
Safety Evaluation Report

Related to the License Renewal of the Dresden Nuclear Power Station, Units 2 and 3 and Quad Cities Nuclear Power Station, Units 1 and 2

Docket Nos. 50-237, 50-249, 50-254, and 50-265

Exelon Generation Company, LLC (Exelon)

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

July 2004



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ABSTRACT

This safety evaluation report (SER) documents the technical review of the Dresden Nuclear Power Station (DNPS), Units 2 and 3 and Quad Cities Nuclear Power Station (QCNPS), Units 1 and 2, license renewal application (LRA) by the U.S. Nuclear Regulatory Commission (NRC) staff (staff). By letter dated January 3, 2003, Exelon Generation Company (Exelon or the applicant) submitted the LRA for Dresden and Quad Cities (D/QCNPS) in accordance with Title 10, Part 54 of the *Code of Federal Regulations* (10 CFR Part 54 or the Rule). Exelon requests renewal of the operating licenses for DNPS Unit 2 (License No. DRP-19), DNPS Unit 3 (License No. DRP-25), QCNPS Unit 1 (License No. DRP-29), and QCNPS Unit 2 (License No. DRP-30) for a period of 20 years beyond the current license expirations of midnight, December 22, 2009; January 12, 2011; December 14, 2012; and December 14, 2012, respectively.

DNPS is located in Grundy County, Illinois, on the shore of a man-made cooling lake, with the Illinois River to the north and the Kankakee River to the east. The QCNPS is located in Rock Island County, IL, on the east bank of the Mississippi River opposite the mouth of the Wapsipinicon River, and about 3 miles north of Cordova, IL. DNPS, Units 1 and 2, and QCNPS, Units 2 and 3, each consist of a General Electric boiling-water reactor (BWR/3) authorized to operate individually at a steady state reactor power level not to exceed 2957 megawatts-thermal, or approximately 850 megawatts-electric.

This SER presents the status of the staff's review of information submitted to the NRC through June 22, 2004, the cutoff date for consideration in the SER. The staff identified open items and confirmatory items that had to be resolved before the staff could make a final determination on the application. Sections 1.5 and 1.6 of this report summarize these items and their resolutions. Section 6 provides the staff's final conclusion of its review of the D/QCNPS LRA.

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ABBREVIATIONS

A	ampacity
AC	alternating current
ACAD	atmospheric containment air dilution system
ACI	American Concrete Institute
ACRS	Advisory Committee on Reactor Safeguards
ACSR	aluminum conductor steel reinforced
ADAMS	Agencywide Document Access and Management System
ADS	Automatic depressurization system
AEC	Atomic Energy Commission
AERM	aging effect requiring management
AFW	auxiliary feedwater
AFU	air filtration unit
AHU	air handling unit
AISC	American Institute of Steel Construction
ALARA	as low as reasonably achievable
AMG	aging management guideline
AMP	aging management program
AMR	aging management review
AMSAC	ATWS mitigation system actuation circuitry
ANS	American Nuclear Society
ANSI	American National Standards Institute
AOR	abnormal occurrence report
APCSB	Auxiliary and Power Conversion System Branch
AR	action report
ARI	alternate rod insertion
ART	adjusted reference temperature
ASME	American Society of Mechanical Engineers
ASNT	American Society for Nondestructive Testing
ASTM	American Society for Testing and Materials
ATWS	anticipated transient without a scram
AVT	all-volatile treatment
AWG	American wire gauge
BMI	bottom mounted instrument
BTP	branch technical position
B&W	Babcock and Wilcox
BWR	boiling-water reactor
BWROG	Boiling Water Reactor Owners Group
BWRVIP	Boiling Water Reactor Vessel and Internals Project
C	Celsius
CAM	containment atmospheric monitoring
CAR	corrective action report
CASS	cast austenitic stainless steel
CBF	cycle-based fatigue
CCST	contaminated condensate storage tank

CCSW	containment cooling service water
CCW	component cooling water
CDF	core damage frequency
CDHR c	container hydrogen detectors and recombiner
CD-ROM	compact disk-read only memory
CDWST	clean demineralized water storage tank
CF	chemistry factor
CFR	<i>Code of Federal Regulations</i>
CI	confirmatory item
CIC	contaminant isolation component
CLB	current licensing basis
CMAA	Crane Manufactures Association of America
CO	carbon monoxide
CO ₂	carbon dioxide
ComEd	Commonwealth Edison
C-RAI	clarification of request for additional information
CRD	control rod drive
CRDA	control rod drop accident
CRD(H)	control rod drive (hydraulic)
CRDM	control rod drive mechanism
CR HVAC	air handles heating/cooling
CS	containment spray system or carbon steel
CST	condensate storage tank
CUF	cumulative usage factor
CV	check valve
CW	circulating water
D/QCNPS	Dresden/Quad Cities Nuclear Power Station
DAM	data acquisition modules
DBA	design-basis accident
DBD	design baseline document
DBE	design-basis event
DC	direct current
DFO	diesel fuel oil
DG	diesel generator
DGB-HVAC	diesel generator building heating, ventilation, and air conditioning
DGCW	diesel generator cooling water
DGSW	diesel generator service water
DNI	drywell nitrogen inerting
DNPIS	drywell nitrogen purge and inerting system
DNPS	Dresden Nuclear Power Station
DPR	developmental power reactor
DR	drywell-to-refueling
D-RAI	draft request for additional information
DRS	development requirements specification
DSER	draft safety evaluation report
DWM	demineralizer water makeup
EC	engineering change

ECCS	emergency core cooling system
ECP	electrochemical corrosion potential
ECR-HVAC	emergency core cooling system corner room heating, ventilation, and air conditioning
EDG	emergency diesel generator
EDY	effective degradation years
EFPY	effective full-power year
EFWST	emergency feedwater storage tank
EGC	Exelon Generation Company, LLC
EHC	electrohydraulic control
EMA	equivalent margin analysis
EPN	equipment part number
EPR	ethylene propylene rubber
EPRI	Electric Power Research Institute
EPU	extended power uprate
EQ	environmental qualification
ESF	engineered safety features
ESS	electronic switching system
ESW	electroslag weld
EWCS	electronic work control system
F	Fahrenheit
FAC	flow-accelerated corrosion
FCC	Federal Communications Commission
F _{en}	environmental fatigue multiplier
FERC	Federal Energy Regulatory Commission
FOI	factor of improvement
FP	fire protection
FPP	fire protection program
FRP	fiberglass reinforced plastic
FSAR	final safety analysis report
FSER	final safety evaluation report
FSSD	fire safe shutdown
ft	foot, feet
ft-lb	foot-pound
FWRV	feedwater regulating valve
GALL	Generic Aging Lessons Learned (Report)
GE	General Electric
GEIS	generic environmental impact statement
GL	generic letter
GSI	generic safety issue
GTR	generic technical report
HCU	hydraulic control unit
HELB	high energy line break
HEPA	high efficiency particulate air

HIC	high integrity container
HPCI	high pressure coolant injection system
HRRM	high-range radiation monitor
HRSS	high radiation sampling system
HSLAS	high strength low alloy steel
HSO	hydrogen seal oil
HTK	high temperature kerite
HVAC	heating, ventilation, and air conditioning
HWC	hydrogen water chemistry
HX	heat exchanger
I&C	instrumentation and control
IA	instrument air
IASCC	irradiation-assisted stress-corrosion cracking
ID	inner diameter
IDR	inspection discrepancy report
IE	Inspection and Enforcement, Office of (NRC)
IEB	inspection and enforcement bulletin
IGA	intergranular attack
IGSCC	intergranular stress-corrosion cracking
IHSI	induction heat stress improvement
ILRT	integrated leak rate test
in.	inch, inches
IN	information notice
INPO	Institute of Nuclear Power Operations
IPA	integrated plant assessment
IR	insulation resistance
IRM	intermediate range monitor
ISG	interim staff guidance
ISI	inservice inspection
ISP	Integrated Surveillance Program
IST	inservice testing
J	joule
K_{eff}	effective multiplication factor
Kip	one thousand pounds
KV	kilovolt
LBB	leak before break
LER	licensee event report
LLRT	local leak rate test
LOCA	loss-of-coolant accident
LOOP	loss of offsite power
LPCI	low pressure coolant injection system
LPRM	local power range monitor

LR	license renewal
LRA	license renewal application
LRTI	license renewal technical instruction
LTOP	low-temperature over-pressurization
LWR	light water reactor
m	margin
M/G	motor generator
MCC	motor control center
MeV	one million electron volts
MG	motor generator
MIC	microbiologically influenced corrosion
mil/y	mils per year
MOV	motor-operated valve
MRV	minimum required value
MSIP	mechanical stress improvement method
MSIV	main steam isolation valve
MSL	mean sea level
MSV	main stop valve
MSIV	main steam isolation valve
MT	magnetic particle test
MWe	megawatt-electric
NACE	National Association of Corrosion Engineers
NaOH	sodium hydroxide
NBI	nuclear boiler instrumentation
NCAD	nitrogen containment atmospheric dilution
NCR	nonconformance report
NDE	nondestructive examination
ND-QAP	Quality Assurance Program for Station Operation
NEI	Nuclear Energy Institute
NEPA	National Environmental Policy Act of 1969
NFPA	National Fire Protection Association
NIS	nuclear instrumentation system
NMCA	noble metal chemical application
NNS	non-nuclear safety
NPAR	nuclear plant aging research
NPS	nominal pipe size
NPSH	net positive suction head
NRC	U.S. Nuclear Regulatory Commission
NSR	non-safety-related
NSSS	nuclear steam supply system
NUMARC	Nuclear Management and Resources Council (now NEI)
NUREG	Nuclear Regulatory Commission technical report
NUREG/CR	NUREG contractor report

OBE	operating based event
OD	outside diameter
OE	operating experience
ODSCC	outside diameter stress-corrosion cracking
OI	open item
OPT	operability test
P(F/E)	Conditional failure probability
P&I	pipng and instrumentation
P&ID	pipng and instrumentation diagram
PC	primary containment
PCIS	primary containment isolation system
PDT	pipng design table
PLL	predicted lower limit
PM	preventive maintenance
PMT	post-maintenance test
PORV	power operated relief valve
ppm	parts per million
PS	process sampling
psi	pounds per square inch
psig	pounds per square inch gauge
PT	penetrant test
P-T	pressure-temperature
PTS	pressurized thermal shock
PUAR	plant-unique analysis reports
PVC	polyvinyl chloride
PWHT	postweld heat treatment
PWR	pressurized-water reactor
QA	quality assurance
QAP	quality action plan
QCNPS	Quad Cities Nuclear Power Station
RAI	request for additional information
RAT	reserve auxiliary transformer
RBCCW	reactor building closed cooling water
RBH-HVAC	reactor building heating, ventilation, and air conditioning
RCCA	rod cluster control assembly
RCIC	reactor core isolation cooling
RCP	reactor coolant pump
RCPB	reactor coolant pressure boundary
RCS	reactor coolant system
RCU	refrigeration condensing unit
RFP	reactor feed pump
RG	regulatory guide
RHR	residual heat removal

RHRSW	residual heat removal service water
RIS	Regulatory Issue Summary
RMS	radiation monitoring system
RPS	reactor protection system
RPV	reactor pressure vessel
RT	radiographic test
RTD	resistance temperature detector
RT _{PTS}	reference temperature for pressurized thermal shock
RT _{NDT}	reference nil ductility transition temperature
RTV	room temperature vulcanizing
RV	reactor vessel
RVI	reactor vessel internals
RVID	Reactor Vessel Integrity Database
RVWLIS	reactor vessel water level instrumentation system
RWCU	reactor water cleanup
RWM	rod worth minimizer
RWST	refueling water storage tank
Sa	stress intensity
SAFW	standby auxiliary feedwater
SBGT	standby gas treatment
SBLC	standby liquid control
SBO	station blackout
SC	structures and components
SC-1	safety class 1
SC-2	safety class 2
SC-3	safety class 3
SCC	stress-corrosion cracking
SDCS	shutdown cooling system
SE	safety evaluation
SER	safety evaluation report
SFP	spent fuel pool
SFC&FS	spent fuel cooling and fuel storage
SFR	system function report
SG	steam generator
SI	safety injection
SIT	structural integrity test
SJAERM	steam jet air ejector radiation monitor
SLC	standby liquid control
SOC	Statements of Consideration
SOER	significant operating event report
SPCS	steam and power conversion systems
SPING	system-level particulate, iodine, and noble gas monitors
SRM	source range monitor
SRP	Standard Review Plan
SRP-LR	standard review plan—license renewal

SRV	safety relief valve
SS	safety significant or stainless steel
SSC	structure, system, and component
SSEL	safe-shutdown equipment list
SSMP	safe shutdown makeup pump system
SV	safety valve
SW	service water
T	thickness, also temperature
TASCS	thermal stratification, cycling, and stripping
TBCCW	turbine building closed cooling water
TCV	turbine control valve
TDAFW	turbine-driven auxiliary feedwater
TID	total integrated dose
TIP	transverse incore probe
TLAA	time-limited aging analysis
TR	topical report
TRM	technical requirements manual
TSC	technical support center
TS	technical specification
TT	thermal transients
UFSAR	updated final safety analysis report
USAS	United States of America Standard
USE	upper-shelf energy
UT	ultrasonic testing
UV	ultraviolet
V	volt
VAC	volts alternating current
VT	visual test
wt. %	percent by weight