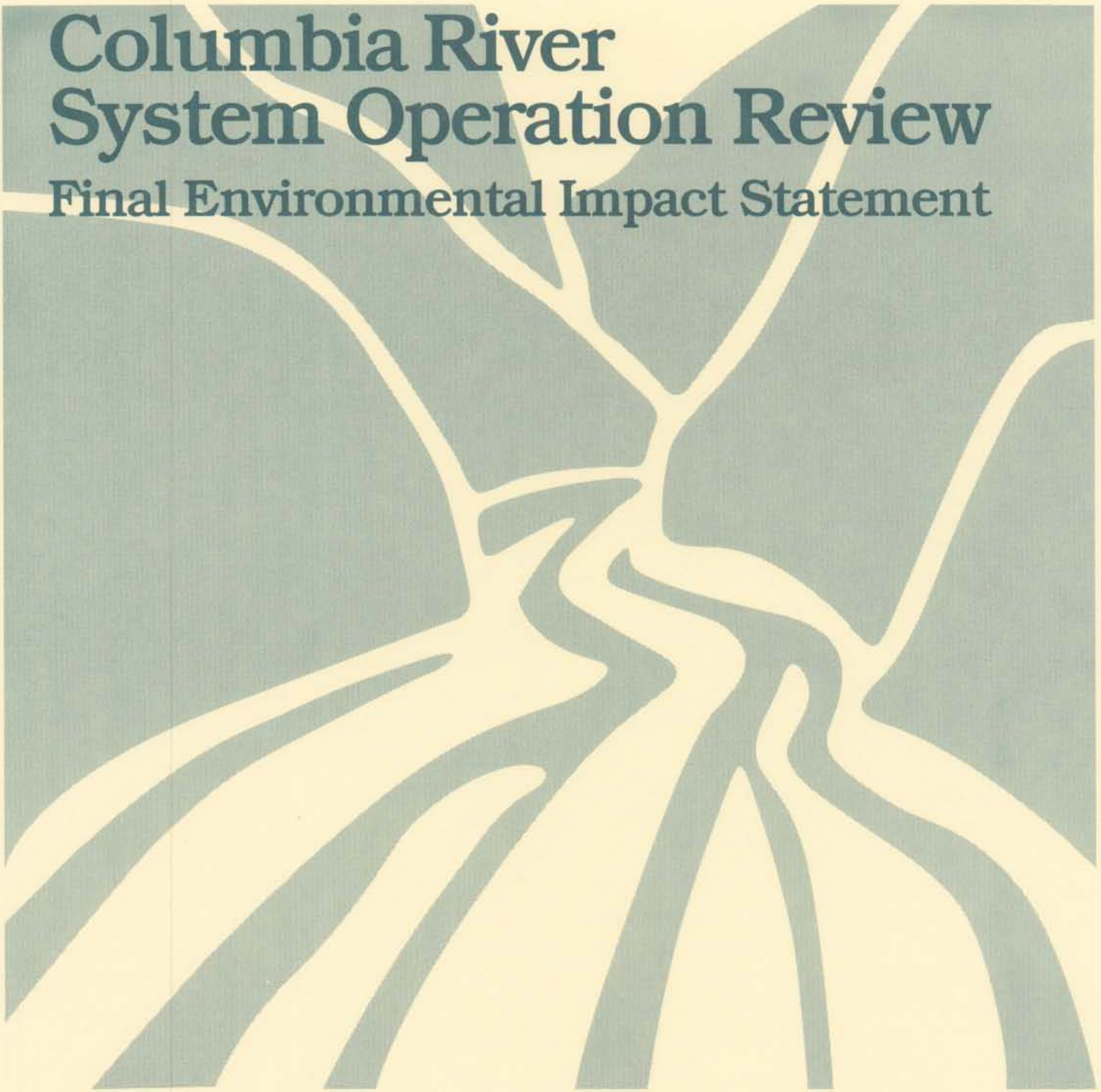
Columbia River System Operation Review

Final Environmental Impact Statement



Appendix R

Pacific Northwest Coordination Agreement (PNCA)

BONNEVILLE POWER ADMINISTRATION

US Army Corps of Engineers
North Pacific Division

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

DOE/EIS-0170

November 1995

PUBLIC INVOLVEMENT IN THE SOR PROCESS

The Bureau of Reclamation, Corps of Engineers, and Bonneville Power Administration wish to thank those who reviewed the Columbia River System Operation Review (SOR) Draft EIS and appendices for their comments. Your comments have provided valuable public, agency, and tribal input to the SOR NEPA process. Throughout the SOR, we have made a continuing effort to keep the public informed and involved.

Fourteen public scoping meetings were held in 1990. A series of public roundtables was conducted in November 1991 to provide an update on the status of SOR studies. The lead agencies went back to most of the 14 communities in 1992 with 10 initial system operating strategies developed from the screening process. From those meetings and other consultations, seven SOS alternatives (with options) were developed and subjected to full–scale analysis. The analysis results were presented in the Draft EIS released in July 1994. The lead agencies also developed alternatives for the other proposed SOR actions, including a Columbia River Regional Forum for assisting in the determination of future SOSs, Pacific Northwest Coordination Agreement alternatives for power coordination, and Canadian Entitlement Allocation Agreements alternatives. A series of nine public meetings was held in September and October 1994 to present the Draft EIS and appendices and solicit public input on the SOR. The lead agencies received 282 formal written comments. Your comments have been used to revise and shape the alternatives presented in the Final EIS.

Regular newsletters on the progress of the SOR have been issued. Since 1990, 20 issues of *Streamline* have been sent to individuals, agencies, organizations, and tribes in the region on a mailing list of over 5,000. Several special publications explaining various aspects of the study have also been prepared and mailed to those on the mailing list. Those include:

The Columbia River: A System Under Stress
The Columbia River System: The Inside Story
Screening Analysis: A Summary
Screening Analysis: Volumes 1 and 2
Power System Coordination: A Guide to the Pacific Northwest Coordination Agreement
Modeling the System: How Computers are Used in Columbia River Planning
Daily/Hourly Hydrosystem Operation: How the Columbia River System Responds to Short–Term Needs

Copies of these documents, the Final EIS, and other appendices can be obtained from any of the lead agencies, or from libraries in your area.

Your questions and comments on these documents should be addressed to:

SOR Interagency Team
P .O. Box 2988
Portland, OR 97208–2988

PREFACE: SETTING THE STAGE FOR THE SYSTEM OPERATION REVIEW

WHAT IS THE SOR AND WHY IS IT BEING CONDUCTED?

The Columbia River System is a vast and complex combination of Federal and non–Federal facilities used for many purposes including power production, irrigation, navigation, flood control, recreation, fish and wildlife habitat, and municipal and industrial water supply. Each river use competes for the limited water resources in the Columbia River Basin.

To date, responsibility for managing these river uses has been shared by a number of Federal, state, and local agencies. Operation of the Federal Columbia River System is the responsibility of the Bureau of Reclamation (Reclamation), Corps of Engineers (Corps) and Bonneville Power Administration (BPA).

The System Operation Review (SOR) is both a study and an environmental compliance process being used by the three Federal agencies to analyze future operations of the system and river–use issues. The goal of the SOR is to achieve a coordinated system operating strategy for the river that better meets the needs of all river users. The SOR began in early 1990, prior to the filing of petitions for endangered status for several salmon species under the Endangered Species Act.

The comprehensive review of Columbia River operations encompassed by the SOR was prompted by the need for Federal decisions to (1) develop a coordinated system operating strategy (SOS) for managing the multiple uses of the system into the 21st century; (2) provide interested parties with a continuing and increased long–term role in system planning (Columbia River Regional Forum); (3) renegotiate and renew the Pacific Northwest Coordination Agreement (PNCA), a contractual arrangement among the region's major hydroelectric–generating utilities and affected Federal agencies to provide for coordinated power generation on the Columbia River system; and (4) renew or develop new Canadian Entitlement Allocation Agreements (contracts that divide Canada's share of Columbia River Treaty downstream power return obligations among three participating public utility districts and BPA). The review provides the environmental analysis required by the National Environmental Policy Act (NEPA).

This technical appendix addresses only the effects of a power coordination agreement.

WHO IS CONDUCTING THE SOR?

The SOR is a joint project of Reclamation, the Corps, and BPA—the three agencies that share responsibility and legal authority for managing the Federal Columbia River System and which are parties to the PNCA. The National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Service (USFWS), and National Park Service (NPS), agencies with both jurisdiction and expertise regarding some aspects of the SOR, are cooperating agencies. They contribute information, analysis, and recommendations where appropriate. The U.S. Forest Service (USFS) was also a cooperating agency, but asked to be removed from that role in 1994 after assessing its role and the press of other activities.

HOW IS THE SOR BEING CONDUCTED?

The system operating strategies analyzed in the SOR could have significant environmental impacts. The study team developed a three–stage process—scoping, screening, and full–scale analysis of the strategies—to address the many issues relevant to the system operating strategies.

At the core of the analysis are 10 work groups. The work groups include members of the lead and cooperating agencies, state and local government agencies, representatives of Indian tribes, and members of the public. Each of these work groups has a single river use (resource) to consider.

Early in the process during the screening phase, the 10 work groups were asked to develop an alternative for project and system operations that would provide the greatest benefit to their river use, and one or more alternatives that, while not ideal, would provide an

acceptable environment for their river use. Some groups responded with alternatives that were evaluated in this early phase and, to some extent, influenced the alternatives evaluated in the Draft and Final EIS. Additional alternatives came from scoping for the SOR and from other institutional sources within the region. The screening analysis studied 90 system operation alternatives.

Other work groups were subsequently formed to provide projectwide analysis, such as economics, river operation simulation, and public involvement.

The three-phase analysis process is described briefly below.

- **Scoping/Pilot Study**—After holding public meetings in 14 cities around the region, and coordinating with local, state, and Federal agencies, and Indian tribes, the lead agencies established the geographic and jurisdictional scope of the study and defined the issues that would drive the EIS. The geographic area for the study is the Columbia River Basin (Figure P-1). The jurisdictional scope of the SOR encompasses the 14 Federal projects on the Columbia and lower Snake Rivers that are operated by the Corps and Reclamation and are coordinated for hydropower under the PNCA. BPA markets the power produced at these facilities. A pilot study examining three alternatives in four river resource areas was completed to test the decision analysis method proposed for use in the SOR.

- **Screening**—Work groups, involving regional experts and Federal agency staff, were created for 10 resource areas and several support functions. The work groups developed computer screening models and applied them to the 90 alternatives identified during screening. They compared the impacts to a baseline operating year—1992—and ranked each alternative according to its impact on their resource or river use. The lead agencies reviewed the results with the public in a series of regional meetings in September 1992.

- **Full-Scale Analysis**—Based on public comment received on the screening results, the study team sorted, categorized, and blended the alternatives into seven basic types of operating strategies. These alternative strategies, which have multiple options, were then subjected to detailed impact analysis. Twenty-one possible options were evaluated. Results and tradeoffs for each resource or river use were discussed in separate technical appendices and summarized in the Draft EIS. Public review and comment on the Draft EIS was conducted during the summer and fall of 1994. The lead agencies adjusted the alternatives based on the comments, eliminating a few options and substituting new options, and reevaluated them during the past 8 months. Results are summarized in the Final EIS.

Alternatives for the Pacific Northwest Coordination Agreement (PNCA), the Columbia River Regional Forum (Forum), and the Canadian Entitlement Allocation Agreements (CEAA) did not use the three-stage process described above, although there was substantial public involvement in the development of alternatives. The environmental impacts from the PNCA and CEAA were not significant and there were no anticipated impacts from the Regional Forum. The procedures used to analyze alternatives for these actions are described in their respective technical appendices.

For detailed information on alternatives presented in the Draft EIS, refer to that document and its appendices.

WHAT SOS ALTERNATIVES ARE CONSIDERED IN THE FINAL EIS?

Seven alternative System Operating Strategies (SOS) were considered in the Draft EIS. Each of the seven SOSs contained several options bringing the total number of alternatives considered to 21. Based on review of the Draft EIS and corresponding adjustments, the agencies have identified 7 operating strategies that are evaluated in this Final EIS. Accounting for options, a total of 13 alternatives is now under consideration. Six of the alternatives

remain unchanged from the specific options considered in the Draft EIS. One is a revision to a previously considered alternative, and the rest represent replacement or new alternatives. The basic categories of SOSs and the numbering convention remains the same as was used in the Draft EIS. However, because some of the alternatives have been dropped, the numbering of the final SOSs are not consecutive. There is one new SOS category, Settlement Discussion Alternatives, which is labeled SOS 9 and replaces the SOS 7 category. This category of alternatives arose as a consequence of litigation on the 1993 Biological Opinion and ESA Consultation for 1995.

The 13 system operating strategies for the Federal Columbia River system that are analyzed for the Final EIS are:

SOS 1a Pre Salmon Summit Operation represents operations as they existed from around 1983 through the 1990–91 operating year, prior to the ESA listing of three species of salmon as endangered or threatened.

SOS 1b Optimum Load–Following Operation represents operations as they existed prior to changes resulting from the Regional Act. It attempts to optimize the load–following capability of the system within certain constraints of reservoir operation.

SOS 2c Current Operation/No–Action Alternative represents an operation consistent with that specified in the Corps of Engineers' 1993 Supplemental EIS. It is similar to system operation that occurred in 1992 after three species of salmon were listed under ESA.

SOS 2d [New] 1994–98 Biological Opinion represents the 1994–98 Biological Opinion operation that includes up to 4 MAF flow augmentation on the Columbia, flow targets at McNary and Lower Granite, specific volume releases from Dworshak, Brownlee, and the Upper Snake, meeting sturgeon flows 3 out of 10 years, and operating lower Snake projects at MOP and John Day at MIP.

SOS 4c [Rev.] Stable Storage Operation with Modified Grand Coulee Flood Control attempts to achieve specific monthly elevation targets year round that improve the environmental conditions at storage projects for recreation, resident fish, and wildlife. Integrated Rules Curves (IRCs) at Libby and Hungry Horse are applied.

SOS 5b Natural River Operation draws down the four lower Snake River projects to near river bed levels for four and one–half months during the spring and summer salmon migration period, by assuming new low level outlets are constructed at each project.

SOS 5c [New] Permanent Natural River Operation operates the four lower Snake River projects to near river bed levels year round.

SOS 6b Fixed Drawdown Operation draws down the four lower Snake River projects to near spillway crest levels for four and one–half months during the spring and summer salmon migration period.

SOS 6d Lower Granite Drawdown Operation draws down Lower Granite project only to near spillway crest level for four and one–half months.

SOS 9a [New] Detailed Fishery Operating Plan includes flow targets at The Dalles based on the previous year's end–of–year storage content, specific volumes of releases for the Snake River, the drawdown of Lower Snake River projects to near spillway crest level for four and one–half months, specified spill percentages, and no fish transportation.

SOS 9b [New] Adaptive Management establishes flow targets at McNary and Lower Granite based on runoff forecasts, with specific volumes of releases to meet Lower Granite flow targets and specific spill percentages at run–of–river projects.

SOS 9c [New] Balanced Impacts Operation draws down the four lower Snake River projects near spillway crest levels for two and one–half months during the spring salmon migration period. Refill begins after July 15. This alternative also provides 1994–98 Biological Opinion flow augmentation, integrated rule curve operation at Libby and Hungry Horse, a reduced flow target at Lower Granite due to drawdown, winter drawup at Albeni Falls, and spill to achieve no higher than 120 percent daily average for total dissolved gas.

SOS PA Preferred Alternative represents the operation proposed by NMFS and USFWS in their Biological Opinions for 1995 and future years; this SOS operates the storage projects to meet flood control rule curves in the fall and winter in order to meet spring and summer flow targets for Lower Granite and McNary, and includes summer draft limits for the storage projects.

WHAT PNCA ALTERNATIVES ARE CONSIDERED IN THE FINAL EIS?

Five alternatives to the PCNA were analyzed on this appendix to the EIS. Briefly, they are:

- **PNCA 1 -- Expiration of Existing Contract, No Replacement (No Action)** considers the impacts of not having a regional power coordination agreement after the expiration of the existing contract in 2003.
- **PNCA 2 -- Contract to Maximize Regional Power Benefits** considers the impacts of an agreement that calls for a pooling of regional power resources under a central authority for the purpose of planning and operating to maximize power production.
- **PNCA 3 -- Extension of Existing Contract (Base Case)** considers the impacts ofcontinuing to coordinate power under the existing PNCA.
- **PNCA 4 -- Modified Contract Supplemental with Operating Procedures (Preferred Alternative)** considers the impacts of coordinating power under a modified agreement that uses short- and long-term operating procedures to facilitate implementation of the contract.
- **PNCA 5 -- Power Coordination Agreement to Enhance Nonpower Considerations** considers powercoordination under an agreement that dedicates federal project residual flexibility to nonpower uses and gives parties without power resources an opportunity to participate in planning power operations.

WHAT DO THE TECHNICAL APPENDICES COVER?

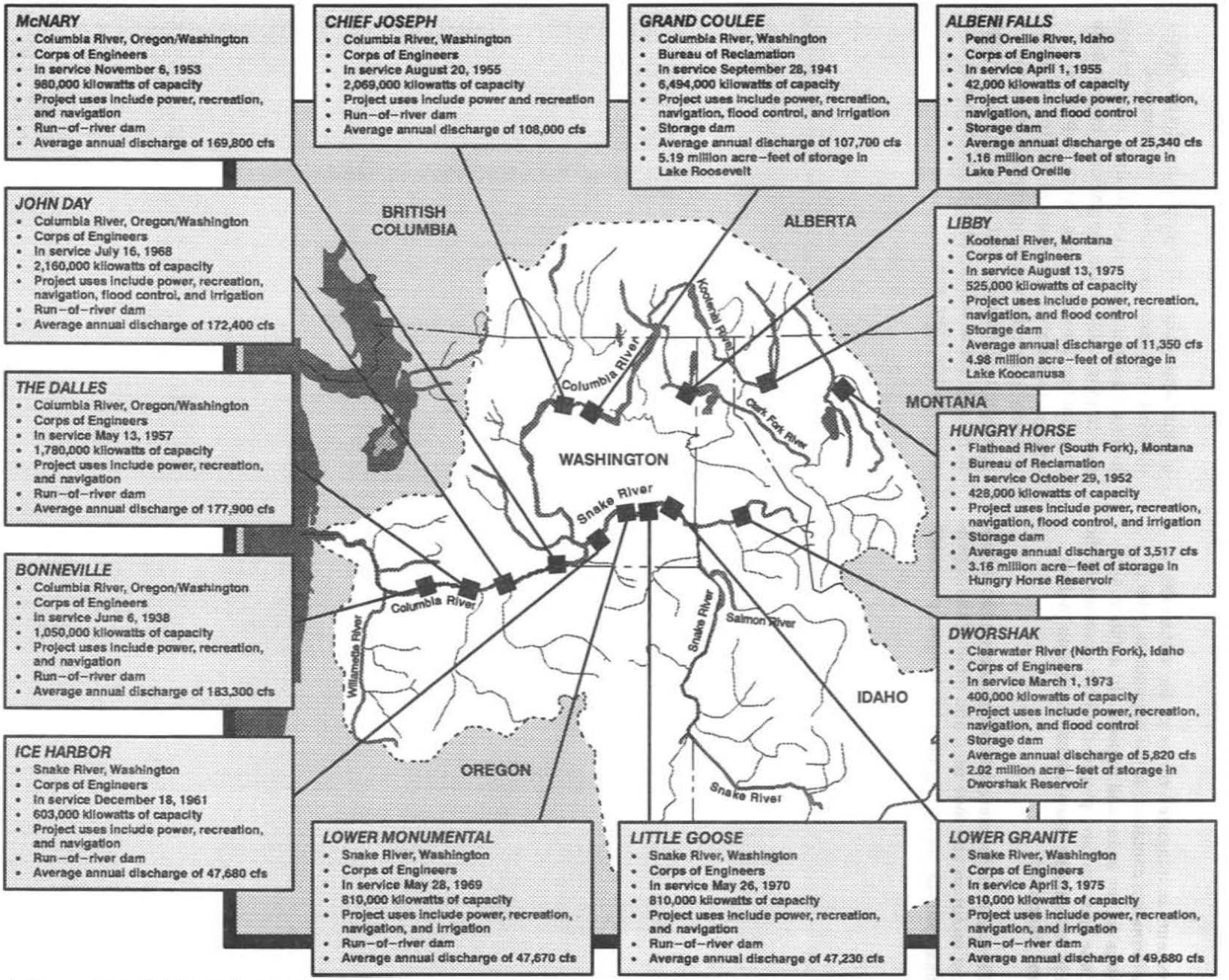
This technical appendix is 1 of 20 prepared for the SOR. They are:

A. River Operation Simulation
B. Air Quality
C. Anadromous Fish & Juvenile Fish Transportation
D. Cultural Resources
E. Flood Control
F. Irrigation/Municipal and Industrial Water Supply
G. Land Use and Development
H. Navigation
I. Power
J. Recreation
K. Resident Fish
L. Soils, Geology, and Groundwater
M. Water Quality
N. Wildlife
O. Economic and Social Impacts
P. Canadian Entitlement Allocation Agreements
Q. Columbia River Regional Forum
R. Pacific Northwest Coordination Agreement
S. U. S. Fish and Wildlife Service Coordination Act Report
T. Comments and Responses

Each appendix presents a detailed description of the work group's analysis of alternatives, from the scoping process through full-scale analysis. Several appendices address specific SOR functions (e.g., River Operation Simulation), rather than individual resources, or the institutional alternatives (e.g., PNCA) being considered within the SOR. The technical appendices provide the basis for developing and analyzing alternatives in the EIS. The EIS

presents an integrated review of the vast wealth of information contained in the appendices, with a focus on key issues and impacts. In addition, the three agencies have prepared a brief summary of the EIS to highlight issues critical to decision makers and the public.

There are many interrelationships among the different resources and river uses, and some of the appendices provide supporting data for analyses presented in other appendices. This Pacific Northwest Coordination Agreement appendix is no exception. Environmental impacts in this analysis result in large part from the SOSs. The insignificant impacts from coordination are discussed in terms of physical changes to the river environment. Therefore, the reviewer must refer to the appropriate technical appendix to determine whether the impact revealed in this document will enhance or reduce benefits to other specific river uses.



1 million acre feet = 1.234 billion cubic meters
1 cubic foot per second = 0.028 cubic meters per second

Figure P–1. Projects in the System Operation Review.

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CHAPTER 1

NEED, PURPOSE, AND SCOPE

1.1 INTRODUCTION

Currently, the Federal government coordinates the planning and operation of the Federal Columbia River Power System (FCRPS) with projects owned and operated by the region's non–Federal hydro-generating utilities pursuant to the Pacific Northwest Coordination Agreement (PNCA). The Bureau of Reclamation (Reclamation), the Corps of Engineers (Corps), and the Bonneville Power Administration (BPA) are parties to the PNCA on behalf of the government of the United States.

The PNCA is a complex agreement that provides an opportunity for the region's power producers to maximize the power system's reliability and economy while meeting their multiple–use objectives. The PNCA does not dictate the operation of the resources it coordinates. It is essentially an accounting mechanism that exchanges the power produced among the parties in order to improve the reliability of the system and reduce regional power costs. Project owners retain complete autonomy to operate as needed to meet their multiple–use requirements.

The PNCA was executed in 1964 as an important component of regional plans to maximize the Northwest's hydro resource capability. Maximization also included the development of storage projects on the Columbia River in Canada pursuant to the terms of the 1964 Columbia River Treaty. The Treaty requires the United States to return to Canada half of the power benefits produced in the U.S. from the storage in Canada. The non–Federal utilities of the region committed to provide a portion of the share of the Treaty benefits required to be delivered to Canada. In return, the United States Government agreed to participate in coordinated operation.

The PNCA expires in 2003. The region's obligation to return Treaty benefits continues, at a minimum, until 2024. Because of the link between power coordination and Treaty issues, the current parties to the PNCA, currently are contemplating entering into a replacement or renewed power coordination agreement. Because the power coordination agreement is a consensual arrangement, its ultimate provisions must be acceptable to all of its signatories.

1.2 THE NEED FOR A POWER COORDINATION AGREEMENT

The overall purpose and need for the System Operation Review is a review of the multi–purpose management of the Columbia River system. A decision on a renewed/renegotiated PNCA is one of four actions being considered in the overall review. The other actions are the review of a System Operating Strategy (SOS), SOS Periodic Review and Update (Forum), and Renewed/renegotiated Canadian Entitlement Allocation Agreements. Although each of these actions could have been reviewed separately, the SOR agencies used their discretion to review them collectively in the SOR.

The primary need for a power coordination agreement is the development, modification, or retention of an agreement facilitating power generation and coordination among the hydro–generating utilities in the Columbia River Basin.

The hydro projects in the Columbia River Basin are owned and operated by a variety of resource management agencies and utilities. However, their operations are both hydraulically and electrically interconnected. The amount of water available for use at downstream projects is determined primarily by operations at upstream projects. Coordinating the planning and operations of these interconnected resources as if they belonged to a single owner

accomplishes two things: (1) efficiencies and diversities maximize use of the coordinated power resources and (2) the availability of information concerning the operations of upstream projects allows downstream parties to make informed decisions about the use of their projects.

With respect to the Northwest, coordinated planning and operations also ensure that the potential benefits of Canadian storage are actually developed. In the early 1960's the United States Entity needed to secure long–term non–Federal participation in the return of the Canadian power entitlements and non–Federal parties needed some certainty to reservoir storage operations before obligating themselves to provide a portion of the return. The PNCA met and still meets these needs.

1.3 PURPOSE

A power coordination agreement should serve the following purposes:

a. Optimize hydropower generation in the Pacific Northwest and reduce the need for additional resources while accommodating Federal and non–Federal multiple–use requirements of the system.

b. Enable the coordinated parties to estimate the hydro generation that can be reliably produced from the Coordinated System.

c. Facilitate the production of the estimated hydro generation of the Coordinated System resources through operations or exchanges.

d. Assure that anticipated benefits from the Columbia River Treaty are realized; facilitate the return of the Canadian share of the benefits commensurate with those received by the parties receiving the benefits.

1.4 SCOPE

1.4.1 The Coordinated Electric System

The regional electric system is the primary focus of this power coordination analysis. It encompasses the service area of BPA and the utilities that are parties to the current PNCA. This area includes Washington, Oregon, Idaho, western Montana, and small portions of Wyoming, Utah, Nevada, and California. Some alternatives do consider service areas outside of the region, e.g., Canada and the Pacific Southwest.

1.4.2 The Coordinated Reservoir System

The power–producing resources to be considered for coordination are those currently operated by the parties of the PNCA. Currently 107 hydroelectric projects are considered. Most of the projects are located on the Columbia River or one of its tributaries. These projects are listed in Exhibit A of this appendix.

Thirty Federal and 77 non–Federal projects produce power that is accounted for in regional power coordination activities. However, operations of 16 Federal and numerous non–Federal projects are so constrained by nonpower uses that they offer little or no flexibility for coordinated power operations. In other words, they do not operate to meet daily, weekly, or seasonal loads. Their power output is a by–product of operations for other purposes. These projects are located in the middle and upper Snake, Umpqua, Klamath, Rogue, Yakima, Deschutes, and Willamette River Basins. The 14 Federal projects which are coordinated in detail under the current PNCA have set the scope of the environmental analysis in the System Operation Review. They are:

- Libby
- Hungry Horse
- Albeni Falls
- Grand Coulee
- Chief Joseph
- Dworshak
- Lower Granite
- Little Goose
- Lower Monumental
- Ice Harbor

- McNary
- John Day
- The Dalles
- Bonneville

These 14 projects and the coordinated non–Federal projects have numerous operating requirements for nonpower uses that must be met before operations for power coordination can be planned and scheduled. It is only after project owners define and accommodate the nonpower–use requirements that any remaining operational flexibility is allowed to be used for power coordination.

1.4.3 Scope of Power Coordination Impacts Analysis

The environmental impacts to river flows and reservoir elevations resulting from power coordination agreements are considered for the Federal projects that set the overall scope of the System Operation Review. Because of the broad reach of the electrical system, the consideration of hydropower, financial, and contractual impacts of power coordination agreements extends beyond the geographic area of the 14 Federal projects to include the service areas of the current PNCA parties. Environmental impacts at the coordinated non–Federal projects are discussed as well.

CHAPTER 2

PNCA AND THE AFFECTED ENVIRONMENT

2.1 BACKGROUND

In the early 1960s four long–planned and interdependent events converged:

- Signing the Columbia River Treaty between Canada and the U.S., which resulted in the construction of large storage reservoirs in both countries;
- Signing a long–term agreement for regional power coordination –– the Pacific Northwest Coordination Agreement;
- Completing the construction of the last of the large storage reservoirs in the U.S.; and
- Completing the Northwest–Southwest transmission intertie in the United States.

The Columbia River Treaty between the United States and Canada calls for the two countries to share the power benefits produced downstream in the United States as a result of the development of reservoir storage in Canada. Those benefits are maximized if the storage is operated as part of a structure of coordinated operation among the major power producers in the Pacific Northwest. The Treaty assumes that the benefits will be so maximized through coordination. In accordance with a set of principles developed by the Secretary of the Interior in 1961, the region's non–Federal utilities committed to provide a portion of the share of Treaty benefits the U.S. was required to deliver to Canada. In return, the U.S. Government agreed to participate in coordinated operation under the same set of principles. The Canadian Entitlement Allocation Agreements (CEAA) and Pacific Northwest Coordination Agreement (PNCA), all signed in 1964, implemented those commitments. The CEAAs and the PNCA expire in 2003, but the earliest date possible for expiration of the Treaty is 2024. The parties are now considering renewing the CEAAs and PNCA to continue the commitments through the term of the Treaty.

2.1.1 The Secretary's Principles

The principles relate both to a coordination agreement and to obligations owed by the regional parties in the return of the Canadian Entitlement. Although the current Coordination Agreement expires in 2003, the Treaty obligations extend through at least 2024. As such, the Secretary's Principles arguably have validity through the term of the Treaty.

In 1991, after consideration of the need and purpose for a replacement coordination agreement, the PNCA parties agreed to generally accept these same principles as goals for a renewed power coordination agreement. The 1961 principles are as follows:

a. No party shall be required to operate the facilities in a manner inconsistent with nonpower uses or functions as determined by such party, or as required pursuant to law.

b. The power facilities of the area shall be operated so as to produce optimum firm load–carrying capability for the area. The coordination contract shall include provisions for (1) the storage and release of water by all reservoirs in the United States, and to the extent permitted by the Treaty, by the reservoirs in Canada; and (2) the generation and exchange of power and energy including, at the option of each storage owner, such exchanges in lieu of storage releases.

c. Upon demand by a downstream storage beneficiary, the owner of storage shall release water in excess of its needs to carry firm loads and its anticipated secondary loads, or such owner shall supply energy in lieu thereof.

d. Each system shall be entitled to the firm load–carrying capability that the system can produce during the critical period of the area with full storage releases; except that if, as a result of the additions of Canadian reservoirs under the terms of the Treaty, the critical period energy capability of any project (including those under construction on January 17, 1961) is reduced, the owner of any such project shall be entitled to purchase energy for restoration of its losses from owners of projects gaining.

e. Energy shall be exchanged between systems to enable each system to maintain its firm load–carrying capability.

f. Energy in excess of that required to supply the area load may be stored by any system entitled thereto in any reservoir with available storage space.

g. The obligation under Article V of the Treaty to provide capacity and energy for delivery to Canada shall be shared by all projects in the area in proportion to the capacity and energy benefits resulting directly and indirectly to each project from the Canadian storage.

h. Equitable compensation shall be provided by non–Federal parties which benefit from reservoirs in the United States. Consistent with applicable laws, the Government will allow equitable credits or offsets for benefits received by the United States from non–Federal reservoirs.

i. To the extent consistent with the owner's requirements, interconnecting transmission facilities shall be utilized and operated to accomplish the objectives of the coordination agreement.

j. The coordination agreement shall include criteria for coordinated operation of all power facilities of the parties. In accordance with such criteria, each party will consult with the others in developing detailed plans for operation of its facilities.

k. Equitable charges will be made for capacity, energy, transmission, storage, and other services.

l. The Bonneville Power Administration will sell to a non–Federal utility at the Bonneville "F" rate, which is now [in 1961] $9 per kilowatt–year, the amount of capacity which it needs for delivery to Canada under the Treaty.

PNCA parties still generally agree that these principles are relevant for power coordination today and into the future.

The parties to the current PNCA are:

- Montana Power Company
- PacifiCorp
- Portland General Electric Company
- Puget Sound Power and Light Company
- Washington Water Power Company
- Colockum Transmission Company, Inc.
- Chelan County Public Utility District (PUD) #1
- Cowlitz County PUD #1
- Grant County PUD #2
- Douglas County PUD #1
- Pend Oreille County PUD #1
- Snohomish County PUD #1
- Seattle City Light
- Tacoma City Light
- Eugene Water and Electric Board
- United States (Bureau of Reclamation, Corps of Engineers, and Bonneville Power Administration)
- United States Entity (Corps of Engineers and Bonneville Power Administration)

2.1.2 Concepts of the PNCA

The language embodied in today's PNCA reflects the negotiations of the parties from 1961 through 1964 as they captured the concepts of the Secretary's Principles. Additional definition and clarity have been added through the years in the form of Annual Operating Procedures as parties gained experience and adapted to changing conditions.

An overriding provision of the PNCA is that priority be given to operating requirements for nonpower uses. These requirements are taken into account when determining the resource capability of the system. Each and every party to the agreement unilaterally establishes these requirements at their projects. The project owners develop and receive these multiple use requirements through Federal Energy Regulatory Commission licensing requirements for non–Federal projects, authorizing legislation for Federal projects, requirements for the protection of species under the Endangered Species Act, and operating experience. Reservoir owners are also influenced by other activities such as the Northwest Power Planning Council's Fish and Wildlife Program and recommendations from numerous agencies and interests. Top priority is given to meeting those requirements; therefore, all PNCA planning and operating studies are bound by––and must accommodate––those requirements.

A basic concept of PNCA is that all parties jointly determine the aggregate hydro resource capability of the system as if it were owned and operated by one entity. In actual operations, the parties support each other's operations to develop this resource capability and to optimize their own hydroelectric resources. As a result, the aggregated resource capability that can be developed exceeds the sum of the individual resource capabilities of all parties.

Another fundamental PNCA concept is the provision for assured and coordinated storage operation. Except for Snohomish PUD, every PNCA party has hydro generation downstream from storage owned and operated by another party. Thus, each party is partially dependent upon others for its hydro resources and its operating economics. This provision assures each party that it can receive the water or energy necessary for its projects to produce their planned capability. PNCA does not specify day–to–day operations. It does establish monthly operating targets for each storage project. These targets represent the expected storage operation of the projects and form the basis of power coordination entitlements and obligations. These entitlements and obligations do not dictate project operations, but do create another decision factor for operators. Project owners often do not operate to these targets and choose to fulfill their entitlements and obligations through other means such as energy exchanges. Each party to the PNCA maintains a continuous accounting of its entitlements and obligations with the other parties.

2.1.3 Benefits of PNCA

The parties to PNCA recognize the benefits they have achieved over the past 30 years by striving to meet the goal of a single–ownership system. These benefits are gained primarily by taking advantage of the diversities among the individual systems. "Pacific Northwest Coordination Agreement: Background and Issues" makes several important points about diversities. Diversity among systems usually is what makes coordination profitable: diversities among the times of day when peak loads occur; diversities among the seasons when peak or heavier energy loads occur; diversities among the planned and forced outages of thermal units; diversities among the costs of operating thermal generation; diversities between predominantly thermal and predominantly hydro systems; diversities among the streamflow regimes of hydro systems; diversities among the times when hydro system reservoirs empty or fill. Bigger systems are not necessarily better systems if diversities do not exist among the systems to be coordinated.

In the late 1970s the Bonneville Power Administration "Role EIS" estimated the diversity benefits of the Coordinated System to be between 1,000 and 2,000 aMW of energy. That is, the firm capability of the Coordinated System is 1,000 to 2,000 aMW greater than the sum of the firm capabilities of its individual parties. A similar range of benefit is

probably applicable to the present system. For reference the firm peak capability of the coordinated hydro system exceeds 30,000 MW in most of the operating year. The parties generally agree that all receive some share of the regional benefits, although the benefits are not evenly distributed. Determining an individual party's pro rata share would be very difficult and would entail evaluation of their mix of resources, other contractual arrangements, and firm load shape. The largest benefit gains should be realized by the parties that are the most diverse with respect to the composite system.

2.2 THE AFFECTED ENVIRONMENT

PNCA does not control reservoir operations; rather, the parties plan for coordinated power operations to maximize hydro resource capability within the multiple-use operating requirements for the reservoirs. The operating requirements for each reservoir are determined by that reservoir's owner. If a reservoir has flexibility remaining for power coordination and the owner elects to make all or a portion of that flexibility available, then PNCA transactions may impact the operation. Generally, the significant environmental impacts associated with reservoir operations result from operating decisions made outside PNCA. Additional impacts may occur under coordination as permitted and limited by a reservoir owner.

The Federal reservoir operating decisions are being made in the context of a "System Operating Strategy," part of the analytical work of the SOR. The potential strategies for using the Federal system span a spectrum from maximizing power to maximizing fish flows (see Preface). All alternative forms of power coordination analyzed in this appendix must conform to--and remain subordinate to the SOS. Hence, the major environmental impacts are those associated with the SOSs. Along with economic and social impacts, the significant environmental impacts of the SOSs can be found in the appropriate technical appendices to the SOR Draft EIS.

The non-Federal reservoir operating decisions are made in the context of their project owners requirements for multiple use. The requirements originate from numerous sources including Federal Energy Regulatory Commission licenses and agreements with agencies and interest groups. Like the Federal projects, the alternative forms of power coordination must be subordinate to the multiple use requirements for these projects. Many non-Federal projects are outside the scope of the environmental analysis of the Federal System Operating Strategy. It would be very difficult to evaluate incremental impacts that may occur as a result of a power coordination agreement. Incremental impacts will result primarily from operating decisions of reservoir owners not bound by this analysis. The preparers of this document will, however, identify potential impacts when possible.

Whether any incremental impacts result from power coordination within the parameters of a given SOS or non-Federal requirement depends upon the amount of flexibility remaining for power coordination purposes. The greater the flexibility, the more chance there is that a given power coordination agreement will have positive or negative impacts that have not been analyzed with respect to the SOS. These incremental impacts, are, for the most part, insignificant. To the extent that there are impacts, they are identified and discussed in Chapter 5 of this appendix.

2.2.1 The Geographical Scope of the Coordinated System

The Coordinated System extends throughout portions of the Columbia River Basin and several coastal river basins in the Pacific Northwest. It includes the service areas of the major Pacific Northwest utilities and the BPA. Several major hydroelectric dams and nonhydro generating resources are coordinated.

The Columbia River Basin is the principal geographic feature in the Coordinated System. To the extent that there are incremental impacts attributable to power coordination, these impacts would most likely occur in the Kootenai, Pend Oreille, Mid- and Lower-Columbia, Clearwater and Lower Snake River Basins. Incremental physical impacts would not be expected for the portion of the Columbia River within Canada as power coordination there is defined by studies and operations associated with

the Columbia River Treaty which is not being affected by the actions analyzed in this review. Nor would physical impacts be expected on the Snake River above Lewiston, Idaho as the Federal and non–Federal projects in that portion of the basin are not coordinated for power.

2.2.2 The Electrical Power Scope of the Coordinated System

Power from the Coordinated System is used primarily to serve customers of the parties throughout major portions of the states of Idaho, Montana, Oregon, and Washington. Smaller portions of the states of California, Nevada, Utah, and Wyoming are also served. Power surpluses and exchanges often result in the use of Coordinated System power outside the parties' service areas. Potential impacts are therefore also discussed for areas such as Canada and the Pacific Southwest.

2.2.3 The Principal Federal Projects of the Coordinated System

Federal agencies have built 30 major power dams on the river and its tributaries. Besides providing flood control, irrigation, navigation, recreation, and other benefits, these projects form one of the largest hydroelectric systems in the world.

As mentioned in the scope discussion in Chapter 1, 14 of the 30 Federal projects have enough flexibility in their operating requirements to warrant power coordination. These projects fall into two major categories: storage and run–of–river. Five of the 14 are storage projects –– Libby, Hungry Horse, Albeni Falls, Grand Coulee, and Dworshak Dams. The remaining are run–of–river –– Chief Joseph, Lower Granite, Little Goose, Lower Monumental, Ice Harbor, McNary, John Day, The Dalles, and Bonneville Dams. Understanding the different categories helps understand the potential for environmental impacts for power coordination at these projects.

- **Storage projects** adjust the river's natural flow patterns to conform more closely to needs for water. They generally store water from the spring snowmelt that exceeds requirements for power production, irrigation, fish flows, flood control and other uses. They generally release stored water in late summer, fall, and winter for power production, minimum flow requirements and flood control. In recent years, storage projects have released more water (or stored less) in spring and summer to benefit anadromous fish. Reservoir levels at storage projects may vary significantly between full and the lowest operating level. For example, Hungry Horse operates over a vertical range of 224 feet; Libby, 172 feet; Dworshak, 155 feet; and Grand Coulee, 82 feet.
- **Run–of–river** projects have limited storage and were developed primarily to raise river levels for navigation and hydropower generation. They release water at nearly the same rate it enters the project. Reservoir levels behind these projects vary only three to five vertical feet in normal operations.

Impacts to Federal projects from alternative forms of power coordination depend on the amount of flexibility to operate within a selected System Operating Strategy (SOS). In this document, impacts are shown as potential changes relative to impacts displayed in the evaluation of the SOSs. For example, storage reservoir levels are characterized as being higher or lower, and project outflows are characterized as greater or less, at certain times of the operating year. Impacts at run–of–river projects are evaluated only as potential changes to project outflows as their reservoir elevations change very little as a result of power coordination.

2.2.4 Principal Non–Federal Projects in the Coordinated System

The non–Federal projects in the Coordinated System include those owned and operated by the non–Federal PNCA parties and the Treaty projects in Canada that are owned and operated by B. C. Hydro. The impacts of this analysis will apply to those non–Federal storage and run–of–river projects in the U.S. that are hydraulically linked to the 14 principal Federal projects. These non–Fed-

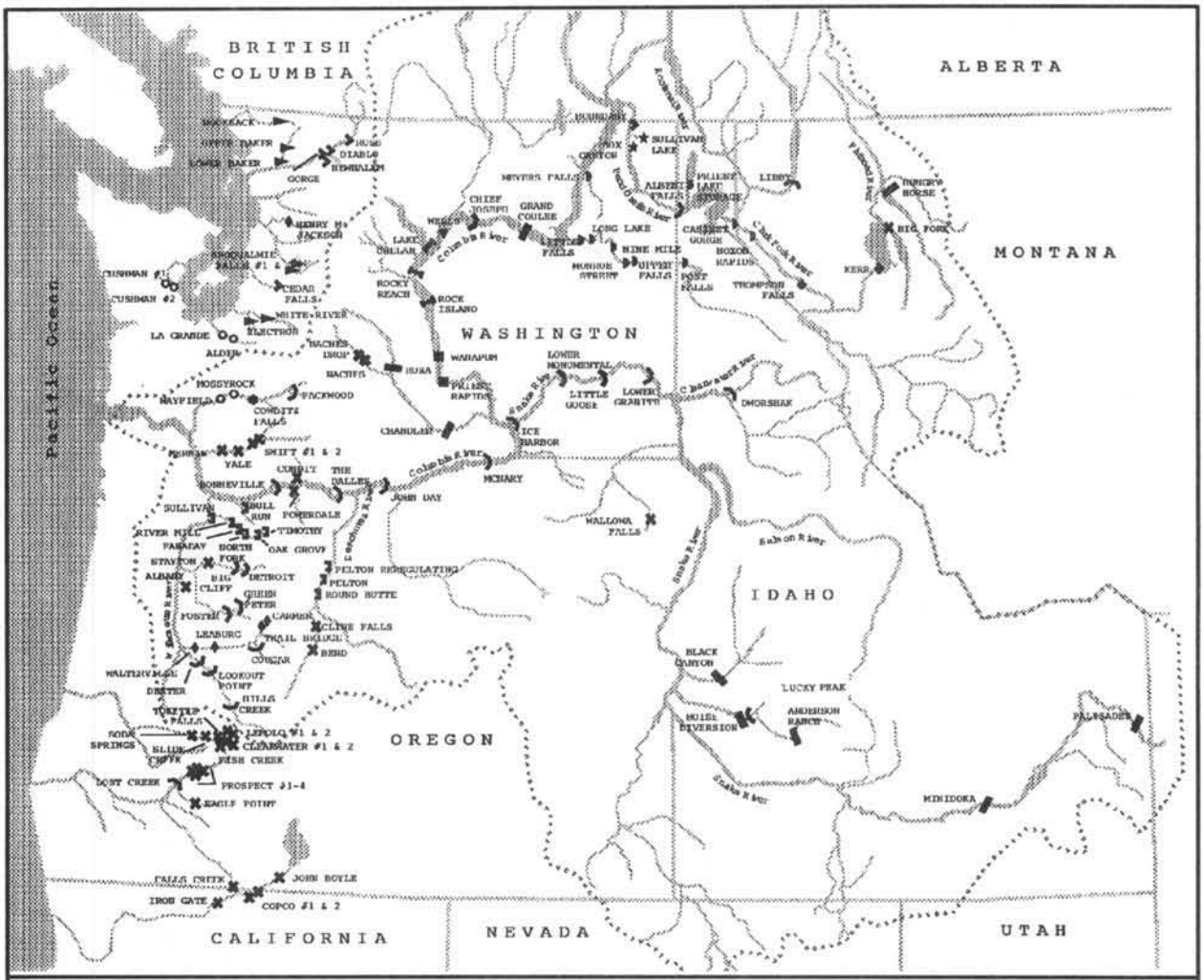
eral projects include those on the Kootenai River below Libby Dam, the Pend Oreille River below Hungry Horse and Albeni Falls Dams, and the five mid–Columbia public utility district projects below Chief Joseph Dam. The three Treaty projects are operated under the terms of the Columbia River Treaty and will not be affected by the power coordination alternatives in this review.

2.2.5 Sources of Potential PNCA Impacts

Under PNCA several rule curves, developed as guidelines for the storage projects, determine the parties' entitlements and obligations. The rule curves are developed to be consistent with the operating requirements for nonpower uses set by the reservoir owners. Consequently, these curves will reflect the current System Operating Strategy set by the Federal project owners and multiple use requirements set by non–Federal project owners. If flexibility for power coordination exists within a given SOS, these rule curves can change. These guidelines take the form of end–of–month reservoir elevations at storage projects and include critical rule curves, assured refill curves, energy content curves, variable energy content curves and others. These curves are components of an operating rule curve used to establish drafting entitlements to produce firm and secondary energy while incorporating the nonpower requirements of the Columbia River system. A detailed discussion of these curves and other PNCA transactions can be found in the SOR publication "Power System Coordination: A Guide to the Pacific Northwest Coordination Agreement." As discussed earlier in Section 2.1.2., a reservoir owner often chooses to deviate from the target elevation defined by the operating rule curve. The uncertainty surrounding a reservoir owner's operating decisions increases the difficulty of analyzing the impacts of power coordination. This is evident in the display of observed versus operating rule curve elevations in Exhibit B of this appendix.

2.2.6 Indian Trust Assets

Reclamation (1993) has a formal policy on Indian Trust Assets, which are defined as legal interests in property held in trust by the United States for Indian tribes or individuals. Common examples of assets include lands, minerals, hunting and fishing entitlements, and water entitlements. The United States (including all of the SOR agencies) has a trust responsibility to protect and maintain such entitlements reserved by or granted to Indian tribes or individual by treaties, statutes, executive orders and other agreements. The protection of these traditional assets at Federal sites will be achieved through requirements of the SOS. Non–Federal site protection should be achieved through the operating decisions of the respective project owners. There is growing potential for Indian tribe involvement in power coordination. The Salish–Kootenai Tribe has an opportunity in 2015 to assume operation of Kerr Dam at Flathead Lake in Montana, currently operated and coordinated by Montana Power Company. The Warm Springs Tribe is involved in Pelton Dam on the Deschutes River in Oregon, currently operated and coordinated by Portland General Electric. The SOR agencies do not foresee any impacts to the trust assets as a result of power coordination.



Current PNCA studies include power generation from 107 hydroelectric projects owned and operated by PNCA parties.

Figure 2–1. Hydroelectric Projects Owned by PNCA Parties

CHAPTER 3

STUDY METHOD FOR THE ANALYSIS OF POWER COORDINATION ALTERNATIVES

3.1 INTRODUCTION AND OVERVIEW

The analysis was conducted by the Pacific Northwest Coordination Agreement (PNCA) Analysis Group (Group). This group and a small subgroup (subgroup) were responsible for the identification of issues, alternatives, evaluation criteria, and analytical techniques, and for the comparative analysis of the alternatives. See Chapter 6 for a list of the participants. The group identified and analyzed the following alternatives:

- PNCA Alternative 1 -- Expiration of Existing Contract, No Replacement (No Action)
- PNCA Alternative 2 -- Contract to Maximize Regional Power Benefits
- PNCA Alternative 3 -- Extension of Existing Contract (Base Case)
- PNCA Alternative 4 -- Modified Contract Supplemented with Operating Procedures (Preferred)
- PNCA Alternative 5 -- Power Coordination Agreement to Enhance Nonpower Considerations

The remainder of this chapter discusses the process and rationale the work group used to derive these alternatives.

3.2 IDENTIFICATION OF ISSUES

The Group held its first meeting on February 5, 1992. Participants represented a diverse range of interests including PNCA parties, utility groups, fish and wildlife agencies, environmental groups, the SOR team and others. The meeting was devoted primarily to discussions of the PNCA including its real and perceived impacts, potential improvements, and potential new contract objectives and features.

Key items, questions, and issues discussed in this meeting included:

- criteria for being a party to the agreement, whether the agreement should include non-utility parties such as the fish and wildlife agencies or other advocates of nonpower uses, and whether the agreement should be open to utility parties outside the Pacific Northwest,
- requirements for submitting nonpower uses into the power planning process,
- the impacts of PNCA transactions on nonpower uses,
- relationship of PNCA transactions to the Columbia River Treaty with Canada,
- the distinction between system and project nonpower requirements,
- the impact of new nonpower requirements on PNCA transactions if these new requirements were not included in PNCA planning,
- PNCA's relationship to the System Operating Strategy and the Regional Forum actions being proposed in the System Operation Review,
- the relationship of PNCA activity in SOR to the ongoing renewal/negotiations of the existing PNCA parties,
- the regional, Federal system, and non-Federal party financial impacts of various forms of power coordination.

Many of these issues and questions would later form the basic elements to be analyzed for power coordination.

3.3 INITIAL LIST OF PNCA ALTERNATIVES

At the initial PNCA Alternatives meeting the SOR team provided a list of potential alternatives. In

addition to the current PNCA, these alternatives included no coordination, full regional coordination, and full West Coast coordination. The "no coordination" alternative would look at power coordination after expiration of the existing agreement in 2003. The "full regional coordination" alternative would coordinate to maximize Northwest economic benefits and minimize Northwest environmental costs. The "West Coast coordination" alternative would maximize West Coast economic benefits and minimize West Coast environmental costs.

3.4 INITIAL LIST OF EVALUATION CRITERIA

With the initial list of alternatives in hand, the Group was tasked with developing evaluation criteria for evaluating impacts on issues and contract elements and for comparing PNCA alternatives. The following criteria were developed:

- Reliability -- the frequency and magnitude of interruptions to top-quartile DSI loads, firm loads and non-firm loads. Overall system reliability, Federal and non-Federal reliability were also considered;
- Efficiency -- firm load carrying capability and system cost (net value) of the system;
- Financial Impact -- impacts on rates, and revenue requirements (BPA and others) and financial uncertainty (e.g., how to cover bad water years);
- Environmental Impacts -- the significant impacts from reservoir elevation and streamflow changes would be captured by other SOR work groups involved in analyzing System Operating Strategies. Air quality impacts would be addressed in BPA's Resource Program EIS.
- Technical Feasibility -- consideration of transmission connections and other features needed to implement an alternative;
- Acceptability -- by the public, possibly through public involvement; by the parties as determined by the likelihood a party would sign the proposed alternative agreement; and by the Canadian Entity with respect to Treaty authorities and impact on the working relationship with Canada.
- Autonomy -- a measure of a party's control over the operation of its own resources;
- Flexibility -- how well an alternative accommodates unexpected events, both for power and nonpower purposes;
- Legality -- links between alternatives, the Treaty, and FERC licenses;
- Columbia River Treaty -- a consideration of Canadian Entitlement Allocation Agreement impacts, impacts on the Canadian Entitlement itself, the Treaty's Principles and Procedures, and the original PNCA principles of coordination (the Secretary's Principles).

These criteria were refined as the analysis progressed.

3.5 DECISION TO EVALUATE ONLY ALTERNATIVES FOR POWER COORDINATION

During the spring of 1992 the group became increasingly embroiled in trying to determine the scope of uses to be coordinated in PNCA alternatives. Should the alternatives address power coordination only or should the alternatives include agreements for multiple use coordination? Many of the group participants perceived that the existing agreement adversely impacted the Federal parties' ability to operate the Columbia River System for environmental purposes. To increase the overall understanding of the relationship of the PNCA to river operations, a tutorial was provided on the features of the existing PNCA.

The tutorial consisted of identifying key contract elements, their use for power coordination, and their potential impacts to both power and nonpower uses. Those key elements were:

- the PNCA Contract Committee;
- Firm Load Carrying Capability;
- Loads and Resource Data (February 1 data submittal);

- Critical Period Planning;
- Critical Rule Curves;
- Refill Study (production of non–firm energy);
- Interchange Energy;
- Energy Content Curve;
- Proportional Draft;
- Operating Procedures;
- Actual Energy Regulation;
- Storage Energy;
- In lieu Energy;
- Flexibility Adjustments;
- Provisional Draft;
- Nonpower uses;
- and FELCC Shift and Shape.

These elements evolved into the key elements for the identification and analysis of power coordination alternatives. Each element would have a range of options. The power coordination alternatives would each be comprised of a unique selection of an option for each of the elements.

Identification of these elements of power coordination moved the development of PNCA alternatives towards power coordination alternatives. This was aided by increased activity on other System Operation Review actions. The Federal System Operating Strategies were being more precisely defined and viewed as the primary source of environmental costs and benefits. The Regional Forum alternatives for Federal projects emerged and were promoted by the SOR team as the potential processes through which the System Operating Strategy (SOS) would be periodically reviewed and updated. Consequently, the SOR team decided to proceed with an analysis of power coordination alternatives only under the premise that power would be coordinated within the limits and flexibility allowed by the SOS as updated by the Regional Forum or similar process. This premise is valid because: (1) it gives first priority to operations for nonpower uses, (2) it is consistent with the Federal commitment to determine Federal multiple use requirements in the Regional Forum, and (3) there is still a need for a power coordination venue. The major source of the significant environmental impacts was the SOS for Federal projects and the applicable multiple use requirements for non–Federal projects.

3.5.1 Environmental Impact Analysis of Power Coordination Alternatives

The decision to analyze only power coordination alternatives helped the group decide that a qualitative environmental analysis would be sufficient and appropriate for comparison of alternatives. Since the power coordination alternatives would be subordinate to the SOS, the significant environmental impacts would be captured in the SOS analysis. Environmental impacts from power coordination would be limited to impacts to the power system's use of remaining flexibility available within a given SOS for both Federal and non–Federal hydro projects. This flexibility was assumed to be small enough to be handled through a qualitative discussion. The group would also look for opportunities for a quantitative analysis if SOSs were developed that resulted in a large amount of flexibility available for power coordination. However, since federal reservoir operators would be implementing the selected SOS alternative under any of the PNCA alternatives, the environmental analysis would essentially duplicate the environmental analysis of the SOS.

3.5.2 Economic and Social Impact Analysis of Power Coordination Alternatives

The SOR team also decided to analyze the economic impacts of power coordination alternatives qualitatively. It was decided that regional power costs and benefits would be again driven primarily by the SOS, a quantitative model would be complicated and extremely difficult to develop, and the anticipated financial impacts to individual parties could be captured qualitatively. The SOR team also concluded that regional power costs and benefits would occur primarily within the designated SOS and that antici-

pated financial impacts to individual parties could be estimated qualitatively.

The development of a quantitative model for economic impacts would have been extremely difficult both from a technical perspective and staff availability. Since each SOS was analyzed quantitatively and the significant environmental and economic impacts are captured within the analysis, the SOR team chose to analyze the power alternatives on a qualitative basis.

Since no potential social impacts were believed to result from the power coordination alternatives, no social analysis was deemed necessary.

3.6 REVISED POWER COORDINATION ALTERNATIVES

During and following the group activities involving evaluation criteria, the tutorial, the identification of power coordination elements, and the decision to limit the analysis to power coordination; a list of alternatives was evolving. By August 1992 these alternatives included the following:

- Alternative 1 -- no system power coordination agreement
- Alternative 2 -- present PNCA
- Alternative 3 -- present PNCA with modified Operating Procedures
- Alternative 4 -- full Pacific Northwest Resource Coordination
- Alternative 5 -- full Columbia River coordination with Canada
- Alternative 6 -- full West Coast Coordination
- Alternative 7 -- "Section 0.067" approach (power has first call on river system)
- Alternative 8 -- Treaty only (limit Section 15 uses to power and flood control)

During the late summer and fall of 1992 a small subgroup of the work group began to reformulate the alternatives as power coordination alternatives that would be subordinate to the SOS. A "no coordination" alternative was kept at a benchmark to portray the benefits of coordination. Alternatives 4, 5 and 6, which were based upon the geographic location of potential parties, were incorporated into the remaining alternatives, each of which retained options for parties. Alternatives 7 and 8 were eliminated because of their first-call priority to power was deemed to be unacceptable given the Federal parties continuing commitment to accommodating nonpower uses prior to producing and coordinating for power. Alternatives were developed to ensure that issues raised in the PNCA parties' renewal discussions would be addressed. As a result the following alternatives were defined:

- Alternative 1 -- a "no action" alternative wherein the present parties would use the existing agreement and its Operating Procedures through its term to 2003,
- Alternative 2 -- the current agreement would be extended through 2024 without changes,
- Alternative 3 -- the current agreement supplemented by long-term Operating Procedures in accordance with the PNCA parties' renewal discussions, and
- Alternative 4 -- a modification of the existing agreement with one option to maximize power coordination and another to emphasize environmental objectives.

3.7 POWER COORDINATION ISSUES IN CURRENT PNCA

With the new list of power coordination alternatives in hand, the subgroup focussed on identifying issues of power coordination that developed from the PNCA parties' renewal discussions, the activities of the PNCA Alternatives Analysis Group, and letters and comments from several sources, especially the environmental community.

A new coordination agreement could have been evaluated in many different ways. For ease of analysis, the work group chose to work from the existing agreement, as for the last thirty years it has achieved the power coordination goals of the parties. Using the current contract as a reference, key elements were identified. Included in the list of elements were specific contract provisions which had been of special concern to some nonpower interests over the years. Several provisions of the current contract were considered as possible elements, but were not specifically analyzed because they resulted from implementation of the key elements. For example, operating rule curves result from implementing Planning Criteria (both Firm and Secondary), Proportional Draft, Adjustments to Firm Hydro Resource Capability and Treatment of both Planned and Unplanned Nonpower Requirements.

After identifying elements the group identified the "coordination goals" which were served by each element, some of which go beyond the goals of the parties in the original contract. The purpose of this exercise was to ensure that the scope of the analysis was broadened beyond the current contract. The goals identified include:

- Achieve more efficient use of the hydro resource capability;
- Preserve the ability of a party to operate its projects to satisfy its own needs and requirements;
- Promote efficient and flexible operations;
- Facilitate implementation of contract transactions;
- Allow system to respond to ever changing power system requirements and resource limitations;
- Provide opportunity to try new methods to implement and refine existing contract provisions on a trial basis;
- Assure availability of hydro system capability for nonpower uses;
- Estimate system firm hydro resource capability and its level of reliability;
- Develop firm hydro resource capability on a period by period basis in order to establish coordination contract entitlements and obligations;
- Optimize the use of renewable resources to meet load;
- Minimize power resource cost;
- Determine the amount of available hydro secondary capability;
- Assure that the use of the secondary hydro resource capability does not jeopardize system's ability to produce its firm capability;
- Provides certainty to downstream parties of assured storage releases;
- Produce firm planned capability;
- Take advantage of diversity of parties' loads and resources;
- Produce the Coordinated System capability through equitable draft amongst storage reservoirs;
- Allow parties to adjust resource capability to differences between planned and actual conditions;
- Allow parties to shape their resources to meet future load;
- Provide transmission access to accommodate transactions required to coordinate the system;
- Know with certainty how unplanned nonpower requirements will impact contract entitlements and obligations; and
- Provide process for charges that compensate parties for services provided.

Next, the group identified a number of options to achieve those goals, including the current treatment.

Another mechanism to broaden the scope of analysis was to craft alternatives to achieve specific objectives by using different combinations of options for each element. These objectives included:

- Provide for centralized control of planning over regional projects;
- Maximize power generation and use of transmission facilities to provide least cost service;
- Satisfy contractual entitlements of individual parties;
- Provide for equitable distribution of contractual benefits;
- Operate consistent with requirements for nonpower uses;
- Preserve operating autonomy;
- Optimize firm and usable secondary hydro and transmission capability;
- Restoration;
- Provide assurance of realization of anticipated benefits from Canadian storage;
- Share storage space;
- Facilitate use of transmission to accomplish coordination;
- Memorialize issues resolved in current Operating Procedures;
- Identify and resolve issues that have arisen during the term of the existing contract;
- Maximize planning and operational flexibilities of regional projects for nonpower uses;
- Sensitize power planning and operational flexibilities of regional projects for nonpower purposes;
- Provide additional opportunity to resolve competing/contrary nonpower uses.

3.8 POWER COORDINATION ISSUES BECOME ELEMENTS OF POWER COORDINATION

After reviewing issues of power coordination, the subgroup selected several that it believed to be key to more precisely identifying the alternatives. These elements included:

Administrative Elements:

- Parties
- Operational Control
- Operating Procedures

Planning Elements:

- Planned Nonpower Requirements
- Firm Hydro Resource Capability Planning Criteria
  a. Shifting
  b. Shaping
- Secondary Hydro Resource Capability Planning Criteria

Elements for Uses of Hydro Resource Capability:

- In Lieu Energy
- Interchange Energy
- Proportional Draft
- Adjustments to Firm Hydro Resource Capability
- Storage Service
- Transmission Service
- Provisional Energy
- Treatment of Unplanned Nonpower Requirements

Charge Elements:

- Service Charge Process
- Interchange Energy Pricing
- Headwater Benefit Payments

The details of these elements and the issues that contributed to their identification as elements can be found in Chapter 4 of this appendix. The group also identified the goal or reason for each element and how it is currently treated. This information can also be found in Chapter 4.

Other possible elements of coordination, for example, Operating Rule Curves, are simply the outcome of the implementation of other elements. For these reasons, a separate analysis was considered unnecessary.

3.9 IDENTIFICATION AND ANALYSIS OF OPTIONS WITHIN THE ELEMENTS

Once goals and objectives were identified for alternative forms of coordination, a variety of options to achieve those goals were developed for each element. For example, the element Firm Hydro Resource Capability Planning Criteria has five options: (1) current critical period planning; (2) stochastic hydrological method; (3) average water planning; (4) incidental hydro generation based entirely upon nonpower operations; and (5) no coordinated planning. Selection of an option from each element provides for different ways to modify the contract to meet the goals of a specific alternative. For example, public input was provided requesting that the Coordinated System plan on an average water basis. This "option" is considered in Table 4–10 of this appendix. Detailed discussion respecting each of the elements, their options, and their options impacts is contained in Chapter 4.

The subgroup then qualitatively analyzed each element's options throughout its range. The impacts were categorized into four broad areas for this analysis:

(1) **Environmental.** How would this option affect the reservoir system within the flexibility allowed by the SOS? Would this option facilitate or hinder implementation of operations for nonpower uses?

(2) **Hydro Power System.** How does this option affect the hydro power system's ability to reliably and efficiently produce power? How does it affect the flexibility to meet changes in requirements for both power and nonpower uses?

(3) **Financial.** What is the effect of this option on the system's and individual party's cost of meeting power requirements? Is there an equitable distribution of costs under this option?

(4) **Contractual.** Will this option be acceptable to the parties and others in the region? How will this option affect the autonomy of parties to operate their own resources? Will this option be consistent with the Columbia River Treaty?

The results of the analysis are in Chapter 4 of this appendix.

3.10 FORMULATION AND ANALYSIS OF POWER COORDINATION ALTERNATIVES

After the identification of options for each element, the power coordination alternatives were formulated by selecting one option from each element. However, Alternatives 2 and 5 were not strictly tied to the identified elements and options. Alternative 2 was designed to represent optimal results for power. Alternative 5 is a power coordination agreement to enhance considerations for nonpower uses.

It is the responsibility of the action agencies to designate a "no action" alternative. CEQ has stated that there are two distinct interpretations of what constitutes a no action alternative, the status quo and not going forward with the proposed action. Under these interpretations, there were two distinct "no action" PNCA alternatives, Alternative 1, which contemplates that there would not be a replacement agreement, and Alternative 3, which assumes a continuation of the status quo. Given the concerns of DEIS commentators, the action agencies redesignated Alternative 1 as the "no–action" alternative in the final EIS. However, Alternative 3 remains the base case for purposes of analyzing impacts resulting from different alternatives. The list of alternatives reached its final form as follows:

- PNCA Alternative 1 -- Expiration of Existing Contract, No Replacement (No action)
- PNCA Alternative 2 -- Contract to Maximize Regional Power Benefits
- PNCA Alternative 3 -- Extension of Existing Contract (Base Case)
- PNCA Alternative 4 -- Modified Contract Supplemented with Operating Procedures (Preferred)
- PNCA Alternative 5 -- Power Coordination Agreement to Enhance Nonpower Considerations

The overall environmental, hydro power, financial, and contractual impacts of the individual alternatives were then qualitatively assessed by reviewing the perceived interactions of the accumulated impacts of the individual elements and their selected option. The results are displayed in Chapter 4 of this appendix. The qualitative analysis by the small group extended to the comparative analysis in Chapter 5 of this appendix. This process can also be used to construct and qualitatively assess alternatives that may be identified later.

3.11 TRACKING THE ENVIRONMENTAL IMPACTS

The subgroup identified potential physical changes to the Federal reservoir system resulting from the various elements/options/alternatives, but did not draw any conclusions about whether these impacts would be positive or negative to reservoir or river uses (for example, fish and wildlife). The potential cumulative impacts of a coordination agreement on non-Federal projects were considered to apply to those non-Federal projects whose operations could vary because they were a part of a Coordinated System (See Exhibit A). To the extent possible, potential impacts at these "coordinated" projects were considered to be similar to Federal impacts, although it is extremely difficult to do so with any certainty. This is because these projects are subject to the multiple use requirements of their project licenses, as well as other applicable law and regulations. Furthermore, each non-Federal party has the ability to operate their project in any manner desired, irrespective of coordination. Impacts will vary depending upon the decisions made by the project owners for both power and nonpower uses. For example, refer to Exhibit B to view how different project owners have operated in the past with respect to PNCA criteria. The Federal project impacts from coordination will never be outside of the range of impacts seen in the analyses of the SOS.

To determine the impacts of coordination on a specific user group, decision-makers should take the description of the potential physical change from this appendix (i.e., reservoir elevations, flow levels), and refer to the technical appendix dealing with the desired user group.

For example, suppose the reviewer is interested in the potential impacts on anadromous fish resulting from shifting as an element of Alternative 3. The first step would be to review the discussion of potential flow impacts from the physical impacts discussion for Alternative 3 from Chapter 4. Then review the discussion of environmental impacts associated with shifting under Element 5a in Chapter 4. It would be noted that there is a potential reduction in spring and summer flows when shifting occurs. One would then turn to the Draft EIS Technical Appendix on Anadromous Fish to assess the impacts of these potential flow changes on anadromous fish.

The reader will not find PNCA impacts specifically discussed in each technical appendix; rather, it is incumbent upon the reader to associate the physical changes described in the PNCA technical appendix with the impact in the other appendices.

It must be noted that this technical appendix does not identify and evaluate impacts resulting from the power generating activities of the parties to the agreement. The power coordination agreement, in effect, coordinates the distribution of the energy which is generated based upon the individual operational decisions of the parties. It does not direct those decisions.

CHAPTER 4

ALTERNATIVES FOR COORDINATION AND THEIR IMPACTS

4.1 INTRODUCTION

As described in Chapter 3, the goals sought to be achieved by the coordination parties through a replacement contract were identified and divided into seventeen "elements of coordination". Five alternative forms of power coordination were constructed using varying combinations of the elements of coordination.

4.1.1 Alternatives

The first alternative represents the absence of a replacement agreement. The second alternative represents the best case scenario for power purposes, both energy and capacity. The third alternative represents a replacement agreement that is similar to the existing contract. The fourth alternative retains portions of the current agreement which were found valuable by the parties, as well as cures issues that have arisen in the past 30 years. In addition, this alternative further strengthens the commitment of the parties to the priority of non-power commitments (for example, see Option 2 for Unplanned Nonpower Requirements). The fifth alternative allows for a power coordination agreement that represents the best case scenario for nonpower purposes.

In this chapter each alternative is described in terms of overall objectives. An example then demonstrates how various options for each of the elements of coordination could be combined to define that alternative. This is especially useful for the comparative analysis in Chapter 5 of this appendix.

As noted above, examples have been created for each alternative using a combination of differing options for each element of coordination. Other alternatives could be crafted using a different combination of elements.

4.1.2 Elements of Coordination

Following are the elements of coordination:

Administrative:

1. Parties. The benefits of coordination are derived from the diversities of the parties. Their makeup determines the load to be met under the contract, as well as the resources used to meet them.

   Options: (1) Current PNCA parties; (2) Northwest parties with major hydro resources; (3) extra-regional parties with major hydro resources; (4) parties with major non-hydro resources; and (5) parties without any resources.

2. Operational Control. The degree of control or autonomy a party exercises over its projects.

   Options: (1) Current practice (control left with project owner) and (2) pooling arrangement controlled by central authority.

3. Operating Procedures. Mechanism to implement contract and allow parties to adapt to changing circumstances.

   Options: (1) Operating Procedures of yearly or longer duration and (2) no Operating Procedures.

Planning:

4. Planned Nonpower Requirements. Method to incorporate requirements for nonpower uses into power planning process.

   Options: (1) Current practice (to extent known nonpower requirements are submitted by parties and accommodated in planning process); (2) allow submittal of requirements by entities that are not parties to the agreement; (3) require six–year notification prior to inclusion of new nonpower requirements into planning process; (4) include nonpower requirements for Federal projects as determined in a regional forum; and (5) current practice, plus Federal agencies will provide replacement energy to non–Federal parties to cover generating losses incurred at non–Federal projects due to submittal of environmental requirements.

5. Firm Hydro Resource Capability Planning Criteria. Method to estimate the availability of firm hydro generation.

   Options: (1) Current practice (critical period planning); (2) stochastic hydrological method; (3) average water planning; (4) incidental hydro generation based entirely upon nonpower operations; and (5) no coordinated planning. Sub–elements include:

   a. Shifting. Mechanism used to increase the amount of planned hydro resource capability in any given year within the critical period.

   Options: (1) Current treatment, (2) no shift, and (3) shift within more restrictive limits.

   b. Shaping. Mechanism used to redistribute planned hydro resource capability within a contract year.

   Options: (1) Current treatment and (2) no shaping.

6. Secondary Hydro Resource Capability Planning Criteria. Method to determine the availability of secondary hydro resource capability.

   Options: (1) Current practice (develop refill requirements to determine amount of secondary generation which will not jeopardize nonpower uses and power operations for subsequent years); (2) forecast availability resulting from nonpower operations; and (3) current method, with higher or lower probability of refill.

Uses of Hydro Resource Capability:

7. In Lieu. Mechanism to give reservoir party choice of releasing water or delivering energy (ensures project owners retain control over operations).

   Options: (1) Current practice (in lieu); (2) eliminate in lieu but require release of water to downstream party; and (3) eliminate in lieu and assured release of water.

8. Interchange Energy. Mechanism used to redistribute resource capabilities between parties (through energy exchanges) to optimize overall power production of the Coordinated System.

   Options: (1) Current practice (Interchange Energy); (2) eliminate Interchange Energy; and (3) provide hydro exporters greater opportunity to control return of Interchange Energy.

9. Proportional Draft. Method to allocate reservoir draft when necessary to produce planned hydro firm capability.

   Options: (1) Current practice (draft occurs proportionately in feet at each project); (2) draft of reservoirs based upon different criteria; and (3) distribute draft between reservoirs based upon most efficient use of water.

10. Adjustments to Firm Hydro Resource Capability. Method to adjust planned firm hydro resource capability during the contract year to redistribute the capability to respond to load and other resource variations in actual operations ("flexibility adjustments").

    Options: (1) Current practice (allow adjustments for specific purposes to preset limits); (2) eliminate flexibility adjustments; (3) current, but with more restricted limits; and (4) current, but limited only by system's physical limitations.

11. Storage Service. Access to available reservoir storage.

    Options: (1) Current practice (storage permitted to extent available with some limitations); (2) expansion of current treatment; (3) independent storage arrangements between parties; and (4) no storage service.

12. Transmission Service. Use of transmission facilities for coordination agreement transactions.

    Options: (1) Current treatment (transmission access granted as available for coordinated transactions); (2) expansion of current treatment; and (3) independent transmission arrangements between parties.

13. Provisional Energy. Mechanism to allow draft by a Reservoir Party to levels lower than planned.

    Options: (1) Current practice (initiated by Reservoir Party with assurance that reservoir will recover and PNCA contract obligations and entitlements are not affected, Reservoir Party has to ensure ability to return draft to reservoir); (2) eliminate provisional energy; (3) current practice but extend the right to call upon provisional draft to any party; and (4) current practice with additional limits.

14. Treatment of Unplanned Nonpower Requirements. Mechanism to determine how unplanned nonpower requirements implemented in actual operations impact contract obligations and entitlements.

    Options: (1) Current practice; (2) dedicate available flexibility to cover impacts and distribute remaining impacts, if any, among affected parties; (3) project owner absorbs the impacts; and (4) Federal parties provide replacement energy to non–Federal parties to cover impacts.

Charges:

15. Service Charge Process. Process to establish charges for services provided to ensure that all parties receive benefits from the agreement.

    Options: (1) Current practice (charges reviewed every five years at the option of the parties); (2) fixed charges for the life of the contract; (3) more frequent changes to charges; (4) current practice, with added "dispute resolution" process concerning changes of charges.

16. Interchange Energy Pricing. Mechanism to compensate delivery party when interchange energy is not recalled.

    Options: (1) Current practice (different prices based upon type of resource) and (2) single price regardless of resource origin.

17. Headwater Benefit Payments. Mechanism to compensate upstream reservoir owners for assured storage releases.

    Options: (1) Current practice (based upon computed gains, but not to exceed a fixed limit); (2) current treatment with increase in limit; and (3) FERC process.

Each element and its goals are described separately in Section 4.3 below. The current contract practice is defined and a variety of options are identified and evaluated.

4.2 ALTERNATIVES

4.2.1 PNCA ALTERNATIVE 1 (No action)

EXISTING CONTRACT TERMINATES, NO REPLACEMENT CONTRACT

DISCUSSION

Parties to the PNCA would coordinate under the terms of the existing agreement until it expires in 2003. It would not be replaced by a similar agreement. This is the no-action alternative.

After 2003, with the loss of coordination the utilities in the region would suffer a loss of dependable and usable hydro resource capability, including firm power. Except for Canadian storage projects, downstream project owners would have little or no ability to anticipate upstream storage releases. Reservoir parties would operate projects to serve their own interests and obligations. Downstream project owners could receive water in quantities greater or less than needed for their own interests and obligations. The utilities would have to take measures to assure usability of water when it is released and provide for other sources of power supply when it is not.

POSSIBLE ELEMENTS OF ALTERNATIVE 1

The following is an example of what could happen in the absence of a coordination agreement. It is based primarily upon predictions of what the Federal system will do although in some cases the possible actions of the non-Federal parties have been identified. See Table 4-1: Elements of Alternative 1.

Administrative

Beyond 2003, there would most likely be a shift from region-wide administrative considerations towards bilateral arrangements for power coordination. The current parties to the contract would not enter into a single replacement agreement, but would operate their systems independently as best they could. The Federal agencies, which have distinct and sometimes differing responsibilities, would probably need a written agreement in order to operate the Federal System in a coordinated fashion.

Planning

Current critical period planning for individual systems would probably continue, and, to the extent possible, firm resource capability would be estimated by individual utilities on a period-by-period basis. It is expected that all parties would continue to include known nonpower requirements in their individual planning. Reservoir parties would likely use shifting and shaping mechanisms to take full advantage of the flexibilities of their independent hydro resources. Parties downstream of others' reservoirs would have to make assumptions of expected upstream operations in order to determine their own resource capability.

Table 4–1. ELEMENTS OF ALTERNATIVE 1: Existing Contract Terminates, No Replacement Contract (No–action)

ELEMENT	OPTION	DESCRIPTION
1. Parties	N/A	N/A
2. Operational Control	N/A	N/A
3. Operating Procedures	2	No Operating Procedures.
4. Planned Nonpower Requirements	1	Federal parties continue to operate for power purposes only after accommodating planned NPR's.
5. Firm Hydro Resource Capability Planning Criteria	1	Federal parties continue to plan for critical water.
5a. Shifting	1	Shift for power purposes.
5b. Shaping	1	Shape for power purposes.
6. Secondary Hydro Resource Capability Planning Criteria	1	Current practice of estimating secondary hydro resource available without jeopardizing refill.
7. In Lieu Energy	3	No in lieu energy transactions.
8. Interchange Energy	2	No interchange energy transactions.
9. Proportional Draft	1	Federal parties draft below operating rule curves when needed to develop firm hydro resource capability.
10. Flexibility Adjustments	1	Reservoir flexibilities will be used to cover load deviations and resource under performance.
11. Storage Service	N/A	N/A
12. Transmission Service	N/A	N/A
13. Provisional Energy	1	Federal parties may draft below operating rule curves for power and nonpower needs.
14. Treatment of Unplanned Nonpower Requirements	3	N/A, no coordinated planning.
15. Service Charge Process	N/A	N/A
16. Interchange Energy Pricing	N/A	N/A
17. Headwater Benefit Payments	3	FERC process.

N/A = Not applicable
NPR = Nonpower requirement

Uses of Hydro Resource Capability

It is expected that parties with reservoirs would use their storage fully to develop firm resource capability and usable secondary energy. Parties without storage reservoirs would lose their current ability to receive water or its energy equivalent from upstream parties in a coordinated manner making it difficult to match planned resource capability with actual power needs. Unplanned nonpower requirements at Federal projects would continue to be met at the discretion of the involved Federal operating agency.

Service Charges

Without a replacement agreement, there would be no service charges nor a process to determine service charges. It is likely that the Federal Energy Regulatory Commission would determine payments for reservoir storage benefits (assuming some gains at downstream projects) and may require some form of coordinated operations.

4.2.2 PNCA ALTERNATIVE 2

CONTRACT TO MAXIMIZE REGIONAL POWER BENEFITS

DISCUSSION

This alternative reflects a new agreement that maximizes regional power benefits, both energy and capacity. Although this alternative will work with any SOS, for purpose of this analysis it has been linked with SOS 1. This alternative calls for a pooling arrangement under which parties plan and operate centrally their pooled resources. The term of the new agreement could extend into 2024 to coincide with the anticipated term of the Columbia River Treaty.

OBJECTIVES

- Provide for centralized control over planning and operations of regional projects.
- Maximize power generation and use of transmission facilities to provide least cost service.
- Satisfy contractual entitlements of individual parties.
- Provide for equitable distribution of contractual benefits.

ELEMENTS OF ALTERNATIVE 2

See Table 4–2: Elements of Alternative 2.

Administrative

The agreement would be open only to parties with major power resources of value to the Northwest. Operational control would involve a complete pooling arrangement directed by a central control entity.

Planning

Planned nonpower requirements would require a six–year lead time before they are reflected in coordination planning and impact the amount of available hydro resource; however, the nonpower requirements could be implemented by the project owner with cooperation of the central entity. Planning objectives would be designed to maximize power benefits and could be based on non–current standards of reliability.

Uses of Hydro Resource Capability

Operational control would involve a complete pooling arrangement directed by a single entity designated by the parties. The central control would operate the Coordinated System consistent with its authorities to maximize power benefits. Power benefits currently achieved through operational elements (see chart) would likely be achieved through other mechanisms. The cost of unplanned nonpower requirements would be borne by the implementing project owner without impact to contract entitlements and obligations of other parties.

Service Charges

Service charges would not be necessary as parties' loads would be met and benefits would be distributed by a single entity.

Table 4–2. ELEMENTS OF ALTERNATIVE 2: Contract to Maximize Regional Power Benefits

ELEMENT	OPTION	DESCRIPTION
1. Parties	1, 2 or 3	Current parties and/or Northwest utilities with major hydro resources and/or extraregional power producers with major hydro resources.
2. Operational Control	2	Central pooling.
3. Operating Procedures	N/A*	N/A
4. Planned Nonpower Requirements	3	Accommodate nonpower requirements in planning on six–year's notice.
5. Firm Hydro Resource Capability Planning Criteria	2	Plan based upon stochastic methodology set to a predetermined level of reliability.
5a. Shifting	N/A*	N/A
5b. Shaping	N/A*	N/A
6. Secondary Hydro Resource Capability Planning Criteria	3b	Maximize use of secondary hydro resource capability based upon economic value.
7. In Lieu Energy	N/A*	N/A
8. Interchange Energy	N/A*	N/A
9. Proportional Draft	3	Draft system as desired based upon the most efficient use and market conditions.
10. Flexibility Adjustments	N/A*	N/A
11. Storage Service	N/A*	N/A
12. Transmission Service	N/A*	N/A
13. Provisional Energy	N/A*	N/A
14. Treatment of Unplanned Nonpower Requirements	3	Absorption of economic consequences of unplanned requirement by submitting party.
15. Service Charge Process	N/A*	N/A
16. Interchange Energy Pricing	N/A*	N/A
17. Headwater Benefit Payments	N/A*	N/A

N/A = Not applicable

* These elements would not be relevant in a pooling arrangement. The elements provide for multi–party operations in a Coordinated System and are not necessary when a single authority operates the system. All of the benefits currently achieved through these elements would be realized through the actions of the central control.

4.2.3 PNCA ALTERNATIVE 3 (Base Case)

EXTENSION OF EXISTING CONTRACT

DISCUSSION

This alternative contemplates a rollover of the current contract (1) without Operating Procedures or (2) with the existing Operating Procedures mechanism. The term of the new agreement could extend into 2024 to coincide with the anticipated term of the Columbia River Treaty. This is the base case alternative for this analysis.

OBJECTIVES

The objectives of the current contract are reflected in the 1961 Secretary's Principles discussed in Chapter 2 of this appendix. These objectives would continue in a rollover contract and include:

a. Nothing in the contract shall require a party to operate a project in a manner inconsistent with its requirements for nonpower uses.

b. The parties agree to coordinate the operations of their respective systems, while preserving autonomy, in order to make available optimum firm and usable secondary hydro resource and transmission capability.

c. Those parties that were adversely affected by the addition of Canadian storage shall be made whole by those parties who benefitted.

d. The parties should be provided assurance that downstream party benefits anticipated from the addition of Canadian storage will be realized and shared.

e. There should be an equitable distribution of benefits.

f. Energy in excess of that required to supply the area load may be stored by any system entitled thereto in any reservoir with available storage space.

g. To the extent consistent with the owner's requirements, interconnecting transmission facilities shall be utilized and operated to accomplish the objectives of the coordination agreement.

A further objective of the rollover alternative is to retain the adaptability of the contract and the knowledge and experience acquired by the coordination parties since the execution of the original contract in 1964.

ELEMENTS OF ALTERNATIVE 3

See Table 4–3: Elements of Alternative 3 below.

Administrative

The parties would be the current signatories and any additional entities added pursuant to the terms of the existing agreement. Parties would continue to operate their own projects both for their own needs and to fulfill contract entitlements and obligations. Operating Procedures may or may not be used to help the parties implement the contract. While Operating Procedures have been beneficial over the history of the contract for clarifying contract procedures, they have also imposed an administrative burden as they have historically covered only one contract year and must be negotiated and approved annually.

Uses of Hydro Resource Capability

The parties would attempt to develop firm resource capability as planned as well as maximize production of secondary energy through current contract mechanisms. The impacts to parties' contract entitlements and obligations resulting from unplanned nonpower requirements, such as minimum streamflow requirements or reservoir elevation requirements, would continue to be addressed by the parties on a case by case basis.

Planning

Submitted nonpower requirements, such as the fish flow requirements at Vernita Bar or refill requirements for recreation and future power generation, would continue to be incorporated into the annual operating plan. Parties would continue to plan on a critical period basis and estimate firm resource capability for each party and the system.

Service Charges

Service charges and the process for modifying service charges would remain the same.

Table 4–3. ELEMENTS OF ALTERNATIVE 3: Extension of Existing Contract (Base Case)

ELEMENT	OPTION	DESCRIPTION
1. Parties	1	The parties would remain the same.
2. Operational Control	1	Parties continue to have operational control over their respective projects.
3. Operating Procedures	1	Annual Operating Procedures.
4. Planned Nonpower Requirements	1	Parties continue to operate for power purposes only after accommodating planned NPRs.
5. Firm Hydro Resource Capability Planning Criteria	1	Parties continue to plan for critical water.
5a. Shifting	1	Shift for power purposes.
5b. Shaping	1	Shape for power purposes.
6. Secondary Hydro Resource Capability Planning Criteria	1	Current practice of estimating secondary hydro resource available without jeopardizing refill.
7. In Lieu Energy	1	Reservoir party retains discretion over whether to release water or deliver the energy equivalent.
8. Interchange Energy	1	Parties have access to interchange energy in order to develop firm resource capability.
9. Proportional Draft	1	Parties would draft below operating rule curves when needed to develop firm hydro resource capability.
10. Flexibility Adjustments	1	Reservoir flexibilities will be used to cover load deviations and resource underperformance.
11. Storage Service	1	Reservoir parties may accept energy for storage from other parties.
12. Transmission Service	1	Parties may provide transmission services to other parties.
13. Provisional Energy	1	Parties may draft below operating rule curves for power and nonpower needs.
14. Treatment of Unplanned Nonpower Requirements	1	Parties confer over the appropriate sharing of impacts from unplanned NPR.
15. Service Charge Process	1	Any party may request a change in charges every fifth year.
16. Interchange Energy Pricing	1	Prices are as directed in the contract or as agreed upon by the parties.
17. Headwater Benefit Payments	2	Headwater benefits are as determined in the contract.

NPR = Nonpower requirement

4.2.4 PNCA ALTERNATIVE 4 (Preferred Alternative)

MODIFIED CONTRACT SUPPLEMENTED WITH OPERATING PROCEDURES

DISCUSSION

This alternative contemplates that some changes would be made to the existing PNCA, and a combination of short– and long–term Operating Procedures would be used to facilitate implementation of the contract. The term of the new agreement could extend into 2024 to coincide with the anticipated term of the Columbia River Treaty.

OBJECTIVES

a. Nothing in the contract shall require a party to operate a project in a manner inconsistent with its requirements for nonpower uses.

b. The parties agree to coordinate the operations of their respective systems while preserving autonomy in order to make available optimum firm and usable secondary hydro resource and transmission capability.

c. Parties that were adversely affected by the addition of Canadian storage shall be made whole by those parties who benefitted.

d. Downstream parties are assured that the benefits anticipated from the addition of Canadian storage will be realized and shared.

e. Benefits will be distributed equitably.

f. The knowledge and experience acquired by the coordination parties since the execution of the contract in 1964 will be retained.

g. Issues resolved in current negotiations will be memorialized as part of replacement contract or combination of supplemental short– and long–term Operating Procedures.

h. Issues that have arisen during the term of the existing contract will be identified and resolved.

ELEMENTS OF ALTERNATIVE 4

See Table 4–4: Elements of Alternative 4.

Administrative

The parties would presumably remain the same as under the current agreement. Additional parties could be added pursuant to the terms of the existing agreement. Each party would continue to operate its own projects. A combination of long– and short–term Operating Procedures would be used to help implement the contract.

Planning

Known nonpower requirements would continue to be accommodated in annual planning. The current method of critical period planning would continue. Shifting and shaping practices would probably continue to take advantage of available flexibility of the hydro system.

Uses of Hydro Resource Capability

The parties would attempt to develop firm hydro resource capability as planned and maximize production of secondary energy. Current in lieu energy and provisional energy practices would continue to allow and account for reservoir operations that deviate from the annual operating plan. Interchange energy would continue to flow, possibly at a single market–based price. Reservoirs would continue to be drafted proportionally when necessary to produce firm hydro resource capability. Flexibility adjustments would continue, but there could be further restrictions on their use. The impacts to contract entitlements and obligations resulting from implementation of unplanned nonpower requirements such as minimum streamflow or reservoir elevation needs could be alleviated by using available hydro resource flexibility of the system. If there is no available flexibility, the impacts could be distributed among the affected parties as predetermined by the parties.

Service Charges

Service charges would be used to compensate parties for providing contract services. Such charges could be subject to more frequent adjustment than under the current contract.

Table 4–4. ELEMENTS OF ALTERNATIVE 4: Modified Contract Supplemented with Operating Procedures

ELEMENT	OPTION	DESCRIPTION
1. Parties	1	The parties would remain the same.
2. Operational Control	1	Parties continue to have operational control over their respective projects.
3. Operating Procedures	1(a)(2)	A combination of long– and short–term Operating Procedures.
4. Planned Nonpower Requirements	1	Parties continue to operate for power purposes only after accommodating planned NPRs.
5. Firm Hydro Resource Capability Planning Criteria	1	Parties continue to plan for critical water.
5a. Shifting	3	Shift within more restrictive limits.
5b. Shaping	1	Shape for power purposes.
6. Secondary Hydro Resource Capability Planning Criteria	1	Current practice of estimating secondary hydro resource available without jeopardizing refill. (SOS is driving element towards Option 2).
7. In Lieu Energy	1	Reservoir party retains discretion over whether to release water or deliver the energy equivalent.
8. Interchange Energy	1	Parties have access to interchange energy in order to develop firm resource capability.
9. Proportional Draft	1	Parties would draft below operating rule curves when needed to develop firm hydro resource capability.
10. Flexibility Adjustments	3	Reservoir flexibilities will continue to be used to cover load deviations and resource underperformance but with more limitations than in current agreement.
11. Storage Service	2	Reservoir parties may accept energy for storage from other parties.
12. Transmission Service	1	Parties may provide transmission services to other parties.
13. Provisional Energy	1	Parties may draft below operating rule curves for power and nonpower needs.
14. Treatment of Unplanned Nonpower Requirements	2	Impacts of unplanned NPRs will be shared.
15. Service Charge Process	1	Periodic modification of charges upon agreement of the parties with backup of dispute resolution mechanism in the event agreement cannot be reached.
16. Interchange Energy Pricing	2b	Interchange energy pricing approximates market value.
17. Headwater Benefit Payments	2	Headwater benefits are as determined in the contract.

NPR = Nonpower requirement

4.2.5 PNCA ALTERNATIVE 5

POWER COORDINATION AGREEMENT TO ENHANCE NONPOWER CONSIDERATIONS

DISCUSSION

This alternative reflects a new power coordination agreement that accounts for concerns of nonpower interests including the opportunity for parties without power resources to participate in the planning and operation of the system.

Like PNCA Alternative 2, under this alternative, the parties plan and operate their resources centrally in a pooling arrangement.

OBJECTIVES

Provide for centralized control over planning and operations of regional projects.

Maximize planning and operational flexibilities of regional projects for nonpower uses such as fish programs, flow targets, and minimum reservoir elevations.

Sensitize power planning and operational flexibilities of regional projects to nonpower purposes such as fish programs, flow targets, and lake elevation requirements.

Provide for additional opportunity to resolve competing or conflicting nonpower uses.

ELEMENTS OF ALTERNATIVE 5

See Table 4–5: Elements of Alternative 5.

Administrative Matters

This agreement would be open to extraregional parties with major power resources. In addition, it would be open to regional parties with multiple–use authorities such as the Northwest Power Planning Council or National Marine Fisheries Service. Operational control would involve a complete pooling arrangement directed by a central authority. Market–based charges could be used as a basis for equitable distribution of costs and benefits accruing to the parties under the pooling agreement.

Planning

Planned nonpower requirements for the Federal parties would be established by the Columbia River Regional Forum. Additionally, the inclusion of entities without power resources would expand the number of parties submitting nonpower requirements. Planning criteria would base firm hydro resource capability on the SOS selected by the Regional Forum (as modified or further defined by the parties). It is likely that options to shift and shape for power purposes would be prohibited. Secondary hydro resource capability would give first priority/reservation to nonpower uses.

Use of Hydro Resource Capability

A single entity designated by the parties would control the operations of the pooled power resources of the system. The single entity would operate the pooled system in a manner that uses system flexibilities for nonpower uses (e.g., fish flow requirements and minimum reservoir elevations) in its operating strategy. The costs or benefits resulting from operational nonpower uses would be shared by the parties in an agreed–upon distribution formula.

Charges

Service charges would not be necessary as netted costs and benefits would be distributed by a single entity.

Table 4–5. ELEMENTS OF ALTERNATIVE 5: Contract to Enhance Nonpower Considerations

ELEMENT	OPTION	DESCRIPTION
1. Parties	4 and 5	Allow extra–regional parties with power resources and parties with multiple–use authority but no power resources.
2. Operational Control	2	Complete pooling under a central authority.
3. Operating Procedures	N/A*	N/A*
4. Planned Nonpower Requirements	2 and 4	Allows NPR submittal by an entity without resources; Columbia River Regional Forum will determine Federal project requirements.
5. Firm Hydro Resource Capability Planning Criteria	4	Determine firm hydro resource capability on more restrictive planning criteria –– more NPRs in planning.
5a. Shifting	2	No shift for power purposes.
5b. Shaping	2	No shape for power purposes.
6. Secondary Hydro Resource Capability Planning Criteria	2	Reserve secondary hydro capability for nonpower uses.
7. In Lieu Energy	N/A*	N/A
8. Interchange Energy	N/A*	N/A
9. Proportional Draft	3	Draft system as allowed based on most efficient use of water.
10. Flexibility Adjustments	N/A*	N/A
11. Storage Service	N/A*	N/A
12. Transmission Service	N/A*	N/A
13. Provisional Energy	N/A*	N/A
14. Treatment of Unplanned Nonpower Requirements	2	Focus system flexibility towards implementing unplanned NPRs regardless of ownership.
15. Service Charge Process	N/A*	N/A
16. Interchange Energy Pricing	N/A*	N/A
17. Headwater Benefit Payments	N/A*	N/A

N/A = Not applicable
NPR = Nonpower requirement

* These elements would not be relevant in a pooling arrangement. The elements provide for multiple–party operation in a Coordinated System and are not necessary when a single authority is operating the system. All of the benefits currently achieved through these elements would be realized through the actions of the central control.

4.3 ELEMENTS OF COORDINATION

4.3.1 Administrative Elements

Elements relating to administrative matters include:

- Parties
- Operational Control
- Operating Procedures

Unless otherwise noted in the Tables 4–6 through 4–8, the impacts displayed apply to all of the parties unless specifically noted as Federal or non–Federal impacts.

ELEMENT 1: PARTIES

DESCRIPTION OF ELEMENT

Coordination optimizes regional power generation by taking advantage of the diversities of individual parties' loads and resources. The sum of the parties' loads and resources determines the coordinated load to be met and resources available to meet them.

APPLICABLE SECRETARY'S PRINCIPLE

(b) The power facilities of the area shall be operated so as to produce optimum firm load carrying capability for the area.

GOALS SERVED BY PARTIES

1. Achieve more efficient use of the Coordinated System hydro resource capability.
2. Achieve more firm resource capability for individual parties.

CURRENT TREATMENT OF PARTIES

The parties to the PNCA operate major electric plants and systems which serve the electric power needs of the Pacific Northwest. The majority of the parties have resources that are hydraulically connected. Additional parties may join the PNCA when all existing parties agree to such joinder. Currently, a party may bring any type of generating resource into coordination.

OPTIONS

1. Current practice;
2. Northwest power production entities with major hydro resources:
   a. Coordination of hydro resources only; or
   b. Coordination of hydro and all other resources:
3. Extra–regional (e.g., Canada and California) power production entities with major hydro resources;
   a. Coordination of hydro resources only; or
   b. Coordination of hydro and all their other resources;
4. Parties with major power resources, but no hydro (regional or extra–regional); and
5. Parties without resources, e.g., Federal or state resource management agencies, tribes, or other interest groups.

The impacts of the Element 1 options are described on Table 4–6.

Table 4–6. IMPACTS, ELEMENT 1: PARTIES

Option	Environmental	Hydro Power System	Financial	Contractual
1: Current	Environmental impacts result from actual hydro system operations as determined by project owners.	Efficiently matches resources to loads. Compared to uncoordinated operations, coordination increases system resource capability by (1) taking advantage of diversities of parties and (2) increasing efficiency by hydraulically and electrically connecting systems.	Distributes benefits among Northwest parties by taking advantage of diversity of regional loads and resources.	Known, manageable, and accepted by parties.
2a: NW Hydro Power Only 2b: NW Hydro and Nonhydro Power	Environmental impacts result from actual hydro system operations as determined by project owners. It is very difficult to predict how project owners might operate as it depends on what entities are signatories to a power coordination agreement.	2a. Potentially more flexibility through increased resource diversity. 2b. Depends on mix of coordinated resources--generally, added resources bring flexibility through diversity, but if thermal additions raise current thermal proportion, hydro may increasingly be used for peaking, leading to greater outflow fluctuations.	Distributes benefits among Northwest parties by taking advantage of diversity of regional loads and resources.	Probably manageable and acceptable to parties.
3a: All Regions, Hydro Power Only 3b: All Regions, Hydro and Nonhydro Power Resources	See discussion in Option 2. Possibly a different use of regional reservoirs. If there are new parties, possibly a different resource mix. Depending on proportion of thermal, hydro might be more dedicated to peaking, leading to greater outflow fluctuations.	Potentially more demand (e.g., short–term fluctuation and drafts) on Northwest hydro resources if required for extra–regional back–up.	3a. Northwest hydro system might have to back up an extra–regional hydro NPR, thereby requiring operation of higher–cost Northwest resources. 3b. Add to 3a, Northwest hydro system might need to back up thermal resources with resulting added costs compared to Option 1. 3a and 3b. Impacts might be offset by opportunities for extra–regional resources to back up regional needs.	Less acceptable than Option 1 to current parties; more difficult to implement and administer; current statutory limitations on regional preference may need to be changed.

Table 4–6. IMPACTS, ELEMENT 1: PARTIES – CONT

Option	Environmental	Hydro Power System	Financial	Contractual
4: Nonhydro Power Resources	See discussion in Option 3.	Depends on mix of coordinated resources--generally, added resources bring flexibility through diversity, but if thermal additions raise current thermal proportion, hydro may increasingly be used for peaking, leading to greater outflow fluctuations.	Similar to Option 3b.	Less acceptable than Option 1 to current parties; more difficult to implement and administer; current statutory limitations on regional preference may need to be changed.
5: Parties without Power Resources	It is very difficult to predict how parties without power resources would influence project–owner decisions to operate. If nonpower resource parties were influential the impacts would depend on the focus of their nonpower objectives (e.g., resident fish versus anadromous fish).	Possibly less hydro resource capability and less power flexibility (including less thermal displacement).	Probable loss of revenues; participation in planning and operations by parties without power resources would presumably take from power needs and interests.	Unlikely to be acceptable to parties; could cause gridlock in contract administration.

Note, financial and hydro system impacts: Federal system and non–Federal party impacts are similar to the regional impacts shown in the table.

ELEMENT 2: OPERATIONAL CONTROL

DESCRIPTION OF ELEMENT

The degree of control or autonomy a party retains over the operations of its projects when they are part of a "coordinated" system.

APPLICABLE SECRETARY'S PRINCIPLES

(b) The power facilities of the area shall be operated so as to produce optimum firm load–carrying capability for the area. The coordination contract shall include provisions for (1) the storage and release of water by all reservoirs in the United States and, to the extent permitted by the Treaty, by the reservoirs in Canada; and (2) the generation and exchange of power and energy including, at the option of each storage owner, such exchanges in lieu of storage releases.

(j) The coordination agreement shall include criteria for coordinated operation of all power facilities of the parties. In accordance with such criteria, each party will consult with the others in developing detailed plans for operation of its facilities.

GOALS SERVED BY OPERATIONAL CONTROL

1. Preserve the ability of an individual party to operate its projects to satisfy its own needs and requirements.
2. Promote efficiency and flexibility of operations.

CURRENT TREATMENT OF OPERATIONAL CONTROL

PNCA establishes contract obligations and entitlements (in terms of energy exchanges or, in limited instances, through payments of money) based upon planned operations, with certain modifications for actual conditions experienced. Planned operations take into account all nonpower requirements submitted by the parties as part of the planning process. Currently, PNCA does not require that coordinated projects be operated in conformance with the plan, just that parties honor contract entitlements and obligations. Operationally, to the extent possible, nonpower uses of projects can be implemented at any time. However, the parties anticipate that it is very likely that annual operations will closely track the annual operating plan. In summary, the parties plan annually for the operation of the Coordinated System, as if the system were owned and operated by one party.

OPTIONS

1. Current practice; and
2. Complete pooling operational arrangement. Under this option the entire system is operated as if owned by one entity and run by a central authority.

The impacts of the Element 2 options are discussed on Table 4–7.

Table 4–7. IMPACTS, ELEMENT 2: OPERATIONAL CONTROL

Option	Environmental	Hydro Power System	Financial	Contractual
1: Current	Neutral because the system is responsible for the same loads and resources. Coordinated planning does not dictate operations regardless of where operational control resides.	Provides for efficient and reliable hydro generation.	The financial impacts have been accepted by the parties.	Preserves autonomy of individual parties is acceptable to parties and proven to be implementable.
2: Pooling under Central Authority	Neutral because the system is responsible for the same loads and resources. Coordinated planning does not dictate operations, regardless of where operational control resides. It is possible that some projects might be operated differently but impossible to predict which ones.	All resources would be available, and the central authority could dispatch the most efficient ones, thus potentially improving hydro system efficiency and flexibility.	Should be less costly for the region because least cost resource(s) could be selected to (1) meet regional load and (2) perform reservoir operations for power and nonpower requirements. Gains not expected to be substantial over current system. Would require compensation procedures for parties giving and receiving benefits.	Would require determination of equitable distribution of benefits among parties because low–cost resources would run more and high–cost resources would run less than at present. Could require reauthorization or relicensing of resources.

Note, financial and hydro power system impacts: Federal system and non–Federal party impacts are similar to the regional impacts shown in the table.

ELEMENT 3: OPERATING PROCEDURES

DESCRIPTION OF ELEMENT

Procedures aid implementation of the technical processes, procedural issues, and special circumstances relating to the contract.

APPLICABLE SECRETARY'S PRINCIPLE

(j) The coordination agreement shall include criteria for coordinated operation of all power facilities of the parties. In accordance with such criteria each party will consult with the others in developing detailed plans for operation of its facilities.

GOALS SERVED BY OPERATING PROCEDURES

1. Procedures facilitate implementation of contract transactions.
2. Procedures allow adaptation of the Coordinated System to changing power system requirements and resource limitations.
3. Procedures allow parties the opportunity to try new methods to implement and refine existing contract provisions on a trial basis.

CURRENT TREATMENT OF OPERATING PROCEDURES

Operating Procedures are not expressly dealt with in the PNCA. They have evolved over time on a mutually agreed basis to assist the parties' implementation of the transactions called for under the contract and to address special situations. For example, the contract calls for each party to determine its Actual Energy Capability (AEC); the Operating Procedures describe in detail the process for an independent third party to calculate AECs for the Coordinated System and for individual systems.

Other examples include the detailed procedures for modeling nonpower requirements, such as the winter streamflow minimums for Vernita Bar and the April–August release of flows for anadromous fish. Operating Procedures are agreed to unanimously and are currently subject to annual revision.

The current Operating Procedures deal with the following issues/mechanisms, many of which are addressed separately:

In Lieu Energy;

Provisional Energy;

Actual Energy Capability;

Operation of Reservoirs below Energy Content Curves and Critical Rule Curves;

Principles for Interchange Energy Pricing;

Operational Implementation of NonPower Requirements for the 1992–93 Contract Year (3 MAF Flow Augmentation);

Adjustments to Firm Resource Capability during Contract Year; and

Actual Energy Regulation and Use of its Results.

OPTIONS

1. Operating Procedures
   a. Term:
      (1) Annual; or
      (2) Long–term with annual revisions;
   b. Procedures as Part of Contract; and
2. No Operating Procedures

The impacts of the Element 3 options are discussed on Table 4–8.

Table 4–8. IMPACTS, ELEMENT 3: OPERATING PROCEDURES

Option	Environmental	Hydro Power System	Financial	Contractual
1: Operating Procedures	No impact	If procedures facilitate contract implementation, they may enhance positive attributes of the underlying contract.	Any additional process to develop operating procedures results in administrative expense. However, the expense is warranted as the procedures help parties carry out a contract.	Positive effect on ability to implement contract. Varying impacts based upon term: 1a. Annual agreement can be cumbersome or difficult, possibly mitigated by provision for automatic rollover of short–term procedures (in effect, long–term procedures with annual revisions). 1b. Possibly not acceptable to parties because of loss of flexibility to respond to changing conditions.
2: No Operating Procedures	No impact	Without operating procedures, the contract would have to be more specific or parties would have to maintain constant communication with one another.	Would require more frequent meetings of parties with a consequent increase in expense.	Unlikely to be acceptable to parties. The current contract initially lacked procedures; parties found they needed more detail to determine entitlements and obligations.

Note: Regional, financial and hydro power system impacts: For the Federal system and non–Federal parties, impacts are similar to the regional impacts shown in the table.

4.3.2 Planning Elements

Elements addressing the objectives of power planning and methods to achieve those objectives include:

- Planned Nonpower Requirements;
- Firm Hydro Resource Planning Criteria (including Shifting and Shaping); and
- Secondary Hydro Resource Planning Criteria.

Unless otherwise noted in the Tables 4–9 through 4–13, the impacts displayed apply to all the parties unless specifically noted as Federal or non–Federal impacts.

ELEMENT 4: PLANNED NONPOWER REQUIREMENTS

DESCRIPTION OF ELEMENT

This element describes the method used to incorporate requirements for nonpower uses into the power planning process.

APPLICABLE SECRETARY'S PRINCIPLE

(a) No party shall be required to operate the facilities in a manner inconsistent with nonpower uses or functions as determined by such party or as required pursuant to law.

GOALS SERVED BY PLANNED NONPOWER REQUIREMENTS

The treatment of planned nonpower requirements sets priorities on the use of the Columbia River System. It assures that hydro system capability will be available for nonpower uses as well as power production.

CURRENT TREATMENT OF PLANNED NONPOWER REQUIREMENTS

The PNCA gives nonpower requirements the highest priority in river operations and states that nothing in the agreement shall require a party to operate a project in a manner inconsistent with its requirements for nonpower uses or functions. In planning, coordination of the parties' resources for power purposes takes place only after all requirements identified for nonpower uses have been accommodated. These requirements may include minimum and/or maximum project outflows or specified reservoir elevations for certain times of the year.

Parties submit nonpower requirements for their projects along with load and resource data in the planning process. In the past, when nonpower requirements required the cooperation of a number of parties, those parties generally reached agreement respecting the requirement outside of coordination. The requirement was then considered as part of the coordination planning process, where the Contract Committee decides how to coordinate for power purposes the power aspects of the requirement. Some requirements such as those recommended by the Northwest Power Planning Council and endorsed by the relevant Federal agencies (e.g., Water Budget), have traditionally been submitted by one or more of the Federal agencies. These submitted nonpower requirements are included in the hydro regulations used to determine the firm hydro energy capability of the Coordinated System and each of the parties.

OPTIONS

1. Current practice;
2. Allow submittal of nonpower requirements by entities that are not parties to the agreement;
3. Require that new nonpower requirements have a six–year lead time so that PNCA planning coincides with the Assured Operating Plan of the Columbia River Treaty (this option would not preclude implementation of new requirements in actual operations);
4. Determine river uses of Federal projects through a regional forum; and
5. Continue current submittal practice, but use Federal low cost replacement energy to compensate non–Federal parties for power loses incurred at their projects due to nonpower uses.

The impacts of the Element 4 options are discussed on Table 4–9.

Table 4–9. IMPACTS, ELEMENT 4: PLANNED NONPOWER REQUIREMENTS

Option	Environmental	Hydro Power System	Financial	Contractual
1: Current	Impacts result from reservoir owner's operational decisions, not from submittal of NPRs to power planning process. There are potential impacts from developing replacement resources if NPRs reduce firm resource capability and party makes resource acquisition based on PNCA hydro capability information.	Trend from activities outside of coordination is to use more hydropower capability for NPR uses. Planning takes these NPRs into account.	Parties bear individual system loss of hydro capability due to nonpower impacts, although impacts on contract entitlements and obligations may be allocated through negotiation and consultation.	Probably acceptable to parties.
2: Submittal of NPRs Allowed by Nonparty	Difficult to predict; even if NPR is submitted into PNCA planning process, reservoir owner must accept it to change operations. If NPR is accepted, impact would depend on nature of NPR.	Could decrease firm resource capability for PNCA generating parties.	For some parties, potential uncertainty and harm from NPRs submitted by entities with no responsibility or liability. Possibly more NPRs than Option 1 resulting in (1) less firm resource capability and (2) impacts from replacement resources including short–term (potentially less reliable) additions.	Not acceptable to parties; requires statutory and licensing amendments.
3: Six–Year Lead Time	There are potential impacts from replacement resources for parties that use PNCA to determine resource acquisition. Parties would have more time to acquire needed replacement resources.	Would provide certainty and equalization of hydro resources available for power purposes.	Reduced, because of planned acquisition of replacement resources.	May be acceptable to parties since option treats NPRs as load growth thus allowing utilities and the region an orderly preparation for resource acquisitions.
4: Federal NPRs from a regional forum	Impacts to streamflows and reservoir levels result from SOS identified in regional forum.	Same as Option 3.	Similar to Option 1.	Would be acceptable, especially to the Federal operating agencies.
5: Federal replacement energy for non–Federal NPRs	Non–Federal project owners should already comply with NPRs, however, this reduces power costs and should facilitate enhancements.	Would provide increased certainty to non–Federal project owners to mitigate impacts to their hydro systems.	Transfers costs of NPR operation to Federal system.	Federal agencies would be very reluctant to sign agreement with this provision.

Note: Impacts are regional, although, for options 1–4, financial and hydro system impacts are the same for the Federal system and non–Federal parties.

ELEMENT 5: FIRM HYDRO RESOURCE CAPABILITY PLANNING CRITERIA

DESCRIPTION OF ELEMENT

The criteria used to estimate the amount of firm hydro generation available from the hydro system.

APPLICABLE SECRETARY'S PRINCIPLES

(b) The power facilities of the area shall be operated so as to produce optimum firm load–carrying capability for the area.

(d) Each system shall be entitled to the firm load–carrying capability that the system can produce during the critical period of the area with full storage release.

(j) The coordination agreement shall include criteria for coordinated operation of all power facilities of the parties. In accordance with such criteria each party will consult with the others in developing detailed plans for operation of its facilities.

GOALS SERVED BY FIRM HYDRO RESOURCE CAPABILITY PLANNING CRITERIA

1. The development of a coordinated estimate of firm hydro resource capability and its level of reliability.

2. The development of firm hydro resource capability on a period–by–period basis in order to establish coordination contract entitlements and obligations.

CURRENT TREATMENT OF FIRM HYDRO RESOURCE CAPABILITY PLANNING CRITERIA

The current contract quantifies and develops the firm hydro resource capability of the Coordinated System using adverse historical streamflows ("critical period"). The critical period used is that portion of the agreed–upon historical streamflow record which, when combined with the drafting of all storage reservoirs from full to empty, would produce the least amount of energy shaped to seasonal load patterns. This conservative planning mechanism provides a high degree of certainty that planned firm hydro resource capability can be developed. It enables Northwest utilities to determine the additional resources and resource acquisition needed to fulfill their statutory and business obligations to meet the load demands of their customers.

The contract allows the parties to redistribute firm hydro resource capability within the critical period through the mechanisms of shifting and shaping. Shifting and shaping are described as Elements 5a and 5b, respectively.

OPTIONS

1. Current practice (criteria based upon the historic critical period analysis);

2. Stochastic hydrological method applied to the historic streamflow record. This would base the firm hydro resource capability on a level of reliability agreed to by the parties. The level of reliability would be based upon planning goals and could approximate the level achieved in critical period planning. This option would smooth out the variations in streamflows observed in the historical record;

3. Average water planning based upon the average streamflows of the historical record.

4. Planning criteria based upon minimum outflow requirements from reservoir operations for nonpower purposes (under this option, the majority of hydro generation would be secondary energy);

5. No coordinated regional planning.

The impacts of the Element 5 options are discussed on Table 4–10.

Table 4-10. IMPACTS, ELEMENT 5: FIRM HYDRO RESOURCE CAPABILITY PLANNING CRITERIA

Option	Environmental	Hydro Power System	Financial	Contractual
1: Current	Impacts result from operating decisions that are reflected in parties' submittals to planning. Provides a conservative measure of hydro capability for parties using PNCA for decisions on resource acquisition.	Compared to no coordination, critical–water planning provides a conservative measure of hydro capability which increases power reliability.	Compared to no coordinated planning, less need for replacement resources.	Federal: (1) Preserves autonomy, accepted by parties, implementable. (2) Consistent with practices of Columbia River Treaty. Non–Federal party: See (1).
2: Stochastic Method	Similar to Option 1.	Similar to Option 1.	Similar to Option 1.	Federal: Similar to Option 1. Non–Federal: Preserves autonomy and is implementable; however, possibly not acceptable to those individual parties that lose firm hydro resource capability.
3: Average Water Planning	Reservoirs more frequently draft to empty and fail to refill resulting in less reliability to meet power and nonpower requirements. This would be a substantial change to current operations.	Average–water planning allows parties an increased use of hydro resources; however, reliability and efficiency would be reduced as half of the time water supply planned for would not be available.	Replacement resources needed to cover refill failures and drafts to empty.	Federal: Unacceptable to the Federal storage reservoir operators. Non–Federal: Unacceptable to some parties.
4: NPR Driven	Similar to Option 1. Impacts driven by strategy.	Similar to Options 1 or 3 depending on water planning assumption.	Similar to Options 1 or 3 depending on water planning assumption.	Federal and non–Federal: Preserves autonomy and is implementable but may not be acceptable.

Table 4–10. IMPACTS, ELEMENT 5: FIRM HYDRO RESOURCE CAPABILITY PLANNING CRITERIA– CONT

Option	Environmental	Hydro Power System	Financial	Contractual
5: No Coordinated regional planning	Requires additional nonrenewable resources with potential impacts. Uses hydro resource less efficiently; could reduce water available for multiple uses such as anadromous fish flows or refill for resident fish.	Possibly less (1) firm hydro resource capability, (2) flexibility, and (3) reliability.	Requires more firm resource acquisitions than Options 1, 2, and 3 but probably fewer than Option 4.	Not acceptable to most parties, particularly downstream parties relying on upstream storage releases.

Note, financial impacts: Options 1–4 provide for some kind of coordinated firm planning without which the region would need more resources to meet firm load. These options differ according to type of planning criteria, which provides information for the amount of replacement resources required. The financial impacts in the table are from a regional perspective, and are a function of the amount of replacement resources needed. Impacts to both the Federal system and non–Federal parties depend upon potential changes to their resource mix; if the mix stays predominantly hydro, both Federal and non–Federal impacts will be similar to the region's.

Note, hydro power system impacts: Federal system and non–Federal party impacts are similar to the regional impacts shown in the table.

Note: PNCA planning only establishes entitlements and obligations. It does not prevent individual parties from deviating from the annual operating plan during operations. For analytical purposes, however, the above table assumes the operating plan is being followed.

SUB–ELEMENT 5A: SHIFTING

DESCRIPTION OF ELEMENT

Historically, the parties have planned conservatively for river operations using critical–period planning. Shifting, a planning strategy, moves hydro resource capability into a given year of the critical period with a compensating decrease in other years. As part of this process, resource capability is established for each year of the critical period.

APPLICABLE SECRETARY'S PRINCIPLES

(b) The power facilities of the area shall be operated so as to produce optimum firm load–carrying capability for the area.

GOALS SERVED BY SHIFTING

1. Shifting provides planning flexibility by moving firm surpluses and deficits throughout the multiple–year critical period.

2. Shifting optimizes the use of renewable resources to meet load conservatively and reliably. Shifting is an attempt to fully utilize the firm hydro resource capability in a particular year of the critical period.

3. Shifting accommodates the transition of new thermal resources into Coordinated System planning.

CURRENT TREATMENT OF SHIFTING

The PNCA plans for a critical period which has historically varied from one to four years in length. The planning process results in an amount of hydro resource capability being identified for each period (generally a month) in this critical period. Shifting moves firm resource capability among years in a multiple–year critical period to obtain more desirable use of resource capability. There is no provision in the PNCA for shift, but it is not precluded by the contract. The amount of shift is limited by nonpower requirements established by reservoir parties in planning. As a matter of practice, the Federal system has shifted to serve the direct service industry's top quartile load. Several parties have used shift to cover deficits and to increase their ability to market critical–period surpluses. Shifting is elective. Some parties are not allowed to shift as a result of other agreements.

OPTIONS

1. Current treatment;

2. No shift; and

3. Shifting within more restrictive limits.

Impacts of the Element 5A options are discussed on Table 4–11.

Table 4–11. IMPACTS, ELEMENT 5A: SHIFTING

Option	Environmental	Hydro Power System	Financial	Contractual
1: Current	There is usually more draft in a year in which firm capability is increased by shift, resulting in slightly more fall and winter flow and less spring and summer flow. There is also potential for a reduced level of spring and summer reservoir elevations in such years. Less draft occurs in years in which firm capability is reduced to offset shift in a different year. Over the long term, shift displaces use of nonrenewable resources.	In the long run, makes more firm resource capability available but may reduce the amount of refill.	For parties that can shift, there is opportunity to reduce power production costs.	Federal system: A known quantity; often viewed as desirable. Non–Federal parties: Possibly less acceptable to parties who are unable to shift.
2: No Shift	Over the long term, there is the potential for more reliance on nonrenewable resources, a slight improvement in refill probability, and a slight reduction in overall reservoir draft.	Under low streamflows, may enhance refill and improve ability to meet regional load with hydro resources.	Less economical than Option 1 over multi–year operations as it does not fully use the reservoir capacity available for firm power.	Might not be acceptable to the Federal system or to some parties, as it reduces the hydro system's flexibility.
3: Shifting within more restrictive limits	Compromise between Option 1 and Option 2; refill potential should be less than Option 2 and greater than Option 1.	Reduced capability in fall/winter over that in Option 1 because of less shift.	More economic than Option 2, less economic than Option 1.	Acceptable to current parties.

Note to Environmental Comments: Shifting is limited by the SOS. Everything described above occurs only within the bounds established by the governing SOS.

Note: The Federal system and non–Federal party financial and hydro system impacts are similar to the regional impacts shown in the table.

SUB–ELEMENT 5B: SHAPING

DESCRIPTION OF ELEMENT

Shaping, a planning strategy, uses the flexibility of the hydro system to adjust the firm resource capability within a contract year.

APPLICABLE SECRETARY'S PRINCIPLES

(b) The power facilities of the area shall be operated so as to produce optimum firm load–carrying capability for the area.

GOALS SERVED BY SHAPING

1. Using hydro system flexibility for meeting load.
2. Optimizing use of renewable hydro resources for power purposes.
3. Minimizing power resource costs by adjusting firm resource capability within the operating year.

CURRENT TREATMENT OF SHAPING

There is no provision in the PNCA for shaping, but it is not precluded by the contract. Shaping moves surplus or deficit firm resource capability on a planned basis among periods in a contract year. Shaping is elective. Some parties are not allowed to shape, but in most instances this is a result of agreements entered into outside of the PNCA.

OPTIONS

1. Current treatment; and
2. No shaping.

Impacts of the Element 5B options are discussed on Table 4–12.

Table 4–12. IMPACTS, ELEMENT 5B: SHAPING

Option	Environmental	Hydro Power System	Financial	Contractual
1: Current	Generally, more draft and increased project outflows in the fall and lower project outflows in winter and spring. Reservoirs refill to similar levels with or without shaping.	Generally contributes to planning flexibility. In rare instances reduces likelihood of refill at specific projects.	Reduces power costs and is a cost–effective way for parties to maximize flexibility.	Known acceptable feature to the parties.
2: No Shaping	Compared to Option 1, less draft in the fall and higher winter and spring outflows.	Compared to Option 1, reduces the use of the flexibility of the hydro system.	Doesn't provide the benefits of Option 1.	Possibly not acceptable to the Federal parties and some non–Federal parties.

Note, hydro power system impacts: For the Federal system and non–Federal parties, they are similar to the regional impacts shown above.

Note, financial impacts: For the Federal system and for non–Federal parties with the ability to shape, impacts are similar to the regional impacts shown above. Parties that cannot shape, however, are potentially disadvantaged.

ELEMENT 6: SECONDARY HYDRO RESOURCE CAPABILITY PLANNING CRITERIA

DESCRIPTION OF ELEMENT

Secondary hydro resource is the storage water in excess of that required to develop planned firm hydro resource capability. Secondary hydro resource capability planning criteria establishes parameters used to determine the availability of secondary hydro resource throughout the contract year.

APPLICABLE SECRETARY'S PRINCIPLE

(a) No party shall be required to operate the facilities in a manner inconsistent with nonpower uses or functions as determined by such party, or as required pursuant to law.

(b) The coordination contract shall include provisions for (1) the storage and release of water by all reservoirs in the United States, and to the extent permitted by the Treaty, by the reservoirs in Canada; and (2) the generation and exchange of power and energy including, at the option of each storage owner, such exchanges in lieu of storage releases.

(c) The coordination agreement shall include criteria for coordinated operation of all power facilities of the parties. In accordance with such criteria, each party will consult with the others in developing detailed plans for operation of its facilities.

GOALS SERVED BY SECONDARY HYDRO RESOURCE CAPABILITY PLANNING CRITERIA

1. Provide a mechanism to determine in real–time the amount of available secondary hydro resource capability.
2. Assure that the use of secondary hydro resource capability does not jeopardize the Coordinated System's ability to produce firm hydro resource capability.

CURRENT TREATMENT OF SECONDARY HYDRO RESOURCE CAPABILITY PLANNING CRITERIA

The contract contains procedures that limit the amount of available secondary resource capability during the contract year.

OPTIONS

1. Current practice (develop assured refill and variable energy content curves for reservoirs to determine storage water contribution to secondary energy production).
2. Forecast availability of secondary hydro resource capability based on nonpower operations.
3. Change secondary hydro resource capability planning criteria such that the capability is not available for use until refill is expected at the following probabilities (currently, 95 percent):
    a. 100 percent (increase in confidence level); or
    b. 50 percent (decrease in confidence level).

Impacts of the Element 6 options are discussed on Table 4–13.

Table 4–13. IMPACTS, ELEMENT 6: SECONDARY HYDRO RESOURCE CAPABILITY PLANNING CRITERIA

Option	Environmental	Hydro Power System	Financial	Contractual
1: Current	Improves certainty of refill with corresponding multiple–purpose benefits. Refill reduces operation of nonrenewable resources to meet future firm loads, but it can limit energy available to displace nonrenewables in current year.	Establishes confidence of refill for future power supply and allows production of usable secondary energy.	Positive. Establishes an agreed–to allocation between reservoir refill for future firm–energy use (high value energy) versus near–term use as secondary energy (lower value).	Acceptable to parties.
2: NPR Driven	Similar to Option 1. Impacts depend on actual use, e.g., increased flows for anadromous fish versus increased reservoir levels for resident fish.	Refill confidence for future power supply would (1) increase if operation of storage reservoirs was driven by resident fish and recreation interests, or (2) decrease if driven by flows for anadromous fish.	NPR establishes the financial impacts.	May or may not be acceptable to parties. This is, in effect, a variation of Options 1 and 3 wherein certain NPRs will dictate the secondary hydro capability regardless of the planning criteria.
3a: 100% Refill Confidence 3b: 50% Refill Confidence	3a. Enhances spring and summer refill, increases unplanned spill, and increases spring and summer flows from Option 1. 3b. Compared to Options 1, 2, and 3a, reduces refill probability, and decreases chances of spill.	3a. Reduces available secondary hydro capability, enhances refill; uses more nonrenewable resources (i.e., fewer displaced). 3b. Increases available secondary hydro, reduces use of nonrenewables by hydro system, but probably lessens refill.	3a. Reduced secondary capability would reduce parties revenues from Option 1 because of unplanned spill from higher spring flows. 3b. More secondary hydro available which should increase power revenues from Option 1.	3a. Not acceptable to parties. 3b. Might not be acceptable to storage reservoir owners.

Note, hydro power system: Federal system and non–Federal party impacts are similar to regional impacts which are shown in the table.

4.3.3 Uses of Hydro Resource Capability Elements

These elements address the use of hydro resource capability, whether it be for power or nonpower purposes. An important component is the degree of certainty that the system will produce planned resource capability in actual operations. The elements include:

- In Lieu Energy
- Interchange Energy
- Proportional Draft
- Adjustments to Hydro Resource Capability
- Storage Service
- Transmission Service
- Provisional Energy
- Treatment of Unplanned Nonpower Requirements.

Unless otherwise noted in the Tables 4–14 through 4–21, the impacts displayed apply to all of the parties unless specifically noted as Federal or non–Federal impacts.

ELEMENT 7: IN LIEU ENERGY

DESCRIPTION OF ELEMENT

In lieu energy is energy delivered by a reservoir owner to a downstream party in lieu of a release of water that the downstream party is entitled to and has requested.

APPLICABLE SECRETARY'S PRINCIPLES

(b) The power facilities of the area shall be operated so as to produce optimum firm load–carrying capability for the area. The coordination contract shall include provisions for (1) the storage and release of water by all reservoirs in the United States, and to the extent permitted by the Treaty, by the reservoirs in Canada; and (2) the generation and exchange of power and energy including, at the option of each storage owner, such exchanges in lieu of storage releases.

(c) Upon demand by a downstream storage beneficiary, the owner of storage shall release water in excess of its needs to carry firm loads and its anticipated secondary loads, or such owner shall supply energy in lieu thereof.

GOALS SERVED BY IN LIEU ENERGY

1. Allows the reservoir party to exercise operational flexibility and control over its reservoirs;
2. Provides certainty to downstream party of assured storage releases or the energy equivalent thereof; and
3. Enables the downstream party to achieve a fundamental component of its actual energy capability for the purpose of developing planned firm capability and fulfilling contract obligations.

CURRENT TREATMENT OF IN LIEU ENERGY

The current contract provides downstream parties with the energy capability associated with assured storage releases. These releases allow the downstream parties to develop their firm energy capability and to meet their coordination contract obligations. In lieu energy is a mechanism that gives the reservoir party, upon the request of a downstream party for the release of storage, the discretion to release the storage or deliver energy in lieu thereof. Downstream parties must return the in lieu energy as releases are subsequently made and the reservoir returns to the operating rule curve.

The PNCA provides that downstream parties are entitled to releases of storage (or, at the discretion of the reservoir party, the energy equivalent of the requested release) above ECC. The Operating Procedures extend that right to water stored above the proportional draft point.

There are 5 major Federal storage projects, plus Canadian Treaty storage, in the Coordinated System. Downstream parties have a right to request a release of water stored above ECC or PDP in any of these projects. For a discussion of the impact of unplanned nonpower requirements on in lieu energy transactions, see "Treatment of Unplanned Nonpower Requirements" under Element 14 in this chapter.

OPTIONS

1. Current practice (in lieu energy);
2. No in lieu energy transactions, but downstream party entitled to release of water; and
3. No in lieu energy transactions and no assured storage releases.

Impacts of the Element 7 options are discussed on Table 4–14.

Table 4–14. IMPACTS, ELEMENT 7: IN LIEU

Option	Environmental	Hydro Power System	Financial	Contractual
1: Current	Generally positive. Reservoir operators have (1) flexibility to meet various requirements on unplanned basis and (2) more control over own projects; allowing water storage to (i) enhance refill objectives, (ii) meet future flow requirements, and (iii) enhance certainty that planned firm resource capability will be developed for downstream parties (reducing the need for firm replacement resources).	Allows reservoir parties more autonomy; provides downstream parties certainty regarding development of their firm resource capabilities.	Generally positive because (1) hydro resource tends to be maximized when parties have flexibility to operate projects to own requirements and to consider multi–year operating concerns (e.g., overall marketing and enhancement of refill probability) and (2) downstream parties are less likely to require costly replacement resources when they are assured that their firm resource capabilities will be developed.	Allows each party more autonomy than under Options 2 or 3 while still meeting coordination principles. Proven, acceptable, and implementable.
2: No Energy, Water is Released	Operations would be close to operating rule curve of the AER. Would give more control over flows to downstream parties; depending on how these entitlements are exercised, tends to decrease flexibility of reservoir operators to adjust to unplanned nonpower and power requirements.	Reservoir party cannot withhold release of water; could adversely affect refill and future firm power supply.	More costly than Option 1 due to reservoir owners' (1) loss of flexibility to respond to unplanned requirements and changing conditions and (2) loss of ability to maximize the use of its project for its own power purposes.	Not acceptable because of loss of party autonomy.
3: No Energy, No Water Assured	Difficult to predict because storage operations would be decided solely by reservoir owner. However, some impacts could occur if nonrenewable resources are operated to replace reduced hydro firm resource capability.	Eliminates assured storage releases for downstream parties which lose certainty of firm hydro resource capability.	More costly than Options 1 or 2 to a downstream party because of investments in other resources to compensate for uncertainty of access to water or energy.	No balancing of entitlements and obligations; eliminates a major regional benefit of the agreement. Not acceptable to parties.

Note, financial impacts: Federal system and non–Federal party impacts are similar to the regional impacts shown in the table.

ELEMENT 8: INTERCHANGE ENERGY

DESCRIPTION OF ELEMENT

Interchange energy allows diverse parties to operate as a single utility through exchanges of energy or capacity, thereby optimizing coordinated system hydro resources. In exchange for dedicating a resource to coordination, a party receives or delivers interchange energy or capacity to compensate for changes made to its hydro operation to maximize overall Coordinate System load carrying capability and shape.

APPLICABLE SECRETARY'S PRINCIPLES

(b) The power facilities of the area shall be operated so as to produce optimum firm load–carrying capability for the area. The coordination contract shall include provisions for (1) the storage and release of water by all reservoirs in the United States, and to the extent permitted by the Treaty, by the reservoirs in Canada, and (2) the generation and exchange of power and energy including, at the option of each storage owner, such exchanges in lieu of storage releases.

(e) Energy shall be exchanged between systems to enable each system to maintain its firm load–carrying capability.

GOALS SERVED BY INTERCHANGE ENERGY

1. Takes advantage of the diversity of the parties' loads and resources to maximize overall load carrying capability;

2. Provides individual parties more certainty in developing their firm resource capability.

CURRENT TREATMENT OF INTERCHANGE ENERGY

When a party coordinates its resources for a system operation, its actual resource capabilities may no longer match its period–by–period firm planned capabilities. However, the total actual Coordinated System capability will equal the total Coordinated System firm planned capability. Interchange energy is used to match individual party resources to planned capability by providing energy exchanges between surplus and deficit parties. Those parties whose actual resource capabilities are greater than their firm planned resource capabilities are exporters of interchange energy, and those whose actual resource capabilities are less than their firm planned resource capabilities are importers of interchange energy. Interchange energy transactions are not mandatory; however, if called upon by an importer, an exporter has an obligation to deliver.

To date, all interchange energy transactions have been energy transfers, not capacity. The following discussion relates to the current treatment of interchange energy.

Imports and exports of interchange energy for each party are planned to balance out over the course of a critical period, but in actual operations, they may not. An exporter may recall previously delivered interchange energy at a later time. At the end of each contract year in which reservoirs of the coordinated system refill, all interchange energy imbalances are closed and exporters are paid for interchange energy supplied and not recalled. If reservoirs fail to refill, the balances in the interchange energy accounts are continued into the next contract year.

The agreement provides for three classes of interchange energy: holding, loaned, and other than loaned (regular). Holding interchange energy transactions among parties are scheduled during the planning process and, for the most part, are adhered to irrespective of actual conditions. With respect to loaned and regular interchange energy, the class of the interchange energy is declared at the time of delivery. Regular interchange energy is further identified when delivered as either hydro or thermal energy. If imbalances were cashed out, hydro interchange energy had a set price and thermal interchange energy had a variable price based upon the incremental cost of the thermal resource plus an adder. Both prices were set at the time of delivery. Parties recently agreed to eliminate the hydro–thermal distinction between interchange energy prices on

a trial basis. Now year–end imbalances are cashed out at the prices agreed to for the trial period. Loaned interchange energy does not have an associated price as the contract almost guarantees that the energy will be recalled during the contract year.

OPTIONS

1. Current practice (Interchange Energy);
2. No Interchange Energy; and
3. Provide greater opportunity for hydro exporters to trigger returns of Interchange Energy.

The impacts of the Element 8 options are discussed on Table 4–15. Interchange Energy pricing is discussed separately as Element 16.

Table 4–15. IMPACTS, ELEMENT 8: INTERCHANGE ENERGY

Option	Environmental	Hydro Power System	Financial	Contractual
1: Current	Difficult to identify impacts to flows and reservoir elevations. Facilitates coordinated reservoir operation lessenes the system draft required to develop the same firm hydro resource capability. Reduces need to operate nonrenewable resources	Positive. Allows full use of hydro resources; parties are assured of ability to develop their planned firm hydro resource capability.	Region generally benefits from more efficient operation of parties' resources.	Acceptable as concept and frequently used. Current pricing is questioned by some of the parties. Equitable rules can be resolved through negotiations among parties.
2: No Interchange	Tends to require more draft of coordinated system reservoirs for system to meet same firm hydro resource capability.	Significantly reduces coordination; could increase demand on reservoir storage, reduce efficiencies, and require additional nonrenewable resources.	Reduces financial gains of coordination by eliminating a significant coordination component.	Substantially reduces regional and individual party benefits of coordination; unacceptable to most parties.
3: Better Hydro Return	Could increase hydro exporter's discretion in timing recall of interchange energy, thus increasing the operation of nonrenewable resources needed to develop and return interchange energy.	Could increase discretion of hydro exporter regarding recall with correspondingly greater use of non–hydro resources to develop and return interchange energy.	Improves opportunities of exporters for recall of interchange within operating year, thus reducing financial impact of delivering interchange energy.	This is one possible way to resolve dispute under Option 1. Unknown whether parties would accept this option.

Note: The environmental, financial and hydro power system impacts described will occur only if parties with interchange energy entitlements exercise those entitlements. Interchange energy transactions affect timing of the operation of numerous resources and are very difficult to predict.

Financial Note: Federal system impacts are similar to regional impacts. Non–Federal party impacts are generally similar; however, some non–Federal parties cannot shift firm resource capability because of other contracts which increases their exposure as exporters as discussed in Option 1.

ELEMENT 9: PROPORTIONAL DRAFT

DESCRIPTION OF ELEMENT

Proportional draft is a method to allocate draft among several reservoirs to produce firm hydro resource capability.

APPLICABLE SECRETARY'S PRINCIPLE

(b) The power facilities of the area shall be operated so as to produce optimum firm load–carrying capability for the area. The coordination contract shall include provisions for the storage and release of water by all reservoirs in the United States, and to the extent permitted by the Treaty by the reservoirs in Canada.

GOAL SERVED BY PROPORTIONAL DRAFT

Proportional draft produces the Coordinated System firm hydro resource capability by distributing required draft equitably among storage reservoirs when actual streamflows are less than planned streamflows.

CURRENT TREATMENT OF PROPORTIONAL DRAFT

Proportional draft is necessary whenever drafting to the energy content curve or critical rule curve will not produce firm resource capability or meet certain flow requirements. Then, all reservoirs are drafted the same proportional distance (expressed in feet of elevation) between critical or other rule curves unless restricted by nonpower requirements. Currently, proportional draft is calculated by the Actual Energy Regulation. The process is described fully in the Operating Procedures.

OPTIONS

1. Current practice (proportional draft based on feet of elevation between rule curves);
2. Proportional draft based on other criteria (e.g., volume, storage energy, refill probability at headwater storage projects).
3. Draft based on most efficient use of water (i.e., produce firm hydro resource capability using the least amount of water consistent with requirements for nonpower uses).

The impacts of the Element 9 options are discussed on Table 4–16.

Table 4–16. IMPACTS, ELEMENT 9: PROPORTIONAL DRAFT

Option	Environmental	Hydro Power System	Financial	Contractual
1: Current	Impacts to streamflows and reservoir levels same as SOSs.	Positive. The hydro system gains flexibility to respond to short–term deviations from planned loads and resources.	Positive. The hydro system gains flexibility to respond to short–term deviations from planned loads and resources.	Acceptable.
2: Change Criteria	Similar to Option 1 for system as a whole but could change the amount of draft, depending upon criteria selected, for individual parties; refill could be enhanced at some reservoirs, but refill failures could be more frequent and deeper at others.	Uncertain for volume and storage–energy options. Draft based upon refill probability would likely improve reliability by reducing refill failures at hard–to–fill projects.	Uncertain.	May be acceptable.
3: Efficiency Driven	Uses least amount of draft from system to meet load. Could enhance system water supply for multiple uses at expense of higher outflows and deeper drafts from the Coordinated System's most efficient storage projects (e.g., Hungry Horse).	After meeting multiple purposes, would most efficiently use the hydro resource for power.	Because the least amount of water is used to meet load, should be more beneficial than other options, but the effects on individual parties of the redistribution of rights and obligations are hard to predict.	May be acceptable.

Note, financial and hydro power system impacts: Federal system and non–Federal party impacts are similar to the regional impacts shown in the table.

ELEMENT 10: ADJUSTMENTS TO FIRM HYDRO RESOURCE CAPABILITY

DESCRIPTION OF ELEMENT

Adjustments to firm hydro resource capability (flexibility adjustments) are made during the contract year to redistribute firm resource capability within the year.

APPLICABLE SECRETARY'S PRINCIPLE

(b) The power facilities of the area shall be operated so as to produce optimum firm load–carrying capability for the area.

GOALS SERVED BY ADJUSTMENTS TO FIRM HYDRO RESOURCE CAPABILITY

Allow parties to change the Coordinated System's firm hydro resource capability in response to differences between planned and actual conditions.

CURRENT TREATMENT OF ADJUSTMENTS TO FIRM HYDRO RESOURCE CAPABILITY

The current contract provides for the use of flexibility adjustments to change firm hydro resource capability, subject to certain limitations, to cover (1) deviations between actual and estimated loads, (2) underperformance of thermal resources due to unplanned maintenance and (3) specific purposes as agreed to by the parties.

Flexibility adjustments result in changes to reservoir draft entitlements, but do not always change reservoir operation. Flexibility adjustments do, however, change draft rights at one or more reservoirs throughout the Coordinated System. Actual draft will depend on how the reservoir party chooses to respond to the change in draft right.

Parties may use flexibility adjustments to increase (borrow) or decrease (save or return) their firm hydro resource capability in a period. A "flexing" party makes a corresponding adjustment in remaining designated period(s) of the contract year. The increased firm energy requirement proportionally drafts all reservoirs to produce the desired generation. When a party returns flexibility reservoirs fill proportionally in the period(s) in which the flexibility is returned. When a party decreases (saves) its firm hydro resource capability, water is stored that may be used for generation in a later period(s).

There are currently two key contractual limitations on flexibility. The first requires a party's flexibility adjustments to net to zero over the contract year. The second provides that the accumulated adjustments to a party's firm hydro resource capability not exceed 5 percent of such party's remaining firm resource capability (hydro plus nonhydro) between the date of the change and the end of the contract year. Currently, the operating procedures impose an additional limit by prohibiting the return of flexibility during the Water Budget operation in May, because of the impact of such a return on the capability of reservoirs to provide fish flows during that month.

OPTIONS

1. Current practice (flexibility adjustments);
2. Elimination of flexibility adjustments; and
3. Current, but further limited, for example:
    a. Limit flexibility to a percentage of the remaining hydro firm resource capability in the contract year, rather than 5 percent of all remaining firm resource capability (hydro plus nonhydro);
    b. Flexibility adjustments to a specific project, resulting in an adjustment of draft rights at a single project rather than their distribution of draft throughout the Coordinated System;
    c. Based upon projected water conditions (for example, larger flexibility adjustments could be allowed when there is more water, smaller adjustments when there is less water);
    d. Limit based upon ability to return energy to project(s) that provided energy; or
    e. Limit based upon firm load deviations; and
4. Flexibility would be limited only by the system's physical limitations (for example, water in storage, ability to move water) and the planned multiple–purpose uses of the system.

The impacts of the Element 10 options are discussed on Table 4–17.

Table 4–17. IMPACTS, ELEMENT 10: ADJUSTMENTS TO FIRM HYDRO RESOURCE CAPABILITY

Option	Environmental	Hydro Power System	Financial	Contractual
1: Current	Flows and drafts may be redistributed throughout operating year with corresponding but hard–to–predict changes to the in–river and reservoir environment; however, changes should not violate multiple–use requirements, including NPRs.	Positive with regard to both reliability and flexibility (increases certainty of meeting load). Potential for positive or negative refill effects at individual projects although system refill for future power supply is maintained.	The least–cost resource (hydro) meets power requirements caused by thermal underperformance or load deviations.	Acceptable. Now used by parties to maintain contract rights and obligations.
2: No Flex	Operations occur as planned (with some variation from actual streamflow).	Compared to Option 1, could enhance refill but would reduce real–time flexibility.	More costly; does not allow use of hydro for thermal underperformance and load deviations.	Not acceptable to most parties.
3: Added Flex Limits	Similar to Option 1.	Provides some flexibility and reliability but not as much as under Option 1.	3a, b, and c. If limitation is hydro only, would limit flexibility and therefore reduce benefits (compared to Option 1).	Depending on limit, might be acceptable to parties.
4: Fewer Flex Limits	Substantial borrowing drafts reservoir and increases risk of not meeting future nonpower requirements.	Could provide greater operational reliability and flexibility than Option 1 but would lessen certainty of refill for future power supply.	Can enhance short–term cost reductions at risk of future costs to maintain a given level of reliability.	Not acceptable to some parties.

Note, financial and hydro power system impacts: Federal system and non–Federal party impacts are similar to regional impacts shown in the table.

ELEMENT 11: STORAGE SERVICE

DESCRIPTION OF ELEMENT

A reservoir party will accept energy for storage from other parties to the extent that the energy can be stored.

APPLICABLE SECRETARY'S PRINCIPLE

(f) Energy in excess of that required to supply the area load may be stored by any system entitled thereto in any reservoir with available storage space.

GOALS SERVED BY STORAGE SERVICE

1. Allows parties to store energy to meet future loads.

2. Increases the water–to–power conversion factor at reservoirs resulting in more efficiency.

3. Enables the parties to store water to meet future nonpower requirements.

CURRENT TREATMENT OF STORAGE SERVICE

A reservoir party is obligated to store energy for other parties to the extent that the reservoir party can reduce its generation and not cause a spill at its projects. Parties will store energy for economic and reliability reasons. This mechanism is also used to store water for future nonpower requirements.

Storage energy is scheduled on a daily basis, under rules governing (1) the hours and rates for delivery and return, and (2) treatment of energy that may be spilled. The charge for this service is set in the PNCA Section 14.

OPTIONS

1. Current practice (storage service);

2. Current treatment with expanded treatment of delivery (accommodate all hours of delivery which would likely require a modification of service charges);

3. Independent policies for each utility (service charge may be set to take advantage of the market price);

4. No storage service.

The impacts of Element 11 options are discussed on Table 4–18.

Table 4–18. IMPACTS, ELEMENT 11: STORAGE SERVICE

Option	Environmental	Hydro Power System	Financial	Contractual
1: Current	Storage operations can slightly change reservoir levels and project outflows within the limits of nonpower requirements. Water stored in the system can be used to displace future regional thermal generation or to meet future NPRs.	Stores water and releases it in the latter months of the operating year.	Positive. Reduces production costs for all parties.	Very desirable; has been accepted by parties.
2: Enhanced Provisions	Similar to Option 1.	May store more water (than Option 1) which provides a greater opportunity for release later in the operating year.	Positive. Provides potential for more efficient operation than Option 1.	Requires contract expansion.
3: Independent Policies	Similar to Option 1, except that it may reduce opportunities to store, resulting in less water available to displace thermal generation or meet NPRs in the future.	Water releases are based on the reservoir party's requirement(s).	Increases net production cost in Northwest.	Anticipated difficulties administering the numerous new independent policies.
4: No Storage	Less water is available to displace thermal generation or meet NPRs in the future	Takes away flexibility to store for future NPRs.	Increases net production cost in Northwest.	Not acceptable to parties.

Note, financial impacts: Federal system and non–Federal party impacts are the same as the regional impacts shown in the table.

ELEMENT 12: TRANSMISSION SERVICE

DESCRIPTION OF ELEMENT

Transmission facilities are made available for the transfer of power associated with coordinated system operation. A party will transfer power between other parties, as requested, to the extent that capacity is available in transmission lines and associated facilities.

APPLICABLE SECRETARY'S PRINCIPLE

(i) To the extent consistent with the owner's requirements, interconnecting transmission facilities shall be utilized and operated to accomplish the objectives of the coordination agreement.

GOAL SERVED BY TRANSMISSION SERVICE

Allows open access to transmission facilities for transactions required to coordinate the Systems.

CURRENT TREATMENT OF TRANSMISSION SERVICE

Transmission facilities are made available free of charge for Coordinated System transactions between two parties. A party is obligated to transfer power associated with coordinated system operation to the extent that its transmission capacity is available after meeting its own requirements.

Third parties are paid to transfer (or wheel) energy between supplying and receiving parties. They may also restrict the transfer during peak load hours for all transactions except for interchange capacity. The charge for wheeling energy is set in the PNCA Section 14 (Other Charges).

OPTIONS

1. Current practice (transmission service except over peak hours for most transactions);

2. Current treatment expanded to require transfer of power over all hours (this will most likely require a revision of charges); and

3. Independent policies (a utility would not be obligated to transfer power between two other utilities).

The impacts of the Element 12 options are discussed on Table 4–19.

Table 4–19. IMPACTS, ELEMENT 12: TRANSMISSION SERVICE

Option	Environmental	Hydro Power System	Financial	Contractual
1: Current	Positive. Compared to no transmission, reduces operation of nonrenewable resources; increases reliability of serving load; permits efficient operation of resources.	Positive. Compared to no transmission, allows more efficient hydro operation.	Positive. Compared to no transmission, reduces net production cost.	Acceptable to the parties.
2: Expanded Service	Positive. Compared to Option 1, further reduces operation of nonrenewable resources; increases reliability of serving load; permits efficient operation of resources.	Positive. Compared to Option 1, allows more efficient hydro operation.	Positive. Compared to Option 1, reduces net production cost.	Requires expansion of current contract; may not be acceptable to some parties.
3: Independent Policies	Negative. Could result in increased operation of nonrenewable resources.	Negative. Reduces efficiency of hydro operations.	Negative. Increases net production cost.	Administration of numerous contracts will be difficult.

Note, financial impacts: Federal system and non–Federal party impacts are similar to the regional impacts shown in the table.

ELEMENT 13: PROVISIONAL ENERGY

DESCRIPTION OF ELEMENT

At their election reservoir parties may draft their reservoirs below levels anticipated by the planning process as adjusted for actual streamflows. Provisional energy draft is limited to ensure that downstream parties' coordination contract entitlements and obligations are not affected and to ensure that the drafted reservoir returns to planned levels.

APPLICABLE SECRETARY'S PRINCIPLES

(a) No party shall be required to operate its facilities in a manner inconsistent with nonpower uses or functions as determined by such party, or as required pursuant to law.

(b) The coordination contract shall include provisions for (1) the storage and release of water by all reservoirs in the United States, and to the extent permitted by the Treaty, by the reservoirs in Canada; and (2) the generation and exchange of power and energy including, at the option of each storage owner, such exchanges in lieu of storage releases.

(j) The coordination agreement shall include criteria for coordinated operation of all power facilities of the parties. In accordance with such criteria, each party will consult with the others in developing detailed plans for operation of its facilities.

GOAL SERVED BY PROVISIONAL ENERGY

Reservoir owners are provided with additional flexibility for drafting of reservoirs beyond levels contemplated in the annual operating plan so long as these drafts do not affect coordination entitlements and obligations.

CURRENT TREATMENT OF PROVISIONAL ENERGY

Reservoir parties may provisionally draft lower than provided for in the annual operating plan for purposes outside the PNCA (e.g., fish flows or power emergencies). In order to draft for provisional energy, the reservoir party must demonstrate that it can replace the energy, if necessary, by firm resources outside of those dedicated to PNCA. Provisional energy is independent of the party's planned firm hydro response capability and does not affect coordination entitlements and obligations.

The PNCA reservoir parties decide when it is appropriate to draft for provisional energy. The PNCA only addresses the accounting of the individual energy transactions among the parties resulting from the draft for provisional energy. When a reservoir provisionally drafts, provisional energy is produced at site and at downstream reservoirs owned by other parties. These downstream parties can effectively participate in the provisional draft by retaining the provisional energy produced at their projects. Or they cannot participate by immediately returning the provisional energy to the reservoir party. Then they would be compensated by the reservoir party for energy losses when reservoir outflows are reduced to return the provisionally drafted project to planned levels.

Provisional draft for energy traditionally occurs in the fall with return in the late winter and spring. Provisional draft for other purposes including nonpower requirements can occur at other times. The Operating Procedures specify several ways to account for the return of provisional energy. Some reservoir parties have agreed to limits that exceed those in the contract.

OPTIONS

1. Current practice (provisional energy);
2. Eliminate provisional energy;
3. Current, but extend the right to call upon provisional energy to any party; and
4. Place additional limits on provisional energy--for example, time of year, rate, return, and water conditions.

The impacts of the Element 13 options are discussed on Table 4–20.

Table 4–20. IMPACTS, ELEMENT 13: PROVISIONAL ENERGY

Option	Environmental	Hydro Power System	Financial	Contractual
1: Current	Positive. Reservoir parties have flexibility to operate their reservoirs differently than planned for power and nonpower purposes. Provisional draft lowers storage reservoir levels and increases project outflows. Impacts depend on how and when party drafts returns the resource capability.	In high–flow years, shapes potential spring spill or low–value energy into higher–value, fall secondary generation.	Positive. Attempts to minimize power costs by optimizing hydro flexibility.	Allows parties to deviate from annual operating plan. Proven; acceptable to parties; provides autonomy to both reservoir and downstream parties.
2: None	Probably none although there are possible impacts because of a reduction in reservoir party's flexibility to operate differently than planned.	Negative. Reduces flexibility by limiting draft; in high flow years, can reduce usable secondary because of increased spring spill.	Negative. Reduces flexibility of the hydro system; spring spill could increase in high–water years due to a reduction in reservoir space that might have been provided by provisional–energy drafts.	Slightly reduces administrative aspects of coordination. Might be unacceptable to some parties, particularly storage reservoir owners.
3: Extended Right	Difficult to predict but may be similar to Option 1, depending on decisions regarding timing of provisional drafting.	Reduces reservoir party's control over its own reservoirs; same impacts as Option 1 although impacts may be more frequent.	Positive. Enhances opportunities of all parties to increase revenues, since all would have the opportunity to produce provisional energy.	Less acceptable to parties because of diminished autonomy.
4: Added Limits	Depends on limits selected; could be more or less compatible with environmental objectives.	Less flexibility than Option 1 but more than Option 2.	Some benefits, depending on limits but less than Option 2.	Possibly acceptable but for reservoir parties, it might set limitations that are not currently part of the agreement.

Note, financial and hydro power system impacts: Federal system and non–Federal party impacts are similar to the regional impacts shown in the table.

ELEMENT 14: TREATMENT OF UNPLANNED NONPOWER REQUIREMENTS

DESCRIPTION OF ELEMENT

This element deals with operating for nonpower requirements that were not known in annual planning.

APPLICABLE SECRETARY'S PRINCIPLE

(a) No party shall be required to operate its facilities in a manner inconsistent with nonpower uses or functions as determined by such party, or as required pursuant to law.

GOAL SERVED BY UNPLANNED NONPOWER REQUIREMENTS

Assuring that parties know prior to the implementation of an unplanned nonpower requirement how its impacts, if any, will be distributed among the parties.

CURRENT TREATMENT OF UNPLANNED NONPOWER REQUIREMENTS

The PNCA provides that nothing in the agreement shall require a party to operate a project in a manner inconsistent with its requirements for nonpower uses or functions. The PNCA gives nonpower requirements first priority. In operations, all nonpower requirements are implemented by the project operator. The cost sharing and adjustments to contractual entitlements and obligations are normally negotiated by the parties in the contract committee.

The parties disagree as to the effects of unplanned nonpower requirements on contract entitlements and obligations. It is undisputed that a reservoir owner can unilaterally implement an unplanned nonpower requirement in real–time operations. The disagreement concerns the impacts of unplanned nonpower requirements on in lieu energy and other PNCA transactions. Currently, the contract committee discusses unplanned nonpower requirements and tries to equitably distribute their impacts on all parties' contract entitlements and obligations.

Some parties believe as a general proposition that unplanned nonpower requirements that result in an inability to release water relieve the reservoir party from the obligation to deliver in lieu energy. Other parties disagree. They interpret the PNCA to require reservoir parties to deliver in lieu energy in the amount of storage reflected in the Actual Energy Regulation, without consideration of unplanned real time nonpower requirements.

OPTIONS

1. Current practice (negotiating cost sharing and adjustments to contract entitlements and obligations in the Contract Committee);
2. Cover impacts of unplanned nonpower requirements by using available resource flexibility of the system, and modifying contractual entitlements and obligations, as necessary;
3. Have project owner absorb all impacts of the unplanned nonpower requirement; and
4. Use Federal low cost replacement energy to compensate non–Federal parties for power losses incurred at their projects due to enhanced operation for unplanned nonpower uses.

The impacts of the Element 14 options are discussed on Table 4–21.

Table 4–21. IMPACTS, ELEMENT 14: TREATMENT OF UNPLANNED NONPOWER REQUIREMENTS

Option	Environmental	Hydro Power System	Financial	Contractual
1: Current	Neutral. Allows implementation of unplanned NPRs on a real–time basis; if nonrenewable resources are operated because of an unplanned NPR, there could be environmental impacts.	Potential loss of planned firm hydro resource capability.	Costs of unplanned NPRs can be equitably shared through facilitated negotiations among parties. However, if affected parties do not agree to the sharing, the project owner must bear full implementation costs. If nonrenewable resources are operated because of unplanned NPR, there could be financial impacts.	Acceptable to parties.
2: Use System Flex	If hydro flexibility is not available, neutral. If available, environmental impacts of operating nonrenewable resources are reduced.	Potential loss of planned firm hydro resource capability if there is no flexibility. If available, flexibility mitigates power and financial impacts.	Minimizes impact to extent flexibility is available. Increases opportunity to distribute costs of unplanned operations; compared to Option 1; leaves implementing party less susceptible and other parties more susceptible to cost. For the Federal system, should reduce cost of unplanned operations, compared to Option 1, as cost increases could be mitigated by operating other reservoirs. Some non–Federal parties, however, would incur added costs from operating their own reservoirs to alleviate problems at others' reservoirs.	Might be acceptable as a compromise dealing with concerns of both reservoir and nonreservoir parties.

Table 4–21. IMPACTS, ELEMENT 14: TREATMENT OF UNPLANNED NONPOWER REQUIREMENTS – CONT

Option	Environmental	Hydro Power System	Financial	Contractual
3: Impact Project Owner	See Option 1.	Negative for project owner as it would have to cover any loss of planned firm hydro resource capability.	Not equitable in the view of some parties, particularly project owners that bear full costs and cannot reduce those costs by using flexibility of others. For the Federal system and for non–Federal project owners more costly than Options 1 and 2. However, would help protect nonreservoir parties from costs of NPR operations.	Would not be acceptable to reservoir parties bearing full costs.
4: Federal replacement energy for non–Federal NPRs	Non–Federal project owners should already comply with NPRs, however, this reduces power costs and should facilitate enhancements.	Would provide increased certainty to non–Federal project owners to mitigate impacts to their hydro systems.	Transfers costs of unplanned NPR operation to Federal system.	Federal agencies would be very reluctant to sign agreement with this provision.

Note, hydro power system impacts: Federal system and non–Federal party impacts are similar to the regional impacts shown in the table above.

Note, financial impacts: Federal system and non–Federal party impacts are similar to regional.

4.3.4 Charge Elements

Parties providing services under this agreement receive some compensation through service charges. The elements concerning various charges for services provided in coordination include:

- Service Charge Process
- Service Charge Pricing (including Interchange Energy and Capacity, Storage, Transmission,and Holding Interchange Energy)
- Headwater Benefit Payments

Unless otherwise noted in the Tables 4–22 through 4–24, the impacts displayed apply to all the parties unless specifically noted as Federal or non–Federal impacts.

ELEMENT 15: SERVICE CHARGE PROCESS

DESCRIPTION OF ELEMENT

The process for setting and revising charges paid for services provided under the agreement.

APPLICABLE SECRETARY'S PRINCIPLE

(k) Equitable charges will be made for capacity, energy, transmission, storage, and other services.

GOAL SERVED BY SERVICE CHARGE PROCESS

The process for setting or amending service charges can ensure that all parties to a coordination agreement are ultimately benefitted by and compensated for services provided under the agreement.

CURRENT TREATMENT OF SERVICE CHARGES

Certain PNCA parties are called upon to provide services more frequently than others. For example, storage services under the contract are most frequently borne by the Federal parties which operate over 80 percent of the storage. Service charges were established to ensure an equitable distribution of coordination benefits. Examples of services for which charges were established are interchange energy, interchange capacity, holding interchange energy, storage energy, and transmission services.

The amounts of service charges were initially set in the PNCA. Any party can seek a modification of charges every five years. A consensus must be reached before a service charge is amended. If the parties cannot reach agreement they have recourse to the Federal Energy Regulatory Commission which acts as a dispute resolution body.

OPTIONS

1. Current practice (service charges potentially modified every five years).
2. No changes to charges in the contract.
3. More frequent amendments to the charges; and
4. Current practice but, in the event that parties cannot agree on amendments to the charges, provide a binding process other than Federal Energy Regulatory Commission to resolve the dispute among the parties.

The impacts of the Element 15 options are discussed on Table 4–22.

Table 4–22. IMPACTS, ELEMENT 15: SERVICE CHARGE PROCESS

Option	Environmental	Hydro Power System	Financial	Contractual
1: Current	No impact.	No impact.	Parties may reopen charge determination every five years; this provision somewhat balances rate stability and the need for adjustments to reflect changing costs. If disputes require dispute resolution by FERC, parties incur associated costs.	Acceptable; current situation. Can be difficult to resolve without FERC intervention as all parties must agree.
2: No Changes	No impact.	No impact.	No opportunity to adjust charges to changing conditions; may be disincentive to coordinate.	Probably not acceptable because it fails to account for changing conditions; possibly not equitable over time.
3: More Frequent Amend-ments	No impact.	No impact.	More equitable distribution of impacts due to more frequent evaluation of what constitutes equitable charges.	Might be acceptable but possibly cumbersome and time–consuming if parties cannot agree.
4: Binding Dispute Resolution	No impact.	No impact.	Parties gain opportunity to resolve disputes regionally instead of at FERC; otherwise, similar to Option 1.	Possibly more acceptable than Option 1; keeps coordination decisions within the region.

ELEMENT 16: INTERCHANGE ENERGY PRICING

DESCRIPTION OF ELEMENT

Interchange energy pricing provides compensation when regular interchange energy is not recalled by the delivering party.

APPLICABLE SECRETARY'S PRINCIPLE

(k) Equitable charges will be made for capacity, energy, transmission, storage, and other services.

GOAL

The delivering party, in the context of overall coordination entitlements and obligations, will be equitably compensated for providing interchange energy services.

CURRENT TREATMENT

The delivering party declares the price for regular interchange energy according to current procedures. Until very recently hydro interchange energy was set at a fixed price that was lower than the thermal price. Thermal interchange energy was based upon its incremental cost, plus an adder. The parties recently negotiated a single price for interchange that is awaiting approval by the Federal Energy Regulatory Commission.[1] For the purpose of this analysis, "current practice" refers to the original contract practice. Deliveries and returns of interchange energy are designed to balance over the critical period. If the system refills prior to the end of the critical period (which is usually the case), and not all of the delivered energy has been recalled, the delivering party is entitled to be paid for that energy.

OPTIONS

1. Current practice (separate hydro and thermal interchange prices); and
2. Single Price;
   a. Low price;
   b. Market price; or
   c. High price (significantly above market).

The impacts of the Element 16 options are discussed on Table 4–23.

[1] FERC has jurisdiction over the investor–owned utilities that are party to the agreement and must approve all charges assessed by those parties.

Table 4–23. IMPACTS, ELEMENT 16: INTERCHANGE ENERGY PRICING

Option	Environmental	Hydro Power System	Financial	Contractual
1: Current	No readily identifiable impacts to streamflows and reservoir levels. When hydro interchange energy is available it can be used to reduce operation of nonrenewable resources. To realize this benefit, the timing but not the overall amount of the draft may be redistributed depending on whether or not parties exercise their entitlements and obligations.	Promotes use of hydro resources as long as the hydro interchange energy price is below market.	Region generally benefits through more efficient operation of parties' resources, although parties disagree about equity of transactions. Some think hydro–only parties are at a disadvantage––as first exporters, they seldom receive market value but if they need to import, higher–priced thermal is usually the only available interchange.	Concept acceptable; interchange energy transactions frequently occur although parties have different views about equity of applicable charges and rules; resolution of differences can be negotiated among parties.
2a: Single Low Price 2b: Single Market Price 2c: Single High Price	2a. Encourages flow of interchange; changes timing but not overall amount of coordinated–project draft. Would tend to minimize impacts by displacing higher–cost thermal resources. Effects on timing are difficult to predict. 2b. Possibly higher reservoir elevations if parties buy on market instead of using interchange. 2c. Tends to lower reliance on hydro interchange, thereby raising reservoir elevations and increasing use of nonrenewables for meeting firm load.	2a and 2b. Similar to Option 1. 2c. Makes the system less efficient; could change planning practices. Parties would rely less on interchange, which might not be used except in extreme cases.	2a. Benefits are unevenly distributed to the detriment of net exporters. 2b. Equates firm resource received through interchange with market price for equivalent of replacement firm resources. 2c. Negative impact on importers who pay a penalty for use of interchange energy.	2a. Not acceptable to some parties. 2b. Possibly acceptable to the parties. 2c. Not acceptable to some parties.

See notes on next page.

Table 4–23. IMPACTS, ELEMENT 16: INTERCHANGE ENERGY PRICING – CONT

Note: Environmental, financial, and hydro power impacts occur only if the parties rights to interchange energy are exercised.

Note, financial impacts: Impacts are similar for the Federal system and the region. Impacts for non–Federal parties are generally similar; however, because of non–PNCA contracts, some parties cannot shift their firm resource capability, thus increasing their exposure to both duration and level of interchange energy export and vulnerability to negative financial impacts.

Note, hydro power system impacts: Federal system and non–Federal party impacts are similar to the regional impacts shown in the table.

ELEMENT 17: HEADWATER BENEFITS PAYMENT

DESCRIPTION OF ELEMENT

Payment for the benefits gained by downstream parties entitled to the coordinated storage releases from upstream reservoirs in the United States.

APPLICABLE SECRETARY'S PRINCIPLE

(h) Equitable compensation shall be provided by non–Federal parties which benefit from reservoirs in the United States. Consistent with applicable laws, the Government will allow equitable credits or offsets for benefits received by the United States from non–Federal reservoirs.

GOAL SERVED BY HEADWATER BENEFITS PAYMENT

Establishes a method for computing headwater benefits gained from the coordinated operation of a unique multi–owner hydro system and the payments to be made for these benefits.

CURRENT TREATMENT OF HEADWATER BENEFITS

The method of computing headwater benefits and payments for these benefits was developed in conjunction with the Coordination Agreement. The method, unique in the United States, has been accepted by FERC for use in the Columbia River Basin.

The computed benefits are a function of the gain in critical period energy and average annual usable energy. The payment to each headwater reservoir is a function of the downstream benefit and the cost of the headwater storage facilities. The value of the benefit received from each storage project is limited for the term of the agreement. The payments for the Federal reservoirs are credited to FERC and not to BPA.

OPTIONS

1. Current practice (payment is function of energy gains);

2. Current practice modified to increase the current limits on payments; and

3. Alternative method. Without an agreement, FERC would mandate an alternative method.

The impacts of the Elements 17 options are discussed on Table 4–24.

Table 4–24. IMPACTS, ELEMENT 17: HEADWATER BENEFIT PAYMENTS

Option	Environmental	Hydro Power System	Financial	Contractual
1: Current	None	None	Current situation.	Acceptable.
2: Increased Limits	None	None	Increases downstream project payment(s). Some reservoir parties will get larger payments.	Acceptable.
3: FERC	None	None	Uncertain.	Uncertain.

CHAPTER 5

COMPARISON OF ALTERNATIVES

5.1 INTRODUCTION

In comparing alternatives, four kinds of impacts were considered: environmental, hydro power system, financial and contractual. The effects of each kind of impact were analyzed for the following five alternatives:

1 Expiration of Existing Contract, No Replacement (No action)

2 Contract to Maximize Regional Power Benefits

3 Extension of Existing Contract (Base Case)

4 Modified Contract Supplemented With Operating Procedures (Preferred Alternative)

5 Power Coordination Agreement to Enhance Nonpower Considerations

Alternative 1 has been chosen as the "no action" alternative. It contemplates that there would not be a replacement agreement.

Alternative 3 has been chosen as a base case for comparative purposes. As described in the following discussion, Alternative 3 is beneficial in all of the areas analyzed for impacts. This alternative accommodates all nonpower requirements identified by the project owners before any power coordination takes place. Additionally, it allows project owners to operate their projects to accommodate unplanned nonpower requirements during the course of a contract year. Alternative 3 also captures the reliability and efficiency benefits of hydro power system coordination that have occurred for the last thirty years. Financially, the contract has worked to increase efficiencies and maintain low cost reliable sources of power for the region. The contract is consistent with the Columbia River Treaty and FERC project licenses. It has proven to be an effective and acceptable means to administer the complex and difficult issues of coordination.

5.1.1 Comparative Analysis Format

This analysis is divided into one section for each of the four kinds of impacts being analyzed -- environmental, hydro power system, financial, and contractual. Each section begins with the analysis of Alternative 3 since it is the base case used for comparison. Each alternative is then discussed in general terms. The detailed comparison follows in tabular form for each kind of impact. A tabular summary concludes this chapter.

5.2 ENVIRONMENTAL IMPACTS

All alternatives implement nonpower requirements before coordinating the System for power, even if the nonpower requirements result in a loss of hydro power generation. It is anticipated that future nonpower requirements implemented at Federal projects will result from the System Operating Strategy (SOS) ultimately selected by the Federal project operators. Non-Federal project owners will continue to determine nonpower requirements at non-Federal projects. Many of these nonpower requirements are mandated by the project's FERC licenses. The System flexibility remaining after the implementation of the nonpower requirements is all that is available for power coordination. Hence, the significant environmental impacts caused by reservoir operations result from the federal SOS and nonpower requirements at non-Federal projects -- not from a power coordination agreement.

Any potential residual impacts from power coordination have been described by the work group as physical changes to the reservoir system including (1) impacts to power production requiring the use of existing nonrenewable resources and the need to

develop replacement nonrenewable resources and (2) impacts to reservoir levels and flows during different times of the year. For analytical purposes, the group concluded that the use of nonrenewable resources would have negative environmental consequences (e.g., resource extraction and air quality). The group did not draw any conclusions about whether impacts to reservoir levels or flows would be positive or negative to other uses (for example fish and wildlife). The reviewer can use the other technical appendices of the SOR to determine the effect on specific uses.

For example, suppose the reviewer is interested in the potential impacts on anadromous fish resulting from shifting as an element of Alternative 3. The first step would be to review the discussion of potential flow impacts from the physical impacts discussion of environmental impacts associated with shifting under Element 5a in Chapter 4. It should be noted that there is a potential reduction in spring and summer flows when shifting occurs. One would then turn to the EIS Technical Appendix on Anadromous Fish to assess the impacts on anadromous fish.

The potential cumulative impacts of a coordination agreement were considered to be insignificant and is extremely difficult to assess with any certainty. This is because the operation of both Federal and non–Federal projects is determined by the project's operating strategy, multiple–use requirements, applicable laws, regulations, and license requirements. Furthermore, the majority of the alternatives (including the Preferred Alternative) allows a reservoir party to operate its project in any manner desired irrespective of power coordination. Thus, impacts will vary depending upon the operational decisions made by the project owners for both nonpower and power uses. (For example, refer to Exhibit B to compare actual operations at certain projects versus PNCA "planned" operations.) The cumulative impacts on Federal projects will never be outside of the range of impacts seen in the analyses of the selected strategy because of a power coordination agreement. Similarly, the cumulative impacts on non–Federal projects will never be outside of the range of impacts found acceptable by the non–Federal project owners, many of whom are subject to their own environmental reviews of reservoir operation decisions.

To compare the environmental impacts of the alternatives, several evaluation criteria were used. Reliability for Environment refers to the certainty of being able to accommodate operations for nonpower uses. Flexibility for Environment refers to the ability to accommodate changes in planned operations for nonpower uses. Efficiency, Reliability, and Flexibility for Power refer to the environmental impacts attributable to an alternative's effects on power production including the amount of power generated by a given amount of water (efficiency), the certainty of producing planned resource capability (reliability), and the ability to modify the level of production to match changing needs (flexibility). All these translate into environmental impacts if they result in a need to acquire or operate nonrenewable replacement resources.

5.2.1 Alternative 3: Extension of Existing Contract (Base Case)

Under Alternative 3 (Base Case) nonpower uses have priority over power uses. Project owners decide how their projects are to operate during a contract year for nonpower purposes and submit these operational requirements (such as fish flow requirements at Vernita Bar) into the coordinated planning process. It is only after these nonpower requirements are accommodated that power coordination takes place. Project owners are also free to implement nonpower requirements that occur on an ad hoc basis during the course of the operating year.

5.2.2 Alternative 1: Expiration of Existing Contract, No Replacement (No action)

Under this alternative, there is no power coordination. Overall, this alternative has negative impacts on the environment because of reduced reliability, efficiency and flexibility for both nonpower and power purposes; and increased acquisition and use of nonrenewable resources.

5.2.3 Alternative 2: Contract to Maximize Regional Power Benefits

The main feature of this alternative is the central pooling concept. This alternative has potential to enhance benefits for both nonpower and power purposes because of increased reliability, efficiency, and flexibility.

5.2.4 Alternative 4: Modified Contract Supplemented With Operating Procedures (Preferred Alternative)

This alternative represents potential modifications to the existing contract to deal with issues that have arisen over the existence of the contract. Its environmental impacts are similar to those of the base case. Some representatives of fishery interests believe that requiring an implementing party to stand the cost of an ad hoc nonpower requirement is a disincentive to accepting the requirement. Current parties do not believe this is so. However, if there is such a disincentive, it is minimized in this alternative which involves cost–sharing among the affected parties.

5.2.5 Alternative 5: Power Coordination Agreement to Enhance Nonpower Considerations

This alternative should be beneficial to the environment because it sensitizes regional power planning and operations primarily to nonpower concerns. This alternative assumes that all power production will be a result of an operation for nonpower uses. However, environmental benefits could be reduced to the extent that the emphasis on nonpower uses increases the need to acquire and/or operate nonrenewable resources. Some representatives of fishery interests believe that requiring an implementing party to stand the cost of an ad hoc nonpower requirement is a disincentive to accepting the requirement. Current parties do not believe this would be so. However, if there is such a disincentive, it is minimized by this alternative, which involves cost–sharing among the affected parties.

5.2.6 Cumulative Environmental Impacts

NEPA requires that the cumulative impacts of a proposed action and all other foreseeable activity be identified and considered in an environmental impact statement. As discussed throughout this technical appendix the impacts are a function of reservoir operations resulting from the operating strategy selected, not from power coordination. The individual and cumulative impacts have been considered as part of the SOS analyses. The physical or environmental impacts of a coordination agreement are de minimis and fall within the impacts resulting from a system operating strategy. Thus as currently structured none of the PNCA alternatives have significant unconsidered or additional physical impacts, either individually or cumulatively.

5.2.7 Comparison of Environmental Impacts

The comparison of the environmental impacts of the alternatives follows on Table 5–1:

Table 5–1. ENVIRONMENTAL IMPACTS

Environmental Impact	PNCA Alt. 3: Extension of Existing Contract (Base Case)	PNCA Alt 1: Expiration of Existing Contract, No Replacement (No action)	PNCA Alt. 2: Contract to Maximize Regional Power Benefits	PNCA Alt. 4: Modified Contract Supplemented with Operating Procedures (Preferred)	PNCA Alt. 5: Power Coordination Agreement to Enhance Nonpower Considerations
Physical	The range of flow and elevation regimes would be set by the SOS for Federal projects. Within these ranges, shifting, shaping, flexibility adjustments, and provisional draft could result in somewhat higher fall and winter flows from storage and run–of–river projects, accompanied by lower storage reservoir elevations. There would probably be consequent reductions in spring and summer flows and storage reservoir levels.	Similar to the Base Case to the extent the Federal operating agencies operated to produce the same power benefits associated with current practices of shifting, shaping, flexibility adjustments, and provisional draft.	Similar to the Base Case.	Similar to Base Case.	Elimination of shifting, shaping, flexibility adjustments, and provisional draft would tend to store more water in the fall and winter with consequent reductions in flows. Actual impacts would be driven by the focus of the nonpower operation (e.g., an anadromous fish focus would have different impacts than a resident fish focus).
Environmental Reliability	Provides for environmental reliability. Power operations are consistent with identified nonpower needs as nonpower requirements are accommodated prior to power operations.	Due to its size and diversity, the Federal system would likely not lose reliability, but the non–Federal parties would, to the extent they lose access to assured storage releases from projects owned and operated by other parties. Loss of assured storage releases could mean that some NPRs would be more difficult to meet and others could be less likely to be met.	Potentially an improvement from the base case as a central authority has access to a Coordinated System to satisfy planned nonpower requirements more reliably.	Similar to Base Case.	Should improve reliability over the Base Case. Restrictions on the generation of secondary energy should make more water available for nonpower needs. Adding nonpower interests as parties should increase opportunities to plan for coordinated multiple–purpose operations. However, since parties without resources could submit NPRs, there could be conflicting nonpower demands on limited resources, thus reducing reliability to meet those demands.

Table 5–1 ENVIRONMENTAL IMPACTS– CONT

Environmental Impact	PNCA Alt. 3: Extension of Existing Contract (Base Case)	PNCA Alt 1: Expiration of Existing Contract, No Replacement (No action)	PNCA Alt. 2: Contract to Maximize Regional Power Benefits	PNCA Alt. 4: Modified Contract Supplemented with Operating Procedures (Preferred)	PNCA Alt. 5: Power Coordination Agreement to Enhance Nonpower Considerations
Environmental Flexibility	Provides the parties the flexibility to accommodate changing nonpower needs as evidenced by adaptations throughout the history of the existing contract.	Due to its size and diversity, the Federal system would likely not suffer a loss of flexibility. However, many non–Federal parties could lose the flexibility available to them through coordination. This flexibility is used for both nonpower, and power purposes. For example, contract entitlements, such as storage, may allow non–Federal parties to reshape their resources to accommodate a nonpower requirement.	With a central authority, the ability to respond to changing conditions is enhanced slightly, thus improving flexibility for the environment.	Similar to Base Case.	Slight improvement over the Base Case and about the same as Alternative 2. Assuming that a central authority would be best for nonpower considerations, this alternative enhances the systems ability to respond to changing conditions assuming parties could agree to NPRs.
Power Efficiency	Enhance the efficient use of power facilities and minimize the need for nonrenewable resources.	The Coordinated System would lose the efficiencies gained through coordination. This loss, which would be more pronounced for non–Federal systems, might increase the acquisition or operation of nonrenewable resources.	Provides the greatest hydro resource capability, the highest degree of efficiency, and the least dependence on nonrenewable resources.	Similar to Base Case.	Efficiency for power would be degraded. Increasing the use of water for nonpower needs will correspondingly increase the need to acquire or operate nonrenewable resources.

Table 5–1 ENVIRONMENTAL IMPACTS– CONT

Environmental Impact	PNCA Alt. 3: Extension of Existing Contract (Base Case)	PNCA Alt 1: Expiration of Existing Contract, No Replacement (No action)	PNCA Alt. 2: Contract to Maximize Regional Power Benefits	PNCA Alt. 4: Modified Contract Supplemented with Operating Procedures (Preferred)	PNCA Alt. 5: Power Coordination Agreement to Enhance Nonpower Considerations
Power Reliability	Parties identify nonpower needs in planning and use their own resources and assured storage releases to optimize their power capability within the nonpower requirements. This minimizes reliance on nonrenewable resources.	Little impact expected to federal system. To the extent assured storage releases are lost, non–Federal parties would lose reliability. To meet their firm power requirements, some may acquire or more frequently use nonrenewable resources. A potential loss of coordinated storage could also affect reliability. Parties are currently able to store surplus generation in other parties' reservoirs for later use. Without storage provisions, this potential storage — and future reliable generation — would both be lost.	Firm hydro resource capability could often developed irrespective of implementation of ad hoc nonpower requirements, possibly enhancing reliability for power and thereby lessening the use or development of nonrenewable resources. This alternative would be the most reliable for power.	Impacts resulting from the adoption of ad hoc nonpower requirements are shared to the extent there is hydro resource capability available to cover the power impacts resulting from the ad hoc requirement. If hydro system flexibility is available, it can reduce the need to acquire or use nonrenewable resources.	Reliability will be less than under Alternatives 2, 3 and 4 to the extent increased use of water for nonpower purposes will necessitate the acquisition or use of nonrenewable resources.
Power Flexibility	Parties have flexibility to adjust their planned capability to meet actual needs which reduces the use of nonrenewable resources.	The loss of coordination would not significantly change the amount of flexibility available to the Federal system. However, many non–Federal parties could lose flexibility achieved through the current contract. To maintain the same level of flexibility, nonrenewable replacement resources might ultimately be needed.	A central authority would be more responsive to changing power conditions because of access to more resources. This increased flexibility would decrease the region's need to use or develop nonrenewable resources.	Similar to Base Case.	Increased use of flexibility for nonpower needs and, consequently, less flexibility for power (compared to all other alternatives) which would result in a greater need to acquire or use nonrenewable resources.

5.3 HYDRO POWER SYSTEM IMPACTS

Hydro power system impacts refer to the effects on the hydro system's ability to reliably and efficiently produce power. Reliability refers to maintaining a level of certainty in producing planned capability from the hydro system. Efficiency refers to the cost of producing power and involves producing the greatest amount of generation from a given amount of water. Flexibility refers to the system's ability to respond to changing conditions that affect power operations. Ability to Implement considers the technical feasibility of an alternative, including the ability of the parties to conduct the necessary studies to plan and operate the system.

5.3.1 Alternative 3: Extension of Existing Contract (Base Case)

Alternative 3 is generally beneficial. It offers the opportunity to optimize power generation as if the system were owned and operated by a single entity.

5.3.2 Alternative 1: Expiration of Existing Contract, No Replacement (No action)

Alternative 1 lacks most of the hydro power benefits of coordination.

5.3.3 Alternative 2: Contract to Maximize Regional Power Benefits

Alternative 2 offers the opportunity for even greater regional power benefits than the base case and should have generally beneficial results for hydro power system reliability, efficiency and flexibility.

5.3.4 Alternative 4: Modified Contract Supplemented with Operating Procedures (Preferred Alternative)

All factors of this alternative are similar to the base case.

5.3.5 Alternative 5: Power Coordination Agreement to Enhance Nonpower Considerations

This alternative should be about the same as Alternatives 2, 3 and 4 with respect to the certainty of producing firm resource capability. Given the fact that the number of parties who can submit nonpower requirements is expanded beyond project owners, it is probable that there will be more requirements resulting in less firm resource capability available for power purposes and less efficient production of that capability. This alternative is not as favorable as the other alternatives with respect to the production of secondary resource capability that can be used strictly for power purposes.

5.3.6 Comparison of the Hydro Power System Impacts

The comparison of the hydro power system impacts follows:

Table 5–2. HYDRO POWER SYSTEM IMPACTS

Hydro Power System Impact	PNCA Alt. 3: Extension of Existing Contract (Base Case)	PNCA Alt 1: Expiration of Existing Contract, No Replacement (No action)	PNCA Alt. 2: Contract to Maximize Regional Power Benefits	PNCA Alt. 4: Modified Contract Supplemented with Operating Procedures (Preferred)	PNCA Alt. 5: Power Coordination Agreement to Enhance Nonpower Considerations
Reliability	Currently, diverse systems' resources are coordinated to maintain a certain level of reliability. Coordinated System resources support individual party needs.	Because of the size of the Federal system, its reliability should not be substantially affected. However, non–Federal parties could lose reliability because of the loss of assured storage releases and/or the loss of information as to how projects would be operated.	Positive because a central authority, with immediate access to all pooled resources, could plan and operate them for maximum reliability.	Potentially reduced as, in some instances, the firm hydro resource capability of the Coordinated System can be reduced during the operating year to cover unplanned nonpower requirements.	Nearly the same as Alternatives 2, 3 and 4 with respect to certainty of producing firm resource capability, although possibly less than the base case. Should be better than under Alternative 1.
Efficiency	Efficiency comes from coordinating diverse systems and maximizing generation as if all the systems were owned by one entity.	An overall loss of efficiency that would be more pronounced in the non–Federal system. Total hydro power generation in the region would be reduced.	More efficient than the base case as a central authority would have immediate access to all pooled resources and could plan and operate them for maximum efficiency.	Similar to Base Case.	Less than Alternatives 2, 3 and 4 as nonpower considerations could outweigh the efficient, cost–effective production of power. Better than Alternative 1, especially for non–Federal parties, as there would still be coordination for power purposes.
Flexibility	Flexibility comes from coordinating diverse systems and maximizing generation as if the system were owned by one party.	Most non–Federal parties would lose a great deal, but the loss on the Federal system is not expected to be large. The ability to respond in a coordinated fashion would also be lost.	Greater than the Base Case because of the ability of a central authority to immediately access all pooled resources.	Better than the Base Case because Coordinated System flexibility, if available, could be dedicated to maintain parties' entitlements and obligations to produce planned resource capability if unplanned nonpower requirements are implemented.	Much less for power purposes than Alternatives 2, 3 and 4 as flexibility currently available for power purposes could be redirected for nonpower uses.

Table 5–2 HYDRO POWER SYSTEM IMPACTS– CONT

Hydro Power System Impact	PNCA Alt. 3: Extension of Existing Contract (Base Case)	PNCA Alt 1: Expiration of Existing Contract, No Replacement (No action)	PNCA Alt. 2: Contract to Maximize Regional Power Benefits	PNCA Alt. 4: Modified Contract Supplemented with Operating Procedures (Preferred)	PNCA Alt. 5: Power Coordination Agreement to Enhance Nonpower Considerations
Ability to Implement	Proven to be technically feasible. The addition of annual Operating Procedures throughout the history of the contract enhances its adaptability to changing conditions.	Not applicable.	Central authority for planning and operation should make implementation easier than under Alternatives 3, 4 or 5.	Similar to Base Case.	Probably similar to the base case, although it could be more difficult to implement because of the increased potential for gridlocked conflicts among nonpower uses.

5.4 FINANCIAL IMPACTS

One of the major incentives for coordination is financial – an overall reduction in power production costs. Financial impacts encompass the alternative's costs of maintaining the reliability, efficiency and flexibility of the hydro system. Reliability refers to the cost of maintaining the same level of certainty of producing one's planned resource capability. Efficiency refers to maintaining the ability to develop resource capability on a least–cost basis. Flexibility refers to the financial impacts of adapting to changing conditions while maintaining a certain level of reliability.

5.4.1 Alternative 3: Extension of Existing Contract (Base Case)

Under Alternative 3 the region has enjoyed a high standard of reliable power at a relatively low cost.

5.4.2 Alternative 1: Expiration of Existing Contract, No Replacement (No action)

In the absence of coordination the Federal system could incur some financial risk because of the United States' obligations to return energy and capacity to Canada under the Columbia River Treaty. There are at least two ways this could happen: (1) the amount of return obligation assumes coordination of U.S. power generation at energy and capacity levels not achieved in an uncoordinated operation, and (2) there is a possibility (the merits of which are disputed) that in the absence of a coordination agreement, the non–Federal parties would not have to share in the return obligation. (Currently the non–Federal parties contribute to the return.) Apart from Columbia River Treaty issues, Alternative 1 would negatively affect the parties, particularly the non–Federal parties, due to losses in reliability, flexibility and efficiency.

5.4.3 Alternative 2: Contract to Maximize Regional Power Benefits

Compared to all other alternatives, this one best reduces the regional costs of producing power.

5.4.4 Alternative 4: Modified Contract Supplemented with Operating Procedures (Preferred Alternative)

This alternative is similar to Alternative 3.

5.4.5 Alternative 5: Power Coordination Agreement to Enhance Nonpower Considerations

This alternative will most likely be the most expensive for meeting the region's power needs because nonpower considerations sometimes adversely affect the economics of power production.

5.4.6 Cumulative Financial Impacts

NEPA requires that the cumulative impacts of a proposed action and all other foreseeable activity be identified and considered in an environmental impact statement. As discussed throughout this technical appendix the impacts are a function of reservoir operations resulting from the operating strategy selected, not from power coordination. The individual and cumulative impacts have been considered as part of the SOS analyses. The financial or economic impacts of a coordination agreement are de minimis and fall within the impacts resulting from a system operating strategy. Thus as currently structured none of the PNCA alternatives would have significant unconsidered or additional economic impacts, either individually or cumulatively.

5.4.7 Comparison of Financial Impacts

The comparison of the financial impacts of the alternatives follows:

Table 5–3. FINANCIAL IMPACTS

Financial Impact	PNCA Alt. 3: Extension of Existing Contract (Base Case)	PNCA Alt 1: Expiration of Existing Contract, No Replacement (No action)	PNCA Alt. 2: Contract to Maximize Regional Power Benefits	PNCA Alt. 4: Modified Contract Supplemented with Operating Procedures (Preferred)	PNCA Alt. 5: Power Coordination Agreement to Enhance Nonpower Considerations
Reliability	The region has enjoyed a high standard of reliable power at a relatively low cost. For example, major cost reductions are achieved by pooling forced outage reserve requirements.	Costs would be greater, mostly for acquiring resources to maintain the current level of reliability. Most significant cost would fall on the non–Federal parties, as the Federal system is large enough to achieve almost the same level of reliability.	Operations through a single entity would maintain the current level at a lower cost than under Alternative 3.	Some parties might incur additional costs; however, overall, the cost of maintaining the existing standard should be unchanged from the base case.	More costly than the other alternatives because it is anticipated that the firm capability of the system could be reduced, both on a planned and unplanned basis, and the acquisition or use of higher cost nonrenewable resources would become necessary to serve the same amount of load.
Efficiency	Provides a high level of efficiency that lessens the region's cost of operating and acquiring nonrenewable resources.	More expensive than the base case given the loss in overall efficiencies currently achieved through coordination. More pronounced for non–Federal parties. Size of the Federal system allows it to operate efficiently in the absence of coordination.	Better than the other alternatives as single entity should lower costs.	Same as Base Case.	The most costly alternative; nonpower concerns could reduce the efficient operation of the hydro system which in turn would require the acquisition or use of higher cost nonrenewable resources.
Flexibility	Coordination increases the power system's ability to accommodate both planned and unplanned conditions (for example, load variations and fishery needs); reducing reliance on relatively expensive existing nonrenewable resources as well as the need for costly additional nonrenewable resources.	Adverse for non–Federal parties, which would increase their cost of doing business. The Federal system might gain slightly to the extent that it captures flexibility currently dedicated to coordination which can provide market opportunities; however, any such gains might be offset by the loss of benefits currently received through coordination (including the non–Federal contribution to the return of the Canadian entitlement).	Lower power costs than the other alternatives.	Same as the Base Case overall; however, the use of the existing hydro system flexibility to cover unplanned nonpower requirements, while of short–term financial benefit, poses long–term financial risks.	More costly than the other alternatives.

5.5 CONTRACTUAL IMPACTS

Contractual impacts include several considerations. Ability to Implement refers to the ease or difficulty of administering the contract. Legal refers to the alternative's consistency with statutory authorities and FERC licenses. Columbia River Treaty refers to the alternative's consistency with the Columbia River Treaty. Autonomy deals with parties' ability to control and be accountable for the operations of their own projects. Finally, given that this is a contract requiring the consent of the parties, Acceptability refers to the willingness of parties to enter into the arrangements contemplated in the alternatives.

5.5.1 Alternative 3: Extension of Existing Contract (Base Case)

This alternative is beneficial with respect to all of the evaluation criteria.

5.5.2 Alternative 1: Expiration of Existing Contract, No Replacement (No action)

Although this is the no-action alternative, contractual considerations have some relevance. Most importantly, legal considerations such as the Treaty and Federal legislation might require or encourage some form of coordination. Therefore, it is unlikely that this alternative would be acceptable to all the parties.

5.5.3 Alternative 2: Contract To Maximize Regional Power Benefits

This alternative appears to have the best overall regional power benefits, but the greatest obstacle to achieving those benefits is contractual impacts due to loss of autonomy.

5.5.4 Alternative 4: Modified Contract Supplemented with Operating Procedures (Preferred Alternative)

Contractually, this alternative is very similar to the Base Case.

5.5.5 Alternative 5: Power Coordination Agreement To Enhance Nonpower Considerations

This alternative differs from the others in that it is more nonpower driven. Given that (1) nonpower requirements are already accommodated prior to any consideration of power concerns, and (2) this alternative could result in little, if any, flexibility for power purposes, it is doubtful that this agreement would be acceptable to the majority of the parties.

5.5.6 Comparison of Contractual Impacts

The comparison of the contractual impacts of the alternatives follows:

Table 5–4. CONTRACTUAL IMPACTS

Contractual Impact	PNCA Alt. 3: Extension of Existing Contract (Base Case)	PNCA Alt 1: Expiration of Existing Contract, No Replacement (No action)	PNCA Alt. 2: Contract to Maximize Regional Power Benefits	PNCA Alt. 4: Modified Contract Supplemented with Operating Procedures (Preferred)	PNCA Alt. 5: Power Coordination Agreement to Enhance Nonpower Considerations
Ability to Implement	Proven implementable for almost 30 years, although most parties believe the Operating Procedures were necessary to implement portions of the contract.	Not applicable.	Might require statutory amendments (especially for Federal projects) or FERC license modifications, which may be difficult to obtain. Once in place, would be easier to implement than the Base Case.	Similar to the Base Case.	Should be equal to the Base Case, with the possible exception of planning and operational gridlock resulting from competing nonpower requirements.
Legal	Provisions are within statutory authorities and FERC licenses.	Probably neutral for many legal requirements; however, some elements of the current contract might continue. (For example, Federal law may require some form of coordination in exchange for FERC headwater benefit payments.)	Might require statutory amendments (especially for Federal projects) and FERC license modifications to facilitate the single entity operation. These amendments/modifications may be difficult to obtain.	Similar to the Base Case.	Could require statutory or licensing amendments to facilitate single–entity operation. Amendments may also be needed if the enhancement of planning and operations for nonpower uses rather than power purposes necessitate a change in authorized or licensed project purposes. These amendments may be difficult to obtain.
Columbia River Treaty	Consistent with the Treaty.	Inconsistent with the assumption in the Treaty that there will be coordinated power planning and operations in the U.S.; possibility (the merits of which are disputed) that without a coordination agreement, the non–Federal parties would not have to contribute to the return of the Canadian entitlement.	For planning purposes, same as the Base Case. For operating purposes, probably an improvement as the system more nearly resembles a one–owner system.	Similar to the Base Case.	Unlikely that the power benefits of the Treaty would be realized, however, U.S. parties would still be obligated to return full benefits to Canada.

Table 5–4 CONTRACTUAL IMPACTS – CONT

Contractual Impact	PNCA Alt. 3: Extension of Existing Contract (Base Case)	PNCA Alt 1: Expiration of Existing Contract, No Replacement (No action)	PNCA Alt. 2: Contract to Maximize Regional Power Benefits	PNCA Alt. 4: Modified Contract Supplemented with Operating Procedures (Preferred)	PNCA Alt. 5: Power Coordination Agreement to Enhance Nonpower Considerations
Autonomy	Provides an acceptable level.	Provides for the highest level.	Parties would lose significantly to the single entity.	Similar to the Base Case.	Negative impacts as operational control is vested in a single entity.
Acceptability	Acceptable to the parties in 1964 and presumably is still acceptable.	Unlikely that most parties would choose to give up coordination, probably not acceptable.	Not acceptable, primarily because of the loss of autonomy.	More acceptable to some parties as it potentially resolves some long–standing concerns in the Base Case such as interchange energy pricing and headwater payment limits.	Negative for the reasons set out in the general comments as well as loss of autonomy.

5.6 SUMMARY OF IMPACTS

The following table simplifies the comparison of the environmental, hydro power system, financial, and contractual impacts of the five alternatives:

Table 5–5. SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

EVALUATION CRITERIA	PNCA ALT 3: EXTENSION OF EXISTING CONTRACT (BASE CASE)	PNCA ALT 1: EXPIRATION OF EXISTING CONTRACT, NO REPLACEMENT (NO ACTION)	PNCA ALT 2: CONTRACT TO MAXIMIZE REGIONAL POWER BENEFITS	PNCA ALT 4: MODIFIED CONTRACT SUPPLEMENTED WITH OPERATING PROCEDURES (PREFERRED)	PNCA ALT 5: POWER COORDINATION AGREEMENT TO ENHANCE NONPOWER CONSIDERA-TIONS
Environmental					
Physical	4	4	4	4	5
Reliability	4	F = 3, N = 1	5	4	5
Flexibility	3	F = 3, N = 1	4 or 5	4	3
Power Efficiency	4	F = 3, N = 2	5	4	3
Power Reliability	4	F = 4, N = 2	5	3	3
Power Flexibility	4	F = 4, N = 2	5	4	1
Hydro Power System					
Reliability	4	F = 4, N = 1	5	3 or 4	3
Efficiency	4	F = 3, N = 2	5	4	3
Flexibility	4	F = 3, N = 1	5	4	1 or 2
Ability to Implement	3	N/A	4	3	2 or 3
Financial					
Reliability	4	F = 3, N = 2	5	4	2
Efficiency	4	F = 3, N = 2	5	4	2
Flexibility	4	F = 4, N = 2	5	4	2
Contractual					
Ability to Implement	4	N/A	3	4	3
Legal	4	2	2	4	2
Columbia River Treaty	4	1	5	4	2
Autonomy	4	5	1	4	1
Acceptability	4	2	1	3	1

F = Federal, N = Non–Federal; 1 = Poor, 2 = Fair, 3 = Satisfactory, 4 = Good, 5 = Excellent

5.7 PREFERRED ALTERNATIVE

The Corps, Reclamation, and Bonneville have selected PNCA Alternative 4 as the preferred alternative for a power coordination agreement. This alternative reflects the tentative understandings reached to date between current contract parties during the negotiating sessions that began in 1989. The majority of concerns raised by the reviewers and other outside groups were well known to the action agencies prior to the commencement of the negotiations. The positions taken by the federal agencies and tentative agreements reached reflect many of these concerns.

The Preferred Alternative is very similar to the existing contract although there is some degradation to the reliability of developing planned resource capability. The cause of this degradation is the decision of the federal action agencies to further clarify the protection of nonpower uses. The PNCA Preferred Alternative is a significant improvement for power coordination compared to the no-action alternative of no coordination agreement after the current contract expires in 2003 (PNCA Alternative 1).

The analysis concluded that none of the PNCA alternatives result in significant impacts. This is because all of the PNCA alternatives analyzed must accommodate reservoir party decisions for multiple-use operation. Those operational decisions (i.e., the SOS) result in the actual environmental impacts. To the extent there are any impacts resulting from power coordination itself, they fall within the impacts found acceptable by a reservoir owner when it selects its operating strategy and makes its operating decisions. Thus all of the PNCA Alternatives are environmentally preferred in the meaning of the CEQ guidelines.

For the SOR action agencies the keystone of the Federal system multiple-use operation is the Preferred Alternative for a System Operating Strategy. That SOS is currently being implemented effectively in actual operations with the existing PNCA (PNCA Alternative 3). The PNCA Preferred Alternative will also effectively accommodate the SOS Preferred Alternative. Further, if any operating flexibility remains after implementing the SOS, the Preferred Alternative represents an improvement over the Base Case with respect to some contract provisions that some environmental groups have considered contrary to SOS objectives. The concerns are discussed in the following paragraphs.

The parties in the PNCA Preferred Alternative are those currently party to the agreement. However, nothing would preclude an additional entity from seeking to become a party.

The Preferred Alternative encourages reservoir parties to incorporate known nonpower requirements into the PNCA planning process. The Corps and Reclamation are committed to incorporating multiple use requirements into PNCA planning including those from the March 1995 Biological Opinion recommendations that are part of the 1995 Biological Opinion. The SOS Preferred Alternative is derived from that opinion. If adopted, it will effectively move the PNCA studies toward Option 4 of Element 5 wherein power production is incidental to nonpower requirements.

The Preferred Alternative prudently retains critical water planning as a tool to determine planned firm hydro resource capability. Hydropower resources are a significant portion of the resource base of Northwest utilities, and those utilities need to know with certainty what hydro capability will be generated in a given year. This does not preclude consideration or use of other techniques by the parties outside of PNCA coordination, such as actual operations or short-term operational planning.

Shifting will be more limited in the PNCA Preferred Alternative than in the current contract although shifting is allowed to the extent the shifting does not violate or negatively impact nonpower uses.

The Preferred Alternative adopts the current practice of determining secondary hydro resource planning criteria. This will continue to provide Northwest utilities with opportunity to reduce costs of producing energy while maintaining the nonpower operation of the SOS. If adopted the SOS Preferred Alternative will effectively move the actual ability to produce secondary capability to that of Option 2 of

Element 6 wherein all secondary capability is a result of operation for nonpower uses.

Parties will continue to use Interchange Energy as a mechanism to facilitate power coordination. The distinction between hydro and nonhydro interchange energy will be eliminated to relieve some of the concerns of the all–hydro systems that were addressed by Option 3 of Element 8.

The current practice of adjustments to firm hydro resource capability (flexibility adjustments) will be limited. Flexibility adjustments will only be allowed to the extent that it can be demonstrated that the hydro system can accommodate nonpower requirements and return reservoirs to the levels they would have been absent the flexibility adjustment.

The Preferred Alternative will offer increased storage service, which could facilitate increased storage of energy in the system and provide more water for use in meeting future power and nonpower demands.

The Preferred Alternative offers improved Treatment of Unplanned Nonpower Requirements (Option 2) which facilitates use of hydro system flexibility to distribute costs of implementing unplanned nonpower operations.

Interchange energy pricing in the Preferred Alternative will be a single price which approximates market value. This could result in less use of stored water to meet interchange energy entitlements and obligations as parties may opt to purchase energy on the market rather than drafting stored water.

CHAPTER 6

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CHAPTER 7

GLOSSARY

Acre–foot: The volume of water that will cover an acre to a depth of one foot. It equals 1,233.5 m^3.

Actual Energy Capability (AEC): Each PNCA party's generating capability based on operating the coordinated system's reservoirs to the energy content curve or to proportional draft points.

Actual Energy Regulation (AER): Hydro regulation study used to determine each party's Actual Energy Capability.

Assured refill curve (ARC): A representation of the lowest drawdown level from which a reservoir could refill given a repetition of the third–lowest runoff year of record.

Average megawatt (aMW): The average amount of energy (in megawatts) supplied or demanded over a specified period of time; equivalent to the energy produced by the continuous operation of one megawatt of capacity over the specified period.

Canadian Entitlement: Canada's share of hydro–power generated at downstream projects by the use of the Columbia River Treaty projects.

Canadian Entitlement Allocation Agreements: Contracts that specify how much power is to be provided by five mid–Columbia projects as a result of increased flows made possible by the Columbia River Treaty projects.

Capacity: The maximum sustainable amount of power that can be produced by a generating resource at specified times under specified conditions or carried by a transmission facility; also, the maximum rate at which power can be saved by a nongenerating resource.

Columbia River Treaty: U.S.–Canadian agreement for bilateral development and management of the Columbia River to achieve flood control and increased power production.

Columbia Storage Power Exchange (CSPE): A non–profit corporation of 11 Northwest utilities that issued revenue bonds to purchase the Canadian Entitlement and sell it to 41 Northwest utilities through a Bonneville Power Administration exchange agreement.

Composite Reservoir: A PNCA operational procedure that simplifies in–lieu energy transactions by treating Federal upstream reservoirs as one reservoir located at Grand Coulee and assuming the same flow time between these upstream reservoirs and the mid–Columbia projects.

Coordinated operation: The operation of interconnected electrical systems to achieve greater reliability and economy; as applied to hydro resources, the operation of a group of hydro plants to obtain optimal power benefits.

Critical period: That portion of the historical 50–year streamflow record which, when combined with the drafting of all storage reservoirs from full to empty, would produce the least amount of energy shaped to seasonal load patterns.

Critical rule curves (CRC): Graphic or tabular representations of reservoir storage water levels under critical streamflow conditions at various times of the year during all years of a critical period.

Critical water: Streamflows that occurred during the critical period.

Cubic feet per second (cfs): A measurement of water flow representing one cubic foot of water moving past a given point in one second. One cfs is equal to 7.48 gallons per second and 0.028 m^3 per second.

Demand: The rate at which electric energy is delivered to or by a system; usually expressed in kilowatts or megawatts over a designated period of time.

Draft: Release of water from a storage reservoir, usually measured in feet of reservoir elevation.

Drawdown: The distance the water surface of a reservoir is lowered from a given elevation as a result of withdrawing water.

Energy: Average power production over a stated interval of time, expressed in kilowatt–hours, megawatt–hours, average kilowatts, or average megawatts.

Energy content curve (ECC): Graphic or tabular representation of the month–end elevations at each storage reservoir which defines certain rights and obligations under the Agreement.

Firm energy load carrying capability (FELCC): The amount of firm energy that the region's hydroelectric system, an individual system or project can be called on to produce during actual operations from all firm resources.

Firm energy: Energy that is guaranteed to be available given a recurrence of the region's worst historical streamflows.

Flood control rule curve (FCRC): A curve, or group of curves, indicating reservoir elevation or drawdown required to control floods.

Flow: The volume of water passing a given point in a given period of time.

Forced outage: An unforeseen outage that results from emergency conditions.

Forced outage reserves: Peak generating capability planned to be available to serve peak loads during forced outages of generating units.

Generation: Production of electric energy from other forms of energy; also refers to amount of electric energy produced.

Headwater benefits: Gains in usable downstream energy as a result of upstream storage.

Historical streamflow record: The unregulated streamflow data base of the 50 years beginning in July 1928; data are modified to adjust for factors such as irrigation depletions and evaporations for the particular operating year being studied.

Hydroelectric: The kind of electric power produced by the force of falling water.

In–lieu energy: Energy provided by a reservoir owner instead of water to which a downstream party is entitled.

Interchange energy: Electric energy received by one utility from another, usually in exchange for energy to be delivered to the other system at another time or place.

Load: The amount of electric power delivered or required at a given point on a system.

Megawatt–hour (MWh): A unit of electrical energy equal to one megawatt of power applied for one hour.

Mainstem: A principal river or channel, as opposed to its tributaries.

Megawatt (MW): A unit of electric power equal to one million watts, or one thousand kilowatts.

Mid–Columbia: The Columbia River from the Canadian border to its junction with the Snake River.

Nonfirm energy: Energy that is not guaranteed; energy that is available when water conditions are better than those in the critical period and not required for refill.

Nonpower requirements (NPRs): Operating requirements at hydroelectric projects that pertain to navigation, flood control, recreation, irrigation, fish and wildlife, and other nonpower uses of the river.

Operating requirements: Guidelines and limits that must be followed in operating a reservoir or generating project; they may originate in legislation, physical limitations, agreements and other sources.

Operating rule curve: A curve, or group of curves, indicating how a reservoir is to be operated under specific conditions and for specific purposes.

Operating procedure: Alternative method substituted for a provision in the PNCA contract by agreement of parties, clarification of the contract, or method for carrying out a procedure.

Operating year: The 12–month period from August 1 through July 31.

Outage: In a power system, the state of a component (such as a generating unit, transmission line, etc.) when it is not available to perform its function due to some event directly associated with the component.

Outflow: The volume of water per unit of time discharged at a hydroelectric project.

Pacific Northwest Coordination Agreement (PNCA): An agreement among owners of hydro generating plants that coordinates the release of stored water and other procedures for obtaining optimum usable energy.

Peak load: The maximum electrical demand in a stated period of time.

Proportional draft: Drafting all reservoirs in the same proportion to meet form loads.

Proportional draft point (PDP): Reservoir elevation that guides operations whenever drafting to the ECC will not produce FELCC; all reservoirs PDPs are the same proportional distance between the critical rule curves unless restricted by NPRs.

Provisional energy: Energy produced by drafting below the ECC or PDP and delivered under contracts which provide for the return of the energy to the delivering utility under certain conditions. Provisional energy is called Advance Energy in contracts between BPA and its direct service industrial customers.

Refill: The annual process of filling a reservoir; also the point at which the hydro system is considered full from the seasonal snowmelt runoff.

Reliability: Generally, the ability of an item to perform a required function under stated conditions for a stated period of time.

Mathematically, the probability that a device will function without failure over a specified time period or amount of use.

In a power system, reliability is a measure of the ability of the system to continue operation while some lines or generators are out of service. Reliability deals with the performance of a system under stress.

For a relay or a relay system, reliability is a measure of the degree of certainty that the relay or relay system will perform correctly. Note that reliability denotes certainty of correct operation together with assurance against incorrect operation from all extraneous causes.

Reregulation: Storing erratic discharges of water from an upstream hydroelectric plant and releasing them uniformly from a downstream storage plant.

Reregulating reservoir: A reservoir located downstream from a hydroelectric peaking plant having sufficient pondage to store the widely fluctuating discharges from the peaking plant and release them in a relatively uniform manner downstream.

Reservoir elevation: The level of water stored behind a dam.

Reservoir storage: The volume of water in a reservoir.

Restoration: Adjustments that permit all PNCA projects to carry the same firm energy load with as without Canadian Treaty storage; projects losing load–carrying capability are restored by projects gaining capability.

Rule curves: Graphic representations of water levels; used to guide reservoir operations.

Run–of–river dams: Hydroelectric projects that use available streamflow and a relatively small amount of short–term storage as opposed to storage projects, which have sufficient storage space to carry water from one season to another.

Secondary energy: Another term for nonfirm energy.

Secretary's Principles: The framework of rights and obligations that forms the basis of PNCA. The principles were formulated by the Secretary of Interior in 1961 to facilitate negotiation of the initial PNCA.

Shaping: In planning, moving surplus or deficit FELCC from one period to another period within the year.

Shifting: In planning, moving surplus or deficit FELCC from one year of the critical period to another to increase the FELCCs value.

Spill: Water that passes over a spillway without going through turbines to produce electricity.

Storage energy: The energy equivalent of water stored in a reservoir above normal bottom elevation.

Storage reservoirs: Reservoirs with space to retain water from the annual high–water season to the following low–water season.

Streamflow: The rate at which water passes a given point in a stream, usually expressed as cubic feet per second or cubic meters per second.

Thermal Resource: Electrical generating means that rely on conventional fuels such as coal, oil, and gas.

Transmission: Transporting electric energy in bulk from one point to another in the power system rather than to individual customers.

Transmission grid: An inter–connected system of electric transmission lines and associated equipment for transferring electric energy in bulk.

Variable energy content curve (VECC): The January through July portion of the energy content curve; the VECC is based on the expected spring runoff.

Water Budget: A volume of water to be reserved and released in the spring if needed to assist in the downstream migration of juvenile salmon and steelhead.

Watt: A unit of electrical power or rate of doing work. The rate of energy transfer equivalent to one ampere flowing under a pressure of one volt at unity power factor. It is analogous to horsepower or footpounds per minute of mechanical power. One horsepower is equivalent to approximately 746 watts. A kilowatt equals 1,000 watts, a megawatt equals 1,000,000 watts.

Wheeling: Using transmission facilities of one system to transmit power of and for another system.

TECHNICAL EXHIBITS
EXHIBIT A
HYDRO PROJECTS OWNED BY CURRENT PNCA PARTIES

FEDERAL STORAGE

Albeni Falls *
Anderson Ranch
Cougar
Detroit
Dworshak *
Foster
Grand Coulee *
Green Peter
Hills Creek
Hungry Horse *
John Day *
Libby *
Lookout Point
Lost Creek
Minidoka
Palisades

FEDERAL RUN-OF-RIVER

Big Cliff
Black Canyon
Boise Diversion
Chandler
Chief Joseph
Dexter
Ice Harbor
Little Goose
Lower Granite
Lower Monumental
McNary
Roza
The Dalles

NON-FEDERAL STORAGE

Alder *
Bull Run
Carmen Smith
Chelan *
Cushman 1 *
Kerr *
Lemolo Lake *
Long Lake *
Lower Baker *
Merwin *
Mossyrock *
Noxon Rapids *
Post Falls *
Priest Lake *
Ross *
Round Butte *
Sullivan Lake *
Swift 1 *
Timothy *
Upper Baker *
White River *
Yale *

NON-FEDERAL RUN-OF-RIVER

Big Fork
Boundry
Box Canyon
Boyle
Cabinet Gorge
Cedar Falls
Copco 1 and 2
Cowlitz Falls
Cushman 2
Diablo
Eagle Point
Electron
Falls Creek
Faraday
Gorge
Iron Gate
Jackson
La Grande
Leaburg
Little Falls
Mayfield
Meyers Falls
Monroe Street
Nine Mile
Naches
Naches Drop
Newhalem
Nooksack
North Fork
Oak Grove
Pelton
Pelton Reregulating
Prospect 1-4

* Coordinated

NON–FEDERAL RUN–OF–RIVER (Cont)
River Mill
Rock Island
Rocky Reach
Sullivan
Swift 2
Thompson Falls
Trail Bridge
Umpqua River Small Plants (7)
Upper Falls Walterville
Wanapum
Wells

* Coordinated

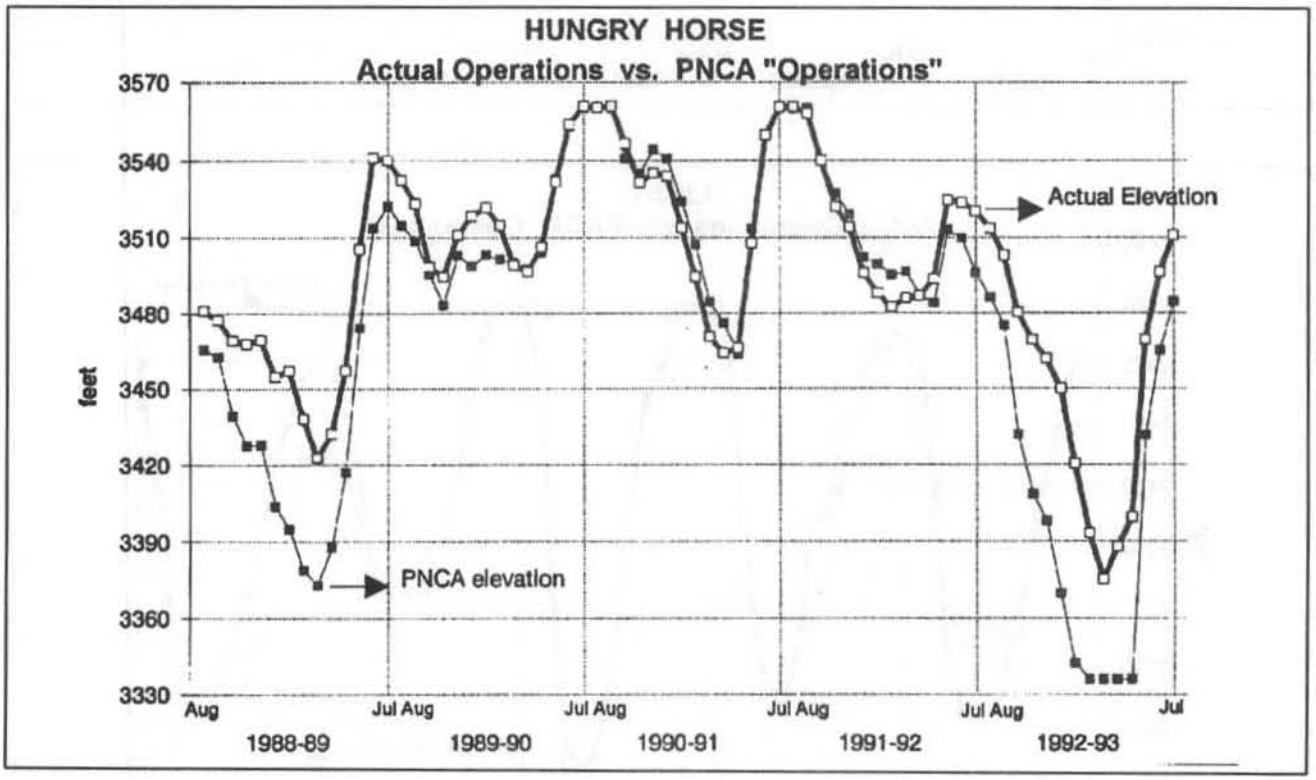
TECHNICAL EXHIBITS

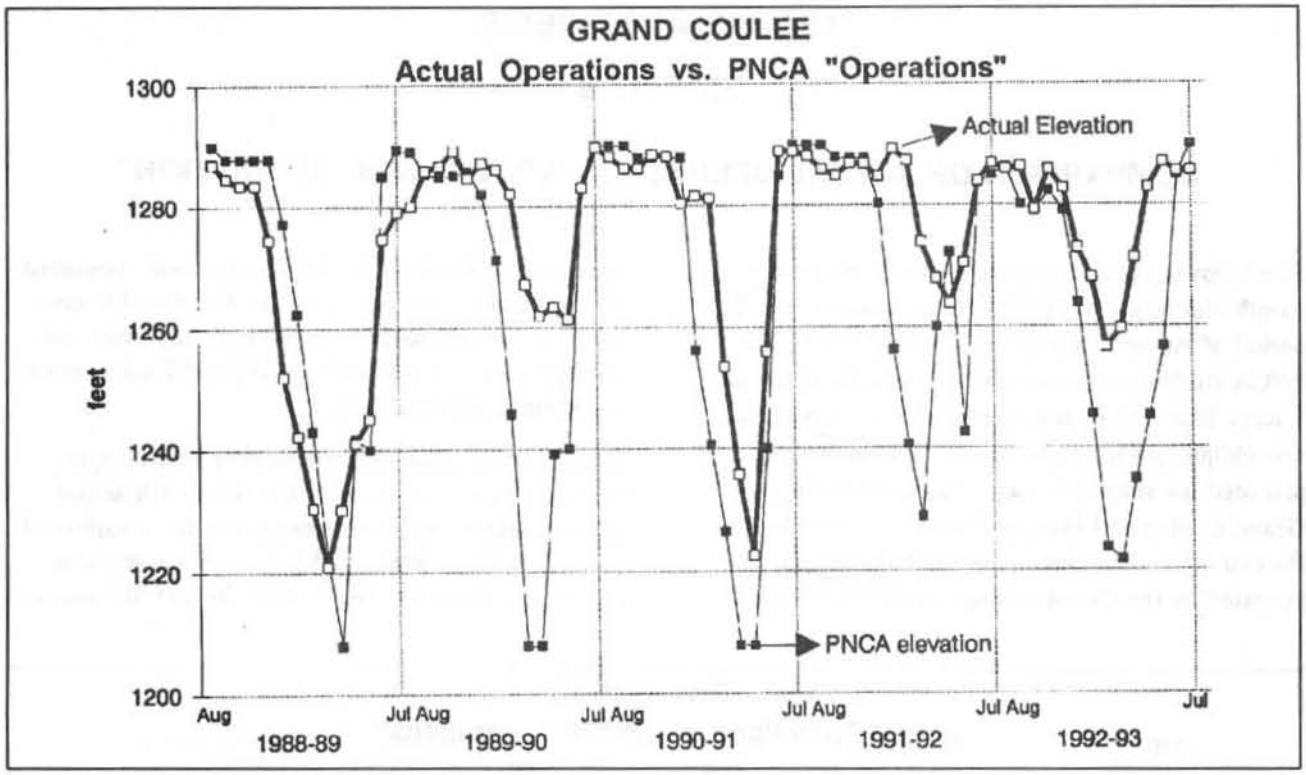
EXHIBIT B

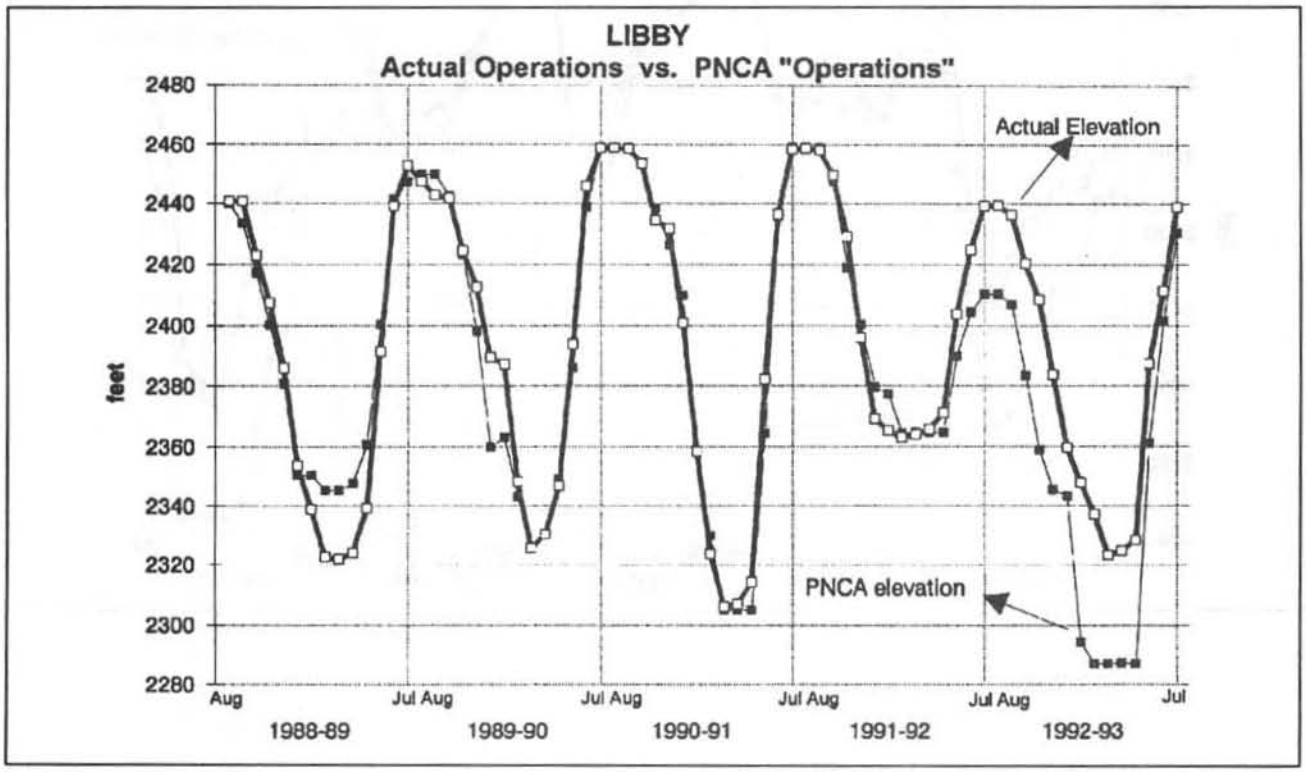
COMPARISON OF ACTUAL OPERATION VERSUS PNCA "OPERATION"

The following plots compare observed end–of–month elevations to PNCA study elevations for the period of August 1988 through July of 1993. The PNCA study elevations came from the final Actual Energy Regulations that determined PNCA rights and obligations for those years. Information is provided for several storage projects including Grand Coulee and Hungry Horse, operated by the Bureau of Reclamation; Libby and Dworshak, operated by the Corps of Engineers; Mossyrock, operated by Tacoma City Light; and Swift, operated by PacifiCorp. Also included are the monthly average flow comparisons for McNary Dam, a run–of–river project operated by the Corps of Engineers on the lower Columbia River.

This information demonstrates how PNCA rights and obligations may or may not track with actual project operations. Variations occur for a variety of reasons at the discretion of the project owners as power and nonpower needs vary through the season.




GRAND COULEE
Actual Operations vs. PNCA "Operations"
feet
1300
1280
1260
1240
1220
1200
Actual Elevation
PNCA elevation
Aug
Jul Aug
Jul Aug
Jul Aug
Jul Aug
Jul
1988-89
1989-90
1990-91
1991-92
1992-93


LIBBY
Actual Operations vs. PNCA "Operations"
feet
2480
2460
2440
2420
2400
2380
2360
2340
2320
2300
2280
Actual Elevation
PNCA elevation
Aug
Jul Aug
Jul Aug
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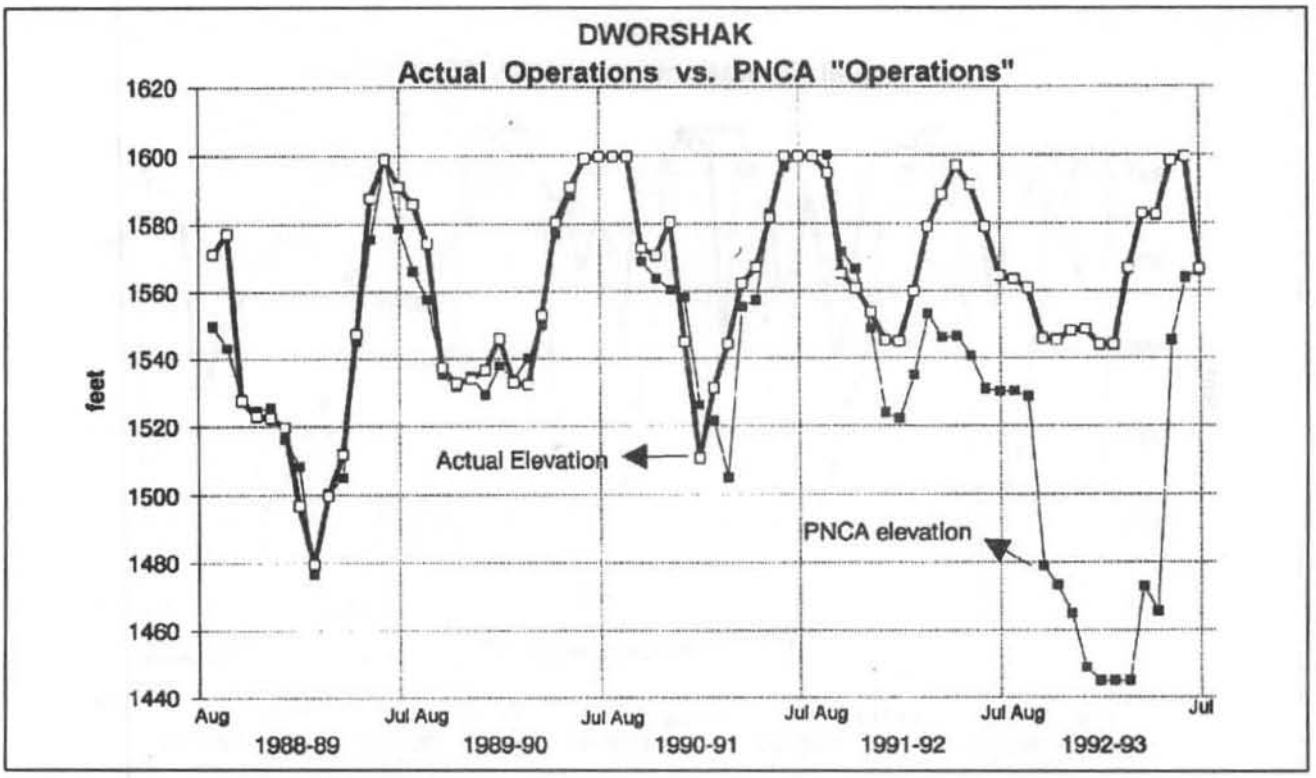
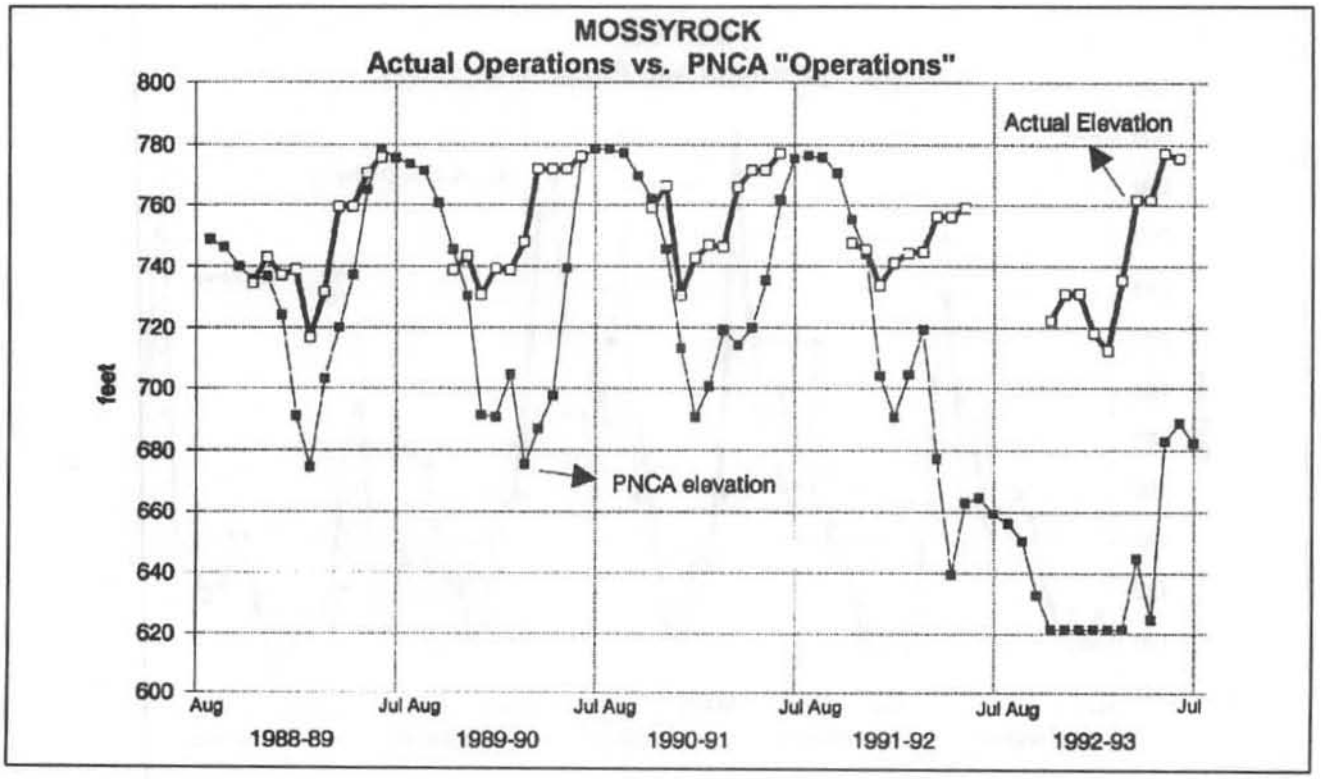
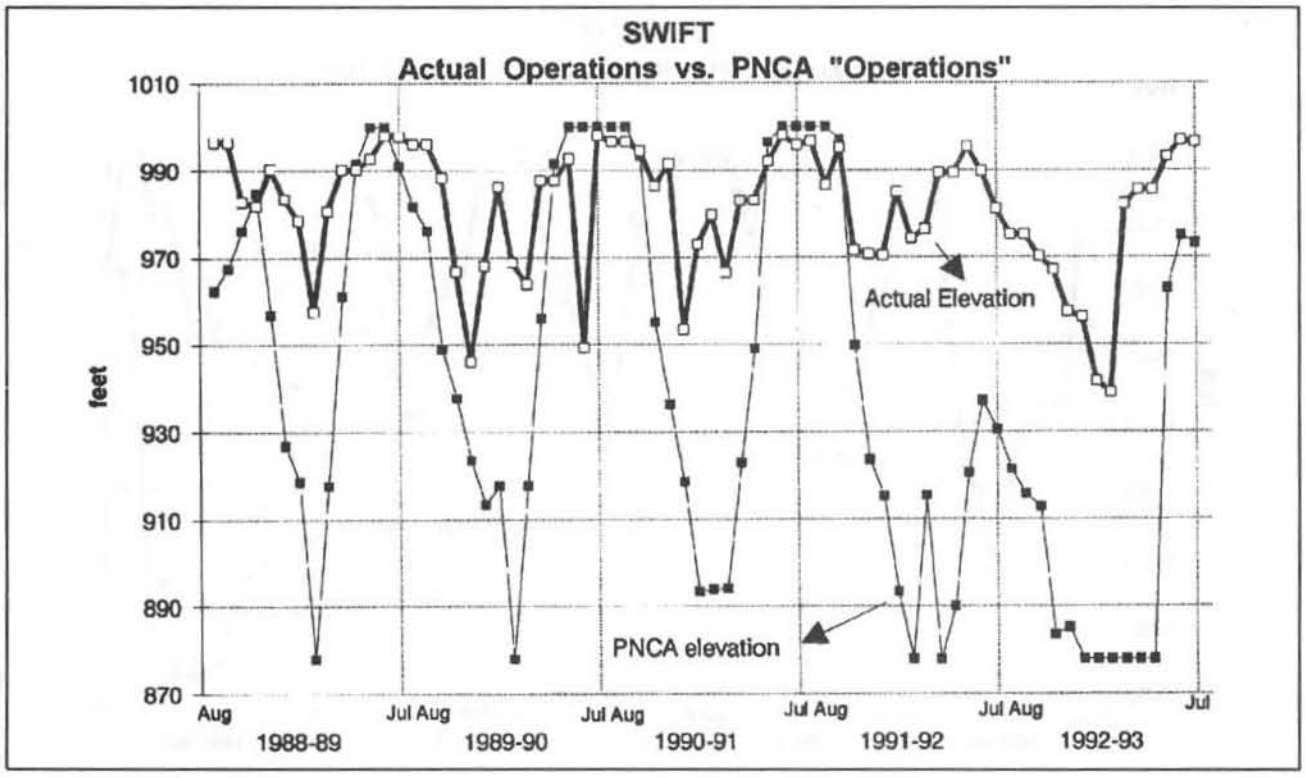
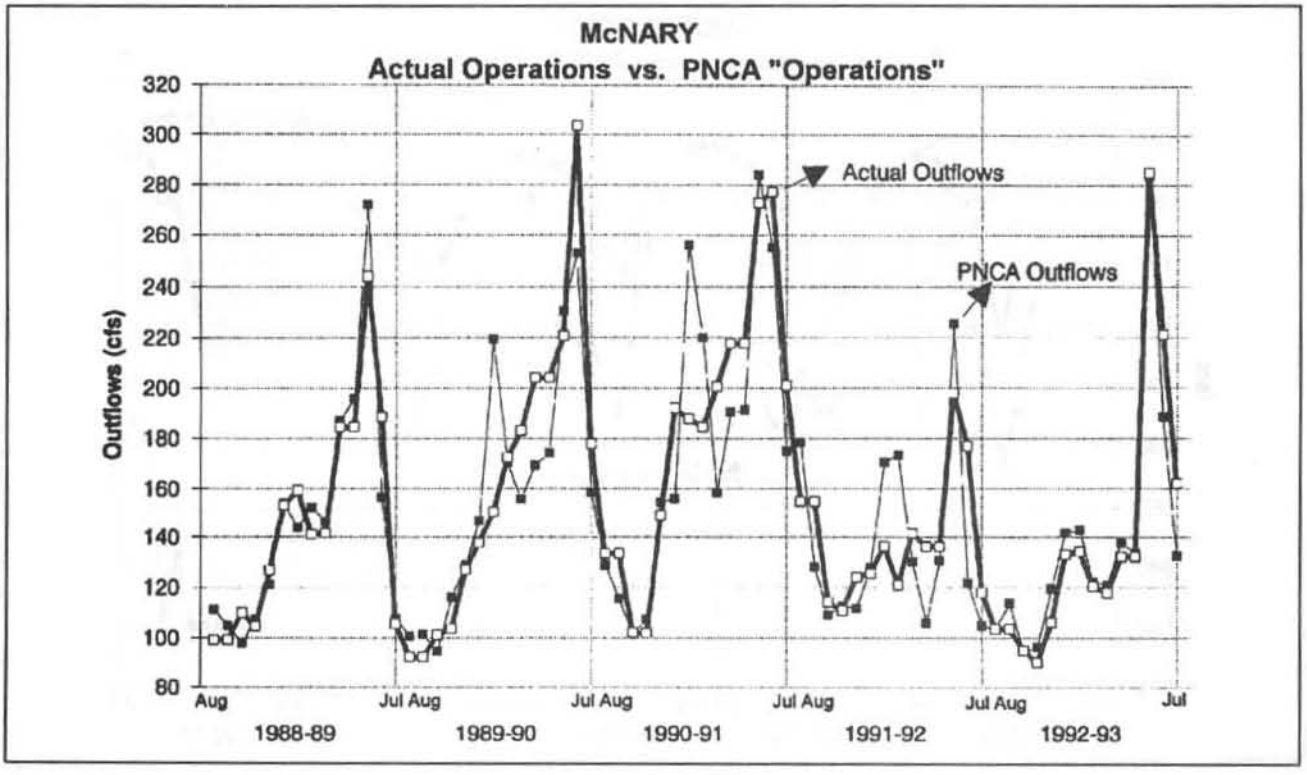
Jul Aug
Jul
1988-89
1989-90
1990-91
1991-92
1992-93


DWORSHAK
Actual Operations vs. PNCA "Operations"
feet
1620
1600
1580
1560
1540
1520
1500
1480
1460
1440
Actual Elevation
PNCA elevation
Aug
Jul Aug
Jul Aug
Jul Aug
Jul Aug
Jul
1988-89
1989-90
1990-91
1991-92
1992-93


MOSSYROCK
Actual Operations vs. PNCA "Operations"
feet
800
780
760
740
720
700
680
660
640
620
600
Actual Elevation
PNCA elevation
Aug
Jul Aug
Jul Aug
Jul Aug
Jul Aug
Jul
1988-89
1989-90
1990-91
1991-92
1992-93


SWIFT
Actual Operations vs. PNCA "Operations"
feet
1010
990
970
950
930
910
890
870
Actual Elevation
PNCA elevation
Aug
Jul Aug
Jul Aug
Jul Aug
Jul Aug
Jul
1988-89
1989-90
1990-91
1991-92
1992-93


McNARY
Actual Operations vs. PNCA "Operations"
Outflows (cfs)
320
300
280
260
240
220
200
180
160
140
120
100
80
Actual Outflows
PNCA Outflows
Aug
Jul Aug
Jul Aug
Jul Aug
Jul Aug
Jul
1988-89
1989-90
1990-91
1991-92
1992-93