TABLE OF CONTENTS

EXECUTIVE SUMMARY ES-1

1.0 PURPOSE OF ACTION AND NEED FOR POWER 1-1

1.1 PURPOSE OF ACTION 1-1
1.2 NEED FOR POWER 1-2
1.3 INTERVENTIONS AND PROTESTS 1-4
1.4 AGENCY CONSULTATION 1-5
1.5 HISTORY OF THE COLLABORATIVE AND SCOPING PROCESS 1-6

2.0 PROPOSED ACTIONS AND ALTERNATIVES 2-1

2.1 NO-ACTION ALTERNATIVE 2-1
2.1.1 Existing Project Facilities and Operations 2-1
2.2 PROPOSED ACTION – SETTLEMENT AGREEMENT 2-8
2.3 SECTION 18 PRESCRIPTIONS, 4(E) CONDITIONS, AND 10(J) RECOMMENDATIONS 2-8
2.4 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY 2-20
2.4.1 Federal Government Takeover of the Project 2-20
2.4.2 Issuing a Nonpower License 2-20
2.4.3 Retiring the Project 2-20
2.4.4 Increasing Timothy Lake Water Storage Capacity for Downstream Water Providers 2-21

3.0 ENVIRONMENTAL CONSEQUENCES 3-1

3.1 GENERAL ENVIRONMENTAL SETTING 3-1
3.1.1 Clackamas River Watershed 3-1
3.1.2 Project Area 3-1
3.2 PROPOSED ACTION 3-3
3.2.1 Geology and Soils 3-3
3.2.2 Water Quantity and Quality 3-9
3.2.2.1 Affected Environment 3-9
3.2.2.1.1 Summary 3-9
3.2.2.1.2 Water Quantity 3-12
3.2.2.1.3 Water Quality 3-35
3.2.2.2 Environmental Effects 3-50
3.2.2.2.1 Flow 3-50
3.2.2.2.2 Proposed Action 3-52
3.2.2.3 Unavoidable Adverse Impacts to Water Quality and Quantity 3-92

3.2.3 Fisheries Resources 3-93
3.2.4 Terrestrial Resources 3-211
3.2.5 Listed Threatened, Endangered, and Other Rare Species 3-239
3.2.6 Cultural Resources 3-273
3.2.7 Recreation 3-286
3.2.8 Land Use 3-324
3.2.9 Aesthetic Resources 3-329
3.2.10 Socioeconomics 3-343

4.0 DEVELOPMENTAL ANALYSIS 4-1

4.1. INTRODUCTION 4-1
4.2. PROJECT POWER BENEFITS 4-1
4.3. COST OF ENVIRONMENTAL MEASURES 4-3
4.4. COMPARISON OF ALTERNATIVES 4-4

5.0 STAFF'S CONCLUSIONS 5-1

5.1 COMPREHENSIVE DEVELOPMENT AND RECOMMENDED ALTERNATIVE 5-1
5.2 CONSISTENCY WITH FISH AND WILDLIFE RECOMMENDATIONS 5-31
5.2.1 Recommendations Pursuant to Section 10(j) of the FPA .. 5-31
5.2.2 Recommendations Pursuant to Section 10(a)(1) of the FPA 5-45
5.3 CONSISTENCY WITH COMPREHENSIVE AND OTHER RESOURCE PLANS 5-46
5.4 RELATIONSHIP OF LICENSE PROCESS TO LAWS AND POLICIES 5-47
5.4.1 Clean Water Act Section 401 Water Quality Certification 5-47
5.4.2 Endangered Species Act 5-47
5.4.3 National Historic Preservation Act 5-48
5.4.4 Coastal Zone Management Act 5-49
5.4.5 Americans with Disabilities Act 5-49
5.4.6 Federal Power Act Section 18 Fish Prescriptions 5-49
5.4.7 Oregon State Land Board 5-49
5.4.8 Columbia River Basin Fish and Wildlife Program 5-50
5.5 CUMULATIVE EFFECTS SUMMARY 5-51
5.5.1 Water Quantity and Quality 5-52
5.5.2 Fisheries Resources 5-56
5.5.3 Riparian/Wetland Habitats and Species 5-58
5.5.4 Recreation Use Patterns 5-60

6.0 LITERATURE CITED 6-1

7.0 LIST OF PREPARERS 7-1

8.0 LIST OF RECIPIENTS 8-1

9.0 APPENDICES 9-1

APPENDIX A WATER QUALITY

APPENDIX B MATRIX OF PATHWAYS AND INDICATORS

APPENDIX C PROJECT-RELATED IMPACTS ON GRAVEL SUPPLY AND ABUNDANCE IN LOWER OAK GROVE FORK

APPENDIX D DM3 MODEL INPUT AND OUTPUT

APPENDIX E INSTREAM FLOW ANALYSIS

LIST OF FIGURES

Figure No.	Figure Name	Page
Figure 1.0-1.	Location map - Clackamas River Hydroelectric Project	1-8
Figure 1.0-2.	Project facilities - Clackamas River Hydroelectric Project	1-9
Figure 1.0-3.	Detailed location map	1-10
Figure 3.2.1.1-1.	Location map of the Clackamas River and the Oak Grove Fork with approximate geologic boundaries of the High Cascades, Western Cascades, and Willamette Valley physiographic regions	3-4
Figure 3.2.1.2-1.	Earthflow management area	3-8
Figure 3.2.2.1-1	Summary of Project Facilities and Reach Designations	3-10
Figure 3.2.2.1-2	Monthly Average for Flows in Clackamas River System	3-11
Figure 3.2.2.1-3.	Simulation model results – Timothy Lake outflow: average flows (1970 – 2000)	3-15
Figure 3.2.2.1-4.	Simulation model results – Timothy Lake outflow: minimum flows (1970 – 2000)	3-16
Figure 3.2.2.1-5.	Simulation model results – Lake Harriet outflow: average flows (1970 – 2000)	3-19
Figure 3.2.2.1-6.	Simulation model results – Lake Harriet outflow: minimum flows (1970 – 2000)	3-20
Figure 3.2.2.1-7.	Simulation model results – Lake Harriet outflow: average water year (1981).	3-21
Figure 3.2.2.1-8.	Flow contributions – Clackamas River above Oak Grove Powerhouse	3-23
Figure 3.2.2.1-9.	Clackamas River above Oak Grove Powerhouse – 31 year average flows (1970 – 2000)	3-24
Figure 3.2.2.1-10.	Clackamas River above Oak Grove Powerhouse – 31 year minimum flows (1970 – 2000)	3-25
Figure 3.2.2.1-11.	Clackamas River above Oak Grove Powerhouse – flows for dry water year 1992	3-26
Figure 3.2.2.1-12.	Simulated flow – 31 year average: Node 270, Three Lynx Gage	3-28
Figure 3.2.2.1-13.	Clackamas River at Three Lynx – 31 Year minimum flows (1970 – 2000)	3-29
Figure 3.2.2.1-14.	Simulated flow – 31 year average – Node 350 – below Faraday Diversion Dam	3-31
Figure 3.2.2.1-15.	Simulated flow – 31 year average – Node 420 – below River Mill Dam	3-33
Figure 3.2.2.2-1	Oak Grove Fork Water Quantity	3-53
Figure 3.2.2.2-2	Clackamas River Water Quantity	3-54

Figure 3.2.2.2-3. Simulation model results - Timothy Lake Level Elevations: average elevation (1970-2000) 3-56
Figure 3.2.2.2-4. Predicted temperature profiles - Timothy Lake 3-58
Figure 3.2.2.2-5. Predicted dissolved oxygen profiles – Timothy Lake 3-60
Figure 3.2.2.2-6. Flow Differences between proposed and current action 3-63
Figure 3.2.2.2-7. Water quality results – dissolved oxygen Upper Oak Grove Fork 3-65
Figure 3.2.2.2-8. Water quality results – temperature Upper Oak Grove Fork 3-66
Figure 3.2.2.2-9. Water quality results – Lake Harriet 3-68
Figure 3.2.2.2-10. Water quality results – Lower Oak Grove Fork - temperature 3-72
Figure 3.2.2.2-11. Water quality results – Lower Oak Grove Fork – dissolved oxygen 3-74
Figure 3.2.2.2-12. Predicted water quality results – Upper Clackamas River, RM 48.2 3-76
Figure 3.2.2.2-13. Predicted water quality results – Clackamas River above North Fork Reservoir, RM 33.4 3-79
Figure 3.2.2.2-14. Predicted temperature profile – North Fork Reservoir 3-81
Figure 3.2.2.2-15. Predicted dissolved oxygen profile – North Fork Reservoir 3-83
Figure 3.2.2.2-16. Predicted water quality results – North Fork Tailrace 3-84
Figure 3.2.2.2-17. Predicted water quality results – Lower Clackamas River, RM 16.5 3-87
Figure 3.2.2.2-18. Predicted Temperature Profile – Estacada Lake 3-88
Figure 3.2.2.2-19. Predicted Dissolved Oxygen Profile – Estacada Lake 3-89
Figure 3.2.2.2-20. Predicted water quality results – River Mill Tailrace 3-91
Figure 3.2.3.1-1. Temporal distribution of adult and juvenile salmonid habitat utilization in the Clackamas River 3-99
Figure 3.2.3.1-2. Temporal distribution of adult and juvenile salmonid habitat utilization in the Oak Grove Fork 3-100
Figure 3.2.3.1-3. Daily flow fluctuations – Oak Grove Fork 3-114
Figure 3.2.3.1-4. Annual flow fluctuations – Oak Grove Fork 3-115
Figure 3.2.3.1-5. Up-ramping rates – Oak Grove Fork 3-116
Figure 3.2.3.1-6. Down-ramping rates – Oak Grove Fork 3-117
Figure 3.2.3.1-7. Instream flow – Clackamas River and Oak Grove Powerhouse discharge 3-128
Figure 3.2.3.1-8. Oak Grove Powerhouse discharges – upramping rates 3-129
Figure 3.2.3.1-9. Oak Grove Powerhouse Discharges – down-ramping Rates 3-130
Figure 3.2.3.1-10. Stage-discharge relationship for Clackamas River Reach 2A transects 3-132
Figure 3.2.3.1-11. River Mill Powerhouse discharges – upramping Rates 3-136

Figure 3.2.3.1-12. River Mill Powerhouse discharges – down-ramping Rates 3-137
Figure 3.2.3.1-13. DM3 model output for existing conditions, Chinook smolts 3-158
Figure 3.2.3.2-1. Wetted perimeter length and mean length at eight transects located in Reach 1B of the Oak Grove Fork of the Clackamas River 3-170
Figure 3.2.3.2-2. Recommended anadromous salmonid spawning habitat availability curve for the lower Oak Grove Fork (Reach 1G). 3-175
Figure 3.2.3.2-3. Recommended 2+ steelhead rearing habitat availability curve for the lower Oak Grove Fork (Reach 1G) 3-176
Figure 3.2.3.2-4. Recommended 1+ coho rearing mainstem habitat availability curve for the lower Oak Grove Fork (Reach 1G). 3-177
Figure 3.2.3.2-5. Habitat availability curves for 1+ coho rearing in the Lower Oak Grove Fork using 1-D, 2-D, and EHM methodologies 3-184
Figure 3.2.7.1-1. Location of recreation facilities, Mainstem Clackamas River 3-287
Figure 3.2.7.1-2. Timothy Lake recreation 3-291
Figure 3.2.7.1-3. Oak Grove recreation 3-295
Figure 3.2.7.1-4. Lower Oak Grove recreation 3-297
Figure 3.2.10.1-1. Socioeconomic resource areas 3-344

LIST OF TABLES

Table No.	Table Name	Page
Table 2.2-1.	Summary of Current Operations and Proposed Action – Agreement in Principal	2-10
Table 3.2.2.1-1.	USGS Gaging Stations in the Clackamas River watershed with hydrologic data	3-13
Table 3.2.2.1-2.	Water withdrawal along the Clackamas River by use type	3-32
Table 3.2.2.1-3.	Temperature monitoring stations during 2000-2001	3-37
Table 3.2.2.1-4.	ODEQ 2004 Water Quality Standards	3-38
Table 3.2.2.1-5.	Mean values for water quality parameters for Clackamas River Reservoirs, April 2000 through April 2001	3-40
Table 3.2.2.1-6.	Water quality results – Clackamas River system (2000 – 2001)	3-42
Table 3.2.2.1-7.	Water quality results – Clackamas River system (2000 – 2001)	3-43
Table 3.2.2.1-8.	Oak Grove Fork temperature summary	3-46
Table 3.2.2.1-9.	Clackamas River Oak Grove Powerhouse to North Fork Reservoir temperature summary	3-47
Table 3.2.2.1-10.	Mean values for water quality parameters for Clackamas River Reservoirs, April 2000 through April 2001	3-48
Table 3.2.2.1-11.	River Mill Dam temperature summary	3-49
Table 3.2.3.1-1.	Fish species in the Clackamas River Basin and Clackamas River Hydroelectric Project area	3-93
Table 3.2.3.1-2.	Major river segments affected by the North Fork and Oak Grove Projects and their relation to fisheries issues	3-95
Table 3.2.3.1-3.	Stream reach definition for stream segments influenced by the Clackamas River Hydroelectric Project	3-107
Table 3.2.3.1-4.	Average rate of rise and fall	3-118
Table 3.2.3.1-5.	Maximum rate of rise and fall	3-118
Table 3.2.3.1-6.	ODEQ standards for temperature, dissolved oxygen, and pH	3-144
Table 3.2.3.1-7.	Water quality standard reach and project reach comparison	3-145
Table 3.2.3.1-8.	7DADM temperature and dissolved oxygen exceedance of the rearing and spawning criteria for existing conditions.	3-146
Table 3.2.3.1-9.	Summary of upstream passage issues and current conditions by Project reach	3-150
Table 3.2.3.1-10.	Summary of downstream passage issues and current conditions by Project element	3-154

Table 3.2.3.1-11. Average, maximum and minimum annual mortality estimates based on DM3 model results for Chinook, coho, and steelhead smolts 3-157
Table 3.2.3.2-1. Summary of existing instream flow release and ramping rate requirements for the Clackamas River Hydroelectric Project..... 3-162
Table 3.2.3.2-2. Timothy Dam Flow Releases under the Proposed Action . 3-168
Table 3.2.3.2-3. Harriet Dam Flow Releases Proposed Under the Proposed Action 3-173
Table 3.2.3.2-4. Flow and habitat at different percentages of maximum habitat derived from the four methods used to develop instream flow recommendations for coho salmon age 1+ in the mainstem Lower Oak Grove Fork..... 3-178
Table 3.2.3.2-5. Flow and habitat at different percentages of maximum habitat derived from the four methods used to develop instream flow recommendations for Age 2+ steelhead in the Lower Oak Grove Fork..... 3-179
Table 3.2.3.2-6. Flow and habitat at different percentages of maximum habitat derived from the four methods used to develop instream flow recommendations for anadromous salmon spawning in the mainstem Lower Oak Grove Fork 3-180
Table 3.2.3.2-7. Comparison of the percentages of potential habitat maxima of anadromous salmonid spawning, 2+ steelhead rearing, 1+ coho rearing (main stem only and main stem and side channel combined) habitats provided by PGE's Proposal and the Preliminary Agency Alternative instream flow releases for the Lower Oak Grove Fork below Lake Harriet Dam. For comparative purposes, a Staff Suggested flow is also provided. Data sources include McBain and Trush (2004; ODFW 2003). Comparisons were based on the habitat – flow response relationships recommended by the Flow-Geomorphology Sub-Group; spawning – 2-D Adjusted Binary; 2+ Steelhead – weighted EHM; 1+ coho main stem – weighted EHM, side channel – 1:10 main stem v side channel adjustment ratio. 3-181
Table 3.2.3.2-8. Comparison of flows that maximize (and represent 80% of maximum) spawning, steelhead 2+ and coho 1+ habitats as determined from PHABSIM -1D, PHABSIM - 2D and Expert Habitat Mapping (EHM) studies completed in the Lower Oak Grove Fork (Reach 1G) below the barrier falls. 3-186

Table 3.2.3.2-9. 7DADM temperature and dissolved oxygen exceedance (expressed as a percentage of data) of the rearing and spawning criteria for Proposed Action 3-201
Table 3.2.3.2-10. Water quality comparison between existing conditions and the Proposed Action 3-202
Table 3.2.4.1-1. Acreage of vegetation cover types within the Project boundary 3-212
Table 3.2.4.1-2. Summary of Project rights-of-way within the Project boundary, including transmission lines, the Oak Grove pipeline, and Project-use roads 3-216
Table 3.2.4.1-3. General occurrence, density, and abundance of exotic and invasive plant species in the Project study area 3-217
Table 3.2.4.1-4. Open road and Project-use road density in the Project vicinity 3-224
Table 3.2.5.1-1. Listed threatened, endangered, and other rare species occurring or potentially occurring in the vicinity of the Project 3-240
Table 3.2.6.1-1. Archaeological sites in the Clackamas River Hydroelectric Project APE 3-278
Table 3.2.6.1-2. Historic buildings and structures in the Clackamas River Hydroelectric Project APE 3-279
Table 3.2.6.2-1. Site-Specific Activities and Associated Management Measures 3-283
Table 3.2.7.1-1. USFS Campgrounds at Timothy Lake 3-290
Table 3.2.7.2-1. Amount of exposed shoreline at key recreation areas as measured from the surcharge water level (el. 3,191.9 ft) ... 3-306
Table 3.2.9.1-1. Mt. Hood National Forest visual quality objectives 3-331
Table 3.2.9.2-1. Aesthetic evaluation of Project features 3-336
Table 3.2.10-1. Selected socioeconomic characteristics 3-345
Table 3.2.10-2. Age distribution and ethnic composition for the Project vicinity, Portland PMSA, Clackamas County, and Oregon, 2000 3-346
Table 3.2.10-3. Employment by place of residence for Project vicinity, Clackamas County, Portland PMSA, and Oregon, 2000 ... 3-348
Table 3.2.10-4. Measures included in the Proposed Action that affect socioeconomic resources 3-352
Table 4.1-1. Key Economic Assumptions for the Economic Analysis of the Clackamas River Hydroelectric Project 4-2
Table 4.3.1. Annualized Capital and Operating and Maintenance Costs of the No-Action Alternative 4-3
Table 4.4-1. Summary of Costs, Power Benefits, and Net Benefits of the Clackamas River Hydroelectric Project Alternatives 4-4
Table 4.4-2. Detailed Cost Estimates for the Proposed Action 4-5

Table 5.1-1 Summary of All Measures Considered in the Staff Alternative 5-2
Table 5.2-1 Analysis of Fish and Wildlife Agency 10(j) Recommendations for the Clackamas Project..... 5-33

LIST OF ACRONYMS AND ABBREVIATIONS

ac	Acre
ac-ft	Acre-feet
APE	Area of Potential Effects
BLM	Bureau of Land Management
CAISO	California Independent System Operator
CEQ	Council of Environmental Quality
cfs	cubic feet per second
Commission	Federal Energy Regulatory Commission
CWA	Clean Water Act
DEIS	Draft Environmental Impact Statement
DLA	Draft License Application
DM3	Downstream Migrant Mortality Model
dpDEIS	Draft Preliminary Draft Environmental Impact Statement
EHM	Expert Habitat Mapping
EIA	Existing Information Analysis
EIS	Environmental Impact Statement
ESA	Endangered Species Act
FEIS	Final Environmental Impact Statement
FERC	Federal Energy Regulatory Commission
FERRIS	Federal Energy Regulatory Records Information System
Forest Service	United States Forest Service
FPA	Federal Power Act
FPTS	Fish Passage Technical Sub-group
ft	feet mean seal level
HART	Hydroelectric Application Review Team
hp	horsepower
HPMP	Historic Properties Management Plan
HSI	Habitat Suitability Index
IFTSG	Instram Flow Technical Sub-group
IIP	Initial Information Package
Kv	kilovolt
KW	kilowatt
LWD	large woody debris
MHNF	Mount Hood National Forest
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
msl	mean sea level
MW	Megawatt
MWh	Megawatt hour
NEPA	National Environmental Policy Act
NFS	National Forest Service

ACS	USFS Aquatic Conservation Strategy
NGO	Non-Governmental Organization
NMFS	National Marine Fisheries Service
NMWSA	Normal Maximum Water Surface Area
NOAA	National Oceanic and Atmospheric Administration
NOAA Fisheries	National Oceanic and Atmospheric Administration's National Marine Fisheries Service
NWPCC	Northwest Power and Conservation Council
ODEQ	Oregon Department of Environmental Quality
ODFW	Oregon Department of Fish & Wildlife
OHP	Oregon State Historic Preservation Office
OOE	Oregon Office of Energy
OPRD	Oregon Parks and Recreation Department
ORV	Outstandingly Remarkable Values
OWRD	Oregon Water Resources Department
PA	Programmatic Agreement
pDEIS	Preliminary Draft Environmental Impact Statement
PFC	Properly Functioning Conditions
PGE	Portland General Electric
Project	Clackamas Hydroelectric Project
PUSP	Provisional Unified State Position
RM	River Mile
ROW	Right-of-way
RRMP	Recreation Resources Management Plan
S/M	Survey and Management Species
SD1	Scoping Document 1
SD2	Scoping Document 2
Staff	Commission staff
SWR	Surface Water Registration
T&E	Threatened and Endangered Species
TES	Threatened, endangered and sensitive
TPC-EIS	Third Party Contractor-Environmental Impact Statement
TWRG	Terrestrial Resources Workgroup
USFWS	United States Fish and Wildlife Service
WQC	Water Quality Certification
EWEB	Eugene Water and Electric Board
mi/mi^2	miles per square mile
USGS	US Geological Survey
RWSP	Regional Water Supply Plan
DO	dissolved oxygen
7DADM	seven day running average of the daily maximum
M7MMT	annual max. 7-day running average of max. daily water temperature
USFS	US Forest Service

ROD	Oregon Record of Decision
MPI	Matrix of Pathways and Indicators
IHA	Indicators of Hydrologic Alternation
FG subgroup	Flow-geomorphology subgroup
1D PHABSIM	
2D PHABSIM	
RHABSIM	Riverine Habitat Simulation
VQO	Visual Quality Objectives