



# SHADCOMM LTD. PROJECT PROFILE

**NB Power Belledune Generating Station**  
**Continuous Ship Unloader (CSU)**  
**Control System Upgrade**  
**Q1 - 2006**



## Énergie NB Power

**Rockwell**  
**Automation**

# NB Power Belledune Generating Station Continuous Ship Unloader PLC System Upgrade

## Overview:

As Shadcomm Ltd's largest Industrial control project to date, the Belledune CSU project served as a stepping stone from the municipal to the industrial sector. This project required the complete replacement of the existing Obsolete Mitsubishi Control System, with an ultra modern Allen Bradley Controllogix System.



## The Design:

The Kone Crane Continuous Ship Unloader located in Belledune New Brunswick, which was installed as part of the original plant production in 1993, is a 1400 Ton crane used to unload the coal from the bulk ships at the Belledune wharf. Its continuous unloading design uses a combination of a rotating bucket wheel, at the end of a rotating boom and several conveyor galleries to bring coal from the holds of the ship directly into the storage areas of the plant. The operating cabin of the CSU is located directly above the bucket wheel, which allows the operator to go directly into the hold of the ship, and control all functions of the CSU.

The CSU uses Electric over hydraulic control for most of the movement functions. Large banks of hydraulic motors are located in several sections of the CSU, and are controlled via distributed controller IO.

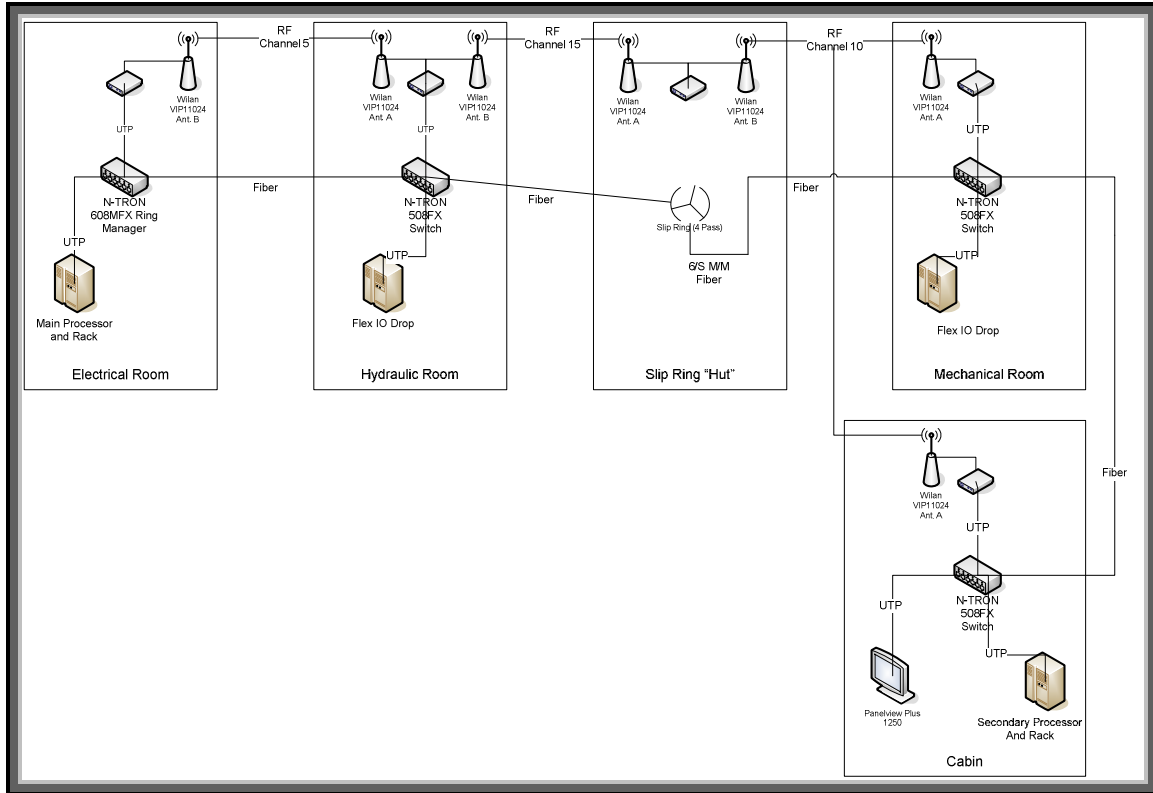
The Control system used a Mitsubishi Melsec A series PLC system, with the main rack located in the Electrical room, and several Remote racks located in the various hydraulic and machinery rooms. All racks were connected via fiber optic cables, and used proprietary MelsecNet protocol for communications between the racks. Over the past few years, there have been numerous failures of the fiber optic connections either near, and sometimes in the PLC and remote racks. Due to the age of these components, spares are basically not available, and any service is very difficult. With the high docking fees from the ships, a failure during unloading is a very costly affair. In October of 2005 it was decided that this was to be upgraded to something more serviceable sometime in February of 2006.



As the successful systems integrator, Shadcomm Ltd was contracted to replace the existing control system with an Allen Bradley Controllogix System. The system IO layout was to be kept virtually the same with the main controller located in the Electrical Room, and Remote Racks located in the various machinery and Hydraulic rooms throughout the CSU. The communications backbone, however, was to be converted to standard Ethernet. This would allow all of the controllers to be connected in a BUS topology, and allow for extra connections at each of the locations. With the use of standard Ethernet hardware, the existing Fiber Optic cables were to be re-terminated using standard ST style connectors. This would allow maintenance of the system in the future without special order equipment. As well, the spare fibers were to be terminated in such a way that they could be easily patched in case of a main fiber failure.

Previously, the weak point of the system was the communications. For this reason, a backup communications system was to be installed. Using Wireless MESH type Ethernet Radios as the various locations, a backup system would be installed on a warm standby basis. The System would run in parallel to the fiber optic system, and in the event of a failure, could be switched over within a few minutes to restore communications throughout the CSU and allow unloading to continue, while scheduling to repair the primary communications system.

The basic System layout was to be as follows:



## Implementation:

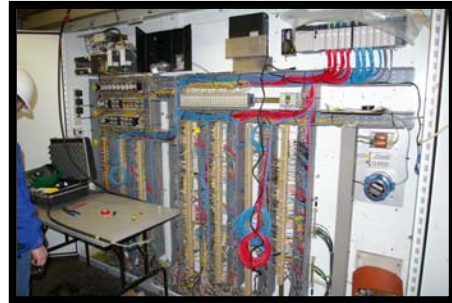
The biggest challenge on this project was the time. Due to the high demand for coal at the plant, and with the CSU as the only means of supply to the plant, the conversion stage had to be tightly scheduled and coordinated with the ever changing ship schedules. For this reason, an extensive Factory Acceptance testing procedure was developed. The entire system was built on temporary backplanes in the Shadcomm shop, and wired to test light and switches. In coordination with the NB Power technical staff a checklist was developed and tests implemented over a 1 Week period. All facets of the system were extensively tested. All motor functions, interlocks, alarm, and communications were tested. Any bugs were documented and removed. Any required changes were made, and the final assembly drawings and documentation was produced.



Once all parties were satisfied with the testing results, an installation plan was created. However, due to the volatility of the ship schedule, the shutdown window was moved from 2 weeks after the FAT to IMMEDIATELY after the FAT. This required us to mobilize the installation team immediately, and begin the physical installation the following Tuesday after the Factory Acceptance testing. For the installation, Sunny Corner Enterprises Ltd was subcontracted as an NMA contractor to do the physical installation portion of the project. We supervised the installation, and provided prewired harnesses, cable tags, and wiring checklists for the onsite electricians to use in first unwiring the existing equipment, and then wiring the new equipment.



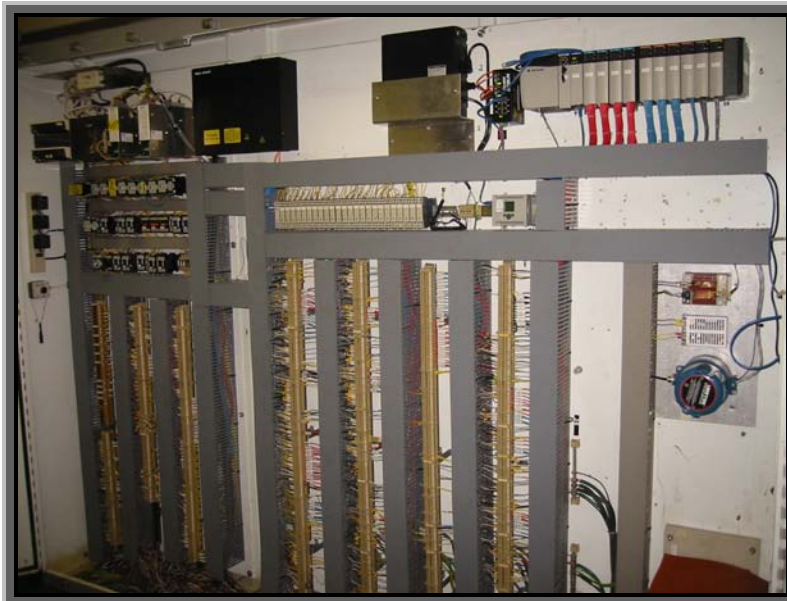
The original plan called for 2 Weeks of installation, and 2 weeks of commissioning. At this stage, however, NB Power Technical staff requested that we fast track the installation, to allow for more commissioning time. After a period of 1.5 weeks, working six 10hr shifts the physical installation was completed.



The Commissioning of the system was done in a similar manner to the Factory Acceptance testing. Dry run testing was done on Conveyors, Hydraulics, and Controls. The Primary and Backup communications systems were commissioned and tested, and the Operators station was programmed and tested. There were 3 Weeks allotted for commissioning, and 1.5 Weeks into commissioning the CSU was back in full operation.

## Conclusion:

This was a very successful project for Shadcomm Ltd. We were able to complete this project ahead of time, and on budget, with very few hiccups. The first boat arrived approximately 2 week after the commissioning was completed, and was successfully unloaded, and boats that followed were unloaded in good time, and without any service calls to the technical department. This previously was a very rare occurrence on this machine.



**Final Electrical Panel Installation**

## References:

The success of this project can be judged by the comments we received from the key NB Power staff on this project:

*"Thanks to you (Jody), to Brad and your group for your good work.  
Regards" Paul Emile Landry, EI&C Supervisor, Belledune GS, (506)522-2471*

*"I would like to add my thanks to all for pulling this off on time on  
such short notice... heck of a job." Sheldon Hovey, Maintenance Superintendent, Belledune GS*

*"Congratulations on a job well done. Thanks to you all." Phil Landry, Plant Manager, Belledune GS*

