APPENDIX D TABLE OF CONTENTS

D DIESEL GENERATOR PROJECT

D.1 INTRODUCTION

Emergency Diesel Generators G-03 and G-04 and related auxiliary equipment were installed via Modification 91-116. The scope of the modification included the construction of the building to house the new EDGS, installation of new B train 4.16kV switchgear 1-A06 and 2-A06, 480 VAC motor control centers (MCC)1-B40 and 2-B40, and DC distribution panels D-28 and D-40, installation of new A train 480 VAC MCCs 1-B30 and 2-B30, installation of a new fuel oil supply system for both trains of EDGs, and the related underground piping, ducts, and cabling linking the equipment in the Diesel Generator Building (DGB) to the equipment in the Control Building.

A project design summary was submitted to the NRC for review (Reference 1, Reference 2, and Reference 3). The design summary included a list of the various codes and standards used in the project. The design summary submittal also included an evaluation of design conformance to the applicable sections of NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants, LWR Edition" and the various 10 CFR 50, Appendix A General Design Criteria, Regulatory Guides and other standards referenced therein. The NRC formally approved the project design in a Safety Evaluation Report dated October 24, 1994 (Reference 4).

Design criteria applicable to structures, systems, or components installed under Modification 91-116 may differ from that used in the original plant construction. This appendix supplements related design information provided elsewhere in the FSAR and is specific to SSC installed under Modification 91-116.

D.2 DIESEL GENERATOR BUILDING (DGB)

The diesel generator building is a two-story reinforced concrete structure. The structure is 110 feet long, 71 feet wide, and 52 feet high. The structure consists of reinforced concrete shear walls in the vertical direction and slabs in the horizontal direction. There are no masonry walls in the building. There is no high energy piping in the building. The building is designed as a Seismic Category I structure. The stairway structure attached to the building is Seismic Class III. All systems and components within the DGB designed as safety-related are designed and qualified as Seismic Class I. All systems and components not designated as safety-related are designed to ensure that a safe shutdown earthquake would not cause any structural failure resulting in damage to safety related systems or components.

Design Loads and Load Combinations

Dead loads, live loads, flood loads, construction loads, snow/rain loads, wind loads, tornado loads, earthquake loads, temperature loads, and pipe reaction loads have been considered in the design of the building.

Dead loads include the weight of framing, roofs, floors, walls, partitions, platforms and all permanent equipment. Minimum live loads of 100 psf, 250 psf, and 200 psf were specified for platforms and gratings, ground floor, and all other floors, respectively. The probable maximum precipitation and wave runup flood elevations were determined to have no detrimental effect on the DGB. All applicable construction loads were considered. A 30 psf snow load and 65 psf rain

load were applied on the horizontal projected roof area. A l00-year recurrence wind of 108 mph was applied to the building. A lateral force caused by a funnel of tornado wind having a peripheral tangential velocity of 300 mph and a forward progress of 60 mph was applied to the building. Temperature loads were considered but were not used in the design, because they were not large enough to make a difference in the final design. Pipe reaction loads were based on the most critical transient or steady-state condition resulting from normal conditions, upset conditions, emergency conditions, and faulted conditions. The load combinations considered for the design of the DGB were in conformance with the Standard Review Plan 3.8.4, Other Seismic Category I Structures, Revision 1, July 1981.

Design Codes for the Diesel Generator Building

The reinforced concrete structure of the DGB was designed in accordance with the ACI-318-89, "Building Code Requirements for Reinforced Concrete." The steel work inside the DGB was in accordance with the AISC, "Manual of Steel Construction," 9th Edition, 1989.

Anchorage

The design of expansion anchors for piping in the DGB meets the requirements of NRC IEB-79-02, "Pipe Support Base Plate Designs Using Concrete Expansion Anchor Bolts." The design of pre-cast anchorage for large supports uses a 45° stress cone. This is the same methodology used in the original plant design calculations. The anchorage criteria developed by the Seismic Qualification Utility Group (SQUG) was used to qualify USI A-46 related anchors.

D.3 CABLE AND RACEWAY DESIGN

1. Cable and raceway separation and segregation within the DGB conforms to the requirements of IEEE 384-1992 except for the requirements of physical separation distances between Class 1E and non-Class 1E circuits within control switchboards.

2. Cable and raceway interconnections between the DGB and the existing plant facilities including all duct runs and other raceway systems excluding cables and raceways routed within existing plant facilities are separated and segregated in accordance with the requirements of IEEE 384-1992.

3. Safety-related (Class 1E) cables are segregated into two distinct Train B divisions, one for EDG G-03 (and its auxiliaries) serving Unit 1, and one for EDG G-04 (and its auxiliaries) serving Unit 2. Safety-related (Class 1E) cables are segregated into two distinct Train A divisions for power and control of the G-01 and G-02 Fuel Oil Transfer Pumps.

4. Cables designated as non-safety-related (non-Class 1E) are segregated from the safety-related cables by routing them in raceways which only contain nonsafety-related cables.

5. Instrument cables do not share raceways with power or control cables.

6. Cable and wire used to interconnect equipment are certified by the manufacturer as passing an approved flame test which meets the intent of IEEE 383-1974. This requirement does not apply to wire internal to factory assembled devices or pieces of equipment (such as the internal wiring of a computer display terminal). Custom assembled equipment such as control boards or switchgear assemblies were specified with flame resistant wiring which meets the intent of IEEE 383-1974.

7. All Class 1E insulated cable have copper conductors, are properly sized to the required ampacity and voltage drop, and are qualified in accordance with IEEE 383-1974.

D.4 VENTILATION SYSTEM

The DGB ventilation systems are designed to provide a suitable environment for the operation of the EDGs, and their associated auxiliary components during all modes of plant operation, including accident conditions. The ventilation system consists of safety-related, and non-safety related portions or subsystems. The non-safety related subsystem provides EDG room heating and cooling when the EDG is not in operation. During EDG operation, the safety-related ventilation subsystem operates to maintain temperatures within the required personnel and equipment limits. Safety related heaters maintain the temperature in the fuel oil transfer pump and day tank rooms above the fuel oil cloud point.

During EDG standby modes, one exhaust fan may run continuously during the cooling season to maintain room temperatures below 105°F. Unit electric heaters are provided to maintain a minimum temperature of 50°F during the heating season. Each EDG room has two thermostatically controlled exhaust fans to maintain the rooms below 120°F during EDG operation. Air is admitted to the room via gravity dampers, which are protected from missiles.

D.5 COMBUSTION AIR INTAKE AND EXHAUST SYSTEM

Each G-03 and G-04 engine has an independent intake and exhaust system to supply fresh air to the engine for combustion and to dispose of the engine exhaust to atmosphere. Intake air for each EDG engine is taken from the outside, no less than 20 feet above grade and away from the exhaust line discharge. Intake air is drawn through an oil bath air intake filter, an intake silencer, and a turbocharger compressor. Exhaust gases are discharged from the cylinders through the turbocharger and exhaust silencer to the atmosphere.

Separation of the exhaust system from the air intake system substantially reduces the possibility of contamination of the intake air with exhaust gases. Interaction of the combustion air intake with other plant related exhaust, fires, or failure of onsite gas storage vessels are precluded by elevation differences between the air intake and these potential sources.

The diesel generator intake and exhaust system is designed as a safety-related system. The design and operation of the G-03 and G-04 EDG engine intake and exhaust system conforms with the guidance as described in the SRP Section 9.5.8, Emergency Diesel Engine Combustion Air Intake and Exhaust System, Revision 2, July 1981.

D.6 ENGINE COOLING SYSTEM

The G-03 and G-04 engines are each provided with an independent closed glycol (coolant) cooling system which cools the engine jacket, cylinder block, aftercooler, and the lube oil cooler. The system is provided with two engine-driven pumps, an expansion tank, a coolant-to-air heat exchanger (radiator), a drain tank, and a three-way thermostatic valve. In addition, the cooling system is provided with a preheating circuit to facilitate quick startup of the diesel engine. The preheating circuit contains an electric immersion heater.

In standby, coolant heated by the thermostatically controlled immersion heater circulates through the lube oil cooler and engine by thermosyphon action to warm the engine. During EDG operation, the coolant temperature is maintained at design temperature by a 3-way thermostatic valve which will either direct flow to, or bypass the radiator.

With the exception of the coolant drain tank and its associated transfer pump and piping, expansion tank fill, overflow, vent beyond the first isolation valve, and drain line valve, the EDG engine cooling system is designed as a safety related, Seismic Class I system.

The design and operation of G-03 and G-04 EDG engine cooling system conforms with the guidance as described in the SRP Section 9.5.5, Emergency Diesel Engine Cooling Water System, Revision 2, July 1981.

D.7 STARTING AIR SYSTEM

G-03 and G-04 each have an independent air starting system, consisting of a diesel-driven air compressor, a motor-driven air compressor, an after cooler, a wet air receiver, an air dryer, and two banks of air receivers. With the exception of the portion from the air compressors, up to the inlet side of the check valve downstream of the air dryer, the system is designed as a safety-related Seismic Class I system.

The design and operation of the starting air system for G-03 and G-04 conforms with the guidance as described in the SRP Section 9.5.6, Emergency Diesel Engine Starting System, Revision 2, July 1981.

D.8 LUBE OIL SYSTEM

An individual lubricating oil system is provided for each of the G-03 and G-04 engines. The system is a combination of four separate subsystems which are the main lubricating system, piston cooling system, scavenging oil system, and auxiliary lube oil system. Each system has its own pump or pumps. The main lubricating, piston cooling, and scavenging oil pumps are driven from the accessory gear train of the engine. The main lubricating oil pump and piston cooling oil pump, although individual pumps, are both contained within a single housing and are driven from a common shaft.

The main lubricating oil system supplies oil under pressure to the various moving parts of the engine. The piston cooling system supplies oil for piston cooling and lubrication of the piston pin bearing surface. During operation, oil is drawn from the sump through a strainer by the scavenging oil pump and discharged through a main oil filter, to the lube oil cooler and then into the main lube oil strainer housing to supply the main lubricating oil pump and piston cooling oil pump.

The auxiliary lube oil system which provides the capability of automatic fast starting consists of two AC motor driven pumps. One is the soakback pump, which prelubes the turbocharger bearings so that the bearings are fully lubricated when the engine receives an automatic start requiring rated speed and application of rated load within a matter of seconds. It also removes residual heat from the turbocharger bearing area upon shutdown of the engine. The other pump will circulate warm oil through the oil system and keep the engine in a constant state of readiness for an immediate start.

With the exception of the auxiliary lube oil system and the lube oil tank fill line, the lube oil system is designed as a safety-related and Seismic Class I.

The design and operation of the lube oil system for G-03 and G-04 conforms with the guidance as described in the SRP Section 9.5.7, Emergency Diesel Engine Lubrication System, Revision 2, July 1981.

D.9 FUEL OIL SYSTEM

The design and operation of the fuel oil storage and transfer system conforms with the guidance as described in the SRP Section 9.5.4, Emergency Diesel Engine Fuel Oil Storage and Transfer System, Revision 2, July 1981.

D.10 REFERENCES

1. VPNPD-93-171, "Design Summary for the Installation of Two additional Emergency Diesel Generators - Point Beach Nuclear Plants, Unit 1 and 2," dated September 24, 1993 and attached Report REP-0026, "PBNP Diesel Project Design Submittal," Revision 0, dated September 21, 1993.

2. VPNPD-94-057, "Technical Specification Change Request 166," dated May 26, 1994 and attached portions of Report REP-0026, "PBNP Diesel Project Design Submittal," Revision 1, dated May 24, 1994.

3. NPL 94-0264, "Addendum to Technical Specification Change Request 166," dated July, 1994 and attached portion of Report REP-0026, "PBNP Diesel Project Design Submittal," Revision 2, dated June 22, 1994.

4. NRC Safety Evaluation 94-0030, "Emergency Diesel Generator Addition Project, Point Beach Nuclear Plant," October 24, 1994.

5. 10 CFR 50.59 Screening SCR 2013-0213, "FSAR Sect 2.5 PMP Flood," Revision 1, January 28, 2014.