Westinghouse APP-GW-GLR-171 (Redacted), (NON-PROPRIETARY VERSION) (44 pages including cover page)

F-6.1-2 Rev 1

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☐ All AP1000 Plants except:

☒ Only the following plants:
HA2, HA3, LN1, LN2, SV3, SV4, TP6, TP7, VS2, VS3, WL1, and WL2

Westinghouse Acceptance of AP1000 Design Partner Document by:
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Contains Redacted Sensitive Unclassified Non-Safeguards Information (SUNSI) relative to the physical protection of an AP1000 nuclear plant that is withheld from public disclosure pursuant to 10 CFR 2.390 (d).

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REVISION HISTORY

RECORD OF CHANGES

REVISION	AUTHOR	DESCRIPTION
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ACRONYMS AND TRADEMARKS

Acronyms	Definition
AC	alternating current
ADS	automatic depressurization system
AOP	abnormal operating procedure
COL	combined operating license
CP	construction permit
DC	direct current
DCD	Design Control Document
DG	diesel generator
ELAP	extended loss of AC power
EOP	emergency operating procedures
FLEX	diverse and flexible coping strategies
FSAR	Final Safety Analysis Report
HCLPF	high confidence, low probability of failure
HDPE	high-density polyethylene
HVAC	heating, ventilation, and air conditioning
I&C	instrumentation and control
LOCA	loss of coolant accident
MCR	main control room
NEI	Nuclear Energy Institute
NRC	Nuclear Regulatory Commission
PCCAWST	passive containment cooling ancillary water storage tank
PCCWST	passive containment cooling water storage tank
PCS	passive containment cooling system
PRHR	passive residual heat removal
QA	quality assurance
PMS	protection and safety monitoring system
RCS	reactor coolant system
RNS	normal residual heat removal system
RRC	Regional Response Centers
RSW	remote shutdown workstation
SAFER	Strategic Alliance for Flex Emergency Response
SAMG	severe accident management guidelines
SAT	systems approach to training
SBO	station blackout
SFP	spent fuel pool
SMA	seismic margin assessment
SSE	safe shutdown earthquake
UHS	ultimate heat sink

Introduction

One of the primary lessons learned from the accident at Fukushima Dai-Ichi was the significance of the challenge presented by a loss of safety-related systems following the occurrence of a beyond-design-basis external event. In the case of Fukushima Dai-Ichi, the extended loss of alternating current (AC) power (ELAP) condition caused by the tsunami led to loss of core cooling and a significant challenge to containment. The design basis for U.S. nuclear plants includes bounding analyses with margin for external events expected at each site. Extreme external events (e.g., seismic events and external flooding) beyond those accounted for in the design basis are highly unlikely but could present challenges to nuclear power plants.

In order to address these challenges, Nuclear Energy Institute (NEI) 12-06, Diverse and Flexible Coping Strategies (FLEX) Implementation Guide, Revision 0, outlines the process to be used by licensees, Construction Permit (CP) holders, and Combined Operating License (COL) holders to define and deploy strategies that will enhance their ability to cope with conditions resulting from beyond-design-basis external events.

This document provides input for AP1000 utilities for implementation of site specific FLEX strategies. The intent is to provide as much standard information as possible within the bounds of the FLEX template such that standard responses and reviews can be utilized to the maximum extent possible.

AP1000 FLEX Integrated Plan	
1.) Determine Applicable Extreme External Hazards **Ref: NEI 12-06 section 4.0-9.0** **JLD-ISG-2012-01 section 1.0**	*Input the hazards applicable to the site; seismic, external flood, high winds, snow, ice, cold, high temps.* *Describe how NEI 12-06 sections 5-9 were applied and the basis for why the plant screened out for certain hazards.*

1a.) Seismic Hazard Assessment

For the AP1000 standard design, the seismic margin assessment (SMA) demonstrates the robustness of the passive safety systems and the associated structures to beyond-design-basis conditions and is already included in the AP1000 licensing basis for design certification. The SMA demonstrates margin over the safe shutdown earthquake (SSE) of 0.3g through confirmation that the plant high confidence, low probability of failures (HCLPFs) is at least 0.5g peak ground acceleration. The SMA for the AP1000 design is discussed further in the Westinghouse AP1000 Design Control Document (DCD) Revision 19, Section 19.55 and as referenced in the Final Safety Analysis Report (FSAR) of each Combined Operating License (COL) holder or applicant.

Based on the above, only the deployment of the FLEX equipment needs additional evaluation with regard to seismic hazards. As described in Section F.3.2 of NEI document NEI 12-06, for the survivability of FLEX equipment, the equipment is stored a sufficient distance from the site such that it would not be reasonably subject to the same seismic hazard and would be expected to be operational following the AP1000 passive 72-hour coping period.

1b.) External Flood Assessment

The AP1000 design basis flood level (refer to Westinghouse AP1000 DCD Revision 19, Table 2-1, Site Parameters, and as referenced in the FSAR of each COL holder or applicant) is required to be below plant grade level. This makes the AP1000 site a "dry site" per NEI 12-06, Section 6.2.1, and no further evaluation is required.

1c.) Extreme Cold, High Wind Hazard, and Extreme High Temperature Assessment

The AP1000 design basis (refer to Westinghouse AP1000 DCD Revision 19, Table 2-1, Site Parameters, and as referenced in the FSAR of each COL holder or applicant) demonstrates the wide range of extreme environmental conditions covered by the design. Because of the conservatisms that are incorporated into the selection of these site environmental conditions, they are expected to bound extreme site-specific values.

Based on the above, only the deployment of the FLEX equipment needs additional evaluation with regard to extreme cold, high wind, and extreme high temperature hazards. As described in Section F.3.2 of NEI 12-06, for the survivability of FLEX equipment, the equipment is stored a sufficient distance from the site such that it would not be reasonably subject to the same hazard and would be expected to be operational following the AP1000 passive 72-hour coping period.

References

1. NEI 12-06, Revision 0, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," Nuclear Energy Institute, August 2012.

2.) Key Site Assumptions to Implement NEI 12-06 Strategies. **Ref: NEI 12-06 section 3.2.1**	*Provide key assumptions associated with the implementation of FLEX strategies.*

Since the AP1000 design has a 72-hour passive system coping time, there is significant time to transport equipment from offsite. Per the U.S. Nuclear Regulatory Commission (NRC) endorsement in JLD-ISG-2012-01 of the guidance in Appendix F of NEI 12-06 for the AP1000 design, initial coping with extended loss of AC power (0-72 hours, or Phases 1 and 2) is addressed through installed, safety-related plant equipment and is already covered by the existing licensing basis for core, containment, and spent fuel cooling. The following assumptions are applied for Phase 3:

- Following conditions exist:
  - — Safety-related (seismically–designed) direct current (DC) battery banks are available.
  - — Safety-related (seismically–designed) DC distribution is available.
  - — Safety-related (seismically–designed) piping is available.
  - — Safety-related equipment, instrumentation, and structures are available and intact.
  - — The spent fuel pool (SFP) is intact and thus, SFP spray capability is not required
  - — Safety-related plant equipment that is contained in structures with designs that are robust with respect to seismic events, floods, high winds, and associated missiles (as applicable to the site) are available.
  - — No AC power is available from onsite sources or offsite connections.
- Appropriately conservative design methods will be applied to FLEX components. All FLEX components will be procured commercially.
- The design hardened connections for post-72 hour equipment are protected against external events. At least one strategy for each functional requirement (heating, ventilation, and air conditioning [HVAC]; instrumentation & control [I&C]; core; containment; and spent fuel cooling) utilizes a connection that is safety-related (AP1000 Safety Class C) and seismic category I.
- FLEX deployment implementation strategies are assessed for hazards impact.
- All Phase 3 components are stored far enough from the site such that they would not be subjected to the hazard(s) that affected the site.
- Storage locations for offsite equipment are located at Regional Response Centers.

3.) Extent to which the guidance, JLD-ISG-2012-01 and NEI 12-06, are being followed. Identify any deviations to JLD-ISG-2012-01 and NEI 12-06. **Ref: JLD-ISG-2012-01** **NEI 12-06 13.1**	*Include a description of any alternatives to the guidance, and provide a milestone schedule of planned action.*

Full conformance with JLD-ISG-2012-01 and NEI 12-06 (including Appendix F) is expected with no deviations. Please reference the Milestone Schedule that accompanies this report.

4.) Provide a sequence of events and identify any time constraint required for success including the technical basis for the time constraint. **Ref: NEI 12-06 section 3.2.1.7** **JLD-ISG-2012-01 section 2.1**	*Strategies that have a time constraint to be successful should be identified with a technical basis and a justification provided that the time can reasonably be met (for example, a walkthrough of the deployment)* *Describe in detail in this section the technical basis for the time constraint(s) identified on the sequence of events timeline.*

For the AP1000 design, the underlying strategies for coping with extended loss of AC power events involve a three-stage approach:

1. Initial coping is through installed plant equipment, without any AC power sources or makeup to the ultimate heat sink (UHS) The AP1000 passive design features provide core, containment, and spent fuel cooling for 72 hours, without reliance on AC power sources.

2. Following the 72-hour passive system coping time, support is required to continue passive system cooling. This support can be provided by installed plant ancillary equipment or by offsite equipment interfacing with installed plant connections. The installed ancillary equipment and stored cooling water are capable of supporting passive system cooling from 3 days after the loss of offsite power and the standby diesel generators to 7 days after the loss of offsite power and the standby diesel generators.

3. In order to extend the passive system cooling time to beyond 3 or 7 days (to an indefinite time), offsite assistance and resources are required.

5.) Identify How Strategies will be Deployed in All Modes. **Ref: NEI 12-06 section 13.1.6**	*Describe how the strategies will be deployed in all modes.*
The Phase 3 deployment strategies are described in Sections 8, 9, and 10. The basic strategies are identical for all modes with minor differences in parameters (e.g., required passive containment cooling system [PCS] and spent fuel pool [SFP] makeup flow depending on location of fuel). Any mode-specific variations are discussed within the sections describing the strategies.	

6.) Provide a Milestone Schedule. • **Modifications timeline** — **Phase 1 Modifications** — **Phase 2 Modifications** — **Phase 3 Modifications** • **Procedure guidance development complete** — **Strategies** — **Maintenance** • **Storage plan (reasonable protection)** • **Staffing analysis completion** • **FLEX equipment acquisition timeline** • **Training completion for the strategies** • **Regional Response Centers operational** • **Unit specific expected drill dates** **Ref: NEI 12-06 section 13.1**	
Please reference the Milestone Schedule that accompanies this report.	

7.) Identify How the Programmatic Controls will be Met. **Ref: NEI 12-06 section 11** **JLD-ISG-2012-01 section 6.0**	

The programmatic controls for implementation of FLEX include:

- Quality attributes
- Equipment design
- Equipment storage
- Procedure guidance
- Maintenance and testing
- Training
- Staffing
- Configuration control

The AP1000 design has a graded approach to the classification of components. In addition to three safety-related classes (A, B, C) and a non-safety-related class (E), there is an in between class (D). This class has variable design, quality assurance (QA) and inservice testing requirements which depend on the safety importance and mission of the equipment.

The AP1000 design has a graded QA approach; the QA applied to non-safety-related equipment with short-term availability controls (DCD Table 17-1) will be applied to the AP1000 FLEX equipment. Because of the differences in the AP1000 design compared to legacy designs, the use of installed ancillary equipment and offsite equipment is utilized in the plant design basis and operation of this equipment has been integrated into the plant procedures.

The AP1000 design has a graded approach to availability and testing as shown in DCD Section 16.3. This graded approach will be applied to the FLEX equipment. The FLEX equipment will be maintained in accordance with Section 11.5 of NEI 12-06.

The design of the FLEX equipment will be in accordance with Section 11.2 of NEI 12-06.

The storage of the FLEX equipment will be in accordance with Section 11.3 of NEI 12-06, and will be located away from the site based on the 72 hour time frame from event initiation for the equipment to be supplied to the site.

The AP1000 design and licensing basis as described in AP1000 DCD Section 1.9.5.4 already provides a

set of procedures (referred to as "Post-72 Hour Procedures") that address the actions that would be necessary 72 hours subsequent to an extended loss of all AC power (extended station blackout [SBO]) to maintain core, containment, and spent fuel cooling for an indefinite period of time. The post-72 hour procedures and their relationship to other procedures and guidelines will be reviewed to confirm integration with the FLEX guidance (NEI 12-06), including consideration of capability for beyond-design-basis external events.	
7a.) Describe Training Plan	Training will primarily consist of the typical objective-based procedure training that operators receive on these procedures and guidelines accompanied by simulator scenario training that integrate these hypothetical events. The training for the FLEX aspects of the AP1000 design will build upon the training that is already required for the post 72-hour operational requirements. Training material for classroom presentation and simulator scenarios need to be developed in accordance with the systems approach to training (SAT) as delineated in 10 CFR 55.4. This includes the development of the following: 1. Objective-based classroom training for the procedures 2. Objective-based classroom training on the integration of the AP1000 design and operator responses and operator tasks for these beyond design basis events 3. Simulator scenarios 4. Exam items for all of this training as appropriate
7b.) Describe Regional Response Center Plan	The industry will establish two Regional Response Centers (RRCs) to support utilities during beyond-design-basis events. Each RRC will hold five sets of equipment, four of which will be able to be fully deployed when requested; the 5th set may have equipment in a maintenance cycle. Where the required set of equipment to support one unit is comprised of multiple pieces of the same equipment, the 5th set contains one piece of this equipment to support the maintenance cycle and not a full set of the same equipment. In case of an event where this equipment is needed at plant(s), equipment will be moved from an RRC to a local staging area, established by the Strategic Alliance for Flex Emergency Response (SAFER) team and the utility. Communications will be established

	between the affected nuclear site and the SAFER team and required equipment moved to the site as needed. A contract will be executed and maintained in accordance with the requirements of Section 12 of NEI 12-06.
8.) Maintain Core Cooling, Containment Cooling, and Spent Fuel Pool Inventory	
8a.) PWR Installed and Portable Equipment (Phases 1 & 2)	

The design basis of the AP1000 plant includes passive design features that provide core, containment, and spent fuel cooling capability for 72 hours, without reliance on AC power. These features do not rely on access to any external water sources since the containment vessel and the passive containment cooling system serve as the safety-related ultimate heat sink. The NRC staff reviewed these design features prior to issuance of the combined licenses for these facilities and certification of the AP1000 design referenced therein. The AP1000 design also includes equipment to maintain the required safety functions in the long term (beyond the 72 hours to 7 days timeframe), including capability to replenish water supplies. Connections are provided for generators and pumping equipment that can be brought to the site to back up the installed equipment. The NRC staff concluded in its final safety evaluation report for the AP1000 design that the installed equipment (and alternatively, the use of transportable equipment) is capable of supporting extended operation of the passive safety systems to maintain required safety functions in the long term.

For these reasons, further consideration of Phases 1 and 2 is not necessary for the AP1000 design.

8b.) PWR Portable (Offsite) Equipment Phase 3	

The AP1000 safety systems (in-containment water inventory, SFP water inventory, and PCS water inventory) have sufficient capacity to support the safety functions of core cooling, containment cooling, and SFP inventory for at least 72 hours.

<u>Primary Strategy</u>

Beyond 72 hours, additional inventory for the PCS and spent fuel pool can be supplied from the onsite passive containment cooling ancillary water storage tank (PCCAWST) using the onsite PCS recirculation pumps, powered using the onsite ancillary diesel generators or offsite replacement generators (as discussed in Section 9). This flowpath can be seen in Figure 2 of this report. Note that the

PCS recirculation pumps, the onsite ancillary diesel generators, and the PCCAWST are non-safety-related components. However, these components are rugged components located in nuclear seismic structures with seismic category II anchorage and are likely to be available or easily repairable following a beyond-design-basis event. The PCS recirculation pumps are located in the seismic category I auxiliary building. The onsite ancillary diesel generators are located in the seismic category II annex building. The PCCAWST is a seismic category II tank in the yard.

For indefinite coping after 7 days, Phase 3 equipment for the AP1000 design includes an offsite pump (PCCAWST makeup pump) and appropriate connection materials to refill the PCCAWST from the closest river, lake, or ocean source.

Alternate Strategy

In the event that the PCS recirculation pumps are unavailable, Phase 3 equipment for the AP1000 design includes a second self-powered, offsite pump (PCS/SFP makeup pump) and appropriate connection materials. The discharge of the self-powered pump is connected to a safety-related, seismically-qualified flange (AP1000 Safety Class C, see Figure 1) in the yard using fire hose or hard pipe. This allows makeup to the SFP and the passive containment cooling water storage tank (PCCWST) as highlighted on Figure 2. The makeup flow necessary to maintain adequate SFP inventory is 35 gpm (8 m^3/hr) for the majority of modes. For beyond–design-basis events that occur during portions of the refueling process, the necessary makeup flow to maintain adequate SFP inventory is 50 gpm (11 m^3/hr). The makeup flow necessary to maintain adequate containment cooling is approximately 100 gpm (23 m^3/hr) for the majority of modes. For beyond-design-basis events that occur during portions of the refueling process, the necessary makeup flow to maintain adequate containment cooling is 80 gpm (18 m^3/hr). Supply to the self-powered pump will come from the closest river, lake, or ocean source. The makeup paths to the PCCWST and SFP are shown in Figure 2.

Additional Information

In the long term, containment makeup may be required due to expected leakage. A safety-related connection is available through a manual containment isolation valve in the normal residual heat removal system (RNS). This capability is described in Westinghouse AP1000 DCD Revision 19, Section 5.4.7.5 and as referenced in the FSAR of each COL holder or applicant.

8c.) Provide a Brief Description of Procedures/Strategies/Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation with a description of the procedure/strategy guideline.*

The AP1000 design and licensing basis as described in AP1000 DCD Section 1.9.5.4 already provides a set of procedures (referred to as "Post-72 Hour Procedures") that address the actions that would be necessary 72 hours subsequent to an extended loss of all AC power (extended SBO) to maintain core, containment, and spent fuel cooling for an indefinite period of time. The post-72 hour procedures and their relationship to other procedures and guidelines will be reviewed to confirm integration with the FLEX guidance (NEI 12-06), including consideration of capability for beyond-design-basis external

events.

General Progression to Post 72-Hour Procedures and SAMGs from EOPs and AOPs

The Post 72-hour procedures are used to perform actions not covered by normal operating procedures, abnormal operating procedures (AOPs), or emergency operating procedures (EOPs) and are independent of the severe accident management guidelines (SAMGs).

Post 72-hour procedures include the following procedures:

- APP-ECS-GJP-720 (Post 72-Hour Operations of Ancillary Diesel Generators)
- APP-VBS-GJP-720 (Post 72-Hour Operations of Main Control Room Ventilation)
- APP-PCS-GJP-720 (Post 72-Hour Operations of Passive Containment Cooling)
- APP-SFS-GJP-720 (Post 72-Hour Operations of Spent Fuel Pool Cooling)
- APP-RNS-GJP-720 (Post 72-Hour Operations of Containment Makeup)

The Post 72-hour procedures provide directions for mitigating an extended SBO event that includes the potential for depletion of the 24- and 72-hour batteries and maintaining the following required functions:

- The critical safety functions of subcriticality, core cooling, heat sink, and containment
- The function of main control room (MCR) habitability
- The function of SFP cooling
- Post accident monitoring from the MCR

After the initial safety-related cooling period of 72 hours, the AP1000 standard passive design includes both onsite equipment in the form of the ancillary diesel generators, as well as safety-related connections designed to interface with transportable emergency equipment that can provide cooling water and address the needs of required plant functions through at least 7 days.

Based upon conditions that occur during this portion of the event from post 72 hours to 7 days, the operators could transition to the following procedures as required: APP-PCS-GJP-720, APP-SFS-GJP-720, APP-VBS-GJP-720, or AOPs (APP-GW-GJP-329 and/or APP-GW-GJP-344).

All of the post 72-hour procedures contain placeholders and structure to direct operators to appropriate supporting procedures. If there is a loss of coolant accident (LOCA), the Critical Safety Function Status Trees, F-0, would direct the operators to FR-C.1 and from there to the SAMGs, if necessary. In addition, a LOCA may have initially directed operators to FR-C.2 or FR-C.3.

Post 72-Hour Procedures Introduction and Background Document (APP-GW-GJR-720):

As stated in APP-GW-GJR-720, background information for Post 72-Hour Operation Procedures, the post 72-hour procedures contain preplanned actions to provide core cooling, containment cooling and pressure mitigation, SFP makeup, and MCR habitability subsequent to an extended SBO event that

eventually leads to a depletion of the plant's DC battery-supported power. The post 72-hour procedures address the use of installed site systems or portable equipment and water sources that can be delivered to the site post accident or post event. These procedures act as an integrated set of operator tasks and instructions to allow for appropriate implementation of the AP1000 design.

APP-ECS-GJP-720 (Post 72-Hour Operations Of Ancillary Diesel Generators)

This procedure provides instructions for starting the ancillary diesel generators and energizing loads to support post 72-hour operations. Entry conditions for APP-ECS-GJP-720 would be met subsequent to a beyond-design-basis event resulting in a SBO. During an extended SBO event, Attachment 3 of APP-GW-GJP-323 would direct operators to APP-ECS-GJP-720 to start the ancillary diesel generators. Upon a loss of functionality of the ancillary diesel generators, this procedure provides instructions for replacing the ancillary generators and/or providing alternate power supplies.

APP-PCS-GJP-720 (Post 72-hour Operations Of Passive Containment Cooling)

This procedure provides instructions for the connection of externally stored or procured pumps and water sources to add water to the PCCWST and/or the SFP. These conditions would have been met during the transition of the operators from the main body of APP-GW-GJP-323 to Attachment 3 of APP-GW-GJP-323.

APP-SFS-GJP-720 (Post 72-Hour Operations Of Spent Fuel Pool Cooling)

This procedure addresses gravity drain to the SFP from the PCCWST when core power is below applicable Tech Spec conditions. Entry conditions in APP-GW-GJP-344 will direct the operators to perform passive gravity draining of the PCCWST to the SFP.

APP-VBS-GJP-720 (Post 72-Hour Operations Of Main Control Room Ventilation)

This procedure provides instructions for placing a MCR ancillary fan and I&C room divisions B and C ancillary fans in service. This procedure would have been entered by the operators as soon as the ancillary diesel generators or offsite portable generators have been started in accordance with APP-ECS-GJP-720.

APP-RNS-GJP-720 (Post 72-Hour Operations Of Containment Makeup)

This procedure provides instructions for making up to the containment sump from a borated water source using a temporary pump during a long-term loss of offsite and onsite AC electrical power. This procedure provides for the use of externally stored or procured pumps and water. This procedure is not anticipated to be needed until after 30 days following automatic depressurization system (ADS) operation.

8d.) Identify Modifications	Not applicable.

8e.) Key Reactor Parameters

The post-accident monitoring system (PAMS) Class 1E instrumentation provides monitoring of these functions. This instrumentation is powered for the first 72 hours by the safety-related batteries and is powered thereafter by onsite ancillary diesel generators or offsite portable generators for indefinite coping. There are multiple connection points for offsite portable generators such that portable instrumentation is not necessary for key parameters. The PAMS instrumentation includes the following:

Instrumentation	Function
Neutron flux, source range	Reactivity control
Reactor Coolant System (RCS) wide range pressure	RCS integrity, core cooling
RCS wide range temperature, hot leg	RCS integrity, core cooling
Containment water level	RCS integrity
Containment pressure	RCS integrity, containment
Pressurizer level	RCS inventory
Hot Leg level	RCS inventory
Core exit temperature	Core cooling
Passive residual heat removal (PRHR) flow	Heat sink
PRHR outlet temperature	Heat sink
PCS water storage tank level	Heat sink
PCS water flow rate	Heat sink
SFP level	Spent fuel cooling

Local instrumentation necessary for monitoring of offsite equipment is also included in this area and includes:

Instrumentation	Function
Offsite pump discharge flow	Core cooling, containment cooling, SFP inventory
Offsite pump discharge pressure	Core cooling, containment cooling, SFP inventory

8f.) Deployment Conceptual Design	**(Attachment 2 contains Conceptual Sketches)**	
Strategy	**Modifications**	**Protection of connections**
See above.	Not applicable.	The refill connection for the PCCWST will be designed to withstand the applicable hazards. The portable pump and associated equipment (fire hose, high-density polyethylene [HDPE] pipe, and pump instrumentation) will come from offsite.
Notes:		
9.) Safety Functions Support – I&C		
9a.) PWR Installed and Portable Equipment (Phases 1 & 2)		
The design basis of the AP1000 plant includes passive design features that provide core, containment, and spent fuel cooling capability for 72 hours, without reliance on AC power sources. Required post-accident I&C is powered by four safety-related DC battery banks for the first 24 hours, and by two safety-related DC battery banks through 72 hours. One of these 72 hour safety-related trains is powered through division B, and the other is powered through division C. The AP1000 design also includes AC power equipment to maintain the required safety functions in the long term (beyond 72 hours to 7 days) including capability to power post-accident I&C. Connections are provided for generators and pumping equipment that can be brought to the site to back up the installed equipment. The NRC staff concluded in its final safety evaluation report for the AP1000 design that the installed equipment (and alternatively, the use of transportable equipment) is capable of supporting extended operation of the passive safety systems to maintain required safety functions in the long term. For these reasons, further consideration of Phases 1 and 2 is not necessary for the AP1000 design.		

9b.) PWR Portable Equipment Phase 3	

Beyond the initial 72 hours, instrument power can be supplied by the use of onsite permanently installed ancillary diesel generators or offsite portable generators with quick and accessible connection points. Permanently installed onsite ancillary diesel generators located in the annex building are capable of providing power for Class 1E post-accident monitoring, MCR lighting, MCR and I&C room ventilation, and power to refill the PCCWST using the PCS recirculation pumps. This capability is described in Westinghouse AP1000 DCD Revision 19, Section 8.3.1.1.1 and as referenced in the FSAR of each COL holder or applicant. Each ancillary diesel generator output is connected to a distribution panel in the same room as the ancillary diesel generators. The distribution panel contains outgoing feeder circuit breakers directly connected to the division B and division C voltage regulating transformers that power the post-accident monitoring loads, the lighting in the MCR, and the ventilation in the MCR and division B and C I&C rooms. This configuration is depicted in Westinghouse AP1000 DCD Revision 19, Figures 8.3.1-3 and 8.3.2-2 and as referenced in the FSAR of each COL holder or applicant. The post72-hour procedures include provisions to start and connect the ancillary diesel generators.

Primary Strategy

The primary strategy will be to use the onsite ancillary diesel generators if they are available post event or offsite replacement portable generators using the same non-safety connections if the permanently installed ancillary diesel generators are unavailable. The AP1000 design does not require that the ancillary diesel generators be safety related. Their operation is not required following a loss of all AC power for 72 hours because they are easily replaced with offsite portable generators, which are capable of being connected to the distribution panel in the same room or to a safety-related connection as described in Westinghouse AP1000 DCD Revision 19, Section 1.9.5.4 and as referenced in the FSAR of each COL holder or applicant. This section of the Westinghouse AP1000 DCD states: "the AP1000 design includes both onsite equipment and safety-related connections for use with transportable equipment."

Alternate Strategy

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Redacted Version – Withheld Under 10 CFR 2.390	
]SRI,a,c [ ]a,c	
Details:	
9c.) Provide a Brief Description of Procedures/Strategies/ Guidelines	See description in Section 8c.
9d.) Identify Modifications	NA
9e.) Key Parameters	The class 1E PAMS variables are the key parameters and are defined in Westinghouse AP1000 DCD Revision 19 Table 7.5-1 and as referenced in the FSAR of each COL holder or applicant.

9f.) Deployment Conceptual Design **(Attachment 2 contains Conceptual Sketches)**		
Strategy	**Modifications**	**Protection of Connections**
See above.	N/A	[ ]a,c
Notes:		

10.) Safety Functions Support – MCR and PMS Division B and C I&C Rooms Ventilation	
10a.) PWR Installed and Portable Equipment (Phases 1 & 2)	
The design basis of the AP1000 plant includes appropriate design features to provide ventilation of the MCR and division B and C I&C rooms for 72 hours, without reliance on AC power sources. These features do not rely on external power sources – cooling is performed through passive heat sinks. The NRC staff concluded in its final safety evaluation report for the AP1000 design that the installed	

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equipment (and alternatively, the use of transportable equipment) is capable of supporting extended operation of the passive safety systems to maintain required safety functions in the long term.

For these reasons, further consideration of Phases 1 and 2 is not necessary for the AP1000 design.

10b.) PWR Portable Equipment Phase 3	

The AP1000 design provides habitability systems with the capability to maintain the MCR environment suitable for occupancy for at least 72 hours, as well as provisions for maintaining appropriate temperatures in the division B and C I&C rooms.

<u>Primary Strategy</u>

Beyond the initial 72 hours, MCR habitability and I&C room cooling can be maintained using offsite replacement portable generators (see above I&C strategy), and permanently installed or offsite replacement ancillary fans for the MCR and I&C rooms. Ancillary diesel generators located in the annex building are capable of providing power for MCR and I&C room ancillary fans. This capability is described in Westinghouse AP1000 DCD Revision 19, Section 8.3.1.1.1 and as referenced in the FSAR of each COL holder or applicant. Each ancillary diesel generator output is connected to a distribution panel in the same room as the ancillary diesel generators. The distribution panel contains outgoing feeder circuit breakers directly connected to the division B and C voltage regulating transformers that power the ventilation in the MCR and division B and C I&C rooms. This configuration is depicted in Westinghouse AP1000 DCD Revision 19, Figures 8.3.1-3 and 8.3.2-2 and as referenced in the FSAR of each COL holder or applicant. The onsite, installed MCR ancillary fans direct outside air from the nuclear island nonradioactive ventilation system (VBS) air intake opening [ ][SRI] and the VBS supply duct. The warm air from the MCR is vented to the annex building [ ][SRI]. See Figure 4 and Figure 5 for sketches of this air flow path. This configuration is depicted in Westinghouse AP1000 DCD Revision 19, Figure 9.4.1-1 (sheet 5) and described in Section 9.4.1.2.3.1 and as referenced in the FSAR of each COL holder or applicant. The onsite, installed ancillary fans located in the division B and C I&C rooms can maintain room temperature below the qualification temperature of the I&C equipment.

The outside air pathway to the I&C room ancillary fans is through the VBS outside air intake [ ][SRI]. The warm air is vented to the annex building [ ][SRI]. This configuration is described in Westinghouse AP1000 DCD Revision 19, Section 9.4.1.2.3.2 and as referenced in the FSAR of each COL holder or applicant. See Figure 6, Figure 7, and Figure 8 for sketches of this air flow path. The post 72-hour procedures include provisions to replace, start, and connect the ancillary diesel generators and initiate the respective ancillary fans as a primary strategy for

post 72-hour ventilation.

Alternate Strategy

Alternatively, post 72-hour MCR habitability and I&C room ventilation can be performed using offsite portable generators, offsite portable fans, and offsite portable ducting/cables.

The offsite portable generators will be comparable to the permanently installed ancillary generators. The offsite fans will be comparable to permanently installed ancillary fans and will use the same air pathways with temporary ducting installed, if necessary. The division B and C I&C rooms' offsite fans and MCR offsite fan will be comparable to the VBS ancillary fans described in Westinghouse AP1000 DCD Revision 19, Section 9.4.1.2.2 and as referenced in the FSAR of each COL holder or applicant.

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The offsite fans and (if necessary) temporary ducting will be transported to the relevant rooms (MCR and division B and C I&C rooms). The offsite fans for the division B and C I&C rooms will be installed in the same mounting as the onsite, permanently installed ancillary fans using common hand tools. Bolting the offsite replacement fans to the existing mountings mitigates the risk of potential seismic interaction with PAMS I&C equipment. The offsite fans will utilize the installed, non-safety-related, seismic category 2 ducting if intact. Otherwise, temporary ducting will be used. The offsite fan for MCR habitability will be placed in the Shift Manager's Office adjacent to the MCR. Portable ducting will be used to connect the MCR ancillary fan to the VBS ducting and from the fan into the MCR. The ducting forming the pathway to the MCR is seismic category I, so it will be operational after a design basis earthquake.

10c.) Provide a Brief Description of Procedures/Strategies/ Guidelines	See description in Section 8c.	
10d.) Identify Modifications	N/A	
10e.) Key Parameters	N/A	
10f.) Deployment Conceptual Design	**(Attachment 2 contains Conceptual Sketches)**	
Strategy	**Modifications**	**Protection of Connections**
Installation of offsite fans, temporary cabling, offsite portable generators, and ductwork. See above for detailed description.	N/A	[ ][a,c]

11.) PWR Portable Equipment Phase 3							
Use and (Potential/Flexibility) Diverse Uses							
List Portable Equipment	**Core**	**Containment**	**SFP**	**Instrumentation**	**Accessibility**	**Performance Criteria**	**Notes**
PCS/SFP Makeup Pump	X	X	X			248 ft. head at 135 gpm and 286 ft. head at 100 gpm	One portable pump per unit Utilize 4–in. standard Storz connection
PCCAWST Makeup pump	X	X	X			150 gpm delivered to the PCCAWST	One portable pump per unit Used in conjunction with the PCS/SFP makeup pump. Pumps water from the nearest lake, river, or ocean to provide indefinite makeup to the PCCAWST.
Two Portable Generators	X	X	X	X	X	80 kw, 480V each	Two portable generators per unit
Diesel Fuel	X	X	X	X		Small cargo fuel tank >100 gallons	

Use and (Potential/Flexibility) Diverse Uses							
List Portable Equipment	**Core**	**Containment**	**SFP**	**Instrumentation**	**Accessibility**	**Performance Criteria**	**Notes**
3 Fans (see performance criteria for details)				X	X	MCR portable fan (1) – 1700 cfm@0.65 in. of water, 0.5 hp I&C rooms (2) – 1500 cfm@ 0.71 inches of water, 0.5 hp	One set (3) of fans per unit
Fire Hose and Hard Pipe	X	X	X			50 ft. hard pipe (6 in. NPS) for PCS/SFP makeup pump suction 50 ft. fire hose (4 in. NPS) for PCS/SFP makeup pump discharge 200 ft. hard pipe (8 in. NPS) for PCCAWST makeup pump suction 0.5 miles hard pipe or fire hose (6 in. NPS) for PCCAWST makeup pump discharge	To be confirmed during detailed design and procurement. One set of each piping per unit

Use and (Potential/Flexibility) Diverse Uses						Performance Criteria	Notes
List Portable Equipment	**Core**	**Containment**	**SFP**	**Instrumentation**	**Accessibility**		
Temporary Cabling (quantities under performance criteria)	X	X	X	X		1. [ ]a,c	
Duct				X	X	200 ft. flexible hose (16 in. NPS)	

Use and (Potential/Flexibility) Diverse Uses						Performance Criteria	Notes
List Portable Equipment	**Core**	**Containment**	**SFP**	**Instrumentation**	**Accessibility**		
Instruments (flow meter and pressure gauge for offsite pumps)	X	X	X				Part of pump packages.
Discharge Throttling Valve	X	X	X				Part of pump packages.
Hand Tools (connections, fan removal)	X	X	X	X	X		

Attachment 1 – Sequence of Events Timeline

Action Item	Elapsed Time	Action	Time Constraint Y/N	Remarks/Applicability
0	0	Event Starts	NA	Plant @100% power
1	1-3 seconds	Reactor trip due to LOOP	N	Original design bases for SBO event
2	1-3 seconds	Emergency Operating Procedure E-0 Entered	N	Design Basis for Reactor Trip or Safeguards signal receipt
3	2 minutes	Standby diesel generator (DG) fails to start	N	Event required failure
4	3-12 minutes	Enter APP-GW-GJP-323, Loss of 6.9 kV or 480 Volt Bus Power	N	Time is dependent upon the progression and severity of the event
5	15-30 minutes	Enter Attachment 3 of APP-GW-GJP-323 "Prolonged Loss of AC Power"	N	Time is dependent upon the progression and severity of the event
6	12-18 hours	Enter Post-72 hour procedures and start ancillary diesel generators as applicable	N	Time is dependent upon the progression and severity of the event
7	~21 hours	Strip all loads from the 24-hour batteries, if charger busses have been deenergized for 21 hours and RCS inventory indicates adequate inventory to continue PRHR HX operation.	N	
8	22 hours	ADS stage 1-3 valves open if 24 hour batteries are not stripped at 21 hours.	N	This only occurs if the load stripping discussed in Step 7 is not performed due to excessive RCS leakage.

Action Item	Elapsed Time	Action	Time Constraint Y/N	Remarks/Applicability
9	~24 hours	Initiate movement of offsite FLEX equipment if ancillary equipment has failed	N	Time is dependent upon the progression and severity of the event.
10	~24 hours	Continue with implementation of Post 72-hour procedures	N	Time is dependent upon the progression and severity of the event
11	~70 hours (~18 hours after a full-core offload)	Provide make-up of SFP through APP-PCS-GJP-720 (APP-SFS-GJP-720 or APP-GW-GJP-344 after full-core offload)	N	Cooling boil-off time is >72 hours under normal condition (~18 hours after a full core offload)
12	72 hr	End of generic WCAP analysis	NA	End of analytical simulation

Attachment 2 –
Conceptual Sketches

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Figure 1. Location of Safety-Related Connection for Water Makeup to PCS and SFP (from DCD Figure 1.2-2, Site Plan)

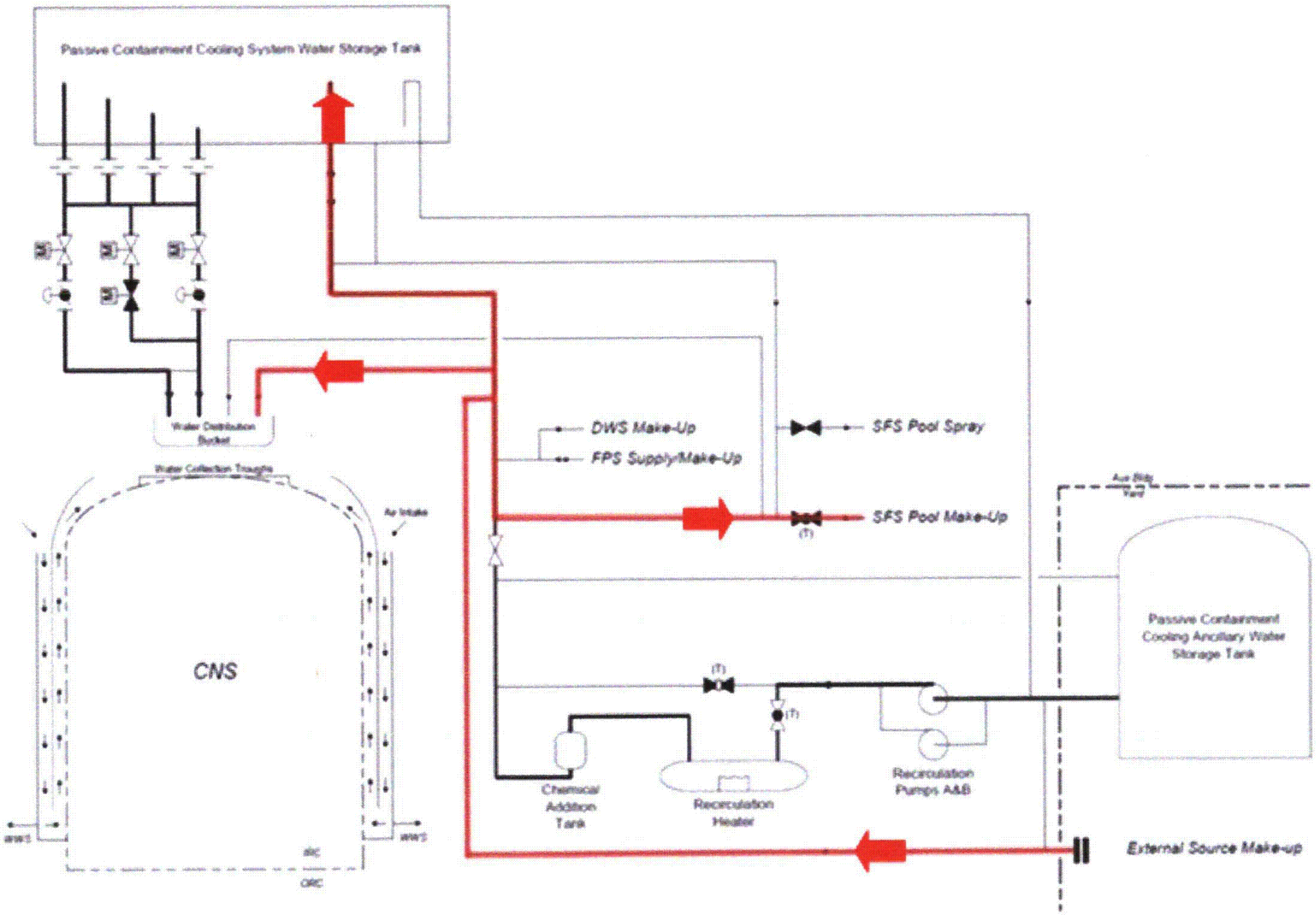

Figure 2. Simplified Sketch Showing Water Makeup Pathway to PCS and the SFP

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Figure 3. [

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Figure 4. Ventilation Path from Outside Air through the Main Control Room

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Figure 5. Ventilation Path from the MCR to the Outside

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Figure 6. Ventilation Path from Outside Air to Division B/C Battery Rooms

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Figure 7. Ventilation from Division B/C Battery Rooms (Elevation 82'-6") into Division B and C I&C Rooms (Elevation 100'-0")

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SRI

Figure 8. Ventilation Path from Division B and C I&C Rooms to Outside

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Figure 9. [

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Figure 10. [

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Westinghouse Application Letter CAW-13-3759
and Affidavit
(7 pages including cover page)

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CAW-13-3759

July 17, 2013

APPLICATION FOR WITHHOLDING PROPRIETARY
INFORMATION FROM PUBLIC DISCLOSURE

Subject: APP-GW-GLR-170 "AP1000 FLEX Integrated Plan" (Proprietary)

The proprietary information for which withholding is being requested in the above-referenced report is further identified in Affidavit CAW-13-3759 signed by the owner of the proprietary information, Westinghouse Electric Company LLC. The affidavit, which accompanies this letter, sets forth the basis on which the information may be withheld from public disclosure by the Commission and addresses with specificity the considerations listed in paragraph (b)(4) of 10 CFR Section 2.390 of the Commission's regulations.

Accordingly, this letter authorizes the utilization of the accompanying affidavit by the AP1000 Owner's Group (APOG).

Correspondence with respect to the proprietary aspects of the application for withholding or the Westinghouse affidavit should reference CAW-13-3759 and should be addressed to James A. Gresham, Manager, Regulatory Compliance, Westinghouse Electric Company, Suite 310, 1000 Westinghouse Drive, Cranberry Township, Pennsylvania 16066.

Very truly yours,

James A. Gresham, Manager,
Regulatory Compliance

Enclosures

AFFIDAVIT

COMMONWEALTH OF PENNSYLVANIA:

ss

COUNTY OF BUTLER:

Before me, the undersigned authority, personally appeared James A. Gresham, who, being by me duly sworn according to law, deposes and says that he is authorized to execute this Affidavit on behalf of Westinghouse Electric Company LLC (Westinghouse), and that the averments of fact set forth in this Affidavit are true and correct to the best of his knowledge, information, and belief:

James A. Gresham, Manager,
Regulatory Compliance

Sworn to and subscribed before me
this 17th day of July 2013

Notary Public

COMMONWEALTH OF PENNSYLVANIA
Notarial Seal
Anne M. Stegman, Notary Public
Unity Twp., Westmoreland County
My Commission Expires Aug. 7, 2016
MEMBER, PENNSYLVANIA ASSOCIATION OF NOTARIES

(1) I am Manager, Regulatory Compliance, in Engineering, Equipment and Major Projects, Westinghouse Electric Company LLC (Westinghouse), and as such, I have been specifically delegated the function of reviewing the proprietary information sought to be withheld from public disclosure in connection with nuclear power plant licensing and rule making proceedings, and am authorized to apply for its withholding on behalf of Westinghouse.

(2) I am making this Affidavit in conformance with the provisions of 10 CFR Section 2.390 of the Commission's regulations and in conjunction with the Westinghouse Application for Withholding Proprietary Information from Public Disclosure accompanying this Affidavit.

(3) I have personal knowledge of the criteria and procedures utilized by Westinghouse in designating information as a trade secret, privileged or as confidential commercial or financial information.

(4) Pursuant to the provisions of paragraph (b)(4) of Section 2.390 of the Commission's regulations, the following is furnished for consideration by the Commission in determining whether the information sought to be withheld from public disclosure should be withheld.

(i) The information sought to be withheld from public disclosure is owned and has been held in confidence by Westinghouse.

(ii) The information is of a type customarily held in confidence by Westinghouse and not customarily disclosed to the public. Westinghouse has a rational basis for determining the types of information customarily held in confidence by it and, in that connection, utilizes a system to determine when and whether to hold certain types of information in confidence. The application of that system and the substance of that system constitutes Westinghouse policy and provides the rational basis required.

Under that system, information is held in confidence if it falls in one or more of several types, the release of which might result in the loss of an existing or potential competitive advantage, as follows:

(a) The information reveals the distinguishing aspects of a process (or component, structure, tool, method, etc.) where prevention of its use by any of

Westinghouse's competitors without license from Westinghouse constitutes a competitive economic advantage over other companies.

(b) It consists of supporting data, including test data, relative to a process (or component, structure, tool, method, etc.), the application of which data secures a competitive economic advantage, e.g., by optimization or improved marketability.

(c) Its use by a competitor would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing a similar product.

(d) It reveals cost or price information, production capacities, budget levels, or commercial strategies of Westinghouse, its customers or suppliers.

(e) It reveals aspects of past, present, or future Westinghouse or customer funded development plans and programs of potential commercial value to Westinghouse.

(f) It contains patentable ideas, for which patent protection may be desirable.

There are sound policy reasons behind the Westinghouse system which include the following:

(a) The use of such information by Westinghouse gives Westinghouse a competitive advantage over its competitors. It is, therefore, withheld from disclosure to protect the Westinghouse competitive position.

(b) It is information that is marketable in many ways. The extent to which such information is available to competitors diminishes the Westinghouse ability to sell products and services involving the use of the information.

(c) Use by our competitor would put Westinghouse at a competitive disadvantage by reducing his expenditure of resources at our expense.

(d) Each component of proprietary information pertinent to a particular competitive advantage is potentially as valuable as the total competitive advantage. If competitors acquire components of proprietary information, any one component may be the key to the entire puzzle, thereby depriving Westinghouse of a competitive advantage.

(e) Unrestricted disclosure would jeopardize the position of prominence of Westinghouse in the world market, and thereby give a market advantage to the competition of those countries.

(f) The Westinghouse capacity to invest corporate assets in research and development depends upon the success in obtaining and maintaining a competitive advantage.

(iii) The information is being transmitted to the Commission in confidence and, under the provisions of 10 CFR Section 2.390, it is to be received in confidence by the Commission.

(iv) The information sought to be protected is not available in public sources or available information has not been previously employed in the same original manner or method to the best of our knowledge and belief.

(v) The proprietary information sought to be withheld in this submittal is that which is appropriately marked in APP-GW-GLR-170 "AP1000 FLEX Integrated Plan" (Proprietary), for submittal to the Commission, being transmitted by APOG Project letter and Application for Withholding Proprietary Information from Public Disclosure, to the Document Control Desk. The proprietary information as submitted by Westinghouse is that associated with the **AP1000** FLEX Integrated Plan (Proprietary), and may be used only for that purpose.

This information is part of that which will enable Westinghouse to provide design details to customers on explicit methods, strategies, connection points, and equipment for off-site support of post 72-hour operations in the event of an extended station blackout at an **AP1000** Nuclear Power Plants (NPP).

Further this information has substantial commercial value as follows:

(a) Westinghouse plans to sell the use of similar information to its customers for the purpose of supporting development of customer licensing submittals and customer commercial specifications for offsite supporting equipment.

(b) The information requested to be withheld reveals the distinguishing aspects of a methodology which was developed by Westinghouse.

Public disclosure of this proprietary information is likely to cause substantial harm to the competitive position of Westinghouse because it would enhance the ability of competitors to provide similar technical evaluation justifications and licensing defense services for commercial power reactors without commensurate expenses. Also, public disclosure of the information would enable others to use the information to meet NRC requirements for licensing documentation without purchasing the right to use the information.

The development of the technology described in part by the information is the result of applying the results of many years of experience in an intensive Westinghouse effort and the expenditure of a considerable sum of money.

In order for competitors of Westinghouse to duplicate this information, similar technical programs would have to be performed and a significant manpower effort, having the requisite talent and experience, would have to be expended.

Further the deponent sayeth not.

Proprietary Information Notice and Copyright Notice
(2 pages including cover page)

Proprietary Information Notice

Transmitted herewith are proprietary and/or non-proprietary versions of documents furnished to the NRC in connection with requests for generic and/or plant-specific review and approval.

In order to conform to the requirements of 10 CFR 2.390 of the Commission's regulations concerning the protection of proprietary information so submitted to the NRC, the information which is proprietary in the proprietary versions is contained within brackets, and where the proprietary information has been deleted in the non-proprietary versions, only the brackets remain (the information that was contained within the brackets in the proprietary versions having been deleted). The justification for claiming the information so designated as proprietary is indicated in both versions by means of lower case letters (a) through (f) located as a superscript immediately following the brackets enclosing each item of information being identified as proprietary or in the margin opposite such information. These lower case letters refer to the types of information Westinghouse customarily holds in confidence identified in Sections (4)(ii)(a) through (4)(ii)(f) of the affidavit accompanying this transmittal pursuant to 10 CFR 2.390(b)(1).

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