APPLICATION FOR CANADIAN CONSULTING ENGINEER AWARDS 2016
Oakville Trafalgar Memorial Hospital – Power Distribution System

MULVEY&BANANI

submitted to:
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re:
CANADIAN CONSULTING ENGINEER AWARDS - 2016
CATEGORY A- BUILDINGS

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A. PROJECT INFORMATION

OAKVILLE TRAFALGAR MEMORIAL HOSPITAL- POWER DISTRIBUTION SYSTEM (PDS)

3001 Hospital Gate, Oakville, ON L6M 0L8
Completed December, 2015

FIRM

Mulvey & Banani International Inc. (MBII)
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ROLE ON PROJECT

Subconsultant for Electrical, ICT and Security Engineering, Audio Visual Design

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B. PROJECT OUTLINE

(1) PROJECT SUMMARY

In conjunction with the overall goal for a state-of the-art digital hospital, OTMH required a traditional power distribution system (PDS) that provided emergency backup power ONLY for a portion of the facility in order to be compliant with codes and standards. MBII's PDS design achieved total redundancy and provides uninterrupted care during a power outage. Now, the OTMH PDS has become an industry "benchmark" and is being mandated in the new McKenzie Vaughan Hospital.

B. PROJECT OUTLINE

(2) PROJECT HIGHLIGHTS

Q.1 Innovation

The new OTMH has the capacity for 457 beds and provides a full range of health services including: complex continuing care; rehabilitation; renal dialysis; acute inpatient care; maternal child care; inpatient and outpatient adult and child and adolescent mental health; and secondary and tertiary level programs.

In conjunction with the overall goal for a state-of the-art digital hospital, OTMH required a traditional power distribution system (PDS) that provided emergency backup power ONLY for a portion of the facility in order to be compliant with current building code requirements and general industry standards. MBII engineered a PDS system that achieved total redundancy and provides uninterrupted care at full capacity during a power outage.

The PDS is a complete dual path system from the incoming service right through to the 120/208V branch distribution level. Thus complete redundancy – both electrically and physically was achieved. In addition, six 2.5MW diesel generators provide 100% power back up for the ENTIRE facility in an N+1 configuration. Traditionally, diesel generators are designed to accommodate life safety, vital and delayed vital loads, requiring a hospital to operate at less than full capacity in the event of power outages. Since the ENTIRE facility was backed up with emergency power diesel generators, the need for a normal distribution branch was eliminated. OTMH can operate at full capacity during a power outage for a minimum of 72 hours without replenishing the diesel fuel and, with scheduled fuel delivery can operate indefinitely.

Double Ended Switchgear Line-up

B. PROJECT OUTLINE

Distinguishable operational features provided include:

- Fault tolerance
- Concurrent maintainability
- Ease of operation and maintenance

Technical distinguishing features include:

- Efficient utilization of electrical distribution equipment utilising 13.8kV medium voltage generators and substations to reduce voltage drop losses and provide an environmentally responsible and energy efficient power distribution system
- Economically responsible power distribution system due to the elimination of idle components such as duplicate emergency distribution equipment which reduces capital and maintenance costs
- 100% back-up power on site / self-reliant during power outage event
- With 100% back-up power, the facility was designed to function as a post disaster facility in the event of a sustained power outage.

The most distinguishing feature of OTMH'S PDS is that it exceeds the industry standard, achieving instant recognition in the Ontario healthcare industry as the model system to follow. Current Healthcare clients are reaching for this new industry "benchmark", requesting similar systems. Additionally, this model it is currently being mandated in York Region's new McKenzie Vaughan Hospital.

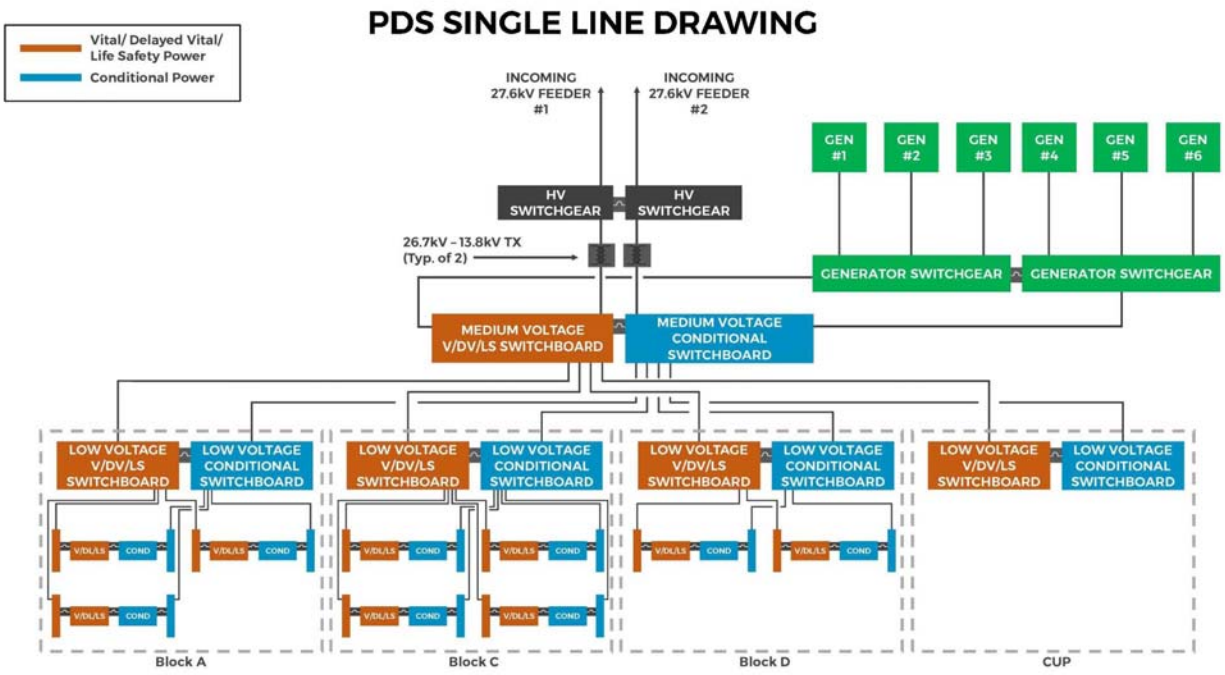
Generator Synchronization Switchboard

B. PROJECT OUTLINE

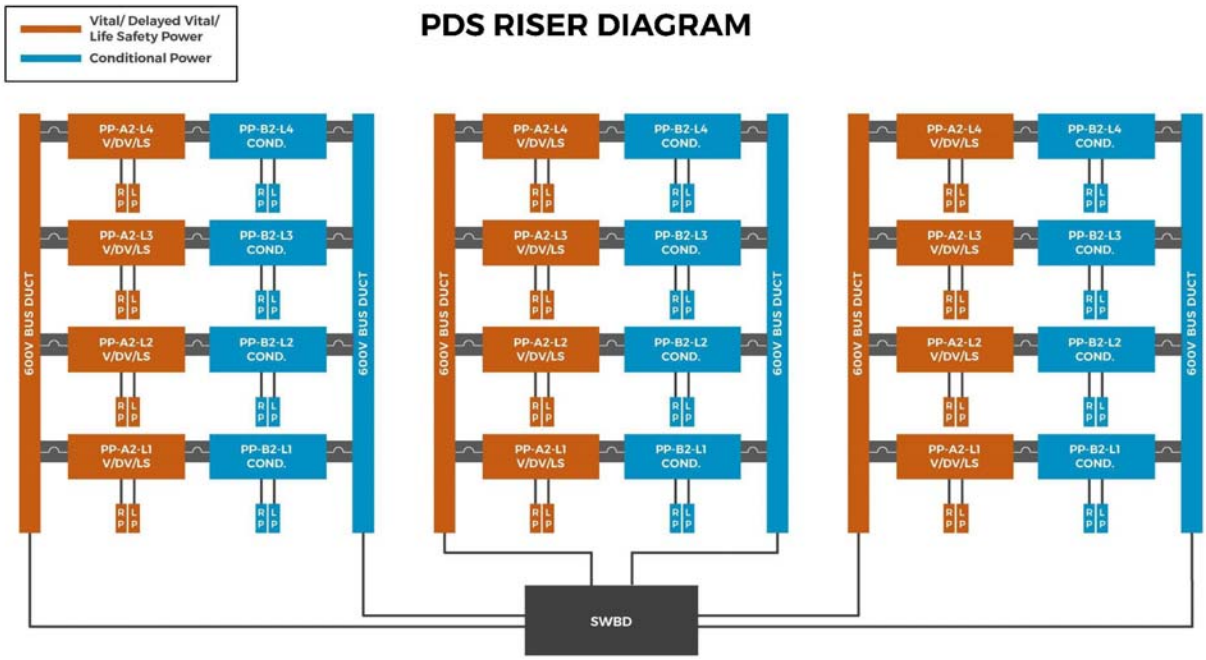
Q.2 Complexity

The large facility with multiple "blocks" presented challenges to the provision of an efficient and effective PDS while ensuring robustness. To provide a fully redundant system, the utility incoming service consists of two independent feeders in separate underground duct banks from the property line and each of these feeders has the capacity to carry the entire load of the new facility in the event of loss of one of the feeders.

To provide a robust electrical distribution system, all low voltage switchboards are double ended, consisting of two main breakers coupled by a normally open tie breaker. With this configuration, should any one transformer or main breaker fail, the tie breaker could be closed, thus allowing the load to be fed from remaining transformer/ main breaker. Traditional PDS designs provide double ended configuration redundancy at the HV or distribution level; the OTMH design provides this level of redundancy to the branch lighting and receptacle panel level. This design realizes the full potential of the redundancy typically provided for the incoming utility services in a health care facility, raising the efficacy of the facility and the services it provides to the public.



B. PROJECT OUTLINE



Q.3 Social and/or Economic Benefits

The key social impact to the community pertaining to the electrical PDS is the capacity for the facility to provide uninterrupted care in the event of a power outage. In addition, the facility is designed to function as post disaster facility offering a place of refuge following a catastrophic event. The facility can operate at minimum of 72 hours without replenishing the diesel fuel and indefinitely with scheduled fuel deliveries.

The PDS was designed around complete utilization of electrical distribution equipment, eliminating any idle equipment which could pose additional points of failure, require additional built environments and amount to additional losses in the system. These efficiencies in the design amounted to a reduction of upfront capital costs/ life cycle costs as well operating and maintenance costs.

The OTMH provides significant economic opportunity for suppliers and contractors in Halton Region and the GTA- post construction as well as during. At the peak of construction, an estimated 1,100+ workers were on site daily.

By far the key economic benefit of the Power Distribution system is the reduction or possible elimination of interruption to facility operation during power outages, thus maintaining the highest level of service for the public and 100% revenue stream.

B. PROJECT OUTLINE

Q.4 Environmental Benefits

The key sustainable feature of the Power Distribution system is complete utilization of electrical distribution equipment, eliminating excess equipment, material and labour.

Other sustainable initiatives MBII designed into the Electrical and ICT systems include:

- "State of the Art" and "Energy Efficient" technologies were utilized for the design of the electrical systems to ensure that the systems are environmentally responsible, including: (1) LED lighting technologies and (2) Co-locating IP based infrastructure and control systems to maximize utilization of mechanical and electrical services.

- The ICT infrastructure (described above) is capable of adapting to changing technologies and is therefore a highly sustainable approach designed with future proofing in mind. Systems/ technologies can be "swapped out" and/or upgraded without substantial infrastructure changes or lengthy, disruptive, costly and resource intense physical changes.

B. PROJECT OUTLINE

Q.5 Meeting Client's Needs

In conjunction with the overall goal of achieving a state-of-the-art digital hospital, the OTMH/ Infrastructure Ontario required the hospital's electrical Power Distribution System (PDS) to be efficient and redundant. These goals were not ONLY met they were EXCEEDED via an efficient, redundant and completely self-reliant PDS that is fully available to the ENTIRE facility. Specific founding principles for the solution were formulated to govern MBII's solution to meet Client's needs:

- EXCEED building code requirements & general industry practice
- "Lifeline" of the Hospital = POWER
- Achieve FACILITY wide power redundancy, availability & reliability
- 100% power backup for ENTIRE facility
- Complete DUAL PATH system - from the incoming service to 120/208V branch distribution level
- ELIMINATED entire normal distribution branch
- Complete redundancy – ELECTRICALLY & PHYSICALLY
- NO single point of failure
- FULL CAPACITY operation during a power outage
- AUTOMATIC operation – no human action required
- 72 HOURS MINIMUM without replenishing diesel fuel
- CONTINUOUS OPERATION with scheduled fuel delivery

Through adherence to these principles, a completely commercially viable, benchmark setting solution was achieved that secures revenue stream and maximizes services to the public. Furthermore, the solution upgrade from the industry standard was cost neutral because of the elimination of the normal power distribution. Not only was the solution a capital cost savings, it provides life cycle and maintenance cost reduction and greater operational efficiency. OTMH recognized the operational advantages of the solution after detailed reviews and presentations and was quick to accept it.

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