

# **COVER SHEET**

## **FEDERAL ENERGY REGULATORY COMMISSION FINAL ENVIRONMENTAL IMPACT STATEMENT FOR THE YADKIN AND YADKIN-PEE DEE RIVER PROJECTS**

**Docket Nos. P-2197-073 and 2206-030**

**Table of Contents, List of Tables, List of Figures,  
Acronyms and Abbreviations  
Pages vii to xviii  
FEIS**

## TABLE OF CONTENTS

LIST OF FIGURES .....	xi
LIST OF TABLES.....	xii
ACRONYMS AND ABBREVIATIONS.....	xvii
EXECUTIVE SUMMARY .....	xix
1.0 PURPOSE AND NEED FOR ACTION .....	1
1.1 PURPOSE OF ACTION .....	1
1.2 NEED FOR POWER.....	3
1.3 SCOPING.....	4
1.4 INTERVENTIONS .....	7
1.5 CONSULTATION AND COMPLIANCE .....	8
1.5.1 Ready for Environmental Analysis Notice.....	8
1.5.2 Settlement Agreements.....	9
1.5.2.1 Yadkin Project .....	9
1.5.2.2 Yadkin-Pee Dee River Project.....	11
1.5.3 Comments on the Draft Environmental Impact Statement .....	12
2.0 PROPOSED ACTIONS AND ALTERNATIVES .....	13
2.1 NO-ACTION ALTERNATIVE .....	13
2.1.1 Existing Project Facilities.....	13
2.1.1.1 Yadkin Project .....	13
2.1.1.2 Yadkin-Pee Dee River Project.....	14
2.1.2 Existing Project Operations.....	15
2.1.2.1 Yadkin Project .....	15
2.1.2.2 Yadkin-Pee Dee River Project.....	16
2.1.3 Project Safety.....	16
2.1.4 Existing Project Boundaries .....	16
2.1.4.1 Yadkin Project .....	16
2.1.4.2 Yadkin-Pee Dee River Project.....	16
2.2 APPLICANTS' PROPOSALS (SETTLEMENTS).....	17
2.2.1 Proposed Project Facilities .....	17
2.2.1.1 Yadkin Project .....	17
2.2.1.2 Yadkin-Pee Dee River Project.....	17
2.2.2 Proposed Operations.....	17
2.2.2.1 Yadkin Project .....	17
2.2.2.2 Yadkin-Pee Dee River Project.....	18
2.2.3 Proposed Environmental Measures .....	20
2.2.3.1 Yadkin Project .....	20
2.2.3.2 Yadkin-Pee Dee River Project.....	22

2.2.4	Proposed Project Boundaries.....	27
2.3	MODIFICATIONS TO THE APPLICANTS' PROPOSAL .....	27
2.3.1	Mandatory Conditions .....	27
2.3.1.1	Water Quality Certification .....	27
2.3.1.2	Section 18 Agency Fishway Prescriptions .....	28
2.3.1.3	Section 18 Applicant's Alternative Fishways Prescriptions.....	29
2.3.1.4	Coastal Zone Management Act .....	30
2.3.1.5	Endangered Species Act .....	31
2.3.1.6	National Historic Preservation Act (Section 106) .....	32
2.3.2	Other Recommendations by Agencies and Interested Parties.....	32
2.3.2.1	Section 10(j) Recommendations.....	32
2.3.3	Staff's Modification to the Proposed Actions .....	33
2.3.3.1	Yadkin Project .....	33
2.3.3.2	Yadkin-Pee Dee River Project.....	34
2.4	OTHER ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY .....	35
2.4.1	Federal Government Takeover.....	35
2.4.2	Non-power License .....	35
2.4.3	Project Retirement.....	35
3.0	ENVIRONMENTAL EFFECTS.....	37
3.1	GENERAL DESCRIPTION OF THE RIVER BASINS .....	37
3.2	CUMULATIVELY AFFECTED RESOURCES.....	38
3.2.1	Geographic Scope.....	38
3.2.2	Temporal Scope.....	39
3.3	PROPOSED ACTION AND ACTION ALTERNATIVES .....	39
3.3.1	Geology and Soils.....	39
3.3.1.1	Affected Environment.....	39
3.3.1.2	Environmental Effects .....	45
3.3.1.3	Cumulative Effects .....	51
3.3.1.4	Unavoidable Adverse Effects .....	52
3.3.2	Water Resources .....	52
3.3.2.1	Affected Environment.....	52
3.3.2.2	Environmental Effects .....	75
3.3.2.3	Cumulative Effects .....	98
3.3.2.4	Unavoidable Adverse Effects .....	99
3.3.3	Aquatic Resources .....	99
3.3.3.1	Affected Environment.....	99
3.3.3.2	Environmental Effects .....	106
3.3.3.3	Cumulative Effects .....	140
3.3.3.4	Unavoidable Adverse Effects .....	143
3.3.4	Terrestrial Resources .....	143

3.3.4.1	Affected Environment.....	143
3.3.4.2	Environmental Effects .....	155
3.3.4.3	Unavoidable Adverse Effects .....	166
3.3.5	Threatened and Endangered Species.....	167
3.3.5.1	Affected Environment.....	167
3.3.5.2	Environmental Effects .....	168
3.3.5.3	Unavoidable Adverse Effects .....	172
3.3.6	Cultural Resources.....	172
3.3.6.1	Affected Environment.....	172
3.3.6.2	Environmental Effects .....	176
3.3.6.3	Unavoidable Adverse Effects .....	179
3.3.7	Recreational Resources .....	179
3.3.7.1	Affected Environment.....	179
3.3.7.2	Environmental Effects .....	196
3.3.7.3	Unavoidable Adverse Effects .....	214
3.3.8	Land Use and Aesthetics .....	214
3.3.8.1	Affected Environment.....	214
3.3.8.2	Environmental Effects .....	222
3.3.8.3	Cumulative Effects .....	230
3.3.8.4	Unavoidable Adverse Effects .....	230
3.3.9	Socioeconomic Resources.....	230
3.3.9.1	Affected Environment.....	230
3.3.9.2	Environmental Effects .....	233
3.3.9.3	Unavoidable Adverse Effects .....	240
3.4	NO-ACTION ALTERNATIVE .....	240
3.5	IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES .....	241
3.6	RELATIONSHIP BETWEEN SHORT-TERM USES AND LONG- TERM USES .....	241
4.0	DEVELOPMENTAL ANALYSIS .....	243
4.1	YADKIN PROJECT .....	243
4.1.1	Power and Economic Benefits of the No-action Alternative .....	243
4.1.2	Power and Economic Benefits of the Proposed Action .....	243
4.1.3	Power and Economic Benefits of the Staff-Recommended Alternative .....	256
4.1.4	Comparison of Alternatives.....	256
4.2	YADKIN-PEE DEE RIVER PROJECT .....	257
4.2.1	Power and Economic Benefits of the No-action Alternative .....	257
4.2.2	Power and Economic Benefits of the Proposed Action .....	258
4.2.3	Power and Economic Benefits of the Staff-Recommended Alternative .....	259
4.2.4	Comparison of Alternatives.....	284

5.0	CONCLUSIONS AND RECOMMENDATIONS.....	285
5.1	COMPREHENSIVE DEVELOPMENT AND RECOMMENDED ALTERNATIVE .....	285
5.1.1	Yadkin Project.....	285
5.1.2	Yadkin-Pee Dee River Project .....	287
5.2	CONSISTENCY WITH THE RECOMMENDATIONS OF THE FISH AND WILDLIFE AGENCIES .....	317
5.3	CONSISTENCY WITH COMPREHENSIVE PLANS.....	326
6.0	LITERATURE CITED.....	329
7.0	LIST OF PREPARERS .....	337
8.0	LIST OF RECIPIENTS.....	339
	NEED FOR POWER.....	7
	CUMULATIVELY Affected RESOURCES .....	8
	GEOLOGY AND SOILS .....	8
	WATER RESOURCES.....	10
	AQUATIC RESOURCES .....	15
	TERRESTRIAL RESOURCES .....	20
	RECREATIONAL RESOURCES .....	23
APPENDIX A.....		A-1
APPENDIX B.....		B-1

## LIST OF FIGURES

Figure 1.	General vicinity of the Yadkin (P-2197) and Yadkin-Pee Dee River (P-2206) Projects .....	2
Figure 2.	High Rock reservoir operating curve .....	18
Figure 3.	Aerial photograph of upper High Rock reservoir with detailed insert of the pump station .....	41
Figure 4.	Thalweg elevations at specific river miles upstream of High Rock dam .....	47
Figure 5.	Calculated thalweg elevations for years 1928 to 2058 with High Rock dam in place and without the dam.....	48
Figure 6.	Yadkin (P-2197) and Yadkin-Pee Dee River (P-2206) Project facilities flow diagram.....	53
Figure 7.	High Rock reservoir existing rule curves .....	56
Figure 8.	High Rock reservoir daily water surface elevations.....	56
Figure 9.	Water surface profiles for the Yadkin River at a discharge of 70,000 cfs. ....	59
Figure 10.	Example of the coordination of project operations between the Tillery and Blewett Falls developments.....	62
Figure 11.	Blewett Falls reservoir daily water surface elevations.....	63
Figure 12.	Daily flow during June, July, and August of 2002 downstream of Blewett Falls dam.....	66
Figure 13.	Calculated flood water surface elevation at the water intake structure (RM 19.4) .....	78
Figure 14.	Calculated flood water surface elevation at the Grant Creek wastewater treatment plant (RM 16.72) .....	79
Figure 15.	Modeling flows and water levels at High Rock dam in 1988 .....	83
Figure 16.	Yadkin Project (P-2197) recreation facilities.....	182
Figure 17.	Yadkin-Pee Dee River Project (P-2206) recreation facilities .....	191

## LIST OF TABLES

Table 1.	Yadkin Project (P-2197) settlement measures .....	20
Table 2.	Yadkin-Pee Dee River Project (P-2206) settlement measures.....	23
Table 3.	Estimated annual sediment accumulation and annual storage capacity loss for Yadkin Project (P-2197) reservoirs .....	40
Table 4.	Reservoir characteristics for the Yadkin (P-2197) and Yadkin-Pee Dee River (P-2206) Projects. ....	54
Table 5.	Monthly exceedances of inflow (cfs) to High Rock reservoir. ....	57
Table 6.	Flood hazard levels at the city of Salisbury pumping station .....	57
Table 7.	Flood recurrence intervals near the Yadkin and South Yadkin River confluence .....	58
Table 8.	Water surface elevations near RM 19.4. ....	59
Table 9.	Relationship between High Rock and Narrows reservoir drawdowns under the existing operating guide .....	60
Table 10.	Monthly exceedances of outflow (cfs) from Falls reservoir .....	61
Table 11.	Monthly exceedances of flow (cfs) at USGS gage no. 02129000 Pee Dee River near Rockingham, NC, 3.6 miles downstream of Blewett Falls dam. ....	64
Table 12.	Annual and monthly median accretion flows downstream of Blewett Falls .....	65
Table 13.	Summary of major water withdrawals from the Yadkin Project (P-2197).....	67
Table 14.	Reservoir drawdown tiers for the Emergency Drought Protocol of 2002 .....	69
Table 15.	Selected water quality criteria .....	70
Table 16.	Water surface elevations near the city of Salisbury's water pump station based on the Salisbury 2006 HEC-RAS modeling.....	77
Table 17.	Licensed, existing, and recommended drawdowns.....	81

Table 18.	Comparison of monthly minimum flows at Falls dam and inflow percentiles at High Rock reservoir .....	84
Table 19.	Low Inflow Protocol flows (cfs) .....	86
Table 20.	Critical reservoir elevations .....	87
Table 21.	Critical flow values .....	87
Table 22.	Monthly flow values during different stages of the Low Inflow Protocol .....	88
Table 23.	Historical months of Low Inflow Protocol implementation .....	89
Table 24.	Freshwater mussel species observed downstream of the Yadkin (P-2197) and Yadkin-Pee Dee River (P-2206) Projects and one snail species observed on the High Rock shoreline .....	101
Table 25.	Stream reaches analyzed for the Yadkin-Pee Dee River Project (P-2206) downstream of Tillery .....	110
Table 26.	Comparison of WUA values (square feet/1,000 feet of linear stream) for 7 life stages/habitat types at a range of existing, proposed, and recommended minimum flows for Reach 3, subreach 1, downstream of Tillery dam .....	112
Table 27.	Comparison of WUA values (square feet per 1,000 feet of linear stream) for 7 life stages/habitat types at a range of existing, proposed, and recommended minimum flows for Reach 3, subreach 2, downstream of Tillery dam .....	113
Table 28.	Comparison of WUA values (square feet per 1,000 feet of linear stream) for 7 life stages/habitat types at a range of existing, proposed, and recommended minimum flows for Reach 3, subreach 3, downstream of Tillery dam .....	114
Table 29.	Summary of percent of maximum WUA values for 7 life stages/habitat types at a range of existing, proposed, and recommended minimum flows, shown by subreach (SR) in Reach 3, downstream of Tillery dam .....	115
Table 30.	Summary of percent of maximum WUA values for 7 life stages/habitat types at a range of existing, proposed, and recommended minimum flows, for all of Reach 3, downstream of Tillery dam. ....	116

Table 31.	Summary of percent of maximum WUA for all species combined for the three subreaches (SR) of Study Reach 3 for the Progress Energy instream flow study .....	117
Table 32.	Summary of the Fish Passage Agreement, which was signed by Progress Energy, FWS, NMFS, North Carolina WRC, and South Carolina DNR on September 12, 2007, and would provide for fish passage at the Yadkin-Pee Dee River Project .....	125
Table 33.	Existing wetland acres at the Yadkin Project (P-2197) reservoirs and tailraces.....	145
Table 34.	Wetland types and acreages associated with Lake Tillery and Blewett Falls reservoir.....	147
Table 35.	Invasive exotic plant species observed in the Yadkin (P-2197) and Yadkin-Pee Dee River (P-2206) Project areas.....	148
Table 36.	RTE species recorded in the Yadkin Project (P-2197) study area, 2004 .....	149
Table 37.	RTE plant species and significant habitat areas documented in the Yadkin-Pee Dee.....	151
Table 38.	RTE terrestrial wildlife species identified in the Yadkin-Pee Dee River Project (P-2206) area, 2004-2005 .....	155
Table 39.	Recreational facilities at the Yadkin Project (P-2197).....	184
Table 40.	Summary of boat ramp accessibility at High Rock reservoir public access areas.....	188
Table 41.	Recreational facilities at the Yadkin-Pee Dee River Project (P-2206) ....	189
Table 42.	Recreational use at the Yadkin Project (P-2197) .....	192
Table 43.	Summary of recreation visitation by month at the Yadkin Project (P-2197).....	193
Table 44.	Summary of recreation visitation by month at the Yadkin-Pee Dee River Project (P-2206).....	195
Table 45.	Yadkin Project (P-2197) reservoir shoreline miles in each land use category .....	215

Table 46.	Yadkin-Pee Dee River Project (P-2206) boundary acreages in each land use category .....	216
Table 47.	Percentage of shoreline as conservation zone at the Yadkin Project (P-2197).....	220
Table 48.	Summary of user responses on Yadkin Project (P-2197) reservoir aesthetics .....	221
Table 49.	Yadkin and Yadkin-Pee Dee River Project areas population change, 1990-2005.....	231
Table 50.	Yadkin and Yadkin-Pee Dee River Project area population projections, 2000-2030. ....	232
Table 51.	Estimated home sale prices at High Rock reservoir by water level scenario and distance.....	237
Table 52.	Estimated change in property tax revenues at High Rock reservoir by water level scenario .....	237
Table 53.	Staff assumptions for the economic analysis of the Yadkin Project (P-2197).....	244
Table 54.	Summary of capital, annual costs, and total annualized costs for environmental measures proposed by Alcoa Generating and recommended by staff and others for the Yadkin Project (P-2197).....	245
Table 55.	Summary of the three action alternatives for the Yadkin Project (P-2197).....	257
Table 56.	Staff assumptions for the economic analysis of the Yadkin-Pee Dee River Project (P-2206).....	258
Table 57.	Summary of capital, annual costs, and total annualized costs for environmental measures proposed by the Progress Energy and recommended by staff and others for the Yadkin-Pee Dee River Project (P-2206) .....	260
Table 58.	Summary of the three action alternatives for the Yadkin-Pee Dee River Project (P-2206). .....	284
Table 59.	Analysis of fish and wildlife agency section 10(j) recommendations for the Yadkin and Yadkin-Pee Dee River Projects.....	318

Table B-1.	Water surface elevations near the city of Salisbury's water pump station based on the Salisbury 2006 HEC-RAS modeling.....	4
Table B-2.	Comparison of recorded flood elevations and modeled flood elevations at the Salisbury pump station .....	5
Table B-3.	Predicted water surface elevations (feet) 1920 to 2058 .....	6

## ACRONYMS AND ABBREVIATIONS

ADA	Americans with Disabilities Act
Alcoa Generating	Alcoa Power Generating, Inc.
APE	area of potential effects
Atlantic Council	South Atlantic Fishery Management Council
°C	degrees Celsius
CFR	Code of Federal Regulations
cfs	cubic feet per second
Commission	Federal Energy Regulatory Commission
Corps	U.S. Army Corps of Engineers
DENR	Department of Environment and Natural Resources, North Carolina
DNR	Department of Natural Resources, South Carolina
DO	dissolved oxygen
DPR	Department of Parks and Recreation
DWQ	Department of Water Quality
DWR	Department of Water Resources
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
EPAct	Energy Policy Act of 2005
ERM	Environmental Resources Management
ESA	Endangered Species Act
°F	degrees Fahrenheit
FERC	Federal Energy Regulatory Commission
Fish Passage Agreement	Yadkin-Pee Dee River Diadromous Fish Passage Plan Agreement
Forest Service	U.S. Department of Agriculture, Forest Service
FPA	Federal Power Act
FWS	U.S. Fish and Wildlife Service
HEC	Hydraulic Engineering Center
HPMP	historic properties management plan
IMZ	impact minimization zone
Interior	U.S. Department of the Interior
kgC	kilograms of carbon
µg/L	micrograms per liter
MBH	Mobile Boundary Hydraulics, PLLC
MGD	million gallons per day
mg/L	milligrams per liter
mL	milliliter
MW	megawatt
MWh	megawatt-hours
National Register	National Register of Historic Places

NGVD	National Geodetic Vertical Datum
NMFS	National Marine Fisheries Service
PA	programmatic agreement
Progress Energy	Progress Energy Carolinas
Projects	Yadkin and Yadkin-Pee Dee River Projects
RM	river mile
RTE	rare, threatened, and endangered
SERC	Southeastern Electric Reliability Council
SHPO	State Historic Preservation Officer
SMP	shoreline management plan
SRU	Salisbury-Rowan Utilities
TMDL	total maximum daily load
TSS	total suspended solids
USGS	United States Geological Survey
VACAR	Virginia-Carolinas
WQC	water quality certification
WRC	Wildlife Resources Commission
WUA	weighted usable area
Yadkin Settlement	Yadkin Relicensing Settlement Agreement
Yadkin-Pee Dee Settlement	Yadkin-Pee Dee Settlement Agreement