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Your ref: Project Number 740
Our ref: DCP/NRC2004

October 4, 2007

Subject: AP1000 COL Standard Technical Report Submittal of APP-GW-GLR-020 Revision 3, (TR 05)

In support of Combined License application pre-application activities, Westinghouse is submitting Revision 3 of AP1000 Standard Combined License Technical Report Number 05. This report completes and documents, on a generic basis, activities required to close COL Information Items 3.3-1 and 3.5-1 in the AP1000 Design Control Document. Changes to the Design Control Document identified in Technical Report Number 05 have been included in Revision 16 of the AP1000 Design Control Document. This Revision to TR05 removes all references to turbine missiles and reduces the scope of the TR to just the closing of the associated COL Information Items as discussed and agreed upon in a teleconference between Andrea Sterdis and John Segala on September 13, 2007. This report is submitted as part of the NuStart Bellefonte COL Project (NRC Project Number 740). The information included in this report is generic and is expected to apply to all COL applications referencing the AP1000 Design Certification.

The purpose for submittal of this report was explained in a March 8, 2006 letter from NuStart to the U.S. Nuclear Regulatory Commission.

Pursuant to 10 CFR 50.30(b), APP-GW-GLR-020, Revision 3, "AP1000 Wind and Tornado Site Interface Criteria," Technical Report Number 05, is submitted as Enclosure 1 under the attached Oath of Affirmation. Revision 2 of TR05 was submitted under Westinghouse letter DCP/NRC 1939 on June 14, 2007. Revisions 0 and 1 of TR05 were internal revisions that were not submitted to the NRC.

It is expected that when the NRC review of Technical Report Number 05 is complete, COL Information Items 3.3-1 and 3.5- 1 will be considered complete for COL applicants referencing the AP1000 Design Certification.

Questions or requests for additional information related to content and preparation of this report should be directed to Westinghouse. Please send copies of such questions or requests to the prospective applicants for combined licenses referencing the AP1000 Design Certification. A representative for each applicant is included on the cc: list of this letter.

Westinghouse requests the NRC to provide a schedule for review of the technical report within two weeks of its submittal.

D063
D079
NRO

Very truly yours,

A. Sterdis, Manager
Licensing and Customer Interface
Regulatory Affairs and Standardization

/Attachment

1. "Oath of Affirmation," dated October 4, 2007

/Enclosure

1. APP-GW-GLR-020, Revision 3, "AP1000 Wind and Tornado Site Interface Criteria," Technical Report Number 05

cc:	D. Jaffe	- U.S. NRC	1E	1A
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ATTACHMENT 1

"Oath of Affirmation"

ATTACHMENT 1

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

In the Matter of:	)
NuStart Bellefonte COL Project	)
NRC Project Number 740	)

APPLICATION FOR REVIEW OF
"AP1000 GENERAL COMBINED LICENSE INFORMATION"
FOR COL APPLICATION PRE-APPLICATION REVIEW

B. W. Bevilacqua, being duly sworn, states that he is Vice President, New Plants Engineering, for Westinghouse Electric Company; that he is authorized on the part of said company to sign and file with the Nuclear Regulatory Commission this document; that all statements made and matters set forth therein are true and correct to the best of his knowledge, information and belief.

Bruce W. Bevilacqua

B. W. Bevilacqua
Vice President
New Plants Engineering

Subscribed and sworn to
before me this 4th day
of October 2007.

COMMONWEALTH OF PENNSYLVANIA
Notarial Seal
Patricia S. Aston, Notary Public
Murrysville Boro, Westmoreland County
My Commission Expires July 11, 2011
Member, Pennsylvania Association of Notaries

Patricia S. Aston
Notary

ENCLOSURE 1

APP-GW-GLR-020, Revision 3

"AP1000 Wind and Tornado Site Interface Criteria"

Technical Report Number 5

AP1000 DOCUMENT COVER SHEET

TDC: ________ Permanent File: ________ APY: ________

RFS#: ________ RFS ITEM #: ________

TSA 10/4/07

AP1000 DOCUMENT NO.	REVISION NO.		ASSIGNED TO
APP-GW-GLR-020	3	Page 1 of ~~18~~ 17	W-Sterdis

ALTERNATE DOCUMENT NUMBER: TR05 WORK BREAKDOWN #:

ORIGINATING ORGANIZATION: Westinghouse Electric Company

TITLE: **AP1000 Wind and Tornado Site Interface Criteria**

ATTACHMENTS:	DCP #/REV. INCORPORATED IN THIS DOCUMENT REVISION: N/A
CALCULATION/ANALYSIS REFERENCE:	

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COL020	Microsoft Word	

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APP-GW-GLR-020 Westinghouse Non-Proprietary Class 3 October 2007
Revision 3

AP1000 Standard Combined License Technical Report

AP1000 Wind and Tornado Site Interface Criteria

Revision 3

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Record of Revisions

Rev	Date	Revision Description[1]
0	May 2006	Original Issue
1	July 2006	Editorial and added section "Neighboring Power Plants and other Industrial Facilities."
2	May 2007	Bellefonte site parameters added. Updated for Regulatory Guide 1.76, R1.
3	Sept. 2007	Removed turbine missile from technical report. Reflected that the seismic classification for the turbine building is non-seismic. Made editorial changes.

Note (1) Significant changes are briefly described in this table. In the rest of the calc note, each row that has been changed is marked using a revision bar in the margin of the page. This approach satisfies the change identification requirements in WP 4.5 Section 7.4.

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1. INTRODUCTION

This report provides information needed by a combined license applicant to close the AP1000 Design Control Document (DCD) (Reference 1) COL Information Items 3.3-1 and 3.5-1 (NRC FSER {Reference 2} Combined License Action Item 3.3.2.2-1 and 3.5.1.5-1) given in DCD Subsections 3.3.3 and 3.5.4. Specifically:

- DCD Section 3.3.3
  Combined License applicants referencing the AP1000 certified design will address site interface criteria for wind and tornado. The Combined License applicant will ensure that a tornado initiated failure of structures and components within the Combined License applicant's scope will not compromise the safety of AP1000 safety-related structures and components (see also subsection 3.5.4).

- DCD Section 3.5.4
  The Combined License applicant will demonstrate that the site satisfies the interface requirements provided in Section 2.2. This requires an evaluation for those external events that produce missiles that are more energetic than the tornado missiles postulated for design of the AP1000, or additional analyses of the AP1000 capability to handle the specific hazard.

Structures that are located adjacent to the nuclear island and considered in the design certification are identified in this report. The evaluation supporting this report demonstrates that if these structures experience a tornado-initiated failure they do not compromise the safety of the AP1000 safety-related structures. Other buildings and structures typically included as part of a nuclear power plant complex are also addressed.

COL Applicant Information Item Completion

Using this generic report supplemented with site specific design information provided by the applicant these COL Information Items 3.3-1 and 3.5-1 can be closed. The information that the applicant must evaluate, along with this generic report, are the following:

- Site parameters for wind and tornado showing that the site satisfies the AP1000 site interface criteria for the wind and tornado conditions. In Appendix A the site parameters for the Bellefonte site are provided. These parameters meet the AP1000 site interface criteria and any sites bounded by these parameters satisfy AP1000 site interface criteria.
- Plant specific site plan
- Differences between the plant specific site plan and the typical site plan used in this generic report. There are expected to be no differences that would change the technical basis for closing the COL information items used in this report.
- Verification that there are no other structures adjacent to the nuclear island other than: turbine building; annex building; radwaste building; and passive containment cooling ancillary water storage tank.
- The civil/structural characteristics of the administration building, gate house, security control building, warehouse and shops, and water service building structures. An evaluation of these buildings and structures is expected to show that the construction materials are similar to those used for other nuclear power plants. Therefore, tornado-initiated failure of these structures will not create tornado missiles different from those that are considered as common construction items

at a site. As a result, no tornado missiles will be produced that are more energetic than those postulated for the design of the AP1000.

Provided in the sections that follow is the technical basis for the conclusions reached (Technical Background) and the Regulatory Impact.

2. TECHNICAL BACKGROUND

2.1 Site Interface Criteria for Wind and Tornado

The site parameters wind and tornado wind speeds for which the AP1000 plant is designed are given in Table 2-1 of the Design Control Document (DCD). They are:

Wind Speed

Operating Basis:	145 mph (3 second gust); importance factor 1.15 (safety), 1.0 (nonsafety); exposure C; topographic factor 1.0
Tornado:	300 mph

These parameters envelope most potential sites in the United States. The site is acceptable for wind and tornado if the site characteristics fall within these AP1000 plant site design parameters. Should specific site parameters or characteristics exceed the envelope of conditions established by Table 2-1, the excedence represents a departure from the design control document. In such a case, the Combined License applicant referencing the AP1000 will be required to complete additional evaluations to demonstrate that the design satisfies the requirements imposed by the specific site parameters and conforms to the design commitments and acceptance criteria described in the AP1000 Design Control Document. The Combined License applicants referencing the AP1000 certified design will address site-specific local wind speeds and site-specific onsite meteorological measurements program.

Table 2.1-1 shows the windward pressure loadings that were used in the AP1000 design. These pressures were calculated based on Equation 6-15 of ASCE 7-98. The COL applicant can use this table to compare to the site specific wind conditions and would demonstrate that site specific wind conditions produce wind loads equal to or less than those given in Table 2.1-1.

Table 2.1-1: AP1000 Windward Pressure Loadings

Height (ft)	Safety Bldg. (psf)	Nonsafety Bldg. (psf)
15	35.78	31.11
20	37.88	32.94
25	39.56	34.40
30	41.25	35.87
40	43.77	38.06
50	45.88	39.89
60	47.56	41.36
70	49.25	42.82
80	50.93	44.29
90	52.19	45.38
100	53.03	46.12
120	55.14	47.95
140	57.24	49.78
160	58.51	50.87
180	60.19	52.34
200	61.45	53.44
250	64.40	56.00

2.2 Tornado-Initiated Failures

Using the typical site plan that is given in the AP1000 DCD Section 1.2, Figure 1.2-2, structures are identified that should be evaluated for tornado-initiated failures. Evaluations summarized in the following demonstrate that these failures do not compromise the safety of the AP1000 safety-related structures.

2.2.1 Plant Site Plan

A typical site plan for the single unit AP1000 is shown in Figure 1.2-2 of the AP1000 DCD Section 1.2. Directions of north, south, east, and west used are nominal site description directions and have no relationship to directions on an actual site. With the exception of the parking area, the entire facility is contained within the perimeter fence. The area considered within the assumed location of the 1400 feet x 775 feet perimeter fence is approximately 25 acres. The evaluations documented in this report are not dependent on the actual location of the perimeter fence or the size of the area contained. The gatehouse at the main gate controls ingress and egress to and from the site. Consideration of the effects of wind and tornado due to failures in an adjacent AP1000 plant are bounded by the evaluation of the buildings and structures in a single unit.

The power block complex consists of five principal building structures: the nuclear island; the turbine building; the annex building; the diesel generator building; and the radwaste building. Each of these building structures is constructed on an individual basemat. The nuclear island consists of the containment building, the shield building, and the auxiliary building, all of which are constructed on a common basemat.

As shown on the site plan, DCD Section 1.2, Figure 1.2-2, these building structures are oriented such that the turbine building is located to the north of the nuclear island, with the other principal buildings adjacent to the nuclear island to meet their functional purpose and to provide access control to vital areas from a central security control point located within the annex building.

The reference plant main cooling tower-circulating water pump complex consists of a natural draft cooling tower, a pump basin, and circulating water pumps.

The circulating water pumps circulate the cooling water from the pump basin to the main condenser and back to the cooling tower through supply and return pipes that are below grade between the main cooling tower and the turbine building.

The transformer area is located immediately adjacent to and north of the turbine building. The unit auxiliary, reserve auxiliary, and the main step-up transformers are located in the transformer area. The main switchyard area shown in this typical site plan is north of the turbine building.

An administrative building is located adjacent to and east of the turbine building within the perimeter fence. Other buildings are also within the boundary of the site but not shown in Figure 1.2-2 of the AP1000 DCD Section 1.2. They are security control building, warehouse and shops, and water service building.

Also shown in AP1000 DCD Section 1.2, Figure 1.2-2 are various storage tanks and miscellaneous structures. The turbine building is designed to Uniform Building Code requirements for seismic loads (Zone 3 with an importance factor of 1.0 per AP1000 DCD Section 3.7.2.8.3). The turbine building is supported on a single basemat foundation.

The annex building in the area outlined by columns E-I.1 and 2-13 (AP1000 DCD Table 3.2-1) is designed to seismic Category II requirements and the other areas are non-seismic. The functions include such items as the health physics area, the Control Support Area, access control, and personnel facilities (shower and locker rooms). The single floor office areas are nonseismic structures designed for wind and seismic loads in accordance with the Uniform Building Code. The annex building is a combination of reinforced concrete structure and steel frame structure with insulated metal siding.

The diesel generator building houses two diesel generators and their associated heating, ventilation and air conditioning equipment. The building is a nonseismic structure designed for wind and seismic loads in accordance with the Uniform Building Code. The building is a single story steel frame structure with insulated metal siding.

The radwaste building contains facilities for the handling and storage of plant wastes. It is a nonseismic structure (AP1000 DCD Table 3.2-2) designed for wind and seismic loads in accordance with the Uniform Building Code.

The annex building, diesel generator building, and the radwaste building each have a foundation that is a reinforced concrete mat.

2.2.2 Interface Grouping of Building Structures and Equipment

From the typical site plan (see AP1000 DCD Figure 1.2-2), the building structures and equipment that is in the vicinity of the nuclear island are identified. They are listed below in two groups.

1. Adjacent to Nuclear Island
   - Turbine Building
   - Annex Building
   - Radwaste Building
   - Passive Containment Cooling Ancillary Water Storage Tank

2. Not adjacent to Nuclear Island
   - Diesel Generator Building
   - Annex Building, Column Lines A to D
   - CWS Intake Canal
   - Circulating Water Pump Intake Structure
   - CWS Cooling Tower
   - Switchyard
   - Gate House
   - Administrative Building
   - Security Control Building
   - Warehouse and shops
   - Water Service Building
   - Circulating Water Pipe
   - Hydrogen Storage Tank
   - Fire water/clearwell storage tank
   - Fire water storage tank
   - Transformer Area
   - Condensate Storage Tank
   - Diesel Generator Fuel Oil Storage Tanks
   - Demineralized Water Storage Tank
   - Boric Acid Storage Tank
   - Diesel-driven Fire Pump / Enclosure
   - Service Water System (SWS) Cooling Towers
   - Miscellaneous (e.g., vehicles, metrological tower)

These two groups of structures are discussed in the following two sections.

2.2.3 Structures Adjacent to Nuclear Island

Three buildings (turbine, annex, and radwaste) and one tank (passive containment cooling ancillary water storage tank) are adjacent to the nuclear island. If these structures experience tornado-initiated failure, then it is necessary to address collapse as well as tornado-initiated missiles. During the licensing of the AP1000, the effect of the tornado on these structures was addressed. In Section 3.3.2.3 of the AP1000 DCD, the effect of failure of structures or components not designed for tornado loads was given and position accepted by the NRC. In this section the basis (criteria or insufficient energy) that these buildings will not compromise the safety of the AP1000 safety-related structures given a tornado is provided. This section is quoted below.

> The failure of structures not designed for tornado loadings does not affect the capability of seismic Category I structures or safety-related systems performance. This is accomplished by one of the following:
>
> - Designing the adjacent structure to seismic Category I structure tornado loading

- Investigating the effect of adjacent structure failure on seismic Category I structures to determine that no impairment of function results

- Designing a structural barrier to protect seismic Category I structures from adjacent structural failure.

The structures adjacent to the nuclear island are the annex building, the radwaste building, and the turbine building.

The portion of the annex building adjacent to the nuclear island (area outlined by columns E-I.1 and 2-13, AP1000 DCD Table 3.2-2) is classified as seismic Category II and is designed to seismic Category I structure tornado loading. The acceptance criteria are based on ACI 349 for concrete structures and on AISC N690 for steel structures. The structure is constructed to the same requirements as nonseismic structures, ACI 318 for concrete structures, and AISC-S355 for steel structures. Siding is permitted to blow off during the tornado.

The radwaste building is a small steel-frame building. If it were to collapse in the tornado, it would not impair the integrity of the reinforced concrete nuclear island.

The turbine building is classified as nonseismic (Table 3.2-2 AP1000 DCD) and is designed to seismic Category I structure tornado loading (AP1000 DCD Section 3.3.2.3). The acceptance criteria for concrete and steel structures use a load factor of 1.0 times the ACI318 and 1.7 times the AISC S355, respectively. Siding is permitted to blow off during the tornado.

As given in AP1000 DCD 6.2.2.2.3, the passive containment cooling ancillary water storage tank is a cylindrical steel tank located at ground level near the auxiliary building. It is filled with demineralized water and has a useable volume of greater than required for makeup to the passive containment cooling water storage tank and the spent fuel pool. The tank is analyzed, designed, and constructed using the method and criteria for a Seismic Category II building. The tank is designed and analyzed for Category 5 hurricanes including the effects of sustained winds, maximum gusts, and associated wind-borne missiles. Seismic Category II structures are analyzed and designed for the AP1000 tornado loads to demonstrate that the primary structural elements do not fail under the tornado.

Based on the above, it can be concluded that the turbine, annex, and radwaste buildings, along with the passive containment cooling ancillary water storage tank, will not have a tornado-initiated event that will compromise the safety of the AP1000 safety-related structures.

2.2.4 Structures Not Adjacent to Nuclear Island

The structures and equipment that have been identified in Section 2.2.3 that are not adjacent to the nuclear island do not compromise the safety of the AP1000 safety-related structures if they collapse during a tornado, but the tornado missiles that they could be produced must be addressed.

The diesel generator building is a single story steel framed structure with insulated metal siding. The roof is composed of a metal deck supporting a concrete slab and serves as a horizontal diaphragm to transmit lateral loads to sidewall bracing and thereby to the foundation. It is a nonseismic structure subject to seismic and wind loads in accordance with Uniform Building Code. Since this building is similar in construction to the radwaste building, the same position can be taken for this building as taken for the radwaste building. (See Section 2.2.3.) The diesel generator building is a small steel framed structure whose collapse will not result in tornado-initiated failure that would compromise the safety of AP1000 safety related structures and equipment. The metal siding or debris from collapse will be no different than that from the radwaste building. Any missiles created from the siding or debris will not have sufficient energy to penetrate the nuclear island and cause loss of safety related structures and equipment.

The annex building structure between column lines A to D is nonseismic. This portion of the building is a steel framed structure with insulated metal siding. The nuclear island is shielded by the seismic Category II portion of the annex building (see section 2.2.3). This part of the building is a small steel framed structure whose collapse will not result in tornado-initiated failure that would be more severe than from the radwaste building and diesel generator building; therefore the safety of AP1000 safety related structures and equipment will not be compromised.

The circulating water pipe is underground and will not be affected by the tornado.

The circulating water system (CWS) intake canal, circulating water pump intake structure, CWS cooling tower, and SWS cooling towers, tanks, transformer area, and switchyard are of similar construction to that used for similar type structures at nuclear power plants. Since they are similar in design as used in other nuclear power plants, any missiles resulting from a tornado-initiated failure will not be more energetic than the tornado missiles postulated for design of the AP1000.

The gate house, administrative building, security control building, warehouse and shops, water service building, diesel-driven fire pump / enclosure, and miscellaneous structures are common structures that are at a nuclear power plant. They will be of similar design and construction to those that are typical at nuclear power plants. Therefore, any missiles resulting from a tornado-initiated failure will not be more energetic than the tornado missiles postulated for design of the AP1000.

In Table 2 of the Regulatory Guide 1.76, Revision 1, are given design-basis tornado missile spectrum and maximum velocities (vertical velocities are 67 percent of the maximum horizontal velocity). These missiles can be considered as representative of the energy from missiles generated from the debris of a tornado-initiated failure of power plant structures and common building structures. A comparison between the AP1000 tornado missiles used in design certification and the Regulatory Guide missiles is discussed below. From this comparison the technical basis is provided for the statements made above about a tornado missile from the debris associated with structures not adjacent to the nuclear island.

The AP1000 tornado missiles used for design are described below:

a. a massive high kinetic energy missile which deforms on impact, assumed to be a 4000 lb. automobile impacting the structure at normal incidence with a horizontal velocity of 105 mph or a vertical velocity of 74 mph. This missile shall be considered at all plant elevations up to 30 feet above grade.

b. a rigid missile of a size sufficient to test penetration resistance, assumed to be a 275 pound 8″ armor piercing artillery shell impacting the structure at normal incidence with a horizontal velocity of 105 mph or a vertical velocity of 74 mph.

c. a small rigid missile of a size sufficient to just pass through any openings in protective barriers, assumed to be a 1″ diameter solid steel sphere assumed to impinge upon barrier openings in the most damaging direction at a velocity of 105 mph.

In Table 2.2-1 is a summary of the kinetic energies associated with the AP1000 tornado missiles. In Table 2.2-2 are given the descriptions, velocities, and kinetic energies associated with the Region I tornado missiles, given in Regulatory Guide 1.76, Revision 1, Table 2.

It can be concluded that the tornado missiles used to design the AP1000 plant have kinetic energies that exceed the design-basis tornado missiles given in Regulatory Guide 1.76, Rev. 1.

In AP1000 DCD Section 3.5.3 it is stated that "the thicknesses of the exterior walls above grade and of the roof of the nuclear island are 24 inches and 15 inches respectively. The roof is constructed using left-in-place metal deck." These thicknesses exceed the minimum thicknesses for Region I tornado missiles specified in Standard Review Plan 3.5.3 (Rev 3, March 2007). However, it is important to note that in the unlikely event that a tornado missile did penetrate the nuclear island, the resulting damage would not be significant. This is discussed below.

If an impacting element does penetrate through a nuclear island building structure or roof or wall, it would not do sufficient damage to significantly affect the core damage probability. Table 2.2-3 is a list of equipment in the upper elevations of the auxiliary building, i.e., most above the 117' level. This equipment includes some containment isolation valves with their instrumentation and control (I&C), and some HVAC ducting. The main control room and main steam lines are also in these areas. The equipment in these upper areas of the auxiliary building are the most likely to be affected by any element penetrating the nuclear island structure.

The lower floors of the auxiliary building are protected by the multiple, two foot thick concrete floors in the upper levels. These structures are designed to resist collapse due to the impact from above. The equipment in the lower floors is more safety significant (e.g., I&C, and remote shutdown area). It is protected by being in the lower elevations and away from areas that could be affected by an impact. Further, the redundancy and diversity in the I&C systems reduces the probability of losing the I&C functions, even in the unlikely event that multiple failures would occur.

If an event occurs that causes the failure of equipment in the upper elevations of the auxiliary building, the probability of core damage developed in the probabilistic risk assessment (PRA) analyses would not be significantly affected. None of the events that would result from the damage of equipment in the upper elevations are dominant contributors to the core damage frequency (CDF), including main steam line breaks. Further, the loss of equipment in the upper elevations will not affect the passive safety systems that would be used to put the plant in a safe shutdown condition should an event occur.

Table 2.2-1 – AP1000 Design Tornado Missiles

Missile	Description	Weight	Vh	Vv	KE horz	KE ver
		#	mph	mph	#-in	#-in
1	Auto	4000	105	74	1.77E+07	8.78E+06
2	Armor Piercing Artillery Shell	275	105	74	1.22E+06	6.04E+05
3	Solid Steel Sphere	0.147	105	105	6.50E+02	6.50E+02

Table 2.2-2 – Regulatory Guide 1.76 Region I Tornado Missile

Missile	Description	Weight	Vh	Vv	KE horz	KE ver
		#	mph	mph	#-in	#-in
1	Auto	4000	92	61.67	1.36E+07	6.10E+06
2	Schedule 40 Pipe	287	92	61.67	9.75E+05	4.38E+05
3	Solid Steel Sphere	0.147	18	11.88	1.85E+01	8.31E+00

Table 2.2-3– SEISMIC CATEGORY I EQUIPMENT ROOM NUMBER*

Room No.	Room Name	Equipment Description
12301	Division A I&C room	Divisional I&C
12302	Division C I&C room	Divisional I&C
12303	Remote shutdown workstation	Remote shutdown workstation
12304	Division B I&C/penetration room	Divisional I&C/electrical penetrations
12305	Division D I&C/penetration room	Divisional I&C/electrical penetrations
12306	Valve/piping penetration room	CCS/CVS/DWS/FPS/SGS containment isolation valves
12401	Main control room	Main control panels VBS HVAC dampers VES isolation valves Lights
12404	Lower MSIV compartment B	SGS containment isolation valves, instrumentation and controls
12405	VBS B and D equipment room	VWS/PXS/CAS containment isolation valves
12406	Lower MSIV compartment A	SGS containment isolation valves, instrumentation and controls
12504	Upper MSIV compartment B	SGS CIVs, instrumentation and controls
12506	Upper MSIV compartment A	VWS/PXS/CAS containment isolation valves

***See AP1000 DCD Table 3.7.3-1.**

2.4 Conclusion

Sites that satisfy site interface criteria and do not build additional structures adjacent to the nuclear island do not have a site-specific wind or missile issue.

3. REGULATORY IMPACT

The FSER in section 3.3 discusses wind and tornado loadings. These loadings are based on the generic values included in the DCD and discussed in this report. The discussions in this report and the proposed DCD changes do no require altering the FSER write-up or conclusions in Section 3.3. The FSER in section 3.5.2 discusses protection from externally generated missiles. This includes postulated tornado missiles. The evaluation of protection against tornado missiles is based on the generic values included in the DCD and discussed in this report.
In the revised Standard Review Plan 3.5.1.4, "Missiles Generated by Tornadoes and Extreme Winds," Revision 3, March 2007, it is stated that R 1.76, Rev 1, provides guidance on the definition and characterization of the design-basis tornado, and describes acceptable design-basis tornado-generated missile spectrum for the design of nuclear power plants. The NRC revised Regulatory Guide 1.76, "Design-Basis Tornado Missiles for Nuclear Power Plants," Rev 1, March 2007 to reference acceptable missiles and associated wind speeds in Table 2. Comparing the missiles given in this regulatory guide, using Region I velocities, to those used for the design of the AP1000 plant, it is noted that the regulatory guide missiles have lower kinetic energies.

The changes to the DCD presented in this report do not represent an adverse change to the design function or to how design functions are performed or controlled. The changes to the DCD do not involve revising or replacing a DCD-described evaluation methodology nor involve a test or experiment not described in the DCD. The DCD change does not require a license amendment per the criteria of VIII. B. 5.b. of Appendix D to 10 CFR Part 52.

Severe Accident Change Criteria

The DCD change does not affect resolution of a severe accident issue and does not require a license amendment based on the criteria of VIII. B. 5.c of Appendix D to 10 CFR Part 52. Mitigation features are not impacted.

Security

The subject changes will not alter barriers or alarms that control access to protected areas of the plant, and will not alter requirements for security personnel. Therefore, the proposed change does not have an adverse impact on the security assessment of the AP1000.

4. REFERENCES

1. APP-GW-GL-700, AP1000 Design Control Document, Revision 15
2. NUREG-1793, Final Safety Evaluation Report Related to Certification of the AP1000 Standard Design, September 2004
3. Not used.
4. Not used
5. Regulatory Guide 1.76, "Design-Basis for Tornado and Tornado Missiles for Nuclear Power Plants," Revision 1, March 2007.
6. Standard Review Plan 3.5.1.4, "Missiles Generated by Tornadoes and Extreme Winds," Revision 3, March 2007.

5. DCD MARK-UP

The following mark-ups are provided for use by the COL applicants in preparation of their FSER. These mark ups assume that the applicant can respond that their site specific plan, building placements, and building design and construction do not differ from those used in this generic topical report.

Revise Subsection 3.3.3 as follows:

3.3.3 Combined License Information

The Combined License information requested in this subsection has been partially addressed in APP-GW-GLR-020 (Reference 7), and the applicable changes are incorporated into the DCD. The work that has been done is summarized in the following paragraph:

> Technical Report APP-GW-GLR-020 includes evaluation of generic wind and tornado loadings on structures, discussion of missiles generated by tornadoes and extreme winds, and evaluation of other buildings for collapse and missile generation.

The information item activities completion activities required of the Combined License applicant are defined in APP-GW-GLR-020. These activities include development of site-specific parameters and verification of bounding conditions, site arrangement, and building construction. Completion of these activities by the Combined License applicant will complete the information item.

The following words represent the original Combined License Information item commitment:

> Combined License applicants referencing the AP1000 certified design will address site interface criteria for wind and tornado. The Combined License applicant will ensure that a tornado-initiated failure of structures and components within the Combined License applicant's scope will not compromise the safety of AP1000 safety-related structures and components (see also subsection 3.5.4).

Add a reference for APP-GW-GLR-020 as follows:

3.3.4 References

7. APP-GW-GLR-020, "Wind and Tornado Site Interface Criteria."

Revise Subsection 3.5.4 as follows:

3.5.4 Combined License Information

The Combined License information requested in this subsection has been partially addressed in APP-GW-GLR-020 (Reference 1), and the applicable changes are incorporated into the DCD. The work that has been done is summarized in the following paragraph:

> Technical Report APP-GW-GLR-020 includes evaluation of generic wind and tornado loadings on structures, discussion of missiles generated by tornadoes and extreme winds, and evaluation of other buildings for collapse and missile generation.

The information item activities completion activities required of the Combined License applicant are defined in APP-GW-GLR-020. These activities include development of site-specific parameters and verification of bounding conditions, site arrangement, and building construction. Completion of these activities by the Combined License applicant will complete the information item.

The following words represent the original Combined License Information item commitment:

> The Combined License applicant will demonstrate that the site satisfies the interface requirements provided in Section 2.2. This requires an evaluation for those external events that produce missiles that are more energetic than the tornado missiles postulated for design of the AP1000, or additional analyses of the AP1000 capability to handle the specific hazard.

Add a reference section as follows:

3.5.5 References

1. APP-GW-GLR-020, "Wind and Tornado Site Interface Criteria," Westinghouse Electric Company LLC.

6. APPENDIX A: Bellefonte Site Parameters

Design Basis Tornado Parameters

The Design Basis Tornado characteristics are specific to the site and region of the country in which the site is located. However, rather than conducting site research on tornado characteristics, most sites in the past licensing proceedings have relied on NRC endorsed studies that set conservative values for key design basis tornado characteristics. These characteristics were then used in the design of the subject facility.

Regulatory Guide 1.76 (Reference RG1.76), based on WASH-1300, has been used since the 1970s by the industry to establish the appropriate design basis tornado characteristics, depending on the proposed site location in the country. Since the issuance of this guide, additional tornado data has become available by way of the National Severe Storms Forecast

Center. Using this later data and the basic Regulatory Guide 1.76 methodology, the NRC developed an interim position, establishing an update to the design basis tornado characteristics. The NRC's updated criteria is contained in the proposed Revision 1 of Regulatory Guide 1.76 (Draft Regulatory Guide DG 1143), January 2006 [Reference DG-1143]. Based on this criteria, the best estimate exceedance frequency is 10^{-7} per year which is the same exceedance frequency as in Revision 0 of Regulatory Guide 1.76. The design basis tornado characteristics defined for this project, as listed below, are based on the guidance in DG-1143. In accordance with DG-1143, the wind velocities and pressures are not assumed to vary with height. The below listed characteristics are associated with the Bellefonte site.

Design Basis Tornado Characteristics

	AP1000 DCD	RG 1.76, R1
Maximum wind speed, mph	300	230
Rotational speed, mph	240	184
Maximum Translational speed, mph	60	46
Radius of maximum rotational speed, ft	150	150
Pressure drop, psi	2.0	1.2
Rate of pressure drop, psi/sec	1.2	0.5

The AP1000 design basis tornado characteristic exceeds the Revision 1 Regulatory Guide 1.76 design basis tornado characteristics. Bellefonte is a Region I site as defined in Regulatory Guide 1.76, Revision 1.

100-Year Return Period Fastest Mile of Wind

The fastest mile of wind speed recorded in 55 years (1950-2005) in Jackson County is 74.8 mph. A Gumbel-Lieblein extreme value analysis of this data gave an estimated value of 82 mph for the 100-year return period fastest mile of wind in Jackson County.

The fastest hourly averaged wind speed recorded by the Bellefonte meteorological tower at 33 feet in the period from 1979 through 1982 was 28.6 mph in 1981. A Gumbel-Lieblein extreme value analysis of this data gave an estimated value of 35 mph for the 100-year return period fastest mile of wind at the Bellefonte site. This result may be low due to the limited data collection period.

The design basis wind velocity is based on the data from ASCE 7-95 (Reference ASCE). From Figure 6-1 of ASCE 7-95, the 50-year return 3-second gust wind speed at 33 ft (10 m) above ground for the Bellefonte site is 90 mph. This gives a design basis 100-year return wind speed of 96 mph based on Table C6-5 of ASCE 7-95. This value does not include any correction for windgusts. This is normally done by means of a gust factor (gust velocity ÷ the velocity of the fastest mile of wind.