Nebraska Public Power District

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NLS2013026
February 28, 2013

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555-0001

Subject: Overall Integrated Plan in Response to March 12, 2012, Commission Order Modifying License with Regard to Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051)
Cooper Nuclear Station, Docket No. 50-298, DPR-46

References:

1. Nuclear Regulatory Commission Order Number EA-12-051, *Order to Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation*, dated March 12, 2012

2. Nuclear Regulatory Commission Interim Staff Guidance JLD-ISG-2012-03, *Compliance with Order EA-12-051, Reliable Spent Fuel Pool Instrumentation*, Revision 0, dated August 29, 2012

3. Nuclear Energy Institute 12-02, Revision 1, *Industry Guidance for Compliance with NRC Order EA-12-051, "To Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation,"* dated August 2012

4. Nebraska Public Power District letter to Nuclear Regulatory Commission, *Initial Status Report in Response to March 12, 2012, Commission Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051)*, dated October 26, 2012

Dear Sir or Madam:

On March 12, 2012, the Nuclear Regulatory Commission (NRC) issued an Order (Reference 1) to Nebraska Public Power District (NPPD). Reference 1 was immediately effective and directs Cooper Nuclear Station (CNS) to have a reliable indication of the water level in its spent fuel storage pool. Specific requirements are outlined in the Enclosure of Reference 1.

Reference 1 requires submission of an Overall Integrated Plan by February 28, 2013. The NRC Interim Staff Guidance (Reference 2) was issued August 29, 2012, and endorses industry guidance document Nuclear Energy Institute 12-02, Revision 1 (Reference 3) with clarifications and exceptions identified in Reference 2. Reference 3 provides direction regarding the content of this Overall Integrated Plan. The purpose of this letter is to provide the Overall Integrated Plan pursuant to Section IV, Condition C.1.a, of Reference 1.

COOPER NUCLEAR STATION
P.O. Box 98 / Brownville, NE 68321-0098
Telephone: (402) 825-3811 / **Fax:** (402) 825-5211
www.nppd.com

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Reference 3, Appendix A-2, contains the specific reporting requirements for the Overall Integrated Plan. The enclosure to this letter provides CNS' Overall Integrated Plan pursuant to Appendix A-2 of Reference 3.

Reference 4 provided CNS' initial status report regarding reliable spent fuel pool instrumentation, as required by Reference 1. NPPD has not yet identified any impediments to compliance with the Order, i.e., no later than two refueling cycles after submittal of the integrated plan, or December 31, 2016, whichever comes first. Future status reports will be provided as required by Section IV, Condition C.2, of Reference 1, and pursuant to Appendix A-2-3 of Reference 3 and will discuss any changes in compliance method, schedule, and any need for relief including the basis.

This letter contains no new regulatory commitments. If you have any questions regarding this report, please contact David Van Der Kamp, Licensing Manager, at (402) 825-2904.

I declare under penalty of perjury that the foregoing is true and correct.

Executed On 02/28/13
(Date)

Sincerely,

Oscar A. Limpias
Vice President - Nuclear and
Chief Nuclear Officer

/bk

Enclosure: Cooper Nuclear Station Overall Integrated Plan for Reliable Spent Fuel Pool Instrumentation

cc: Regional Administrator, w/enclosure
USNRC - Region IV

Director, w/enclosure
USNRC - Office of Nuclear Reactor Regulation

Cooper Project Manager, w/enclosure
USNRC - NRR Project Directorate IV-1

Senior Resident Inspector, w/enclosure
USNRC - CNS

Blake A. Purnell, w/enclosure
USRNR - NRR

Lisa M. Regner, w/enclosure
USNRC - NRR

Steven R. Jones, w/enclosure
USNRC - NRR

CNS Records, w/enclosure

NPG distribution, w/o enclosure

NLS2013026

ENCLOSURE

COOPER NUCLEAR STATION

OVERALL INTEGRATED PLAN FOR

RELIABLE SPENT FUEL POOL INSTRUMENTATION

Cooper Nuclear Station
Overall Integrated Plan for
Reliable Spent Fuel Pool Instrumentation

Nebraska Public Power District
Cooper Nuclear Station
72676 648A Avenue
Brownville, NE

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1. Applicability

The Nuclear Regulatory Commission (NRC) issued Order EA-12-051, "Order to Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation," (Ref. 9.2) on March 12, 2012. The Order requires licensees to have a reliable indication of the water level in associated spent fuel storage pools capable of supporting identification of the following pool water level conditions by trained personnel: (1) level that is adequate to support operation of the normal fuel pool cooling system, (2) level that is adequate to provide substantial radiation shielding for a person standing on the spent fuel pool operating deck, and (3) level where fuel remains covered and actions to implement make-up water addition should no longer be deferred. The Order also requires that an overall integrated plan be submitted to the NRC by February 28, 2013. The overall integrated plan is to provide a description of how the requirements of the order will be achieved.

NEI 12-02, "Industry Guidance for Compliance with NRC Order EA-12-051, 'To Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation'," (Ref. 9.4) provides an approach for complying with order EA-12-051. NRC Interim Staff Guidance JLD-ISG-2012-03, "Compliance with Order EA-12-051, Reliable Spent Fuel Pool Instrumentation," (Ref. 9.3) endorses the methodologies and guidance provided in NEI 12-02, subject to the clarifications and exceptions specific to Section 3.4, Qualification, as an acceptable means of meeting the requirements of Order EA-12-051.

This integrated plan provides the Cooper Nuclear Station (CNS) approach for complying with Order EA-12-051 using the methods described in NEI 12-02 in conjunction with NRC JLD-ISG-2012-03. Six-month progress reports will be provided consistent with the requirements of Order EA-12-051 and the guidance in NEI 12-02.

2. Schedule

The installation of reliable Spent Fuel Pool (SFP) level instrumentation for the SFP associated with CNS is scheduled for completion prior to startup following Refueling Outage 29 (expected to be in November 2016), but no later than December 31, 2016. Refueling Outage 29 will be the second refueling outage after submittal of this overall integrated plan. This is in accordance with NRC Order EA-12-051 (Ref. 9.2) paragraph IV.A.2 and NEI 12-02 (Ref. 9.4) paragraph A-3.

The initial status report required by paragraph IV.C.2 of Ref. 9.2 was provided to the NRC by CNS on October 26, 2012 (Ref. 9.11). Subsequent status reports will be submitted by the following dates in accordance with paragraph IV.C.2 of Ref. 9.2:

- August 28, 2013
- February 28, 2014
- August 28, 2014
- February 28, 2015
- August 28, 2015

- February 28, 2016
- August 28, 2016
- Completion of project

A list of project milestones and their expected completion dates is provided below:

- Complete Scoping Study – March 2013
- Generate Detailed Design – October 2014
- Complete Refuel 28 Outage Walkdowns – November 2014
- Complete Procurement of Parts – December 2014
- Complete Detailed Design – October 2015
- Complete Installation Outage – October 2016
- Complete Installation/Testing Outage – November 2016
- Inservice/Mod Complete – November 2016

3. Identification of Spent Fuel Pool Water Levels

NRC Order EA-12-051 Attachment 2 lists three key SFP water levels that are to be identifiable by trained personnel. These key water levels are described and quantified below:

3.1. Level 1 – Level adequate to support operation of the normal fuel pool cooling system

Level 1 elevation for Cooper Nuclear Station will be at 999' 7" based on the bottom of the weir that leads to the skimmer surge tanks (CNS Dwg. 1330-17 Det. 1 & 1A, Ref. 9.8). This equates to a water level of 37' 4" above the bottom of the SFP (CNS Dwg. 4230 sect. 856, Ref. 9.9) or 22' $1^{5}/_{8}$" above the top of the spent fuel racks (CNS Dwg. 80E1143, Ref. 9.10). This is consistent with the guidance provided in NEI 12-02 sect. 2.3.1. The Cooper SFP instrumentation system Level 1 monitoring will meet or exceed the Level 1 monitoring requirements provided in NEI 12-02.

3.2. Level 2 – Level adequate to provide substantial radiation shielding for a person standing on the spent fuel pool operating deck

Level 2 elevation for Cooper Nuclear Station will be at 987' $5^{3}/_{8}$". This equates to a water level of 25' $2^{3}/_{8}$" above the bottom of the SFP (CNS Dwg. 4230 sect. 856, Ref. 9.9). This elevation is based on a water level of 10 feet above the top of the fuel racks in the SFP in accordance with NEI 12-02 sect. 2.3.2. The minimum shielding required is reflected in USAR XII sect. 3.3.2 (Ref. 9.6) which states in part, "For purposes of providing adequate shielding, a minimum of $8^{1}/_{2}$' of water is maintained above irradiated fuel located in the Spent Fuel Pool." The NEI 12-02 guidance of 10 feet of water exceeds the $8^{1}/_{2}$ feet minimum requirement, so it will be used as the basis for Level 2.

3.3. Level 3 – Level where fuel remains covered

Level 3 elevation for Cooper Nuclear Station will be at 977' $5^{3}/_{8}$". This equates to a water level of 15' $2^{3}/_{8}$" above the bottom of the SFP. This elevation is based on a water level that is even with the top of the fuel racks (CNS Dwg. 80E1143, Ref. 9.10) in the SFP in accordance with NEI 12-02 Section 2.3.3.

It should be noted that although approximately $3^{5}/_{8}$" of a fuel assembly's lifting bail will extend above the top of the fuel racks at this water level, all of the irradiated fuel will remain below the top of the fuel racks, and thus submerged.

4. Instruments

The design of the instruments will be consistent with the guidelines of NRC JLD-ISG-2012-03 and NEI 12-02 as discussed below.

4.1. Primary and Backup Instrument Channels

Technology:

The primary and backup instrument channels will be of identical design and will consist of fixed components. The plan is for both channels to utilize Guided Wave Radar (GWR), which functions according to the principle of Time Domain Reflectometry (TDR).

This technology requires that a wave guide for each channel be installed in the pool water such that it runs the entire length of the instrument range. Solid supports, qualified to seismic class I requirements, will be utilized to support the wave guides. The design details of these supports will be determined during the design development process.

Range:

Both instrument channels will measure the same range of level in the fuel storage pool. In order to avoid any of the key levels described in section 3 from coinciding with the top or bottom of the instrument range, some margin at each end of the range will be required. Thus, the range will extend from approximately one foot below the top of the fuel racks to approximately one foot above the normal level of the pool. This will result in a minimum range of 24 feet.

Displays:

The signal processor for each instrument channel will be mounted remotely from its respective probe (wave guide), but within the manufacturer's specified maximum cable length. This will allow each processor to be mounted in the control building so that it can be accessed during an event without requiring entry into the reactor building. The signal processor for each channel provides a local indication of SFP level.

5. Reliability

Reliability of the primary and backup instrument channels will be assured by conformance with the guidelines of NRC JLD-ISG-2012-03 (Ref. 9.3) and NEI 12-02 (Ref. 9.4).

6. Instrument Channel Design Criteria

Instrument channel design criteria will be consistent with the guidelines of NRC JLD-ISG-2012-03 and NEI 12-02 as described below:

6.1. Arrangement

Probes:

The primary and backup level sensing probes will be located in the SFP separated by a distance that is comparable to the shortest side of the pool. These locations will provide the needed separation of the channels to provide reasonable protection against a single missile damaging both the primary and backup SFP indication. This is in accordance with the guidance provided in NEI 12-02 Section 3.2 which provides as one of the example arrangements, "separated by a distance comparable to the shortest length of a side of the pool."

Signal Processors and Indication:

The primary and backup channel's signal processors will be located within the control building. As a result, SFP level indication will be accessible without requiring entry into the reactor building. The signal processors will be separated by a sufficient distance and/or barrier(s) in order to prevent physical damage due to a common cause. Also, the control building is designed to protect equipment within it from external missiles.

Cable Routing:

The power and signal cable required for each channel will be routed separately from the other channel. Conduit supports that are qualified for seismic class I applications will be used for routing all conduit in both the reactor and the control buildings. The conduit in the reactor building will be installed to ensure that it will not interfere with fuel handling activities or other activities in the SFP.

6.2. Mounting

Mounting of the primary and secondary channel signal processors and probes will be seismic class I. The equipment will be installed in its designated plant area to be seismically qualified to withstand the maximum seismic ground motion considered in the design of that area. This will ensure that the mounting of the equipment will meet the NRC JLD-ISG-2012-03 and NEI 12-02 guidance requirements.

6.3. Qualification

The primary and backup instrument channels will be reliable at temperature, humidity and radiation levels consistent with the SFP water at saturation conditions for an extended period.

The instrument channel reliability will be demonstrated via an appropriate combination of design, analyses, operating experience, and/or testing of channel components for the following sets of parameters:

- Conditions in the area of instrument channel component use for all instrument components
- Effects of shock and vibration on instrument channel components used during and following any applicable event for all instrument channel components
- Seismic effects on instrument channel components used during and following a potential seismic event for all installed components

Augmented quality components, similar to those applied to fire protection, will be used for this project.

During the engineering design phase, the environmental conditions that are necessary for qualification of all equipment will be addressed. These environmental conditions will include the temperature, humidity, and radiation levels that are consistent with conditions in the vicinity of the SFP and the area of use during normal operations, abnormal events, and post-events. The duration required for qualification will be for no fewer than seven (7) days post-event or until off-site resources can be deployed by the mitigating strategies resulting from Order EA-12-049 (Ref. 9.1). Examples of post-event (beyond-design-basis) conditions that will be considered are:

- Radiological conditions for a normal refueling quantity of freshly discharged (100 hours) fuel with the SFP water level at level 3 as described in Section 3.3,
- Temperatures of 212°F and 100% relative humidity environment,
- Boiling water and/or steam environment,
- The impact of FLEX mitigating strategies.

Components of the instrument channels will be qualified for shock and vibration using one or more of the following methods:

- Components are supplied by manufacturers using commercial quality programs with shock and vibration requirements included in the purchase specification at levels commensurate with portable hand-held devices or transportation applications;

- Components have a substantial history of operational reliability in environments with significant shock and vibration loading, such as portable hand-held device or transportation applications; or
- Components are inherently resistant to shock and vibration loadings, such as cables.

Verification that the design and installation of instrument channel components (with the exception of battery chargers and replaceable batteries) is adequate to withstand a potential seismic event will be required. Applicable components of the instrument channels will be rated by the manufacturer (or otherwise tested) for seismic effects at levels commensurate with those of postulated design basis event conditions in the area of instrument channel component use using one or more of the following methods:

- Demonstration of seismic motion consistent with that of existing design basis loads at the installed location.
- Substantial history of operational reliability in environments with significant vibration, such as for portable hand-held devices or transportation applications. Such a vibration design will be inclusive of the effects of seismic motion imparted to the components at the proposed installation location in the plant.
- Adequacy of seismic design and installation will be demonstrated based on the guidance in Sections 7, 8, 9, and 10 of IEEE Standard 344-2004, "IEEE Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations," (Ref. 9.7) or a substantially similar industrial standard.
- Demonstration that proposed devices are substantially similar in design to models that have been previously tested for seismic effects in excess of the plant design basis at the location where the instrument is to be installed (g-levels and frequency ranges); or
- Seismic qualification using seismic motion consistent with that of existing design basis loading at the installation location.

6.4. Independence

The primary instrument channel will be independent of the backup instrument channel. The probes for the two channels will be located near the edge of the SFP and separated by a distance that is comparable to the length of the shortest side of the pool.

The signal processors for both the primary and backup instrument channels will be located in the control building. These signal processors will be separated by a distance of at least 20 feet in order to prevent simultaneous physical damage due to a common cause.

Conduit and cable for the primary channel will be routed separately from the conduit and cable for the backup channel. The normal power for the primary and backup channels will be from different divisions of non-essential AC power.

6.5. Power Supplies

The power supplies for the instrument channels will be arranged as follows:

The primary instrument channel will normally receive power from a non-essential, Division I, 120 VAC circuit. In the event of a failure of this circuit, an internal battery for the signal processor will supply the instrument for between 4 and 24 hours. This time can be extended by utilizing an on-demand measurement feature of the processor where indication will be provided only when requested by the operator. An external battery will also be provided which can provide power for up to seven (7) days of continuous use.

The backup instrument channel will normally receive power from a non-essential Division II, 120 VAC circuit. Since the backup channel is identical to the primary channel, it also has an internal battery for the signal processor which will supply the instrument for between 4 and 24 hours. This time can be extended by utilizing the same on-demand measurement feature as the primary channel. An external battery will also be provided which can provide power for up to seven (7) days of continuous use.

For both the primary and the backup channels, an external 120 VAC connection will be provided that can be used to supply power to the signal processors. This connection can be used to connect a portable generator or any other 120 VAC source to the signal processors.

The provisions described above will permit the operation of the SFP level instrumentation until off-site resources can be deployed by the mitigating strategies resulting from Order EA-12-049 (Ref. 9.1).

6.6. Accuracy

The primary and backup instrument channels will be designed to maintain their design accuracy following a power interruption or change in power source without recalibration. The accuracy of the instrument channels, including display accuracy, will be consistent with the guidelines of NRC JLD-ISG-2012-03 & NEI 12-02 (Ref. 9.3 and 9.4, respectively).

Both channels will be calibrated with the same range limits. Since the two channels will be identical in design and will be exposed to the same environment, they will provide the same readings within their limits of accuracy at all times. This will prevent the two indications from conflicting with each other.

6.7. Testing

Both the primary and backup instrument channels will be designed to provide for routine in-situ testing and calibration. Details will be determined during the engineering and design phase.

6.8. Display

Both the primary and backup instrument channels will have accessible displays available in the control building. Each signal processor has a local display which may be used during normal operations or in the event of a control room evacuation.

7. Instrument Channel Program Criteria

7.1. Training

Systematic Approach to Training (SAT) methods will be used to identify the population to be trained and to determine both the initial and continuing elements of the required training.

7.2. Procedures

Procedures will be developed or revised, as necessary, using guidelines and vendor instructions to address the maintenance, operation, and abnormal response issues associated with the new SFP level instrumentation.

Procedures will also address the following situations consistent with the applicable NEI 12-02 guidelines (Ref. 9.4):

- If, at the time of an event or thereafter until the unit is returned to normal service, an instrument channel ceases to function, its function will be recovered within a period of time consistent with the emergency conditions that may apply at the time.

- If, at the time of an event or thereafter until the unit is returned to normal service, an instrument channel component must be replaced, if necessary, it may be replaced with a commercially available component that may or may not meet all of the qualifications (Section 6.3 above) in order to maintain the instrument channel functionality.

- Cooper Nuclear Station will have a strategy to ensure SFP water level addition is initiated at an appropriate time consistent with the implementation of NEI 12-06 (Ref. 9.5).

7.3. Testing and Calibration

Processes will be established and maintained consistent with the applicable NEI 12-02 guidelines (Ref. 9.4) for scheduling and implementing necessary testing and calibration of the primary and backup SFP level instrument channels to maintain the instrument channels at the design accuracy. The testing and calibration of the instrumentation will be consistent with vendor recommendations or other documented basis. Calibration will be specific to the mounted signal processor and display.

8. Need for Relief and Basis

Cooper Nuclear Station is not requesting relief from the requirements of Order EA-12-051 (Ref. 9.2) or the guidance in NRC JLD-ISG-2012-03 (Ref. 9.3) at this time.

9. References

9.1. NRC Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events"

9.2. NRC Order EA-12-051, "Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation"

9.3. NRC JLD-ISG-2012-03, "Compliance with Order EA 12-051, Reliable Spent Fuel Pool Instrumentation"

9.4. NEI 12-02 Rev. 1, "Industry Guidance for Compliance with NRC Order EA-12-051, 'To Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation' "

9.5. NEI 12-06 Rev. 0, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide"

9.6. CNS USAR XII, "Structures and Shielding"

9.7. IEEE Standard 344-2004, "IEEE Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations"

9.8. CNS Drawing 1330-17 Rev. 2, "Fuel Storage Pool Details"

9.9. CNS Drawing 4230 Rev. 14, "Reactor Building Misc. Pool Sects. & Dets. Sh. #1"

9.10. CNS Drawing 80E1143 Rev. N01, "Fuel Storage Rack"

9.11. CNS Letter NLS2012111 dated October 26, 2012 (ADAMS Accession # ML12310A199)

10. Conceptual Design

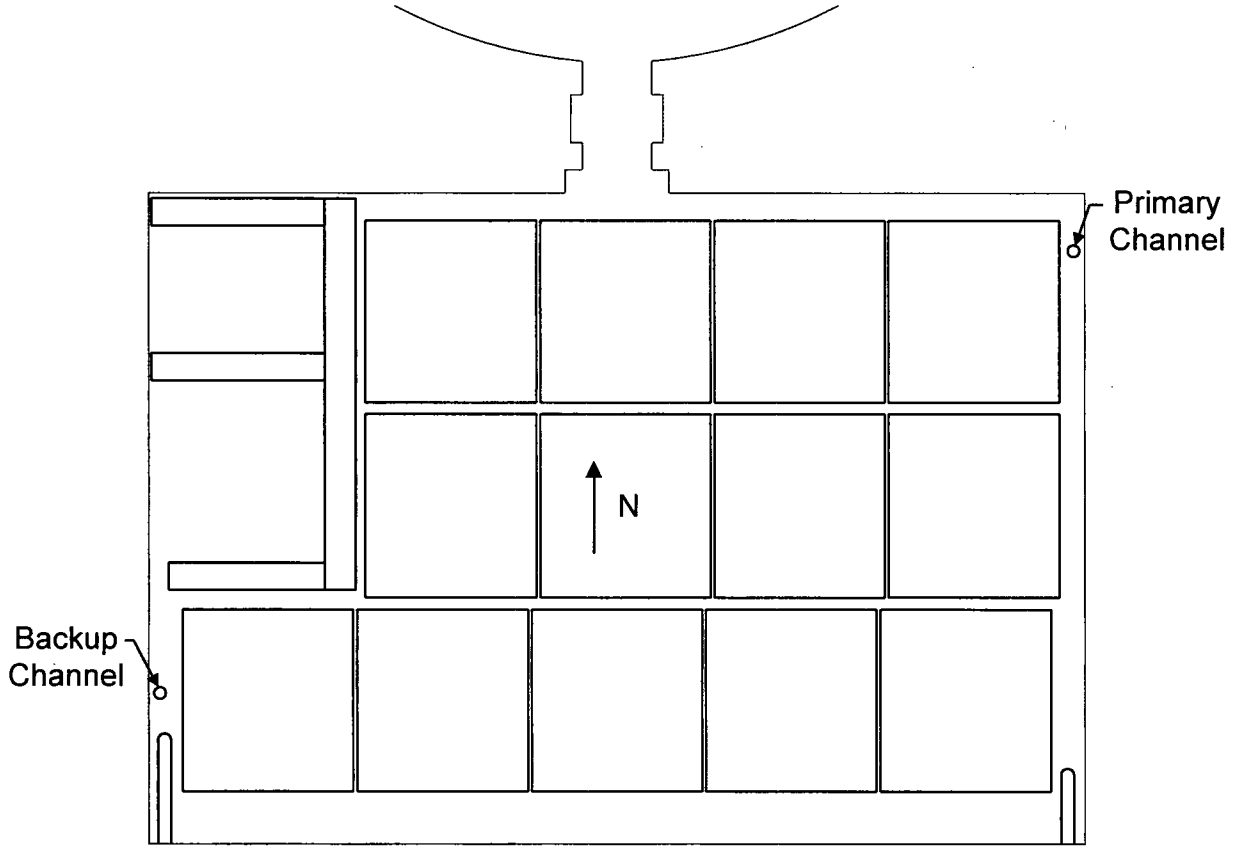

Figure 1: Spent Fuel Pool Level Probe Layout

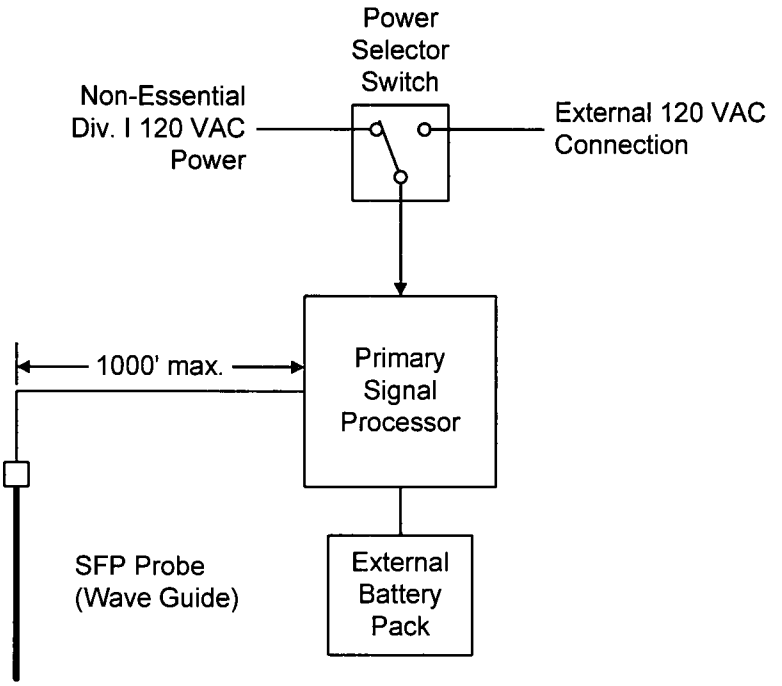

Figure 2: Primary Instrument Channel

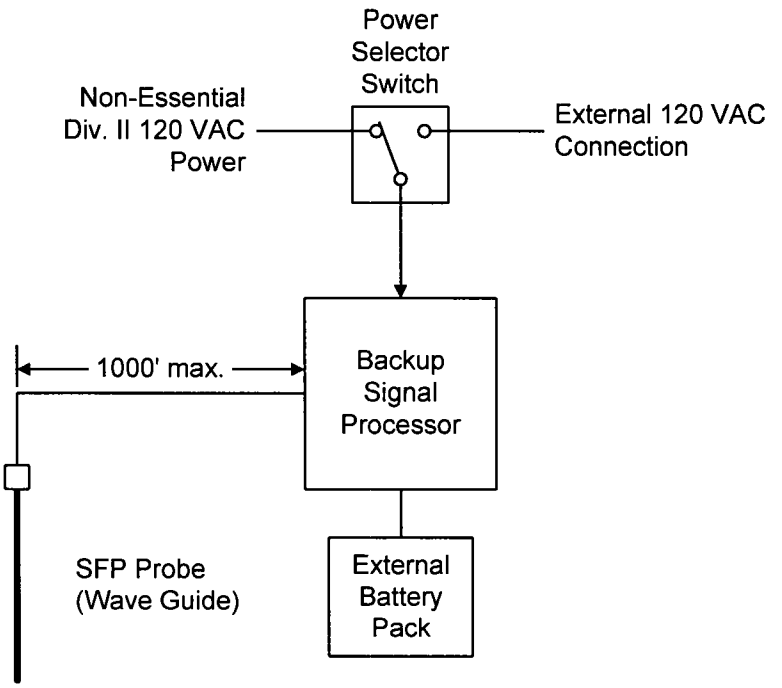

Figure 3: Backup Instrument Channel