



**TENTH REGULAR SESSION
FINANCE AND ADMINISTRATION COMMITTEE
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Proposed Electric Upgrades to WCPFC Headquarters

**WCPFC10-2013-FAC7-12
1 November 2013**

Introduction

The Commission's Headquarters Building was first occupied in 2008. There have been on-going concerns regarding the ability to maintain, repair, and upgrade the electrical system in the building. The main power distribution and electrical breakers for the building are built with parts that cannot be maintained by local vendors and cannot be replaced with locally available parts. It is proposed that the main junction boxes and breakers be replaced.

Electric Upgrade

This year, the Secretariat worked with an electrical engineer to assess the current electrical system installed at WCPFC Headquarters. The full report from the engineer is attached as Appendix A. In summary the engineer states that:

- The system does not appear to have been designed for use with US electrical systems;
- Replacement parts are unavailable through normal supply channels;
- Due to the current condition of the equipment continued operation there is a risk that the equipment could fail during an electrical fault resulting in personnel injury or damage to the facility equipment and structure; and
- It is recommended that the existing electrical equipment be replaced with US standard equipment.

In light of the recommendations, the Secretariat is currently working with vendors to supply the needed components to upgrade the electric system. The Secretariat would like to start work immediately to update the system in order to reduce the risk of an electrical outage to the Headquarters building.

Funding Options

The electrical upgrade cost is projected is estimated to cost USD80,000 to USD100,000. It is projected that the 2013 Commission budget will be underspent by roughly USD650,000 (WCPFC10-2013-FAC7-12 Rev1). These savings could be used to fund the project in 2013.

Recommendation

The Committee is invited to:

- (i) consider the proposed electric upgrades to WCPFC Headquarters and make their recommendation to the Commission

Engineering Report

Evaluation of Existing Electrical Service Equipment

Prepared By: David R. Hawkins, PE

General Information

The Western and Central Pacific Fisheries Commission (herein after referred to as 'Tuna Commission') occupies a two (2) story facility in Kolonia Town that was built under a country to country grant by the Chinese. The Tuna commission has occupied the building for about seven years, during which they have modify the existing electrical system on several occasions to accommodate changes in facility operation. Modifications have includes replacing the main circuit breaker, removal of package A/C units and the installation of individual split units, along with numerous smaller changes to accommodate changes in how the facility is used.

Throughout this process the Tuna Commission has been faced with difficulties in procuring required materials to accommodate system modifications. The electrical service equipment installed in the facility under the grant was supplied through Chinese sources and appears to be of an international configuration or possible to have been design for applications within China. This equipment is not UL (underwriter's laboratories) Listed and does not appear to have been designed for applications with US standard electrical systems. Obtaining replacement parts has been very difficult as they are not available through normal supply channels off the US west coast.

As this situation has become a significant concern to the Tuna Commission a decision was made to retain a Professional Engineer to provide the following services.

Scope of Work

Work performed under this contract includes:

1. Evaluating the facilities power usage.
2. Performing an inspection of the existing electrical switchboard to determine code compliance and system reliability.
3. Make a recommendation of how to proceed.

Evaluation of Power Usage

1. Load Evaluation: I received utility billing data going back to January 31, 2011 or approximately 18 months. This information has been tabulated to show monthly usage and respective system demand. System demand defined as the average sustained power requirement for a 15 minute period. Billing data includes line items for the fuel charge (adjusted monthly to reflect current fuel cost), kWh usage (\$0.12 per kWh), and demand (\$9.04 per kW).

The utility began reading the meter bi-monthly for usage and monthly for demand during the July, 2011 billing cycle. As the utility does not have a service charge bi-monthly meter reading does not affect the overall billing for the facility. Over the last 12 months the average monthly usage of electricity has been 22,267 kWh, with peak or maximum usage occurring in September 2012, and a low or minimum usage occurring in December 2012. During this same time period the average demand for the facility has been 50 kW, with a maximum demand of 57 kW in September 2012 and a minimum of 46 kW.

By converting the utilities maximum demand reading (57 kW) to Amps it can be shown that the facilities maximum electrical draw from the utility is 158 amps. It should be noted that maximum and minimum demand readings did not coincide with those for electrical usage however; this is not an unusual occurrence.

Based on the 600-amp rating of the main circuit breaker, the facility has approximately 400-amps of available capacity for future expansion; the service rating of 600-amps minus peak amperage of 158-amps plus a 25-percent safety factor.

Inspection/Evaluation

2. Quality of the existing electrical service equipment:

Service equipment appears to be of an international design with circuit breakers connected to the buss via insulated buss bars. Alterations have involved the removal of connecting bus bars and the installation of insulated conductor for connections between the circuit breakers, the buss. The transfer switch is of a vacuum type typical of international applications, it has incoming terminals for two points of connection; the Main Circuit Breaker and the generator. The load-side of the transfer switch is bonded together with copper buss. The main buss connection for switchboard sections 'AA2 & AA3' have been jumped with cooper conductor. It was unclear when this jumper was been installed at the time of installation or if it had been added during one of the electrical upgrades. However, it appears to be the result of later work. Refer to Attached Riser diagrams for clarification.

The existing electrical service equipment includes the following components:

- 2.1 Section 'AA1 - Main Service Disconnect': This section houses the main service disconnect for the facility and at some point has been modified by replacing the main circuit breaker and buss. The replacement circuit breaker is a 600-Amp, 3-pole bolt on unit, and the existing connecting buss work has been replaced with what appears to be two sets of 300 MCM copper conductors. Conductor is routed between the main circuit breaker and the transfer switch located in Section 'AA0 – Transfer Switch'.
- 2.2 Section 'AA2 – Distribution Section': is comprised of eight (8), 3-pole circuit breakers overall this section looks to be in serviceable condition with the exception of one 200 amp circuit breaker that has been previously damaged. Due to the condition of the damaged circuit breaker it is difficult to determine if this breaker would operate

properly during a fault. Additionally, it appears that if the breaker were to be tripped under load by maintenance personnel it could arc and shock or burn the operator. Spare breakers that were provided with the equipment were under rated to be used as a replacement.

- 2.3 Section 'AA3 – Distribution Section': This section appears to have had the least amount of work done to it since the facility has been occupied. Overall section 'AA3' appears in serviceable condition.
- 2.4 Emergency UPS and branch circuit board: The UPS is no longer in service as the batteries have failed; an attempt was made to determine what circuits were feed through the branch circuit board. However, due to limited time available I was not able to isolate the loads served. My belief is that the branch circuit board provides power to emergency lighting circuits and selected outlets.
- 2.5 Circuit Breakers: Labeling of electrical loads was confusing as branch load centers were not labeled properly. However, with selective outages by disconnecting individual circuit breakers I was able to determine what each circuit breaker was connected to. Circuit breakers appear to be manufacture by Klockner Moeller and Moeller Electric with the following breaker provided within the facility:
 - 2.5.1 Klockner Moeller 63A3P circuit breaker, Cat. #NZM7-63S-nhi, with thermal, magnetic trip, and continuous current rating of 63-amps. The sub-script nhi refers to auxiliary contacts.
 - 2.5.2 Klockner Moeller 80A3P circuit breaker, Cat. #NZM7-80S-nhi, with thermal, magnetic trip, and continuous current rating of 80-amps. The sub-script nhi refers to auxiliary contacts.
 - 2.5.3 Klockner Moeller 100A3P circuit breaker, Cat. #NZM7-100S-nhi, with thermal, magnetic trip, and continuous current rating of 100-amps. The sub-script nhi refers to auxiliary contacts.
 - 2.5.4 Klockner Moeller 200A3P circuit breaker, Cat. #NZM7-200S-nhi, with thermal, magnetic trip, and continuous current rating of 200-amps. The sub-script nhi refers to auxiliary contacts.
 - 2.5.5
- 2.6 Branch Panels: The general configuration of the branch panel included a multi-section panel for power and next to it a single section panel for lighting. For each of the panels located in the ground-floor corridor a second panel was located in the second floor corridor space above. For example Circuit Breaker "AA2-Q1" is a three-pole breaker rated at 80-Amps it feeds power to a multi-sectional panel 'AL1-2 & AL2-2' with the primary section located on the Power is provided by splices located on the ground-floor with a second section located on the second-floor. Both panels have been provided with 40A3P main breakers. In general this is not a problem. However, rather than sub-feeding the second floor panel via a circuit breaker in the ground floor panel, power is provide via a feeder tap located within the ground floor panel. While feeder taps are allowed by the NEC under the right applications a contractor is not allowed to make a splice within a panel. Branch panels are not UL

listed for the application and are not built to US standards. Replacement parts are not available through local source.

- 2.7 Sizing of Conductor: Most of the conductor used within the facility is of Chinese manufacture and it does not appear to be labeled with either a size or a type of insulation. As such, it is very difficult to determine if it has been installed with adequate current carrying capacity. For the purpose of this investigation I estimated conductor size based on visual examination, and installation has been assumed to be adequate for the application. In general the existing conductor appeared to be sized correctly based on the breaker sizes serving the existing feeder loads; typically 80-amps for lighting, 100-amps for general power, and 200-amps for air conditioning. Conductor sizing per the American Wire Gage would be #4, #2, and #3/0 respectively with THHW/THWN insulation.

Recommendation/Conclusion

As reference previously, the existing switchboard line-up has numerous modifications to its original design; it is not UL listed for its current application and it does not appear to have been designed for use in US electrical systems. Replacement parts are unavailable through normal supply channels, and due to the current condition of the equipment continued operation there is a risk that the equipment could fail during an electrical fault resulting in personnel injury or damage to the facility equipment and structure.

It is recommended that the existing electrical equipment be replaced with US standard equipment consisting of a new main circuit breaker, an automatic transfer switch, and a distribution panel as noted:

1. Main circuit Breaker – The existing Service load with a 25-percent safety factor is approximately 200-amps as note previously. The choice of a new MCB therefore needs to be sized to carry the existing load plus provide the facility with the ability to add additional loads in the future. As the existing MCB is rated for 600-amps and future capacity is an unknown quantity it is recommended that a new 600-amp MCB be installed.
 - Main Circuit Breaker to be Square D, Cutler Hammer, GE, or equal. Circuit breaker enclosure is to be a NEMA Type 1 surface mounted enclosure, UL listed for use as service entrance equipment. MCB is to be Rated at 600-amps Typical of a Square D Catalog No. LCL26600. Estimated Cost \$15,000.00.
2. Automatic Transfer Switch to be ASCO, GE or equal. Typical of ASCO Series 300 Power Transfer Switch rated for 600-amps. Transfer switch shall be wall mounted. Estimated Cost \$18,000.00.
3. Distribution Panel with Circuit Breakers to be Square D, Cutler Hammer, GE, or equal. Typical of Square D Type 'I-Line', 600-amp, main lugs only, provide a minimum of 63-inches of space for the mounting the following circuit breakers:
225 Ampere Frame Size, Square D Type Q2,
 - 200 Amp, 3-pole, Cat. #Q232000, mounting height 4-1/2" – Quantity required two (2)100 Ampere Frame Size, Square D Type FA

- 100 Amp, 3-pole, Cat. #FA32100, mounting height 4-1/2" – Quantity required Four (4)
- 80 Amp, 3-pole, Cat. #FA32080, mounting height 4-1/2" – Quantity required Four (4)
- 60 Amp, 3-pole, Cat. #FA32060, mounting height 4-1/2" – Quantity required Four (4)

Estimated Cost \$15,000.00

4. Estimate Labor Cost \$25,000 to \$30,000
5. Miscellaneous materials at 10-percent of project cost \$7,300

Total Estimated Project Cost \$80,000.00.