

2807 West County Road 75  
Monticello, MN 55362



November 15, 2016

L-MT-16-063  
EA-14-193

ATTN: Director – Division of Nuclear Materials Safety  
U.S. Nuclear Regulatory Commission Region III  
2443 Warrenville Road  
Suite 210  
Lisle, Illinois 60532-4352

Monticello Nuclear Generating Plant  
Docket No. 50-263  
Renewed Facility Operating License No. DPR-22  
Independent Spent Fuel Storage Installation Docket No. 72-058

Information Responsive to Confirmatory Order Related to NRC Reports  
No. 05000263/2015008; 07200058/2014001 and OI Report 3-2014-004

References: 1) NRC Letter (Pederson) to Northern States Power - Minnesota (Gardner)  
EA-14-193, Confirmatory Order Related to NRC Reports No.  
05000263/2015008; 07200058/2014001 and OI Report 3-2014-004;  
Monticello Nuclear Generating Plant, dated December 21, 2015 (ADAMS  
Accession No. ML15355A459)

Pursuant to the subject Confirmatory Order (Reference 1), Northern States Power Company, a Minnesota corporation (NSPM), doing business as Xcel Energy, provides information related to the following action:

“Within 360 calendar days of the issuance date of the Confirmatory Order, Xcel Energy shall submit an article to an industry publication, such as UxC Spent Fuel, describing the circumstances of the violation, the root and contributing causes, and the corrective actions. The licensee shall provide a draft to the Director, DNMS, Region III, at least 30 calendar days in advance of the submittal.”


To address this action, Xcel Energy will submit an article to the Ux Consulting Company, LLC (“UxC”) for potential publication. Attached to this letter is a draft of the article.

Please contact Michael Baumann (612-330-6816) or Martin Murphy (612-330-1992) if you have any questions or comments.

RECEIVED NOV 23 2016

Summary of Commitments

This letter makes no new commitments and no revisions to existing commitments.

  
\_\_\_\_\_

Martin C. Murphy  
Director Nuclear Licensing and Regulatory Affairs  
Northern States Power Company-Minnesota

Attachment

cc: Document Control Desk, USNRC  
Administrator, Region III, USNRC  
Rob Kuntz, Project Manager, Monticello Nuclear Generating Plant, USNRC  
Christian Jacobs, Project Manager, Spent Fuel Management, USNRC  
Resident Inspector, Monticello Nuclear Generating Plant, USNRC  
Mark Lombard, NMSS/DSFM  
Darrell Roberts, Region III  
Richard Skokowski, Region III  
Jared Heck, Region III  
Matthew Learn, Region III  
Jorge Corujo-Sandin, Region III

**Draft Article**

**Spent Fuel Storage Dye Penetrant Test Issue**

**9 pages follow**

## Confirmatory Order Commitment Industry Article

A spent fuel loading campaign was scheduled to be completed for the Xcel Energy<sup>1</sup> Monticello Nuclear Generating Plant during 2013. The plan was to load ten (10) AREVA TN NUHOMS<sup>®</sup> 61 BTH Dry Shielded Canisters (DSC). A contractor with experience in loading AREVA DSCs was hired to complete the "Pool-to-Pad" activities. These activities included all work associated with loading spent fuel into the DSC, welding and weld inspections to seal the DSC, and moving and inserting the DSC into the concrete Horizontal Storage Module (HSM) at the Monticello Independent Spent Fuel Storage Installation (ISFSI). It was a contractual requirement that the contractor perform the welding and weld inspection activities under their approved 10 CFR Part 50 Appendix B program using qualified personnel. Additional oversight of the contractor was provided by the licensee, but as discussed in this article, proved to be inadequate to ensure certain aspects of the loading procedures were being properly performed by the contractor.

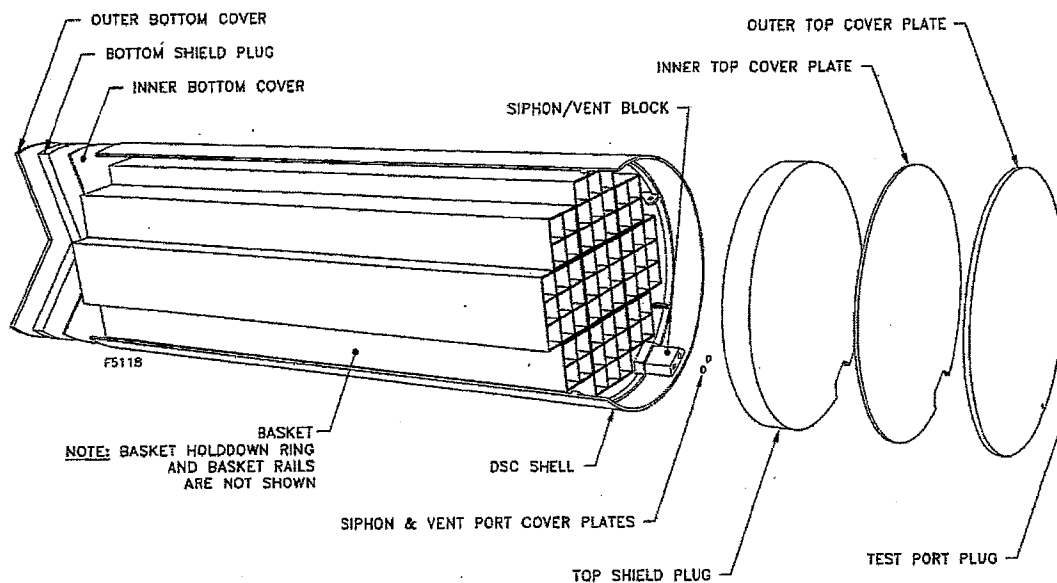


Figure 1

The AREVA TN NUHOMS<sup>®</sup> 61 BTH Dry Shielded Canisters are welded canisters. The major components of the DSC are shown in Figure 1. There are several seal weld passes required to seal each DSC. The seal welds include welds on the Inner and Outer Top Cover Plates, the Siphon and Vent Port Cover Plates and the Test Port Plug. Each closure weld is required to pass a Dye Penetrant Test (PT) as required by the NUHOMS<sup>®</sup> 61 BTH Technical Specifications. Specifically, Technical Specification 1.2.5 states:

"All DSC closure welds except those subjected to full volumetric inspection shall be dye penetrant tested in accordance with the requirements of the ASME Boiler and Pressure Vessel Code Section III, Division 1, Article NB-5000. The liquid penetrant test acceptance standards shall be those described in Subsection NB-5350 of the Code."

**DRAFT**

The 2013 loading campaign commenced on September 3, 2013 with five (5) DSCs being loaded and placed in their respective HSMs by October 14, 2013. Loading of the sixth canister, designated DSC-16, began on October 14, 2013 and work continued through October 17, 2013 at the time the PT of the final weld pass on the DSC-16 Outer Top Cover Plate was being completed. During the performance of this PT, a Nuclear Regulatory Commission (NRC) Inspector was observing the activities. The NRC Inspector questioned the PT inspection parameters he witnessed. Based on the questioning from the Inspector, the following was entered into the Condition Reporting System:

“On 10/17/2013 at approximately 1530 NDE was performed on the final pass of the Dry Shielded Canister Outer Top Cover Plate. An NRC inspector observed part of this activity and questioned the ISFSI project team if the dwell and development times were sufficient to meet procedural requirements.”

In response to the question posed by the NRC Inspector, the following immediate actions were taken:

- Stop Work Order was issued
- Review of video taken during the entire loading process of the six (6) canisters loaded showed numerous failures to adhere to required PT dwell times along with other violations of procedural requirements by the individuals performing the PTs. In addition to the procedural violations, it was identified that the PT dwell and developer time written documentation did not match the actual dwell and developer times determined from the recorded video. The review ultimately identified that all weld PTs performed during the loading campaign did not meet procedural requirements.
- Based on the issues identified during the review of the video, Operations declared DSCs 11 – 16 Inoperable, Not Meeting Technical Specifications.
- A review of results of final process used to ensure adequate confinement was completed. This final process includes a Helium Leak Test of the DSC confinement barrier. The review of the results of the Helium Leak Tests showed all six DSCs had passed, thereby providing confidence that the DSCs already in storage were capable of providing the required protection of the health and safety of the general public.
- A Root Cause Evaluation Team was chartered to investigate this event.

The Root Cause Evaluation completed by the licensee identified the root cause as “Inadequate organizational structure and process requirements to drive accountability in the oversight of [the Pool-to-Pad contractor] and other activities.” There were three contributing factors identified by the Root Cause team. They were (1) “Inadequate site oversight to verify [the Pool-to-Pad contractor] was performing tasks in accordance with applicable procedures”, (2) “Inadequate guidance in [the loading procedures] regarding verification of PT performance and documentation of PT information and (3) based on the performance of this same Pool-to-Pad contractor during the 2008 loading campaign at MNGP, “There was a lack of formality in the documentation and review of risk and consequences in the determination of level of cause evaluation.”

**DRAFT**

Further event evaluation identified several additional areas as contributors. Based on a Nuclear Oversight (NOS) Missed Opportunity Review, it was identified that a number of oversight functions were weak barriers in support of the NOS Project Oversight process. In addition, project oversight plans for spent fuel storage activities focused on fabrication activity oversight with limited oversight during the completion of loading activities onsite. It was also identified that there was a single NOS Project Oversight plan for both the MNGP and the Prairie Island Nuclear Generating Plant (PINGP) which lacked sufficient detail on the roles and responsibilities to assure adequate oversight was applied to the activities presenting the greatest risk to cask integrity and compliance. A single oversight plan could not adequately address the difference in oversight responsibilities based on the use of a welded canister system at MNGP and the bolted lid design in use at PINGP.

A number of missed opportunities were identified that may have prevented or mitigated the consequences of the event. Those missed opportunities included relying on a supplier performance audit of the "Pool-to-Pad" contractor conducted by another utility without additional evaluation of the contractor by Xcel Energy. This was the second loading campaign at MNGP conducted by this "Pool-to-Pad" contractor and the first campaign had quality control issues that were not factored into the selection process during evaluation of responses to our request for proposal for the pool-to-pad services or the oversight plan for on-site work performance by the contractor. The two Level II Non-Destructive Examination (NDE) inspectors used by the "Pool-to-Pad" contractor had no previous experience in completing PT exams on DSCs. The Level III NDE inspector hired by the "Pool-to-Pad" contractor provided only minimal oversight of the work being performed by the Level II inspectors. This lack of engagement by the Level III inspector may have been identified through more intrusive oversight of the performance of the work being done by the Level II inspectors.

Recovery efforts commenced concurrent with the incident evaluation. Five of the six DSCs loaded were located in their respective Horizontal Storage Modules (HSM) and the sixth remained in the transfer cask in the Reactor Building at MNGP. Three options were evaluated to address the current status of all six DSCs: (1) unload fuel from the six DSCs and return the fuel to the spent fuel pool, (2) repair the welds on the six DSCs or (3) request an exemption from Technical Specification 1.2.5. Following analysis of a number of factors, such as risk of damage to a DSC and radiation dose, it was decided to pursue the exemption request.

Notwithstanding the non-compliant PT, the initial exemption request was based on confirmed quality assurance of the subject canisters which included quality material procurement, welder qualifications, and satisfactory results for helium leak test of the completed welds. Further support for canister weld integrity was derived from the inherent character of multi-layer welds to mend any surface flaws of root welds and prevent creation of continuous flaws between layers.

Additional support for the exemption request was provided by a flaw-size analysis that provided satisfactory stress results for assumed flaw sizes that would bound the actual flaws detected on the accessible weld on DSC 16 and any other latent flaws in the other DSCs. In part, the

**DRAFT**

exemption request applied NRC Interim Staff Guidance (ISG-15), where the NRC acknowledges that the performance of the PT exam may not identify all imperfections or flaws in the weld. To address this potential the ISG-15 states:

“The structural lid weld should be examined by ultrasonic testing (UT) or other volumetric methods. Review the applicant’s evaluation of the critical flaw size using the linear-elastic fracture mechanics methodology based on service temperature, dynamic fracture toughness, and critical design stress parameters, as specified in Section XI of the ASME Code.

Progressive surface examinations, utilizing dye penetrant testing (PT) or MT, are permitted only if unusual design and loading conditions exist. In addition, a stress-reduction-factor of 0.8 is imposed on the weld strength of the closure joint to account for imperfections or flaws that may have been missed by progressive surface examinations. The weld design should be approved by the NRC on a case-by-case basis.”

However, NRC Nuclear Material Safety and Safeguards (NMSS) Staff took issue with this analysis because: (1) it assumed a value of Stress Allowable Reduction Factor (SARF) that was qualitatively derived from ASME tables, and (2) the analysis was not supported by sufficient data of the subject welds. [For additional information the following is available through the NRC “Agencywide Document Access and Management System” (ADAMS) ascension number ML14199A370]. Following extensive public discussions with NRC, the licensee decided to withdraw its initial exemption request.

Due to the NRC interactions and significant amount of time expended on the initial exemption request, the licensee’s recovery strategy changed to focus on the DSC remaining in the transfer cask on the refueling floor in the reactor building (designated DSC 16). With the DSC in this configuration there was a potential to develop an alternate inspection technique of the closure welds on the Inner Top Cover Plate and Outer Top Cover Plate.

Working with AREVA, equipment was designed and an inspection technique was developed and qualified to allow inspection of the full circumference of the Outer Top Cover Plate and the majority of the Inner Top Cover Plate circumference utilizing Phased Array Ultrasonic Test (PAUT) methods. The PAUT was not capable of interrogating the area of the Vent/Siphon Block. The NRC witnessed the development and testing of the inspection technique. The basic equipment to complete the PAUT is shown in Figures 2 and 3.

**DRAFT**

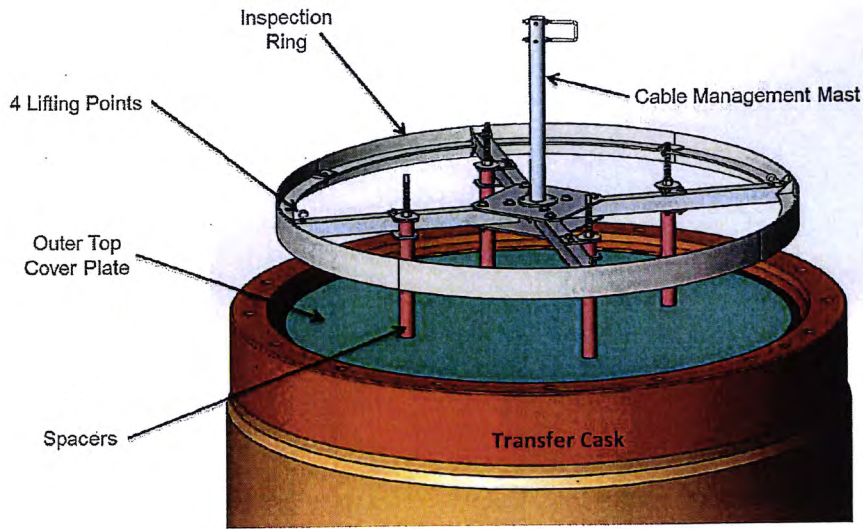


Figure 2

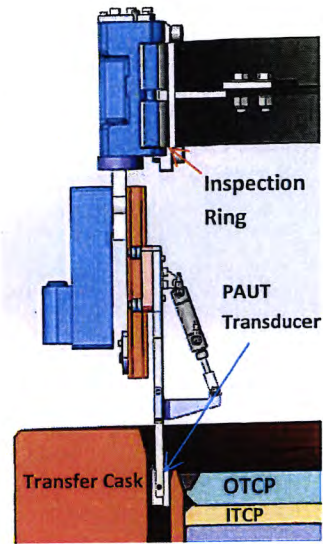


Figure 3

Inspections of the OTCP and ITCP welds were completed utilizing the equipment and qualified process. The PAUT inspection revealed 67 flaws of various dimensions and orientations within the weld material. This was the first application of PAUT to inspect the closure welds of the AREVA TN NUHOMS® 61 BTH Dry Shielded Canisters that were completed in the field during the fuel loading process.

AREVA TN developed a model of the ITCP and OTCP conservatively incorporating the flaw distributions identified during the PAUT. The impact of the identified flaws was evaluated using Finite Element Analyses (FEA). Using the limit load analysis methodology of ASME Section III, the FEA demonstrated adequate stress margin in the welds to accommodate the identified flaws. The results of the PAUT inspection and FEA formed the basis for our submittal of an exemption request for DSC 16. The exemption request was submitted in September 2015. For additional information, the following are available ML15275A023, ML15275A024 and ML15275A025 in ADAMS.

The NRC conducted additional investigations based upon the circumstances surrounding the failures to adhere to the PT procedure and documentation issues. The NRC Office of Investigations (OI) became involved because of the potential willful aspects of the NDE inspectors' conduct giving rise to the incident. The result of the OI investigation was in part the issuance of Notices of Violation to these two individuals involved in the performance of the PTs (ML15363A369 and ML15363A370). In addition to the violations issued to the two individuals, Northern States Power Company, Minnesota (NSPM) was provided notice of three apparent violations (ML15203B187). The apparent violations considered for escalated enforcement were:

**DRAFT**



- The first apparent violation involves the apparent deliberate failure, on the part of two technicians, to perform liquid penetrant nondestructive examinations on the dry shielded canisters in accordance with required procedures.
- The second apparent violation involves the apparent deliberate failure by the same technicians to accurately record the results of the liquid penetrant nondestructive examinations.
- The third apparent violation involves the apparent failure to assess the effectiveness of the technicians' work.

In determining the potential for escalated enforcement action, the NRC provided NSPM with the opportunity to:

- (1) Provide a written response to the NRC;
- (2) Request a Predecisional Enforcement Conference (PEC)
- (3) Request Alternative Dispute Resolution (ADR).

NSPM decided to meet with the NRC staff for Alternative Dispute Resolution (ADR). The ADR meeting between NSPM and NRC occurred on October 15, 2015. The ADR process uses an independent professional mediator to work with both parties to develop a common basis for agreement on the issues and develop a corrective action plan. Based on the preliminary settlement agreement reached during the ADR meeting the NRC issued a Confirmatory Order (ML15355A459) on December 21, 2015.

The Confirmatory Order issued to NSPM requires the completion of nine items summarized below:

1. The licensee shall restore compliance to 10 CFR Part 72 to DSCs 11 through 16 within 5 years of the date the NRC takes final action upon the September 29, 2015, exemption request pending for DSC 16 (ML15275A023).
2. Within 180 calendar days of the NRC's final action on the docketed exemption request dated September 29, 2015, the licensee shall submit a project plan for returning DSCs 11 through 16 to compliance.
3. Within 180 calendar days after submittal of the DSCs 11 through 16 project plan, Xcel Energy shall submit a letter regarding progress under the plan. A letter providing a progress update shall be provided every 360 calendar days thereafter.
4. Within 90 calendar days of the issuance of the Confirmatory Order, Xcel Energy shall evaluate Monticello's dry storage procedures and ensure the procedures require direct licensee oversight during the entire evolution of each dye penetrant test performed by contractors on DSC closure welds.
5. Within 120 calendar days of the issuance of the Confirmatory Order, Xcel Energy shall ensure and document that all first line supervisors and above, who oversee contractors

**DRAFT**

- performing field work in the Xcel Energy nuclear fleet, review the circumstances and lessons learned from the events that gave rise to the Confirmatory Order.
6. Within 360 calendar days of the issuance of the Confirmatory Order, the licensee shall assess and document the effectiveness of improvements in oversight of supplemental workers (e.g., contractors) in the Xcel Energy nuclear fleet, including the actions taken in item 5.
  7. Within 540 calendar days of the issuance date of the Confirmatory Order, Xcel Energy shall develop and make a presentation based on the facts and lessons learned from the events that gave rise to the Confirmatory Order, with emphasis on corrective actions taken as a result. Xcel Energy shall make the presentation materials available to NRC for review at least 30 days in advance of the presentation.
  8. Within 360 days of the issuance date of the Confirmatory Order, Xcel Energy shall submit an article to an industry publication, such as UxC Spent Fuel, describing the circumstances of the violation, the root and contributing causes, and the corrective actions. The licensee shall provide a draft to the NRC at least 30 calendar days in advance of the submittal.
  9. Upon completion of all terms of the Confirmatory Order, Xcel Energy shall submit to the NRC a letter discussing its basis for concluding that the Confirmatory Letter has been satisfied.

At this time a number of the actions required or associated with the Confirmatory Order have been completed or are underway. One of the main drivers on the timing of completion of these items is the requirement in the Confirmatory Order that actions are based on when "... the NRC takes final action upon the September 29, 2015, exemption request pending for DSC 16". The exemption request to allow DSC 16 to be placed in the Horizontal Storage Module based on the results and analyses of the PAUT data was approved by NRC on June 15, 2016 (ML16167A036).

DSC 16 was successfully moved from the Reactor Building and inserted into the HSM on October 5, 2016.

Xcel Energy is working on plans to meet the Confirmatory Order requirement to "... submit a project plan for returning DSCs 11 through 16 to compliance" by December 12, 2016. NSPM is planning on conducting a public meeting with the NRC regarding the plan to restore compliance prior to actually submitting the plan in accordance with the confirmatory order.

[Note that the timing of the requirement to submit this article for publication by December 15, 2016 and the requirement to submit the project plan by December 12, 2016, does not allow for further description of the project plan at this time].

Xcel Energy implemented a number of corrective actions to enhance not only the oversight of activities related to spent fuel dry storage activities but also to help manage other high-risk evolutions. The corrective actions implemented to date are summarized below.

**DRAFT**

1. Revised its Nuclear Oversight (NOS) procedures to require the establishment of an NOS Project Oversight Plan for any Safety-Related or Augmented Quality fabrication or construction activities performed at the nuclear plant sites under a supplier's Quality Assurance (QA) Program.
2. The NOS procedure for project oversight was also revised to address site project implementation in addition to project component fabrication, and associated project risks. Upfront planning of the level and type of NOS oversight is based on those risks.
3. Xcel Energy Supply Chain procedures were revised to strengthen NOS involvement in vendor selection and qualification.
4. Separate NOS Spent Fuel Project Plans were developed for MNGP and PINGP to address the differing requirements for welded canister designs and bolted lid designs that provide greater detail on implementation of oversight responsibilities.
5. A nuclear fleet procedure for oversight of supplemental personnel (e.g., contractors) based upon the Institute of Nuclear Power Operations (INPO) AP-930 "Supplemental Personnel Process Description," which includes a requirement that each incoming contract worker have a face-to-face review of station standards, expectations, and requirements with the Maintenance Manager or designee. This includes current and all future contract personnel including contract quality control (QC) inspectors.
6. Xcel Energy issued a rapid operational experience notice for this event, which prompted a review of the event by Prairie Island Nuclear Generating Plant staff and shared the event with the nuclear industry through the INPO Consolidated Event System (ICES).
7. Xcel Energy reviewed its General Access Training to ensure it adequately addresses the consequences of willful violations.
8. Spent Fuel Dry Storage Loading procedures for both MNGP and PINGP were reviewed and revised to ensure better oversight. Specifically for MNGP, the following requirements are now included in the procedures.
  - a. The procedures now require oversight of all procedural steps related to AREVA TN NUHOMS® 61 BTH Dry Shielded Canisters Technical Specifications.
  - b. Quality Control Hold Points were added to the procedures to ensure Xcel Energy Nuclear Oversight is in attendance to witness all Dye Penetrant Tests (PTs).
  - c. Sign-offs in the procedures by Xcel Energy Nuclear QC are required to acknowledge the direct oversight of the PTs, to ensure the proper recording of the PT parameters, and to acknowledge that the PT parameters are in compliance with the procedural requirements.
  - d. The Operations Shift Manager is required to review all actions related to the AREVA TN NUHOMS® 61 BTH Dry Shielded Canisters Technical Specifications immediately following completion of the procedural steps to ensure compliance with the requirements.
  - e. The NOS Project Oversight Procedure has been expanded in scope to require formal oversight plans for all high-risk projects.

As you enter into the initial process of loading spent fuel for storage in an Independent Spent Fuel Storage Installation (ISFSI) or you are preparing for your next loading campaign, take a look at your

**DRAFT**

processes and standards with respect to this event to ensure no one in the industry experiences a similar event. Consider also the experience and past performance of any organization involved in spent fuel activities. Where there is limited experience with or by a vendor, or where there may have been past vendor performance challenges ensure there is sufficient, effective oversight of performance to assure compliance with all relevant codes, standards and regulatory requirements. In addition, review your processes and standards against numerous industry guidance documents including, as a beginning, the INPO "Principles for an Engaged, Thinking Organization" and the INPO "Principles for a Strong Nuclear Safety Culture".

---

<sup>1</sup> Legal entity - Northern States Power Company doing business as Xcel Energy. Northern States Power Company, Minnesota (NSPM) is the Nuclear Regulatory Commission Licensee for the Monticello Nuclear Generating Plant (MNGP).

**DRAFT**