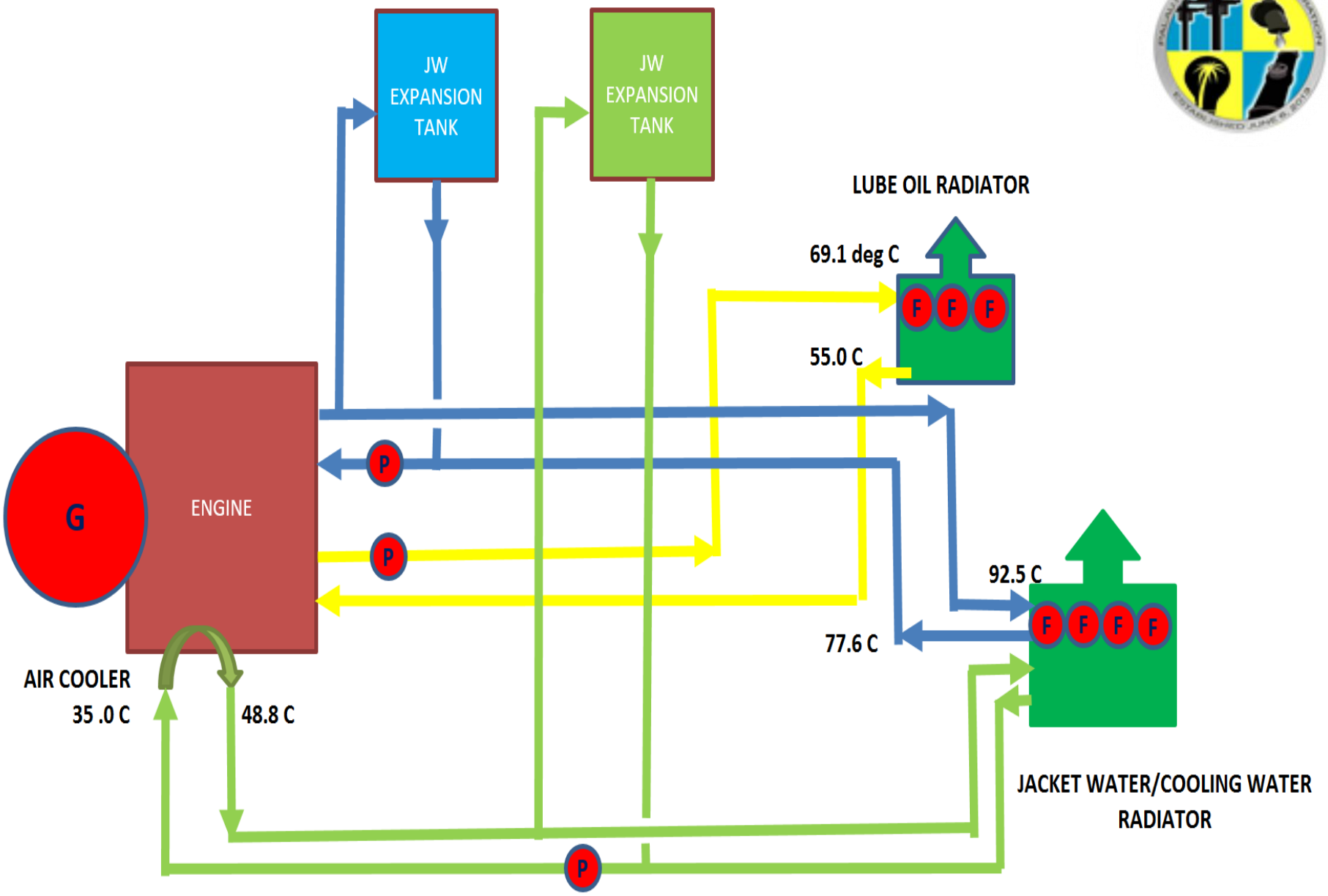
NEW RADIATOR FOR NIIGATA 14 & 15

ACTUAL DESIGN OF THE NEW RADIATOR FOR NIIGATA 14 & 15

FLOW DIAGRAM OF COOLING TOWER SYSTEM



MODIFICATION WORKS



BENEFITS OF NEW RADIATOR FOR NIIGATA ENGINES:

1. MINIMIZE WATER CONSUMPTION
2. NIIGATA OPERATIONS WILL NOT BE AFFECTED BY DROUGHT AS EXPERIENCED IN FEBRUARY – MAY 2016.
3. LESS MAINTENANCE AS WE ARE CLEANING THE COOLING TOWER EVERY MONTH.

BENEFITS OF NEW RADIATOR FOR NIIGATA ENGINES:

TECHNICAL ASPECTS:

Malakal power station comprises of 11 operational units with two Niigatas rated at 5.0 MW each as the base load. These two Niigata units utilizes the cooling tower for its cooling water system. PPUC encountered a severe drought from February to May 2016 wherein the two Niigata engines were put to into an emergency/standby condition. With this kind of operation, the plant efficiency and reliability were affected as we are obliged to run the smaller and lower efficiency engines.

BENEFITS OF NEW RADIATOR FOR NIIGATA ENGINES:

Approach:

First to be constructed is the new radiator foundation of Niigata # 15 engine followed by t he demolition of its cooling tower system structures. The new radiator system will be constructed and assembled one at a time. This will allow the remaining unit to run in parallel with two Mitsubishi units in Aimeliik Power Station. The first cooling tower to be dismantled is the one serving the cooling system of Niigata # 15 and followed by Niigata # 14. Both units are expected to run on the new radiator system by the end of August 2017.

BENEFITS OF NEW RADIATOR FOR NIIGATA ENGINES:

Findings or Results:

Radiator cooling system is most effective and ideal for Island countries especially Palau where water supply is a big problem during a period of dry spell.

The radiator system made from Ecodyne guarantee's the efficient cooling and will never affect the capacity of both Niigata engines.

BENEFITS OF NEW RADIATOR FOR NIIGATA ENGINES:

Conclusion:

Maintenance wise, the plant could save man hours from monthly servicing/cleaning of cooling towers and thus these man-hours will be diverted to other maintenance activities and improved as well as maintain the power station.

PROJECT COMMENCEMENT:

1. DECEMBER 25, 2013 – NIIGATA SUBMITTED PROPOSAL TO PPUC.
1. NOVEMBER 5, 2014 – NIIGATA SUBMITED REVISED SCHEDULE.
2. AUGUST 19, 2016 – NIIGATA ADJUSTED FOR CONFIRMATION BY PPUC.
3. NOVEMBER 15, 2016 – MADE A SOLE SOURCE JUSTIFICATION TO NIIGATA.
4. DECEMBER 19, 2016 – NIIGATA MADE SOME ADJUSTMENT ON THE CONTRACT.
5. MARCH 15, 2017 – FINAL MEETING IN NIIGATA OFFICE IN JAPAN. FINALIZED WORK SCHEDULE

PROJECT IMPLEMENTATION:

1. MAY 20, 2017 – ARRIVAL OF NIIGATA AND TOSHIBA PERSONNEL .
2. MAY 22, 2017 – CONDUCTED MEETING WITH NIIGATA AND TOSHIBA PERSONNEL.
3. MAY 23, 2017 – KICK OFF MEETING ATTENDED BY SUB CONTRACTOR OF TOSHIBA.
4. MAY 24, 2017 – LOCAL CONTRACTOR STARTED THE FOUNDATION WORKS.
5. MAY 29, 2017 – WEEKLY MEETING WITH NIIGATA, TOSHIBA AND LOCAL CONTRACTOR.

PROJECT IMPLEMENTATION:

JUNE 2, 2017 – ON GOING DELIVERY OF PIPING MATERIALS.

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PROJECT IMPLEMENTATION:

JUNE 8, 2017 – POURING OF LEAN CONCRETE.

PROJECT IMPLEMENTATION:

JUNE 9, 2017 – POURING OF LEAN CONCRETE.

PROJECT IMPLEMENTATION:

JUNE 11, 2017 – CUTTING OF STEEL PLATES H- BEAMS FOR PIPE SUPPORTS

PROJECT IMPLEMENTATION:
JUNE 11, 2017 – CUTTING OF STEEL PLATES
H- BEAMS FOR PIPE SUPPORTS

PROJECT IMPLEMENTATION:

JUNE 12 -14 2017 – CUTTING OF STEEL PLATES H- BEAMS FOR PIPE SUPPORTS

PROJECT IMPLEMENTATION:

JUNE 15 - 16, 2017 – ASSEMBLY OF FOUNDATION REBARS

PROJECT IMPLEMENTATION:

JUNE 18, 2017 – FABRICATION OF FLUSHING TANK.

PROJECT IMPLEMENTATION:

JUNE 19 2017 – REBARS FOR THE FOUNDATION

PROJECT IMPLEMENTATION:

JUNE 20 - 22, 2017 – CONCRETING OF FOUNDATION

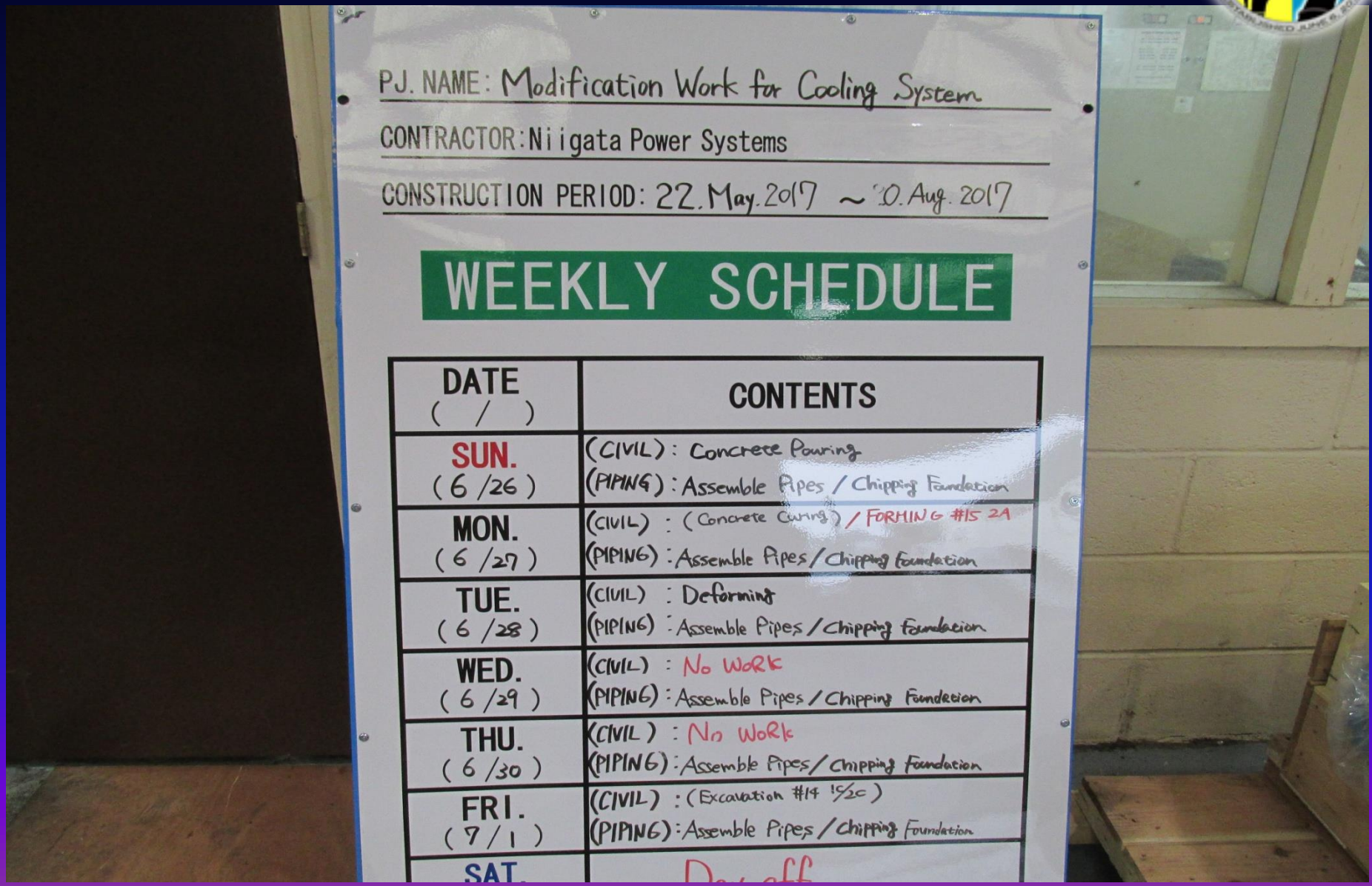
PROJECT IMPLEMENTATION:

JUNE 23, 2017 – CONCRETING OF FOUNDATION

PROJECT IMPLEMENTATION:
JUNE 25, 2017 – CONTINUE CONCRETE POURING ON FOUNDATION

PROJECT IMPLEMENTATION:
JUNE 25, 2017 – INSTALLATION OF PIPINGS

PROJECT IMPLEMENTATION:
JUNE 26, 2017 – WEEKLY SCHEDULE



PJ. NAME: Modification Work for Cooling System

CONTRACTOR: Niigata Power Systems

CONSTRUCTION PERIOD: 22. May. 2017 ~ 10. Aug. 2017

WEEKLY SCHEDULE

DATE (/)	CONTENTS
SUN. (6/26)	(CIVIL): Concrete Pouring (PIPING): Assemble Pipes / Chipping Foundation
MON. (6/27)	(CIVIL): (Concrete Curing) / FORMING #15 2A (PIPING): Assemble Pipes / Chipping Foundation
TUE. (6/28)	(CIVIL): Deforming (PIPING): Assemble Pipes / Chipping Foundation
WED. (6/29)	(CIVIL): No Work (PIPING): Assemble Pipes / Chipping Foundation
THU. (6/30)	(CIVIL): No Work (PIPING): Assemble Pipes / Chipping Foundation
FRI. (7/1)	(CIVIL): (Excavation #14 1/2C) (PIPING): Assemble Pipes / Chipping Foundation
SAT.	Day off

PROJECT IMPLEMENTATION:
JUNE 27, 2017 – REPAINTING OF PIPINGS

PROJECT IMPLEMENTATION:
JUNE 28, 2017 – REPAINTING OF PIPINGS

PROJECT IMPLEMENTATION:

1. JUNE 29, 2017 – REPAINTING OF PIPINGS

PROJECT IMPLEMENTATION:
JUNE 30, 2017 – PREPARATION OF MAIN PANEL FOR INSTALLATION

PROJECT IMPLEMENTATION:
JULY 03, 2017 – LAY OUT OF PIPINGS OUTSIDE THE PLANT.

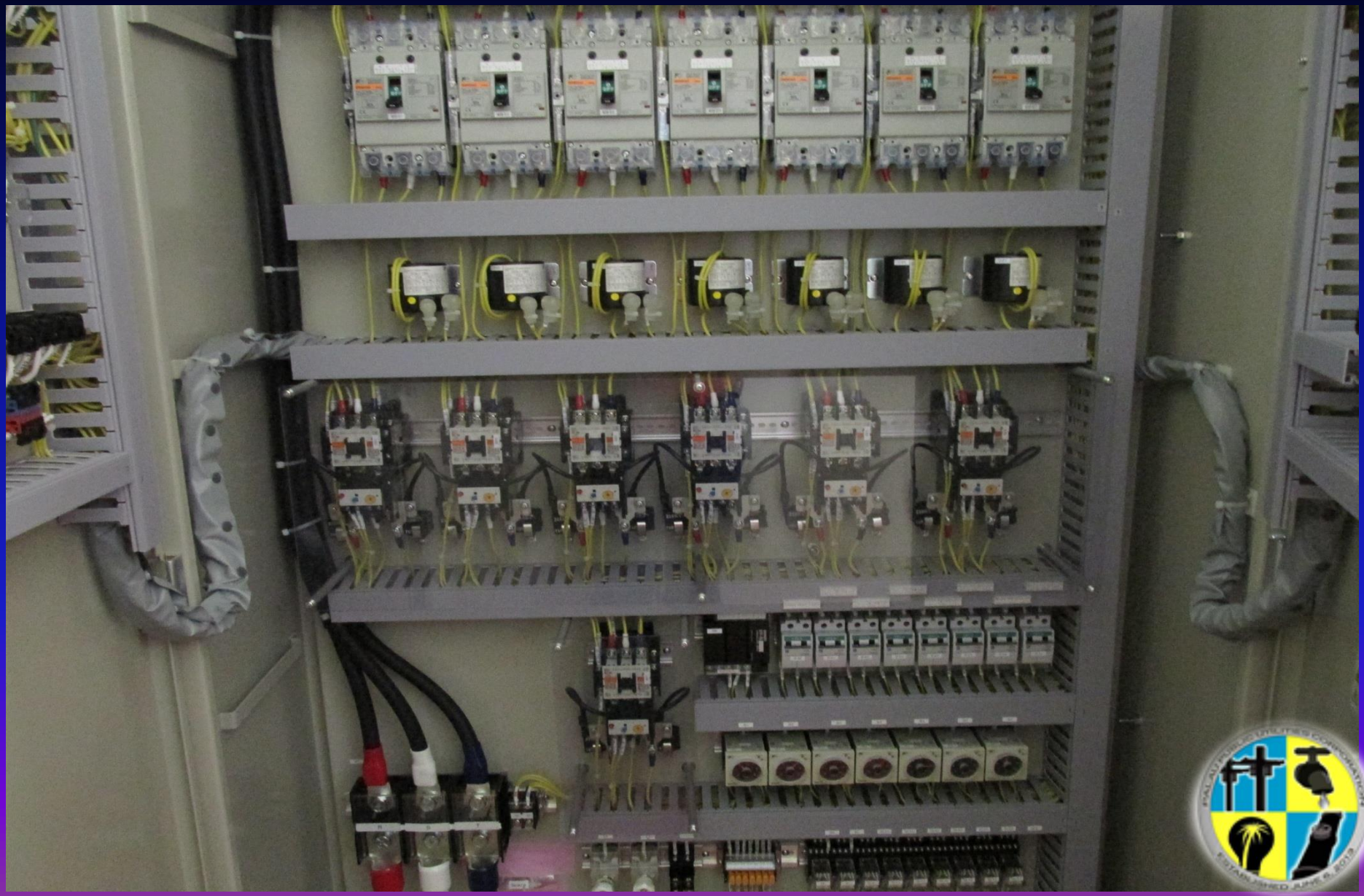
PROJECT IMPLEMENTATION:

1. JULY 03, 2017 – WEEKLY SCHEDULE

PROJECT IMPLEMENTATION:
JULY 04, 2017 – INSTALLATION OF RADIATOR CONTROL PANEL

PROJECT IMPLEMENTATION:
JULY 05, 2017 – RADIATOR CONTROL PANEL

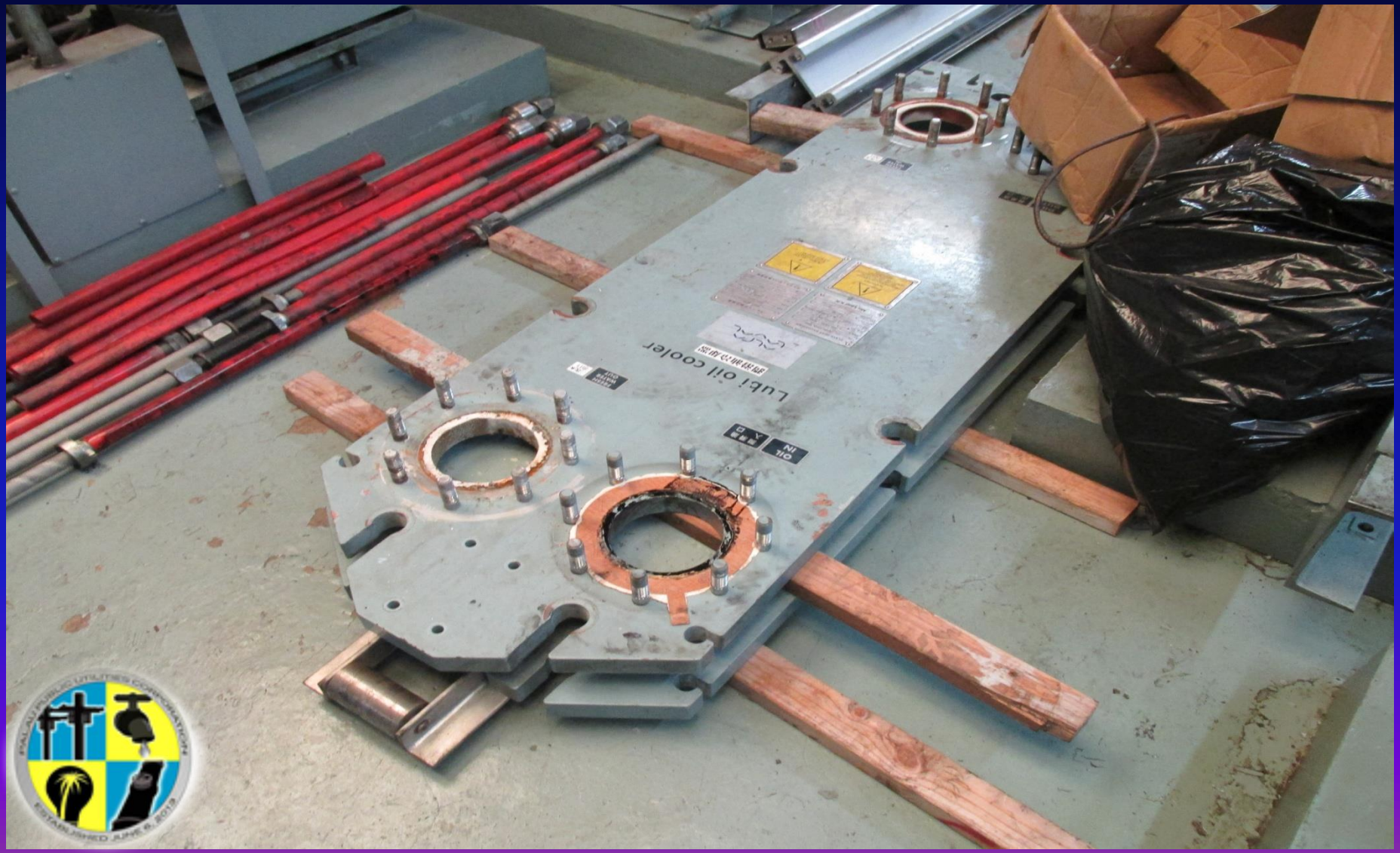
PROJECT IMPLEMENTATION:
JULY 06, 2017 – RADIATOR CONTROLLERS



PROJECT IMPLEMENTATION:
JULY 07, 2017 – REPAINTING OF PIPINGS

PROJECT IMPLEMENTATION:

JULY 09, 2017 – DISMANTLING OF LUBE OIL COOLER



PROJECT IMPLEMENTATION:
JULY 10, 2017 – UNLOADING OF THE NEW RADIATOR

PROJECT IMPLEMENTATION:

JULY 11, 2017 – CONTINUE UNLOADING OF THE NEW RADIATOR

PROJECT IMPLEMENTATION:

JULY 12, 2017 – HAULING OF THE NEWLY DISMANTLED COOLING TOWER.

PROJECT IMPLEMENTATION:

JULY 13, 2017 – DEMOLITION OF COOLING TOWER FOUNDATION

PROJECT IMPLEMENTATION:

JULY 14, 2017 – CONTINUE DEMOLITION OF COOLING TOWER FOUNDATION

PROJECT IMPLEMENTATION:

JULY 15, 2017 – ALIGNMENT AND INSTALLATION OF RADIATOR SUPPORT.

PROJECT IMPLEMENTATION:

JULY 16, 2017 – CONTINUE INSTALLATION OF RADIATOR FRAME SUPPORT

PROJECT IMPLEMENTATION:
JULY 17, 2017 – INSTALLATION OF RADIATOR

PROJECT IMPLEMENTATION:
JULY 17, 2017 – CONTINUE INSTALLATION OF RADIATOR FOR NIIGATA # 15

PROJECT IMPLEMENTATION:
JULY 18, 2017 – FINAL PIPING CONNECTION AT THE RADIATOR OF NIIGATA # 15.

PROJECT IMPLEMENTATION:

JULY 19, 2017 – CONTINUE PIPING CONNECTION AT THE RADIATOR AREA

PROJECT IMPLEMENTATION:

JULY 20, 2017 – CONTINUE PIPING CONNECTION AT THE RADIATOR AREA

PROJECT IMPLEMENTATION:

JULY 21, 2017 – OIL FLUSHING ON NEWLY INSTALLED PIPINGS.

PROJECT IMPLEMENTATION:

JULY 22, 2017 – OIL FLUSHING ON NEWLY INSTALLED PIPINGS.

PROJECT IMPLEMENTATION:
JULY 23, 2017 –WATER FLUSHING ON NEWLY INSTALLED PIPINGS.

PROJECT IMPLEMENTATION:

JULY 24, 2017 – FLUSHING OF LUBE OIL ON THE NEW RADIATOR.

PROJECT COMPLETION:

JULY 25, 2017 – COMMSSIONING OF THE NEWLY INSTALLED RADIATOR ON NIIGATA #15

2000H – DRAIN FLUSHING OIL AT THE NEW RADIATOR

2030H – MAKE – UP NEW LUBE OIL FOR THE NEW RADIATOR

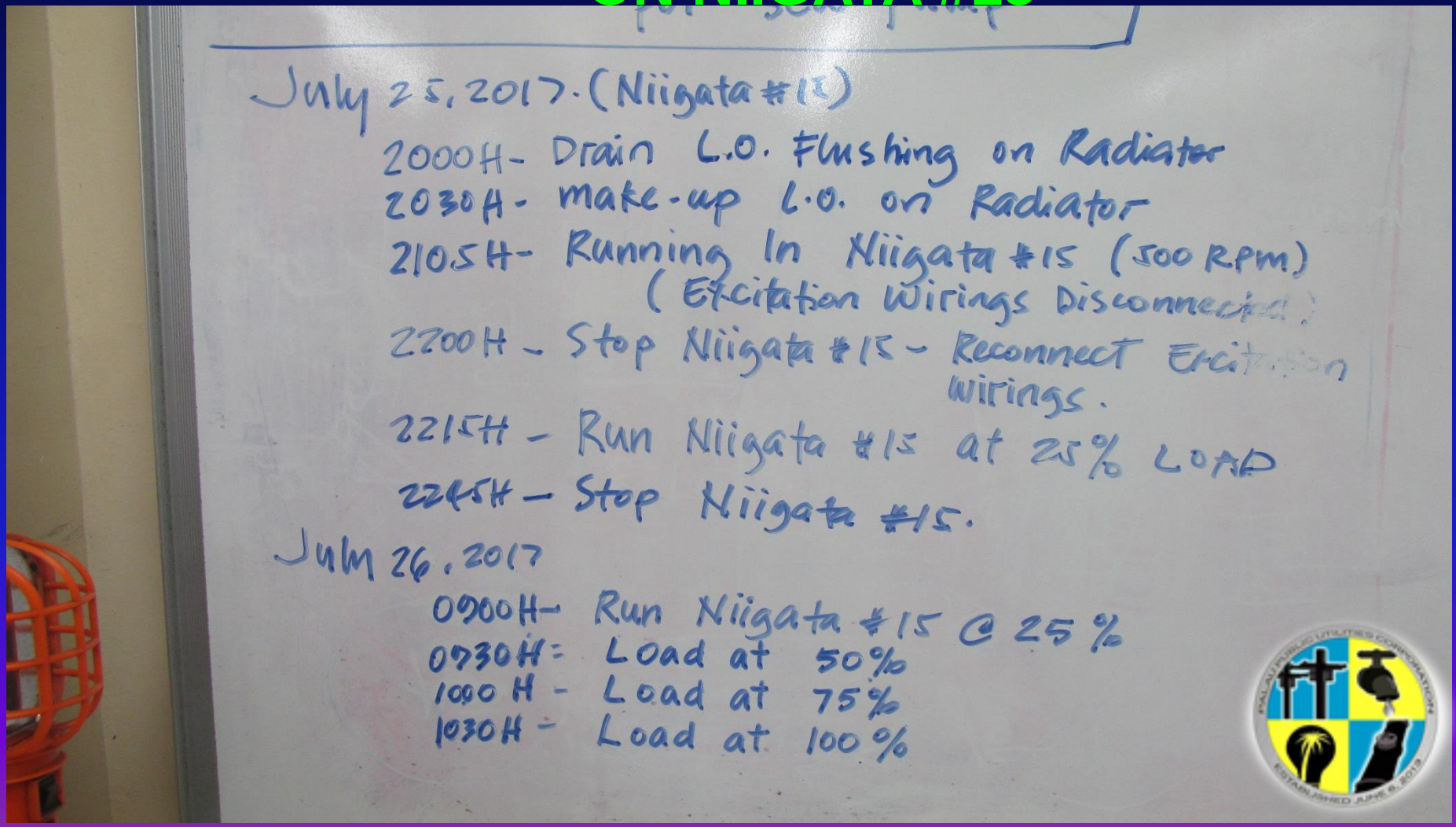
2105H – RUNNING IN OF NIIGATA # 15
MAXIMUM OF 720RPM

2205H – STOP NIIGATA # 15 & INSTALL EXCITATION WIRINGS.

2210H – RUN NIIGATA # 15 AT 25% LOAD

2310H – STOP NIIGATA # 15.

PROJECT COMPLETION:
JULY 26, 2017 – COMMSSIONING OF THE NEWLY INSTALLED RADIATOR ON NIIGATA #15



PROJECT COMPLETION

JULY 26, 2017 – COMMERCIAL OPERATION OF NEW RADIATOR FOR NIIGATA # 15.

0900H – RUN NIIGATA # 15 AT 25% LOAD
0930H – RAISE THE LOAD UP TO 50%
1000H – RAISE THE LOAD UP TO 100%

ACTUAL TEMP. READINGS:

		RADIATOR	COOLING TOWER
LOAD	=	5.0 MW	5.0 MW
LUBE OIL INLET, TEMP.	=	72.8 deg C	73 deg C
LUBE OIL OUTLET TEMP.	=	54.0 deg C	55 deg C
JACKET WATER INLET TEMP.	=	83.7 deg C	88 deg C
JACKET WATER OUTLET TEMP.	=	78.0 deg C	82 deg C
COOLING WATER INLET TEMP.	=	43.0 deg C	44 deg C
COOLING WATER OUTLET TEMP.	=	38.6.0 deg C	36 deg C

NIIGATA # 14 & 15

NIIGATA # 14 & 15 CONTROL ROOM

Radiator cooling system is most effective and ideal for Island countries especially Palau where water supply is a big problem during a period of dry spell.

The radiator system made from Ecodyne guarantee's the efficient cooling and will never affect the capacity of both Niigata engines.

Conclusion:

Maintenance wise, the plant could save man hours from monthly servicing/cleaning of cooling towers and thus these man-hours will be diverted to other maintenance activities and improved as well as maintain the power station.

PART 2:

SITE VISIT

JULY 2018

SEE YOU IN PALAU

THANK YOU VERY MUCH