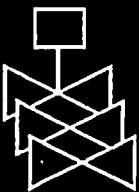
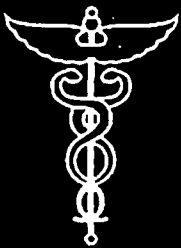
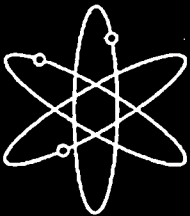
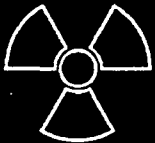


Safety Evaluation Report
Related to the License Renewal of
the Brunswick Steam Electric Plant,
Units 1 and 2

Docket Nos. 50-325 and 50-324

Carolina Power & Light Company

U.S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation
Washington, DC 20555-0001



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Prepared by
M. Heath and S. Mitra

**Division of License Renewal
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001**



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ABSTRACT

This safety evaluation report (SER) documents the technical review of the Brunswick Steam Electric Plant (BSEP), Units 1 and 2, license renewal application (LRA) by the staff of the U.S. Nuclear Regulatory Commission (NRC) (the staff). By letter dated October 18, 2004, Carolina Power & Light Company (CP&L or the applicant) submitted the LRA for BSEP in accordance with Title 10, Part 54, of the *Code of Federal Regulations* (10 CFR Part 54). CP&L is requesting renewal of the operating licenses for BSEP Units 1 and 2, (Facility Operating License Numbers DPR-71 and DPR-62, respectively) for a period of 20 years beyond the current expiration dates of midnight September 8, 2016, for Unit 1 and midnight December 27, 2014, for Unit 2.

The BSEP units are located south of Wilmington, NC, at the mouth of the Cape Fear River in Brunswick County, NC, and two miles north of Southport, NC. The NRC issued the construction permits for Units 1 and 2 on February 7, 1970. The NRC issued the operating licenses for Unit 1 on November 12, 1976; and for Unit 2 on December 27, 1974. Units 1 and 2 are boiling water reactors (BWRs) with primary containments of the BWR Mark I design. Each unit has a nuclear steam supply system that is supplied by General Electric (GE) Nuclear Energy Company. The balance of the plant was originally designed and constructed by Brown & Root with the assistance of its agent, United Engineers & Constructors. Each unit operates at a licensed power output of 2923 megawatt thermal (Mwt), with a gross electrical output of approximately 1007 megawatt electric (Mwe).

This SER presents the status of the staff's review of information submitted to the NRC through December 6, 2005, the cutoff date for consideration in the SER. The staff will present its final conclusion on the review of the BSEP application in its update to this SER.

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ABBREVIATIONS

AC	alternating current
ACI	American Concrete Institute
ACRS	Advisory Committee on Reactor Safeguards
ACSR	aluminum conductor steel reinforced
ADS	automatic depressurization system
AERM	aging effects requiring management
AFFF	aqueous fire fighting foam
AFW	auxiliary feedwater
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AMP	aging management program
AMR	aging management review
AMSAC	ATWS mitigating system actuation circuitry
ANSI	American National Standards Institute
AOG	augmented off-gas/auxiliary off-gas
AOO	anticipated operational occurrence
API	American Petroleum Institute
APRM	average power range monitor
ARI	alternate rod injection/alternate rod insertion
ARM	area radiation monitor
ART	adjusted reference temperature
AS&CR	auxiliary steam and condensate recovery
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
AST	accident source term
ASTM	American Society for Testing and Materials
ATWS	anticipated transient without scram
ATWS-RPT	anticipated transient without scram--recirculation pump trip
AWS	American Welding Society
AWWA	American Water Works Association
B&PV	boiler and pressure vessel
BNP	Brunswick Nuclear Plant
BSEP	Brunswick Steam Electric Plant
BTP	branch technical position
BTRS	boron thermal regeneration system
BWR	boiling water reactor
BWROG	Boiling Water Reactor Owners Group
BWRVIP	Boiling Water Reactor Vessel and Internals Program
CAC	containment atmospheric control
CAD	containment atmosphere dilution
CAP	Corrective Action Program
CASS	cast austenitic steel
CB	control board

CCW	closed cooling water or component cooling water
CDD	condensate deep bed demineralizer
CDF	core damage frequency
CET	core exit thermocouple
CF	chemistry factor
CFD	condensate filter demineralizer
CFR	<i>Code of Federal Regulations</i>
CHRS	containment heat removal system
CI	confirmatory item
CL	chlorination
CLB	current licensing basis
CMAA	Crane Manufacturers Association of America
CP&L	Carolina Power & Light Company, a Progress Energy Company
CR	condition report
CRD	control rod drive
CRDH	control rod drive housing
CRDM	control rod drive mechanism
CRGT	control rod guide tube
CRW	clean radioactive waste
CS	containment spray or carbon steel
CST	condensate storage tank
CUF	cumulative usage factor
CVCS	chemical and volume control system
CW	circulating water
DBA	design-basis accident
DBE	design-basis event
DC	direct current
DG	diesel generator
DGB	diesel generator building
DOR	Division of Operating Reactors (NRC)
D/P	differential pressure
DRW	dirty radioactive waste
DSCSS	drywell and suppression chamber spray system
DW	demineralized water
DWT	demineralized water tank
ECCS	emergency core cooling system
EDB	equipment database
EDG	emergency diesel generator
EFPY	effective full-power year
EOL	end of life
EPRI	Electric Power Research Institute
EQ	environmental qualification
ESF	engineered safety feature
FAC	flow-accelerated corrosion
F _{en}	environmental fatigue factor
FERC	Federal Energy Regulatory Commission

FHA	fire hazards analysis
FO	fuel oil
FOL	facility operating license
FOST	fuel oil storage tank
FP	fire protection
FPP	fire protection plan
FSAR	Final Safety Analysis Report
FSD	functional system description
FSER	Final Safety Evaluation Report
FW	feedwater
GALL	generic aging lessons learned
GDC	general design criteria or general design criterion
GE	General Electric
GEIS	generic environmental impact statement
GL	generic letter
GSI	general safety issue
HAZ	heat-affected zone
HCU	hydraulic control unit
HD	heater drains
HDFSS	high density fuel storage system
HELB	high-energy line break
HE/ME	high energy/moderate energy
HEPA	high efficiency particulate air
HJTC	heated junction thermocouple
HMWPE	high molecular weight polyethylene
HP	high pressure
HPCI	high pressure coolant injection
HPCS	high pressure core spray (not an applicable system for BSEP)
HVAC	heating, ventilation, and air conditioning
HWC	hydrogen water chemistry
HX	heat exchanger
IA	instrument air
IAN	non-interruptible instrument air
IASCC	irradiation assisted stress corrosion cracking
I&C	instrumentation and control
ID	inside diameter
IE	inspection and enforcement (former NRC Office of Inspection and Enforcement)
IEEE	Institute of Electrical and Electronics Engineers
IGA	intergranular attack
IGSCC	intergranular stress corrosion cracking
ILRT	integrated leak rate test (containment type A test)
IN	information notice
INPO	Institute of Nuclear Power Operations
IPA	integrated plant assessment
IPCEA	Insulated Power Cable Engineers Association
IR	insulation resistance

IRM	intermediate range monitor
ISG	interim staff guidance
ISI	inservice inspection
KV	kilovolt
LBB	leak before break
LER	Licensee Event Report
LO	lubricating oil
LOCA	loss-of-coolant accident
LOOP	loss of offsite power
LP	low pressure
LPCI	low pressure coolant injection
LPCS	low pressure core spray
LPRM	local power range monitor
LR	license renewal
LRA	license renewal application
—1	intended function (pressure boundary)
—2	intended function (filtration)
—3	intended function (flow restriction)
—4	intended function (structural support/seismic integrity)
—5	intended function (heat transfer)
MCB	main control board
MEAP	material, environment, aging program
MeV	million electron volts
MIC	microbiologically induced corrosion
MOD	motor operated disconnect
MS	main steam
MSIV/LCS	main steam isolation valve/leakage control system
MSL	main steam line or mean sea level
MSLB	main steam line break
MSR	moisture separator reheater
MVD	miscellaneous vents and drains
Mwe	megawatt electric
Mwt	megawatt thermal
MWTS	makeup water treatment system
NDE	nondestructive examination
NDTT	nil-ductility transition temperature
NEI	Nuclear Energy Institute
NEPA	National Environmental Policy Act of 1969
NFPA	National Fire Protection Association
Ni	nickel
NMS	neutron monitoring system
NPAR	nuclear plant aging research
NPS	nominal pipe size
NRC	U.S. Nuclear Regulatory Commission
NSR	non-safety-related

NSSS	nuclear steam supply system
NUREG	designation of publications prepared by the NRC staff
OBE	operating-basis earthquake
ODSCC	outside-diameter stress-corrosion cracking
OE	operating experience
OI	open item
OLTP	original licensed thermal power
OPRM	oscillation power range monitor
PASS	post-accident sampling system
PBDS	period based detection system
PCB	power circuit breaker
PCS	primary containment structure
PEC	Progress Energy Carolinas
PFM	probabilistic fracture mechanics
pH	concentration of hydrogen ion
P&ID	piping and instrumentation diagram
PM	preventive maintenance
PNS	pneumatic nitrogen system
PORV	power-operated relief valve
PRF	penetration room filtration
PRM	process radiation monitoring
PSRF	non-safety-related that can prevent a safety-related function
P-T	pressure-temperature
PTLR	pressure-temperature limits report
PTS	pressurized thermal shock
PVC	polyvinyl chloride
PW	pipe whip
PWS	potable water system
PWSCC	primary water stress-corrosion cracking
QA	quality assurance
RAI	request for additional information
RB	reactor building
RBCCW	reactor building closed cooling water
RBM	rod block monitor
RCIC	reactor core isolation cooling
RCP	reactor coolant pump
RCPB	reactor coolant pressure boundary
RCS	reactor coolant system
RFP	reactor feedwater pump
RG	regulatory guide
RHR	residual heat removal
RI	risk informed
RI-ISI	risk-informed inservice inspection
RMCS	reactor manual control system
RMS	radiation monitoring system

RMWST	reactor makeup water storage tank
RNA	reactor non-interruptible air
RPIS	rod position information system
RPS	reactor protection system
RPV	reactor pressure vessel
RT _{NDT}	reference temperature nil-ductility transition
RT _{NDT(U)}	reference temperature nil-ductility transition (unirradiated)
RT _{PTS}	reference temperature pressurized thermal shock
RTS	reactor trip system
RVI	reactor vessel internals
RVLIS	reactor vessel instrumentation system
RWCU	reactor water cleanup system
RWM	rod worth minimizer
RWST	refueling water storage tank
RXS	reactor building sampling system
SA	service air
SAT	startup auxiliary transformer
SBO	station blackout
SC	structure and component or suppression chamber
SCC	stress-corrosion cracking
SCW	screen wash water
SDV	scram discharge volume
SE	safety evaluation
SER	Safety Evaluation Report
SFP	spent fuel pool
SGBD	steam generator blowdown
SGTS	standby gas treatment system
SI	safety injection
SJAE	steam jet air ejector
SLC	standby liquid
SLMS	stator leak monitoring system
SMP	structural monitoring program
SOC	statement of consideration
SPDS	safety parameter display system
SR	safety-related
SRP	Standard Review Plan
SRP-LR	Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants
SRV	safety relief valve
SS	stainless steel
SSC	system, structure, and component
SSE	safe-shutdown earthquake
SW	service water
SWIS	service water intake structure
TAC	technical assignment control (internal NRC work management tool)
TASCS	thermal stratification, cycling, and striping

TB	turbine building
TBCCW	turbine building closed cooling water
TGSCC	trans-granular stress corrosion cracking
TID	total integrated does
TIP	traversing incore probe
TLAA	time-limited aging analysis
TPNS	total plant numbering system
TS	technical specification
TSC	technical support center
TSP	trisodium phosphate
TT	thermal transients
UAT	unit auxiliary transformer
UFSAR	updated final safety analysis report
USAS	United States of America Standards
USE	upper-shelf energy
UUSE	unirradiated upper shelf energy
UT	ultrasonic test
VAC	Volts alternating current
VDC	Volts direct current
VFLD	vessel flange leak detection
WANO	World Association of Nuclear Operators
WCAP	Westinghouse Commercial Atomic Power (report)
WOG	Westinghouse Owners Group
XLPE	cross-linked polyethylene