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Your ref: Project Number 740
Our ref: DCP/NRC2043

November 16, 2007

Subject: AP1000 COL Standard Technical Report Submittal of APP-GW-GLR-020 Revision 4, (TR 05)

In support of Combined License application pre-application activities, Westinghouse is submitting Revision 4 of AP1000 Standard Combined License Technical Report Number 05. This report completes and documents, on a generic basis, activities required to close Combined Operating License (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. The purpose of this Revision to TR05 is to clarify information and activities required of the COL applicants to address site-specific missiles and building collapse as discussed and agreed upon in a teleconference between Don Lindgren and Bill Gleaves on October 30, 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 NRC.

Pursuant to 10 CFR 50.30(b), APP-GW-GLR-020, Revision 4, "AP1000 Wind and Tornado Site Interface Criteria," Technical Report Number 05, is submitted as Enclosure 1 under the attached Oath of Affirmation. Revision 3 of TR05 was submitted under Westinghouse letter DCP/NRC2004 on October 5, 2007. 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, the proposed changes to the AP1000 DCD will be generically approved 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 November 16, 2007

/Enclosure

1. APP-GW-GLR-020, Revision 4, "AP1000 Wind and Tornado Site Interface Criteria," Technical Report Number 05

cc:	D. Jaffe	-	U.S. NRC	1E	1A
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	B. Barbush	-	Westinghouse	1E	1A

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

W. E. Cummins, being duly sworn, states that he is Vice President, Regulatory Affairs and Standardization, 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.

W. E. Cummins
Vice President
Regulatory Affairs and Standardization

Subscribed and sworn to
before me this 16th day
of November 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

Notary

ENCLOSURE 1

APP-GW-GLR-020, Revision 4

"AP1000 Wind and Tornado Site Interface Criteria"

Technical Report Number 5

AP1000 DOCUMENT COVER SHEET

TDC:_____ Permanent File:_____

AP1000 DOCUMENT NO.	REVISION	PAGE	ASSIGNED TO	OPEN ITEMS (Y/N)
APP-GW-GLR-020	4	1 of 16	W-Sterdis	

ALTERNATE DOCUMENT NUMBER: TR05 WORK BREAKDOWN #:

ORIGINATING ORGANIZATION: Westinghouse Electric Company

TITLE: AP1000 Wind and Tornado Site Interface Criteria

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

ELECTRONIC FILENAME	ELECTRONIC FILE FORMAT	ELECTRONIC FILE DESCRIPTION
~~COL020~~ APP-GW-GLR-020 R4.doc	Microsoft Word	

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PATENT REVIEW DOUGLAS EKEROTH	SIGNATURE / DATE Douglas Ekeroth 11/16/07

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REVIEWER(S)	SIGNATURE / DATE	
	SIGNATURE / DATE	
	SIGNATURE / DATE	
VERIFIER(S) B. Barbush	SIGNATURE / DATE Bridget Barbush 11/15/07	Verification Method: Detailed Review ✓

**Plant Applicability: ☒ All AP1000 plants except: No Exceptions
☐ Only the following plants:

APPLICABILITY REVIEWER** J. A. Speer	SIGNATURE / DATE James A. Speer 11/16/07
RESPONSIBLE MANAGER* L. Tunon-Sanjur	SIGNATURE / DATE Leonardo Junior-Sanjur 11/16/07

* Approval of the responsible manager signifies that the document and all required reviews are complete, the appropriate proprietary class has been assigned, electronic file has been provided to the EDMS, and the document is released for use.

AP1000 Standard Combined License Technical Report

AP1000 Wind and Tornado Site Interface Criteria

Revision 4

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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.
4	Nov. 2007	Address NRC comments. Provide guidance to COL applicants related to missiles caused by external events separate from tornado.

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.

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. Specifically, the information that the applicant must evaluate are the following demonstrating that any exceedances or differences do not compromise the safety of the plant:

- Site parameters for wind and tornado showing that the site satisfies the AP1000 site interface criteria for the wind and tornado conditions. If there are exceedances, they must be discussed and shown acceptable.
- Provide plant specific site plan and discuss any differences between the plant specific site plan and the typical site plan shown in Figure 1.2-2 of the AP1000 DCD Section 1.2.
- 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. If there are then the affect of these structures on the AP1000 nuclear island must be discussed,
- Show that missiles caused by external events separate from the tornado have energies less than the tornado missile spectrum energies that the AP1000 is designed. If missile energy is greater, evaluate and show that it will not compromise the safety of AP1000 safety-related structures and components.

2. AREAS TO BE ADDRESSED BY COL APPLICANT

In order to close out the COL action items 3.3-1 and 3.3-5, the following must be addressed by the applicant:

- Site interface criteria for wind and tornado (addresses 3.3-1)

- Collapse of adjacent structures on nuclear island (addresses 3.3-1)
- Missiles that are created by external events separate from the tornado (addresses 3.3-5)

These areas are discussed in the subsections that follow.

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

Additional Design Parameters Applicable to Design Basis Tornado (DCD Section 3.3.2.1

Maximum rotational speed:	240 mph
Maximum translational speed:	60 mph
Radius of maximum rotational wind from center of tornado:	150 ft
Atmospheric pressure drop:	2.0 psi
Rate of pressure change:	1.2 psi/sec

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 as listed above, the exceedance 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 Collapse

Using the typical site plan that is given in the AP1000 DCD Section 1.2, Figure 1.2-2, structures are identified that have been evaluated for tornado-initiated failures. These structures have been analyzed for failure, or their seismic classification changed so that they will not compromise the safety of the AP1000 safety-related structures. If the COL applicant has adjacent structures to the nuclear island that are different from these typical buildings, then they must be evaluated by the applicant to demonstrate that their failure will 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. <u>This building was evaluated for its impact or collapse on the nuclear island demonstrating that it would not impair the structural integrity of the nuclear island (DCD 3.7.2.8.2).</u>

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 and 2.3.

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 Seismic Category II. 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. <u>If the COL applicant has adjacent structures that are different from those described above for the AP1000, then a justification must be provided that they will not collapse, or their failure will not affect the safety of the AP1000 safety-related structures.</u>

2.3 Missile Protection

The structures and equipment that have been identified in Section 2.2.2 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 produce are already considered as part of the tornado missile spectrum defined for the AP1000 (DCD 3.5.1.4). These 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.

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

General Design Criterion 4 of Appendix A to 10 CFR 50 requires that structures, systems, and components important to safety be protected from the effects of missiles. External missiles may be generated from external events that include transportation accidents and explosions. The COL applicant is responsible for identifying sources within their plant site, and the external event that could cause a missile that would threaten the integrity of AP1000 safety-related structures and components. The COL applicant should compare the energy associated with such external missiles to the energy associated with the AP1000 tornado missile spectrum given in Table 2.2-1. Acceptability of the missile caused by an external event separate from the tornado is demonstrated if the AP1000 tornado missile energy envelops the energy associated with the external event missile. If the external event missile has higher energy, the affect of the missile must be evaluated and demonstrated that it does not compromise the safety of the AP1000 safety-related structures.

2.4 Conclusion

Sites that satisfy site interface criteria, and do not build additional structures adjacent to the nuclear island, and do not have external event missiles that exceed the AP1000 tornado missile energies, then COL Information Items 3.3-1 and 3.5-1 can be considered closed.

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). The information item 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. Specifically, the information that the applicant must evaluate are the following demonstrating that any exceedances or differences do not compromise the safety of the plant:

- Site parameters for wind and tornado showing that the site satisfies the AP1000 site interface criteria for the wind and tornado conditions. If there are exceedances they must be discussed and shown acceptable.
- Provide plant specific site plan and discuss any differences between the plant specific site plan and the typical site plan shown in Figure 1.2-2 of the AP1000 DCD Section 1.2.
- 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. If there are then the affect of these structures on the AP1000 nuclear island must be discussed,
- Show that missiles caused by external events separate from the tornado have energies less than the tornado missile spectrum energies that the AP1000 is designed. If missile energy is greater, evaluate and show that it will not compromise the safety of AP1000 safety-related structures and components.

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). The information item 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. Specifically, the information that the applicant must evaluate are the following demonstrating that any exceedances or differences do not compromise the safety of the plant:

- Site parameters for wind and tornado showing that the site satisfies the AP1000 site interface criteria for the wind and tornado conditions. If there are exceedances they must be discussed and shown acceptable.
- Provide plant specific site plan and discuss any differences between the plant specific site plan and the typical site plan shown in Figure 1.2-2 of the AP1000 DCD Section 1.2.
- 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. If there are then the affect of these structures on the AP1000 nuclear island must be discussed,
- Show that missiles caused by external events separate from the tornado have energies less than the tornado missile spectrum energies that the AP1000 is designed. If missile energy is greater, evaluate and show that it will not compromise the safety of AP1000 safety-related structures and components.

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.

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.