METHODOLOGY FOR ESTIMATING FISH OPERATIONS COSTS

Goals:

To describe the principles, tools, and methods BPA uses for estimating the cost of hydro system operations for fish.

Timeframes:

- ✓ Retrospective**:** fish cost evaluation method.
- ✓ Prospective**:** fish cost evaluation method.

Methodology for Estimating Fish Operations Costs (Retrospective)

Retrospective fish cost evaluation method:

- In 1999, the Northwest's four governors requested the Council to issue annual reports on BPA's expenditures for fish recovery efforts. BPA provides the cost information used in the Council report.

- An agreement between BPA and the other federal agencies involved in fish recovery efforts in the Columbia Basin requires the agency to identify the total cost of the effort.

- The 1980 Northwest Power Act Section 4(h)(10)(C) provides for BPA to take a credit against its annual Treasury payment for the portion of the costs it sustains for fish measures attributable to the non-power uses of the hydro system.

Annual Process for Estimating Cost of FCRPS Operations for Fish

Process Steps:

1. Identify energy production of hydro system with, and without, fish measures using the HYDSIM monthly computer model.
   - HYDSIM routes water from the headwaters of the Columbia basin as it actually occurred through the system of dams, storing in and drafting from reservoirs to meet non-power and power requirements established by the modeler.

2. Compare monthly energy production from each study with the firm load carrying capability of the system without fish measures to quantify the system surplus and deficits for each condition.
   - The firm load carrying capability is the amount of energy that could be produced by the system today if the worst water conditions experienced in the region between 1929 and 1978 recurred. While not a guarantee, it is highly likely.

Annual Process for Estimating Cost of FCRPS Operations for Fish (continued)

Process Steps:

3. Apply the actual Dow Jones Mid-Columbia month-average spot market energy prices to the surplus and deficits.
   - This price is the average of day-average prices of all transactions of that type that occurred at that point of electrical system interconnection. It is published as a Dow Jones service and is an indicator of regional energy values.

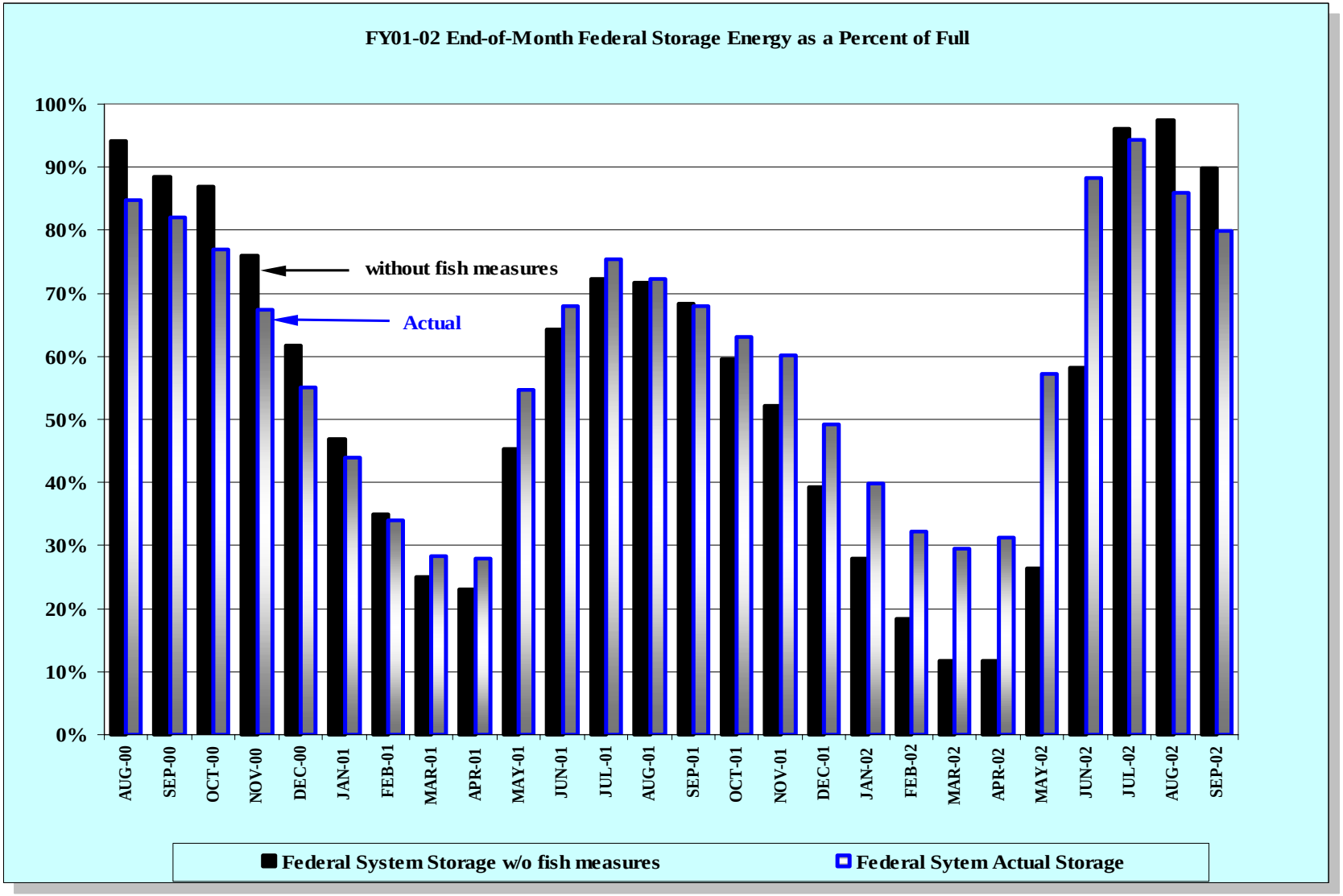
4. Net the surplus and deficits of the two studies to get the additional power purchases and foregone revenues.

Input/Output for HYDSIM Analysis of Fish Costs (Retrospective)

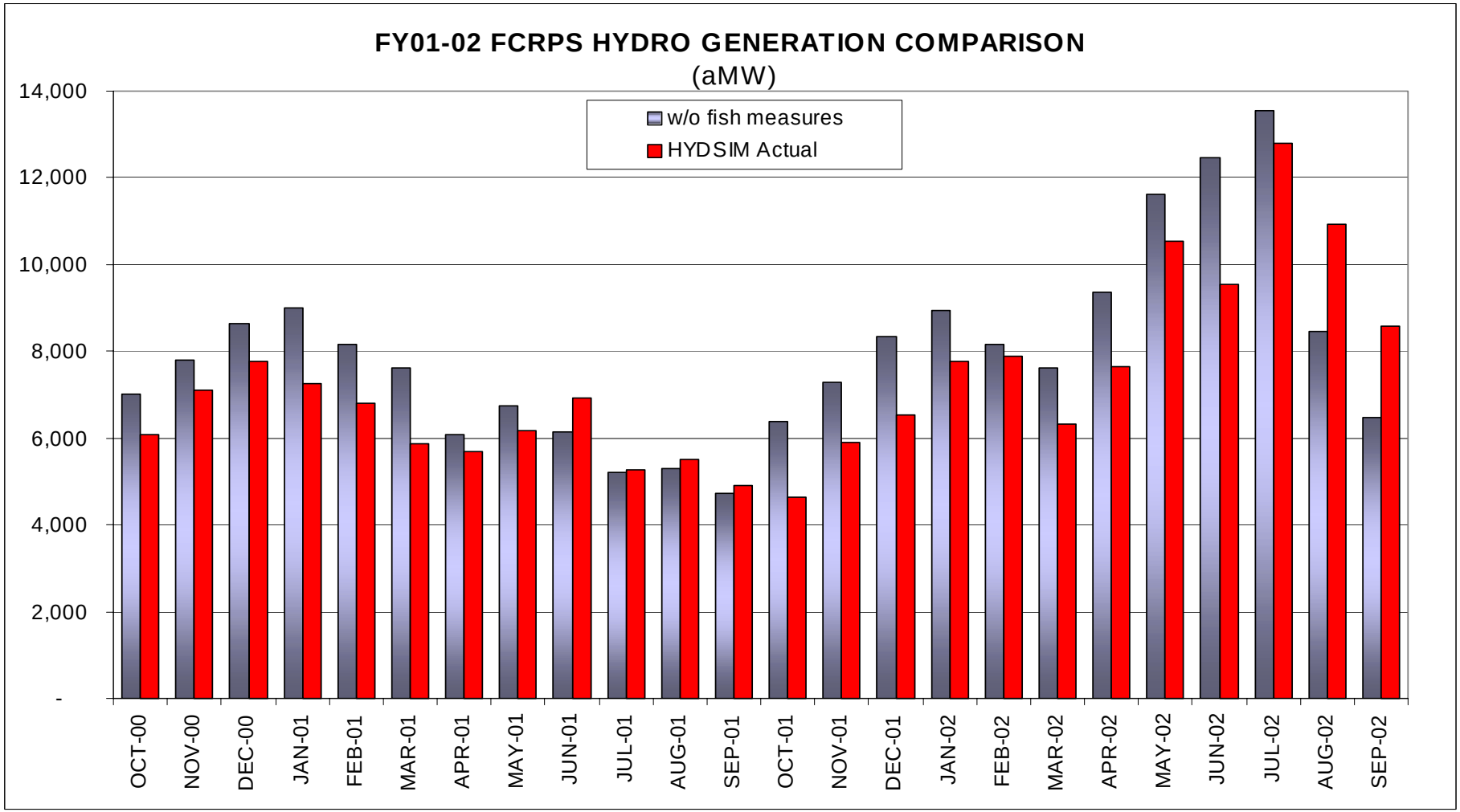
	Input for HYDSIM Analysis of Fish Costs	
	WITH Fish Measures	**WITHOUT Fish Measures**
Natural Stream Flows	Actual	Actual
Reservoir Elevations	Actual	None (allow reservoir regulation to determine)
Project Spill	Actual	None (allow reservoir regulation to determine)
Firm Load	None (this study does not attempt to meet load. It runs to pruduce the measures for fish and generation is near actual as a result of using actual reservoir elevations and project spill)	Firm energy load carrying capability of the system without fish measures

	Output from HYDSIM for Analysis of Fish Costs	
	WITH Fish Measures	**WITHOUT Fish Measures**
Project Outflows	Actual	All of these parameters are determined by the reservoir regulation developed month-by-month, using then-current information to meet load, produce energy to gain revenues, and meet nonpower requirements.
Reservoir Elevations	Actual	
Project Spill	Actual	
Project Generation	HYDSIM actual	
Surplus/Deficit	System energy produced compared to firm energy load carrying capability of the system without fish measures	

Example of Implementing the Cost Methodology

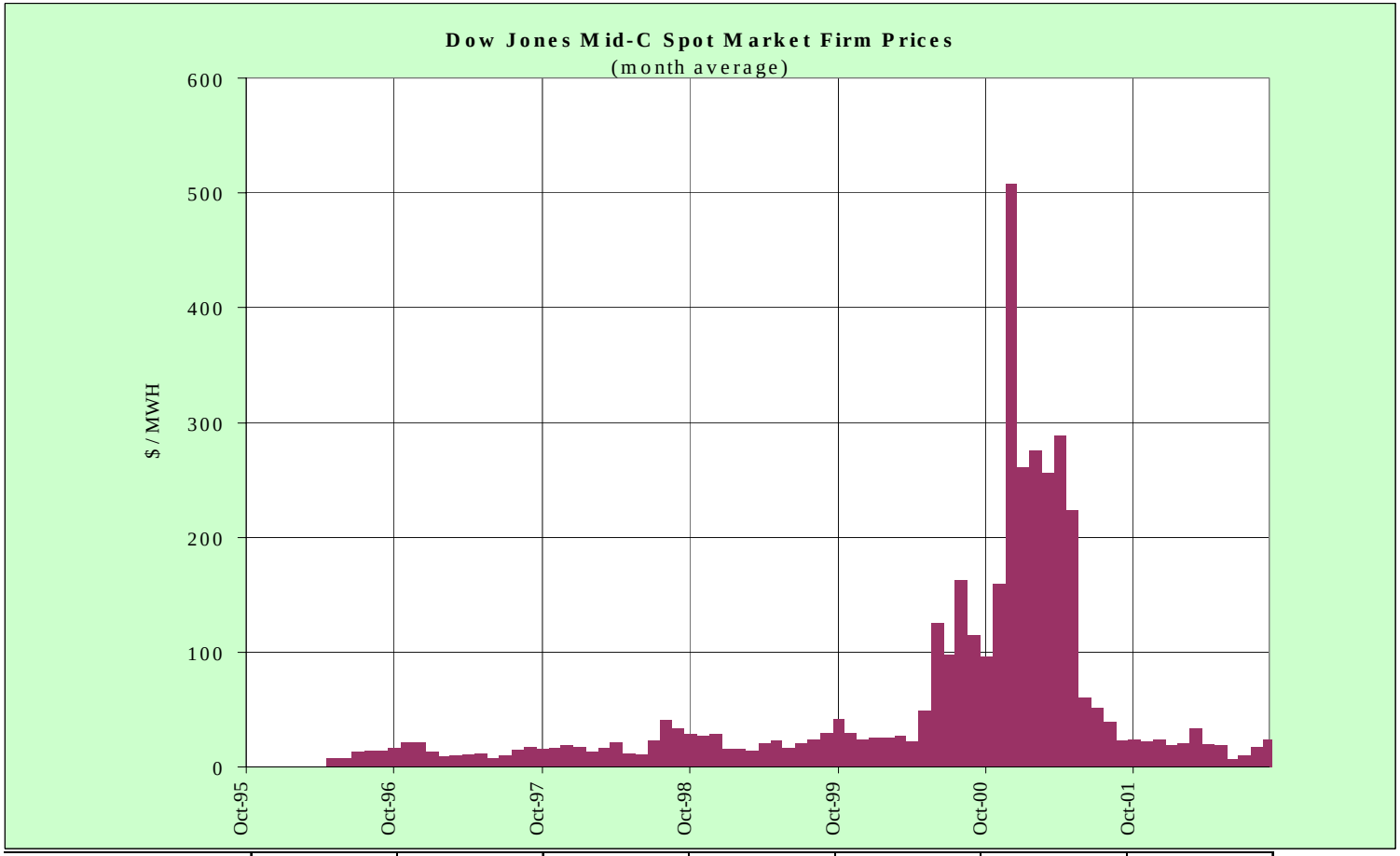


Example of Implementing the Cost Methodology (continued)



Dow Jones Price in $/MWH	96	160	508	261	275	255	289	223	61	52	39	23	24	22	24	19	20	34	19	19	7	10	17	24

Example of Implementing the Cost Methodology (continued)



Estimated Cost of Fish Operations ($millions)	FY1996 $83	FY1997 $110	FY1998 $120	FY1999 $251	FY2000 $337	FY2001 $1,505	FY2002 $160
Treasury Credit due to Fish Operations ($millions)	$5	$4	$1	$0	$27	$557	$66

Summary of Possible Outcomes:
Monthly Surplus (+) or Deficit (-) Results

Potential Outcomes:	without fish measures		with fish measures	effect on power purchases	effect on sales revenues	net effect of fish measures
1	surplus	vs.	bigger surplus	none	more	gain
2	surplus	vs.	smaller surplus	none	less	loss
3	surplus	vs.	deficit	more	less	loss
4	deficit	vs.	smaller deficit	less	none	gain
5	deficit	vs.	bigger deficit	more	none	loss
6	deficit	vs.	surplus	less	more	gain

Examples:	without fish measures	with fish measures	additional power purchases	foregone revenues	total cost of fish measures
1	200	300	0	-100	-100
2	200	100	0	100	100
3	200	-100	100	200	300
4	-200	-100	-100	0	-100
5	-200	-300	100	0	100
6	-200	100	-200	-100	-300

Methodology for Estimating Fish Operation Costs (Prospective)

Prospective fish cost evaluation method:

- Most often this type of analysis is used to assess the effects of some proposed alternative operation for fish under varying conditions of water availability (50 historical years, 1929-1978).

- The process is the same as the Retrospective process in that it compares energy production results from two scenarios (a base case vs. the alternative), using the HYDSIM computer model, and values those differences using estimated market prices of energy.

- The market prices are the product of the AURORA economic model and represent energy transactions made at the Mid-Columbia point of interconnection of transmission facilities.

Input/Output for HYDSIM Analysis of Fish Costs (Prospective)

	Input for HYDSIM Analysis of Fish Costs	
	Alternative Case Fish Measures	**Base Case Fish Measures**
Natural Stream Flows	Actual (50-year historical)	Actual (50-year historical)
Reservoir Elevations	Reservoir regulation to meet Alternative proposed	Reservoir regulation to meet Base Case requirements
Project Spill	Project spill to meet Alternative proposed	Project spill to meet Base Case requirements
Firm Load	None (this study does not attempt to meet load. It runs to produce the measures for fish such as flow targets and juvenile bypass spill).	None (this study does not attempt to meet load. It runs to produce the measures for fish such as flow targets and juvenile bypass spill).

	Output from HYDSIM for Analysis of Fish Costs	
	Alternative Case Fish Measures	**Base Case Fish Measures**
Project Outflows	All of these parameters are determined by the reservoir regulation developed month-by-month, using then-current information to meet load, produce energy to gain revenues, and meet nonpower requirements.	All of these parameters are determined by the reservoir regulation developed month-by-month, using then-current information to meet load, produce energy to gain revenues, and meet nonpower requirements.
Reservoir Elevations		
Project Spill		
Project Generation		
Surplus/Deficit		

Estimate of Summer Spill Cost
(50-Year Averages in $ millions)

	BiOp Spill Cost			
	July	Aug 1-15	Aug 16-31	Total
Ice Harbor	4	2	2	8
John Day	11	6	5	22
The Dalles	11	7	6	24
Bonneville	9	7	7	23
Total	35	21	20	77

range = $55 to $92 million

These costs were estimated using AURORA prices for FY2004 from the SNCRAC Rate Case.

SPILL CRITERIA (as modeled in HYDSIM for FY2004 SNCRAC Rate Case):

Ice Harbor	July: 50% of outflow 24 hrs/day August: 50% of outflow 24 hrs/day
John Day	July: 30% of outflow 24 hrs/day August: 30% of outflow 24 hrs/day
The Dalles	July: 40% of outflow 24 hrs/day August: 40% of outflow 24 hrs/day
Bonneville	July: 140 kcfs 12 hrs (night), 120 kcfs 12 hrs (day) August: 140 kcfs 12 hrs (night), 120 kcfs 12 hrs (day)

CONCLUSION: BPA uses a computer modeling method for estimating the cost of the operations for fish and applies consistent principles for retrospective and prospective analyses.

Potential Mitigation Actions for Reduced Summer Spill

- The savings from reduced summer spill is expected to be up to $77 million (50-year average), but must be netted against additional cost of the offset actions.

- Offset Actions:
  - Predator control actions:
    - Increased Pikeminnow bounty.
    - Select small mouth bass removal.
    - Avian predation control (e.g., cormorants, terns).
  - Hanford Reach rearing protection.
  - Habitat improvements:
    - Increased riparian habitat protections.
    - Augmented water transactions.