RECLAMATION

Managing Water in the West

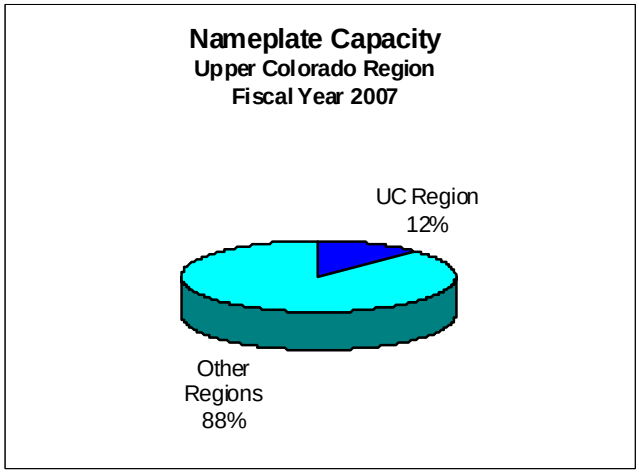
Upper Colorado Region Power Performance

For Fiscal Year 2007

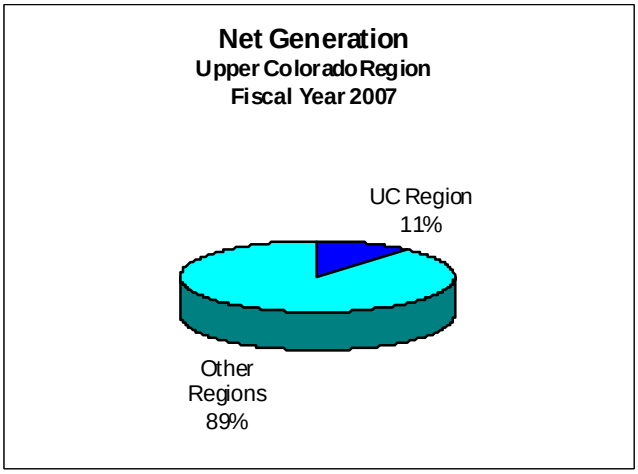
U.S. Department of the Interior
Bureau of Reclamation

Upper Colorado Regional Power Overview

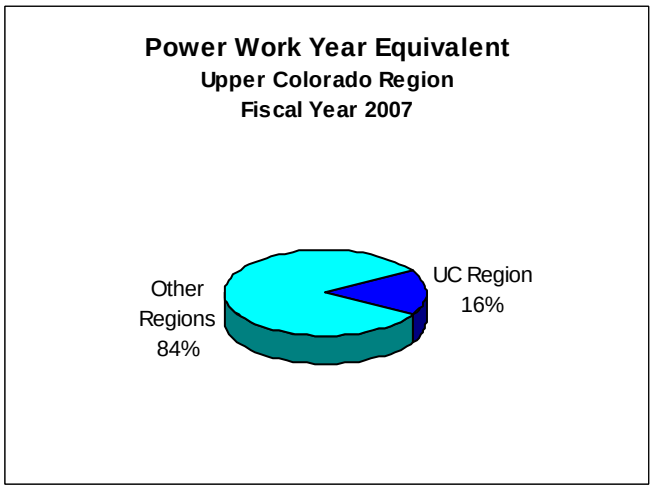
The Upper Colorado Regional Office is located in Salt Lake City, Utah. The regional office oversees and reports on the operation of 12 powerplants: Blue Mesa, Crystal, Deer Creek, Elephant Butte, Flaming Gorge, Fontenelle, Glen Canyon, Lower Molina, McPhee, Morrow Point, Towaoc, and Upper Molina.



The total capacity for this region is 1,832 megawatts, which comprises 12 percent of the Reclamation total capacity.

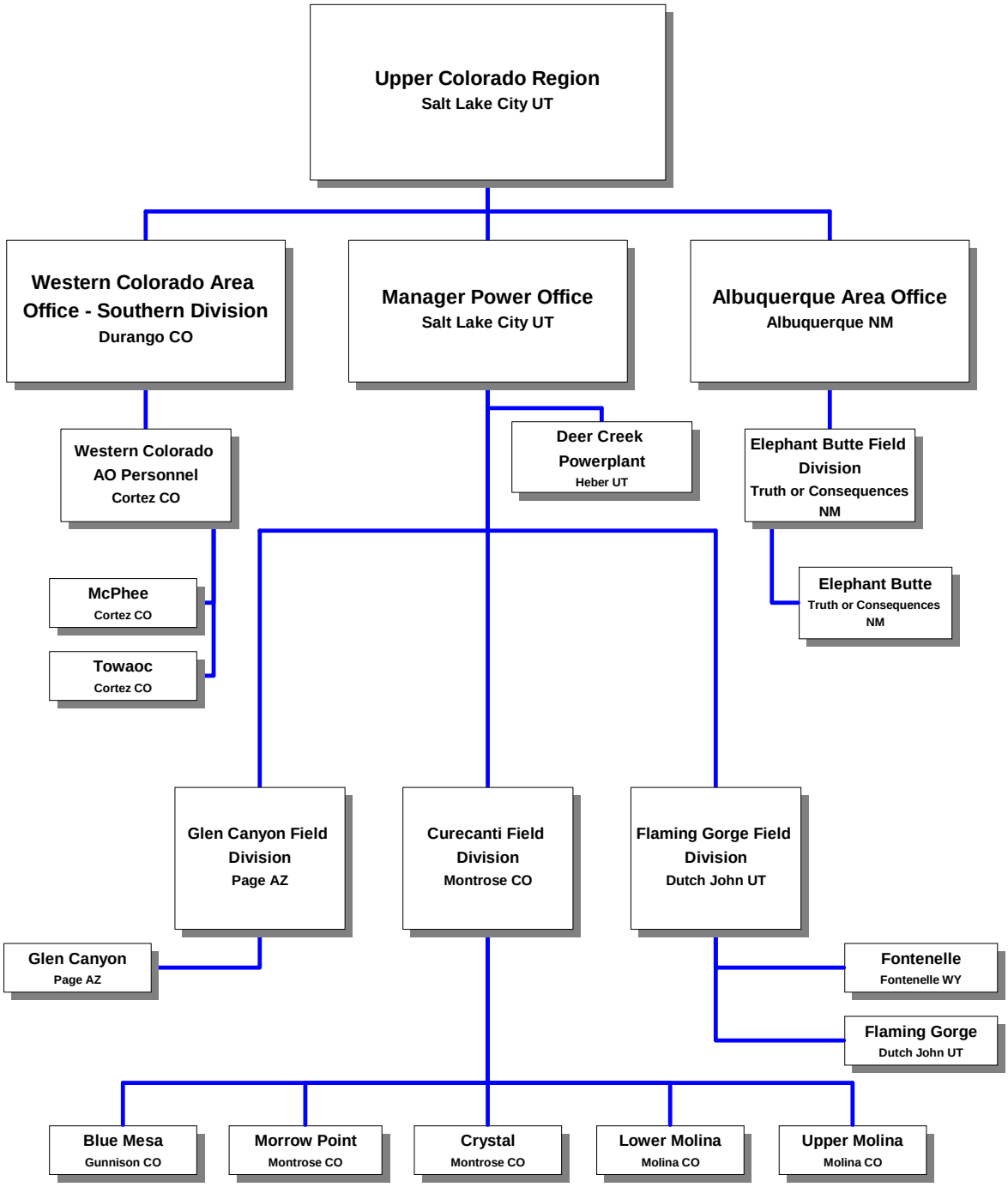


In 2007, this region produced 4,618 net gigawatt-hours. This comprises 11 percent of the total net generation for Reclamation in 2007.



In 2007, this region employed 16 percent of the full time equivalent charged to power facilities. Of the 12 facilities located in this region, 3 have no personnel on site.

Organizational structure:



This organizational structure displays the offices directly involved with the power program.

Regional Office: Bureau of Reclamation, Upper Colorado Regional Office

125 South State Street, Room 6107
Salt Lake City UT 84138-1102

Larry Walkoviak,
Regional Director, UC-100

(801) 524-3600

Power Office	Kerry McCalman, UC-600 (801) 524-3612 Max Spiker, UC-622 (801) 524-3745 Jane Blair, UC-606 (801) 524-3628
Glen Canyon Field Division:	Glen Canyon Field Division PO Box 1477 Page AZ 8604-1477 Kerry McCalman, UC-600 (801) 524-3612
Curecanti Field Division:	Curecanti Field Division 1820 S. Rio Grande Avenue Montrose CO 81401-4859 Donald Phillips, CCI-100 (970) 240-6300
Flaming Gorge Field Division:	Flaming Gorge Field Division 5595 Flaming Gorge Visitor Center Dutch John UT 84023-3224 Steve Hulet, FG-100 (435) 885-3231
Albuquerque Area Office:	Albuquerque Area Office 505 Marquette NW, Suite 1313 Albuquerque NM 87102-2162 John Poland, ALB-100 (505) 462-3542
Elephant Butte Power and Storage Division:	Elephant Butte Power and Storage Division HC30, Box 312 Truth or Consequences NM 87901-9802 James Powell, EB-600 (505) 894-6661
Western Colorado Area Office:	Western Colorado Area Office 835 East Second Avenue Southern Division PO Box 640 Durango CO 81302-0640 Brad Dodd (970) 385-6557

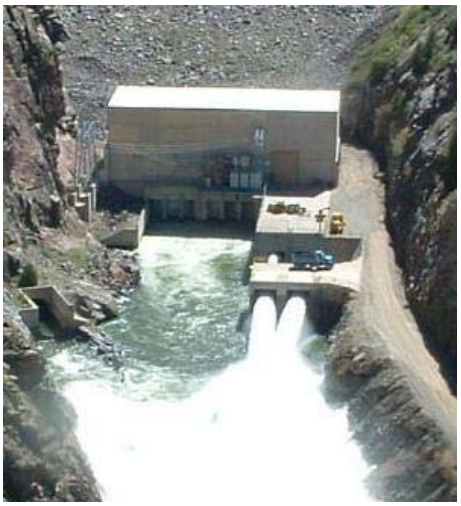
Cortez Field Office:

Bureau of Reclamation
Cortez Field Office
60 South Cactus
Cortez CO 81321

Vern Harrell
(970) 565-0865

WASHINGTON
MONTANA
OREGON
IDAHO
WYOMING
NEVADA
UTAH
COLORADO
CALIFORNIA
ARIZONA
NEW MEXICO
Fontenelle
Flaming Gorge
Deer Creek
Lower Molina
Upper Molina
Crystal
Morrow Point
Blue Mesa
Towaoc
McPhee
Glen Canyon
Elephant Butte

Blue Mesa Powerplant
Colorado River Storage Project
Wayne N. Aspinall Storage Unit



Plant Contact:
Donald Phillips, Manager
Curecanti Field Division

Plant Address:
Blue Mesa Powerplant
Gunnison CO

Telephone Numbers:
Phone: (970) 240-6300
Fax: (970) 240-6304

E-Mail Address:
dphillips@uc.usbr.gov

Reclamation Region: Upper Colorado

NERC Region: Western Electricity Coordinating Council, Rocky Mountain Power Area

PMA Service Area: Western Area Power Administration, Colorado River Storage Project Management Center

Project Authorization: Congress authorized construction of four storage units of the Colorado River Storage Project and 11 participating projects on April 11, 1956, under Public Law 485, 84th Congress, 70 Stat. 105. Additional projects have been added since the original legislation was adopted.

Project Purposes: The Colorado River Storage Project provides for the comprehensive development of the Upper Colorado River Basin. The project furnishes the long-term regulatory storage needed to permit States in the upper basin to meet their flow obligation at Lees Ferry, Arizona, as defined in the Colorado River Compact and still use their apportioned water.

Plant Location: The Blue Mesa Powerplant is located on the Gunnison River in Gunnison County, about 30 miles west of Gunnison, Colorado, and about 1.5 miles below Sapinero, Colorado.

Plant Facts: The Blue Mesa Powerplant consists of two 43,200-kilowatt generators, driven by two 41,500-horsepower turbines. Each turbine is designed to operate at a maximum head of about 360 feet.

One 16-foot-diameter penstock conveys water to the two turbines and also carries water for the outlet works. After branching from the main penstock, each of the penstock laterals is controlled by 156-inch butterfly valves. The main penstock is reduced by a wye branch to the outlet works control valves.

Plant Purpose: Generation of hydroelectric power for the upper basin and adjacent areas.

Plant History: Power generation was initiated in September 1967 at the Blue Mesa Powerplant. Generators were up rated from 30,000 kW to 43,200 kW in 1988. The Governors were replaced in 2001-2002. A new generator step up transformer was installed in 2002. Remote main breaker racking devices are to be installed on both breakers in 2003-2004. Upgrade emergency generator for black start capability and cleaned oil storage tanks in 2005. Repaired powerplant roof in 2006.

Present Activities: Design for draft tube liner repairs.

Future Planned Activities: Replace the runner.

Special Issues: None

River:	Gunnison River	**Plant Type:**	Conventional
Powerhouse Type:	Above Ground	**Turbine Type:**	Francis
Original Nameplate Capacity:	60,000 kW	**Installed Capacity:**	86,400 kW
Year of Initial Operation:	1967	**Age:**	40 years
Net Generation (FY-2007):	237.3 GWh	**Rated Head:**	332 feet
Average Plant Factor (FY-2007):	31.5 percent	**Remotely Operated:**	Yes
Production Mode:	Peaking		

Ancillary Services

Blue Mesa
Ancillary Services

Spinning Reserve	Yes
Non-Spinning Reserve	Yes
Replacement Reserve	Yes
Regulation/Load Following	Yes
Black Start	No
Voltage Support	Yes

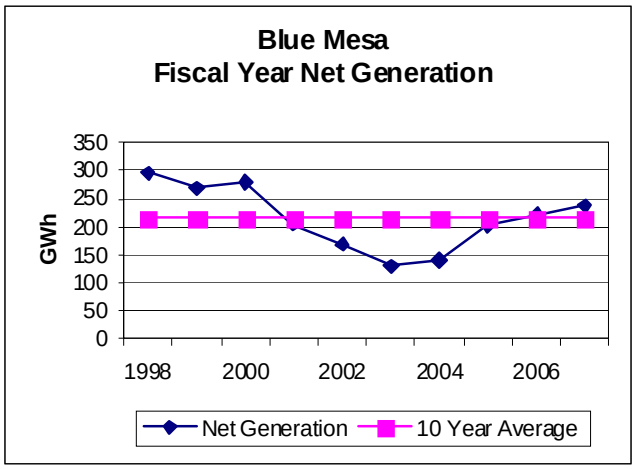
Generators

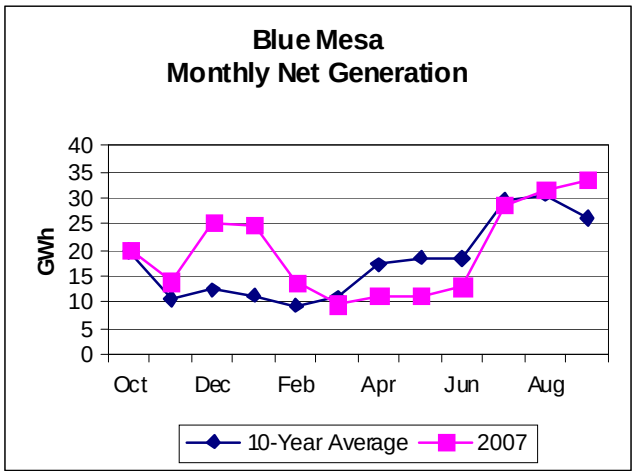
Blue Mesa Generators

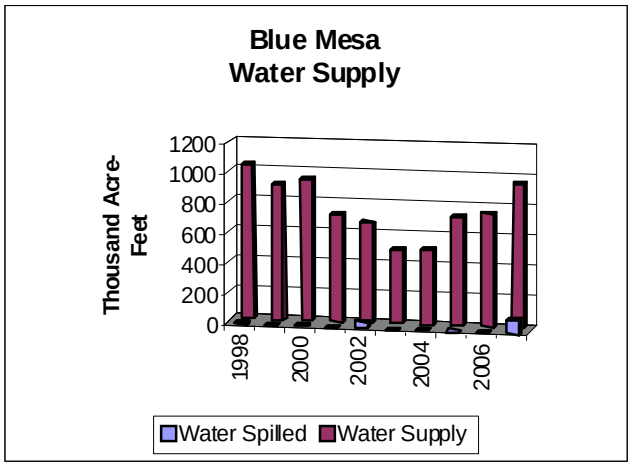
Existing Number and Capacity

Unit #	Original Capacity (kW)	Capacity Increased (kW)	Present Capacity (kW)
1	30,000	13,200	43,200
2	30,000	13,200	43,200
2 units	60,000	26,400	86,400

Generation

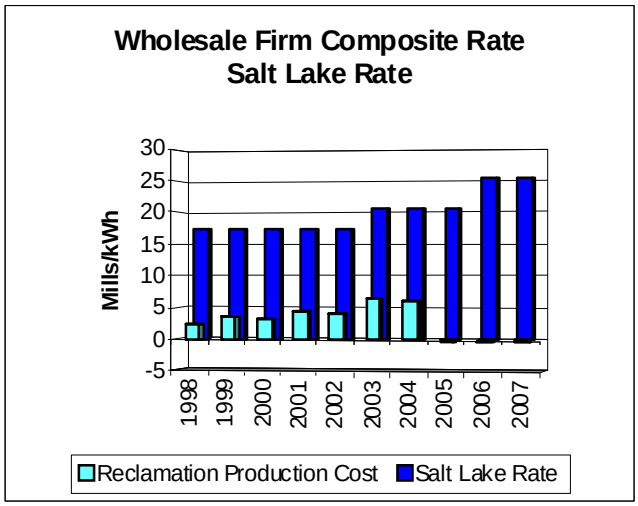

Blue Mesa
Fiscal Year Net Generation
GWh
350
300
250
200
150
100
50
0
1998
2000
2002
2004
2006
Net Generation
10 Year Average


Blue Mesa
Monthly Net Generation
GWh
40
35
30
25
20
15
10
5
0
Oct
Dec
Feb
Apr
Jun
Aug
10-Year Average
2007

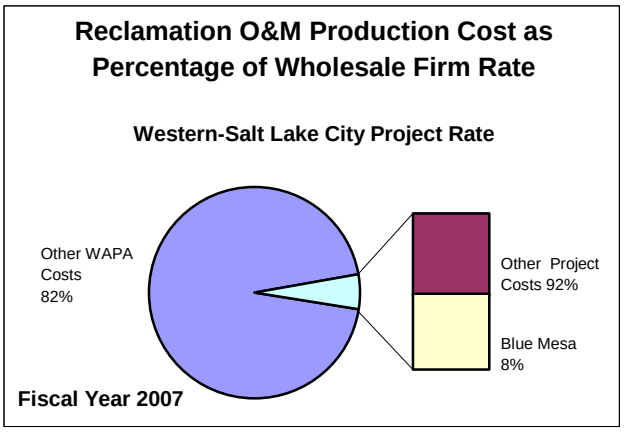

Blue Mesa
Water Supply
Thousand Acre-Feet
1200
1000
800
600
400
200
0
1998
2000
2002
2004
2006
Water Spilled
Water Supply

Prime Laboratory Benchmarks

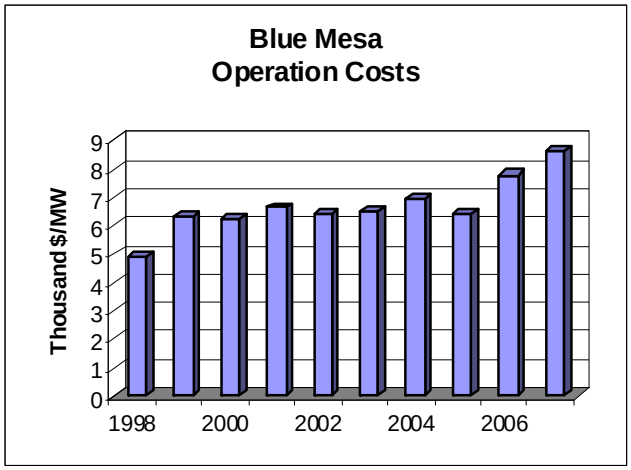
Benchmark 1
Wholesale Firm Rate

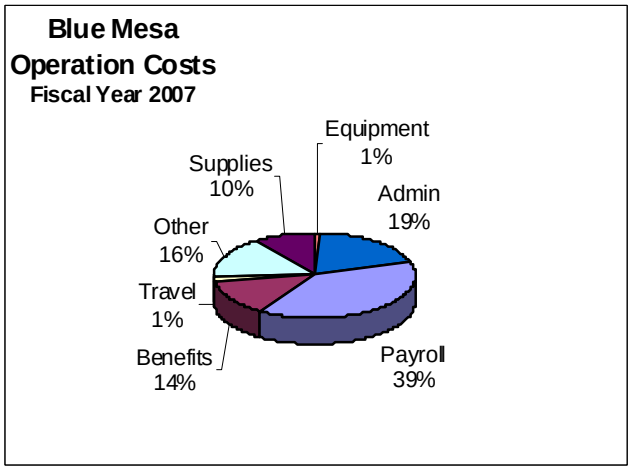


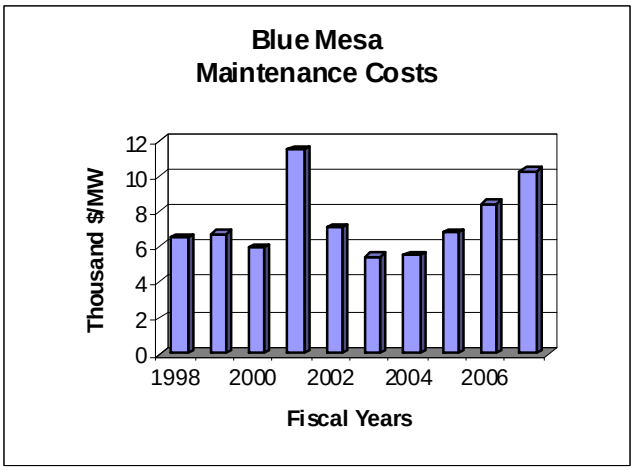
Benchmark 2
Reclamation's Production Cost as Percentage of Wholesale Firm Rate

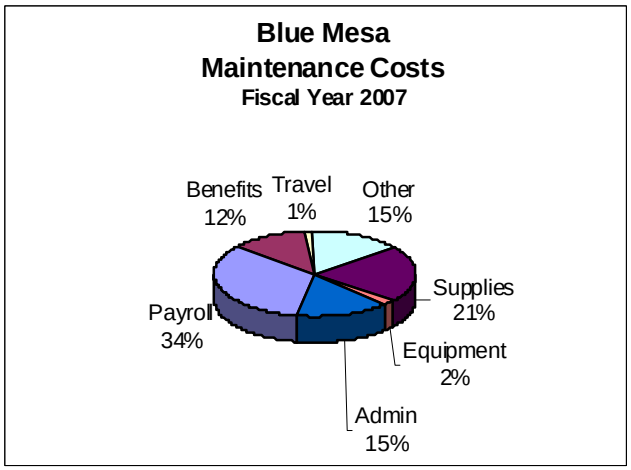


Benchmark 3
Production Cost

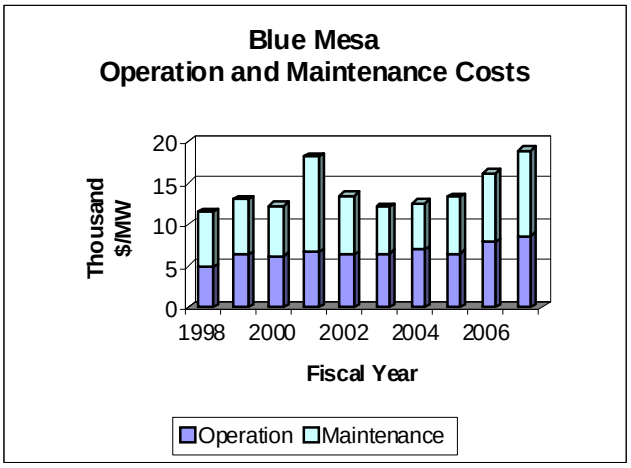


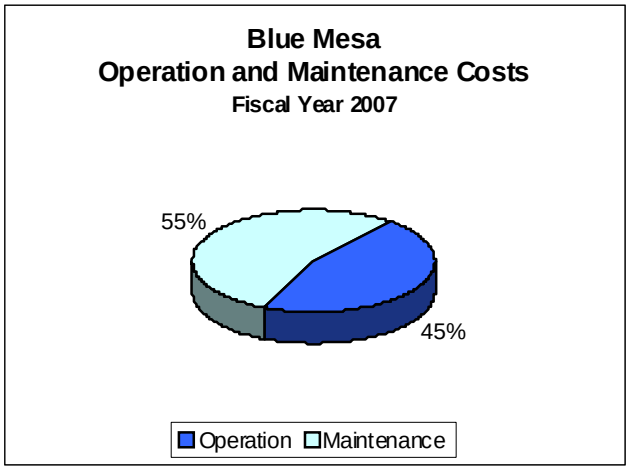


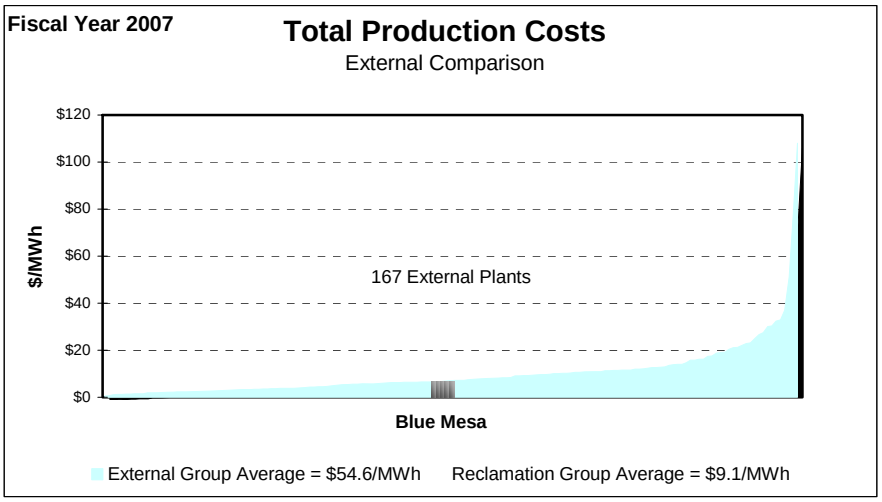


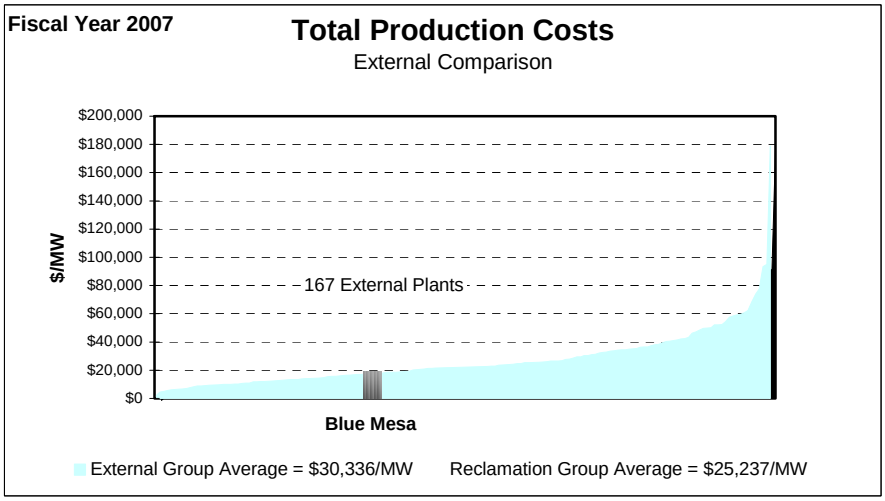


Benchmark 3
Production Cost



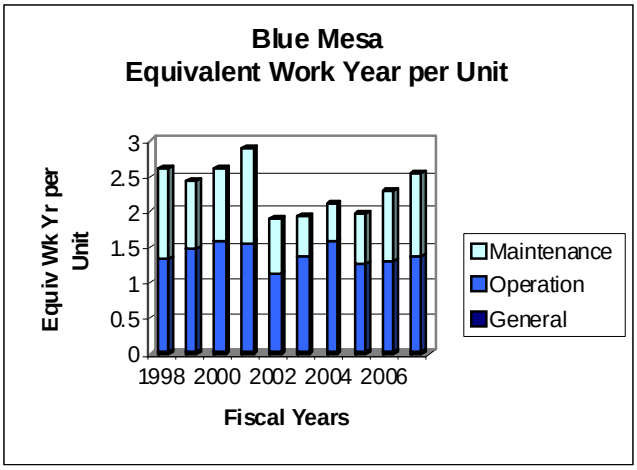


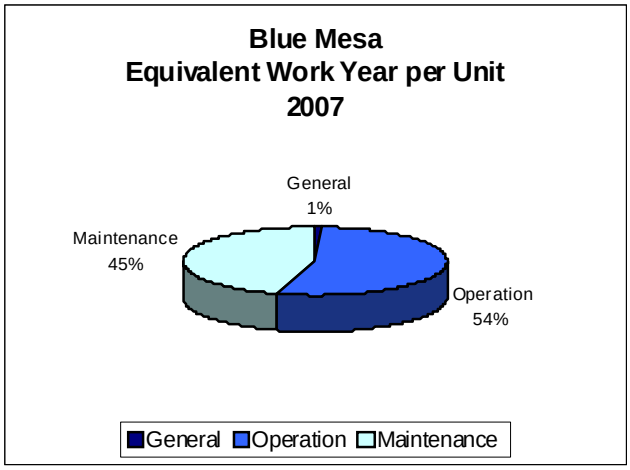


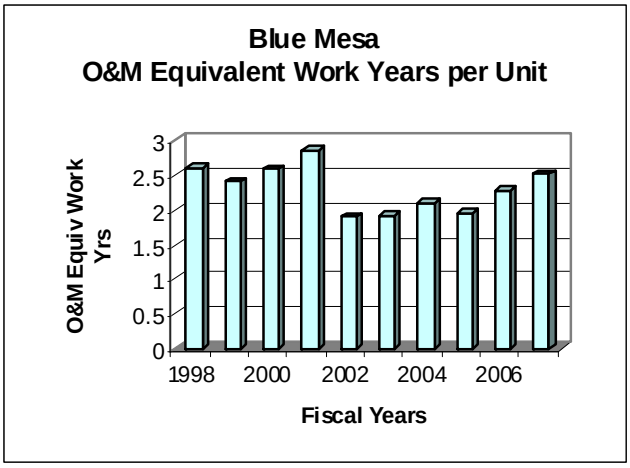


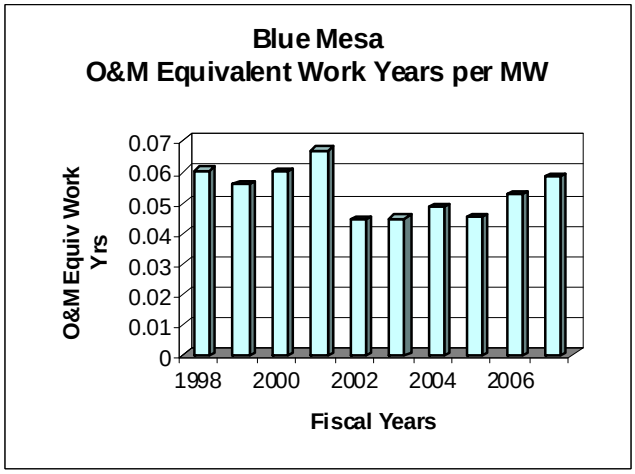
Benchmark 4
Workforce Deployment

Blue Mesa FY 2007 Equivalent Work Staffing Year Levels						
	Equivalent Work Year Staffing Charged to Powerplant	Leave Additive	Denver and Washington Equivalent Work Year Staffing Additive	Total Equivalent Work Year Allocated to Powerplant	Total Equivalent Staffing Work Year per Generating Unit	Total Equivalent Work Year Staffing per Megawatt
General	0.00	0.00	0.04	0.04	0.02	0.00
Operation	2.48	0.26	0.00	2.74	1.37	0.03
Maintenance	2.08	0.22	0.00	2.31	1.15	0.03
Total Staffing	4.56	0.49	0.04	5.08	2.54	0.06

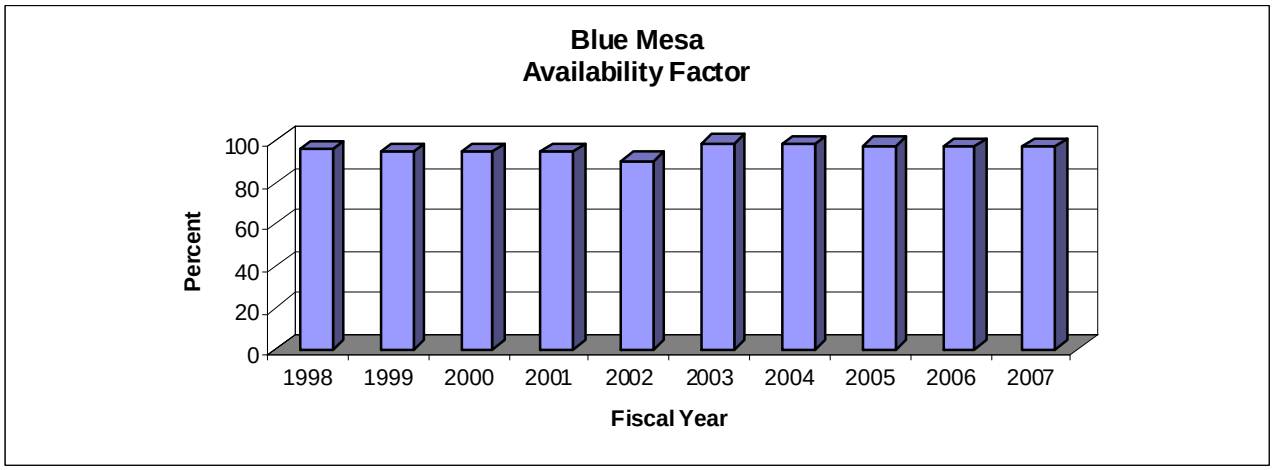




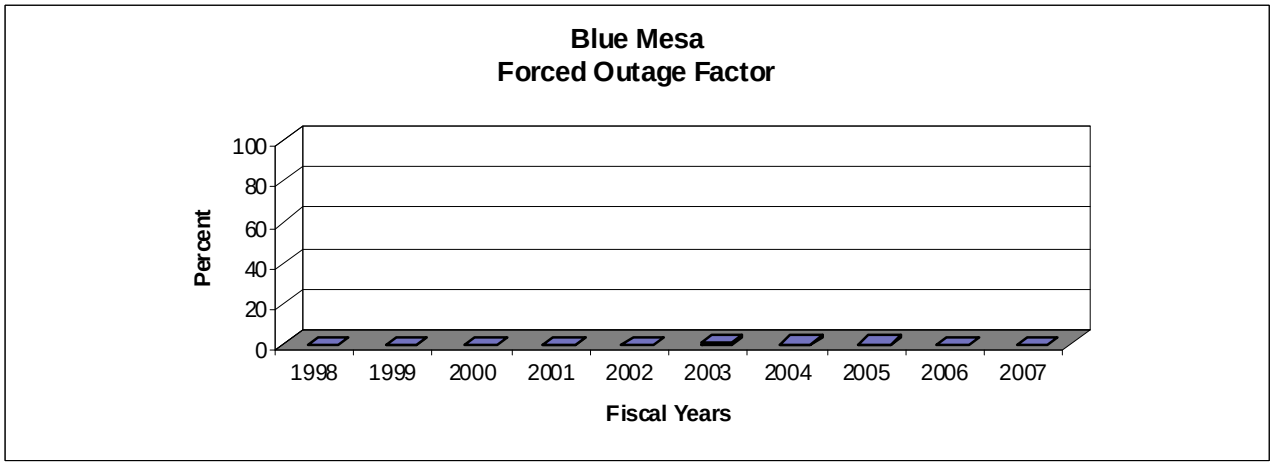




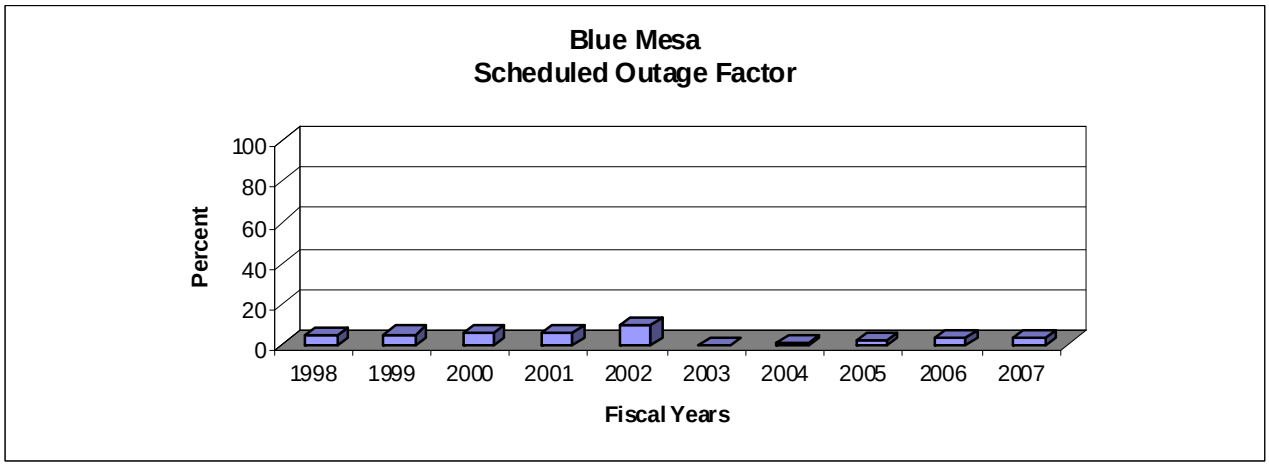
Benchmark 5
Availability Factor



Benchmark 6
Forced Outage Factor

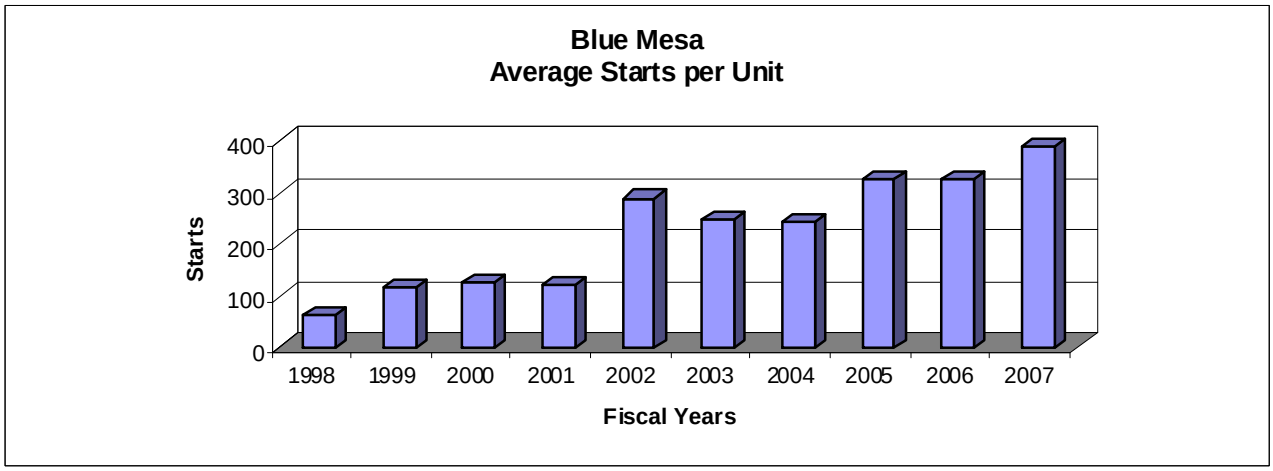


Benchmark 7
Scheduled Outage Factor



FY-97 - Extended maintenance

Starts



Benchmark Data Comparison

Fiscal Year 2007	Blue Mesa Powerplant	Reclamation Average 30-100 MW Group	Total Reclamation Average	Industry Average	Best Performers
Wholesale Firm Rate Mills/kWh	20.7	Not Applicable	*22.45	Not Available	Not Available
Production Cost as Percentage of Wholesale Firm Rate	1.69%	Not Applicable	12.1%	Not Applicable	Not Applicable
O&M Cost $/MWh	6.90	7.85	2.76	***54.63	1.00
O&M Costs $/MW	18,953	24,132	7,847	***30,336	2,897
O&M Equiv Work Year per MW	0.06	0.10	0.03	Not Available	0
Availability Factor	97.0	81.3	82.3	**88.64	98.54
Forced Outage Factor	0.0	0.2	2.6	**2.61	0.00
Scheduled Outage Factor	3.0	18.5	15.1	**8.74	0.00

Benchmark Data Comparison

Fiscal Year 2007	Blue Mesa Powerplant	Reclamation Average 30-100 MW Group	Total Reclamation Average	Industry Average	Best Performers
Wholesale Firm Rate Mills/kWh	20.7	Not Applicable	*22.45	Not Available	Not Available
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O&M Cost $/MWh	6.90	7.85	2.76	***54.63	1.00
O&M Costs $/MW	18,953	24,132	7,847	***30,336	2,897
O&M Equiv Work Year per MW	0.06	0.10	0.03	Not Available	0
Availability Factor	97.0	81.3	82.3	**88.64	98.54
Forced Outage Factor	0.0	0.2	2.6	**2.61	0.00
Scheduled Outage Factor	3.0	18.5	15.1	**8.74	0.00

*Weighted by Net Generation
**2006 NERC Average

***Energy Information Administration Data

Crystal Powerplant
Colorado River Storage Project
Wayne N. Aspinall Storage Unit

Plant Contact:
Donald Phillips, Manager
Curecanti Field Division

Plant Address:
Crystal Powerplant
Montrose CO

Telephone Numbers:
Phone: (970) 240-6300
Fax: (970) 240-6304

E-Mail Address:
dphillips@uc.usbr.gov

Reclamation Region: Upper Colorado

NERC Region: Western Electricity Coordinating Council, Rocky Mountain Power Area

PMA Service Area: Western Area Power Administration, Colorado River Storage Project Management Center

Project Authorization: The Congress authorized construction of four storage units in the Colorado River Storage Project and 11 participating projects on April 11, 1956, under Public Law 485, 84th Congress, 70 Stat. 105. Additional projects have been added since the original legislation was adopted.

Project Purposes: The Colorado River Storage Project provides for the comprehensive development of the Upper Colorado River Basin. The project furnishes the long-time regulatory storage needed to permit States in the upper basin to meet their flow obligation at Lees Ferry, Arizona, as defined in the Colorado River Compact and still use their apportioned water.

Plant Location: The Crystal Powerplant is located on the Gunnison River in Montrose County, Colorado, 6 miles downstream of Morrow Point Powerplant and approximately 20 miles east of Montrose, Colorado.

Plant Facts: The Crystal Powerplant was completed in 1978. It has a generating capacity of 28,000 kilowatts from one unit driven by a 39,000-horsepower hydraulic turbine. It is connected to the main Colorado River Storage Project transmission system at the Curecanti substation by a 115-kilovolt line.

Plant Purpose: Generation of hydroelectric power for use in the project.

Plant History: Transformer KRA was replaced in fiscal year 1996. Outlet tube No.2 was repaired in 2001. Governor and the station service transformer were replaced in 2002 and 2003 respectively. Generator was shut down during the winter of 2002-2003 due to lack of water. Generator rewind upgrade, turbine repairs, control and protective relay upgrade, design and repair of penstock gate stem holding system, lightning arrestors on the 115 KV cable changed, and remote main breaker racking devices installed in 2003-2004. Updated domestic water system, replaced UPS system , and Battery Chargers in 2005.

Present Activities: Repaired powerplant roof, cleaned dam drains, purchase replacement for emergency generator, and rebuilt reservoir boat dock in 2006.

Future Planned Activities: None

Special Issues: This plant is used for control of the water flow in the Gunnison River. At least 1 MW is used to control flow variations caused by reservoir level changes.

River:	Gunnison River	**Plant Type:**	Conventional
Powerhouse Type:	Above Ground	**Turbine Type:**	Francis
Original Nameplate Capacity:	28,000 kW	**Installed Capacity:**	31,500 kW
Year of Initial Operation:	1978	**Age:**	29 years
Net Generation (FY-2007):	168.2 GWh	**Rated Head:**	207 feet
Average Plant Factor (FY-2007):	61.5 percent	**Remotely Operated:**	Yes
Production Mode:	Base Load		

Ancillary Services

Crystal
Ancillary Services

Spinning Reserve	Yes
Non-Spinning Reserve	Yes
Replacement Reserve	Yes
Regulation/Load Following	Yes
Black Start	Yes
Voltage Support	Yes

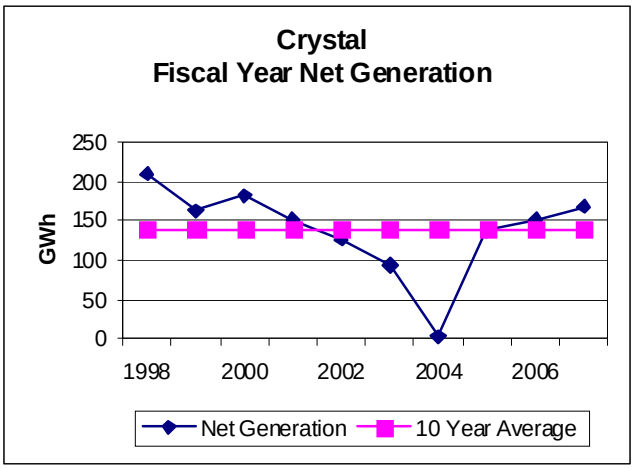
Generators

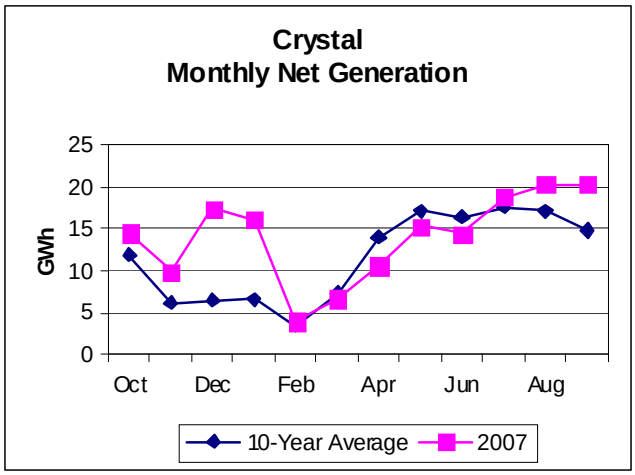
Crystal Generators

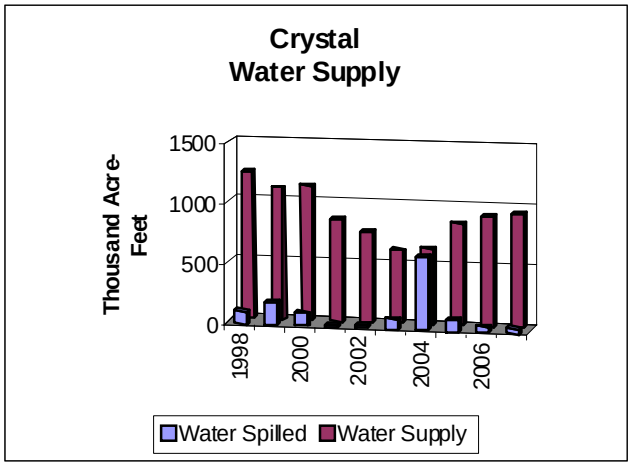
Existing Number and Capacity

Unit #	Original Capacity (kW)	Capacity Increased (kW)	Present Capacity (kW)
1	28,000	3,500	31,500
1 Unit	28,000	3,500	31,500

Generation

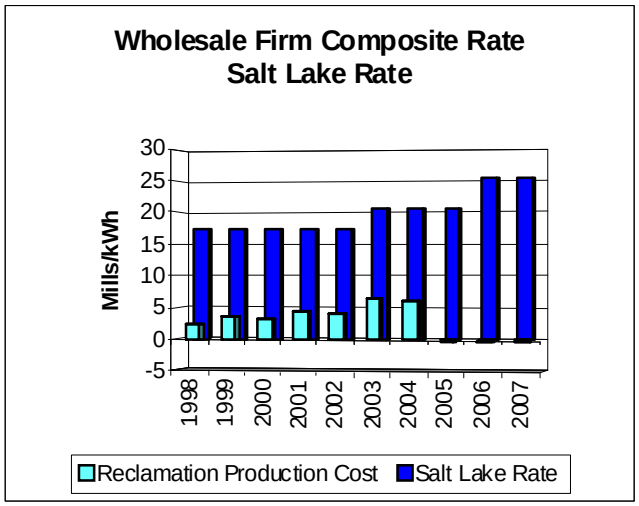

Crystal
Fiscal Year Net Generation
GWh
250
200
150
100
50
0
1998
2000
2002
2004
2006
Net Generation
10 Year Average


Crystal
Monthly Net Generation
GWh
25
20
15
10
5
0
Oct
Dec
Feb
Apr
Jun
Aug
10-Year Average
2007

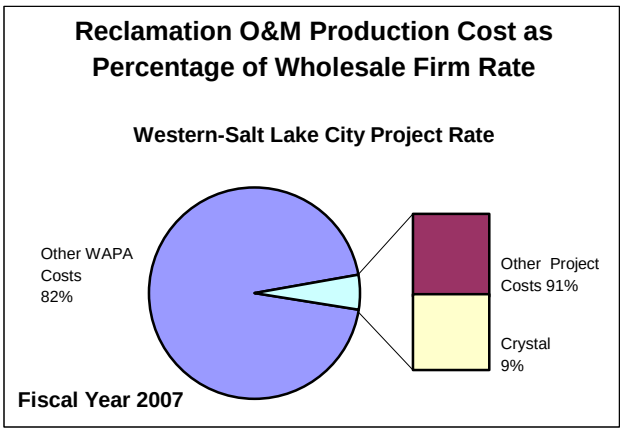

Crystal
Water Supply
Thousand Acre-Feet
1500
1000
500
0
1998
2000
2002
2004
2006
Water Spilled
Water Supply

Prime Laboratory Benchmarks

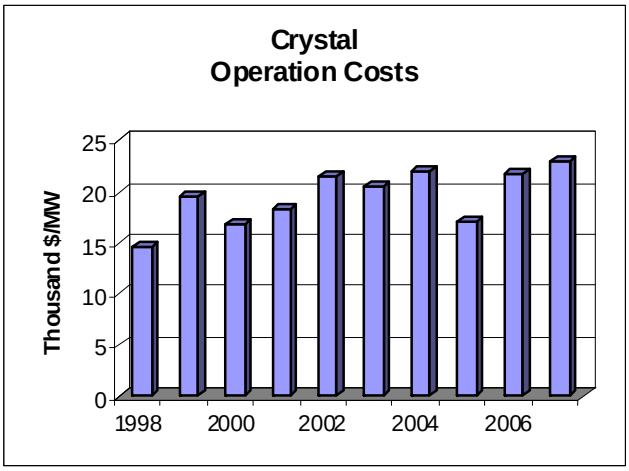
Benchmark 1
Wholesale Firm Rate

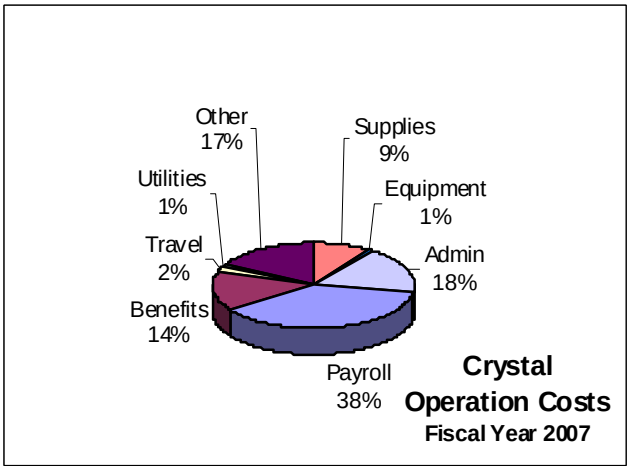


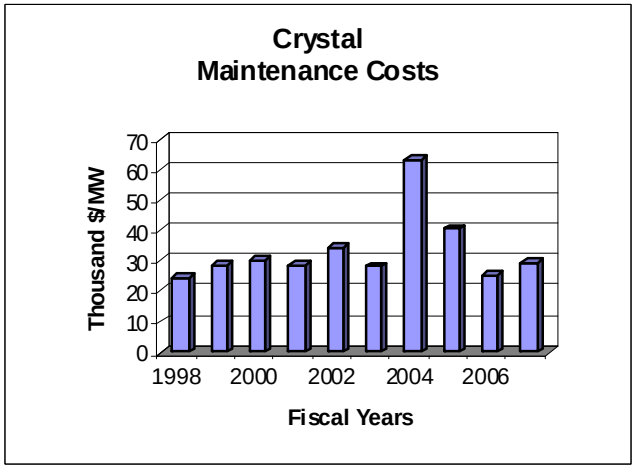
Benchmark 2
Reclamation's Production Cost as Percentage of Wholesale Firm Rate

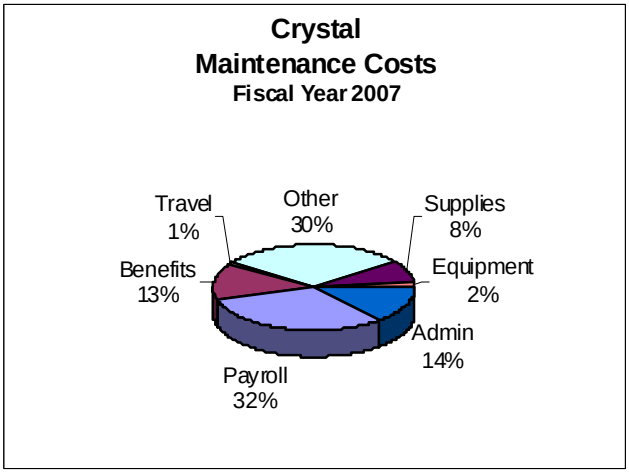


Benchmark 3
Production Cost

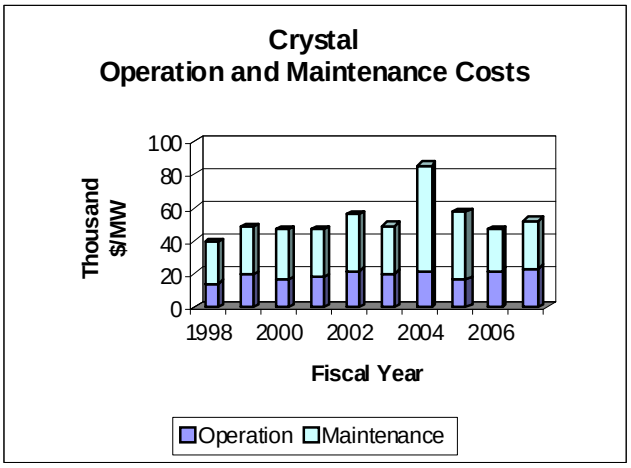


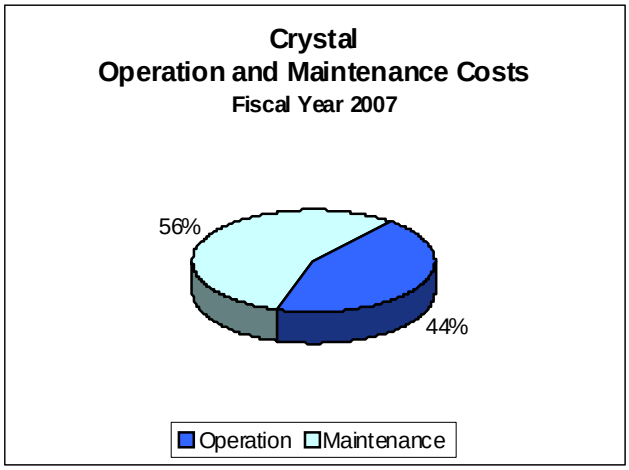


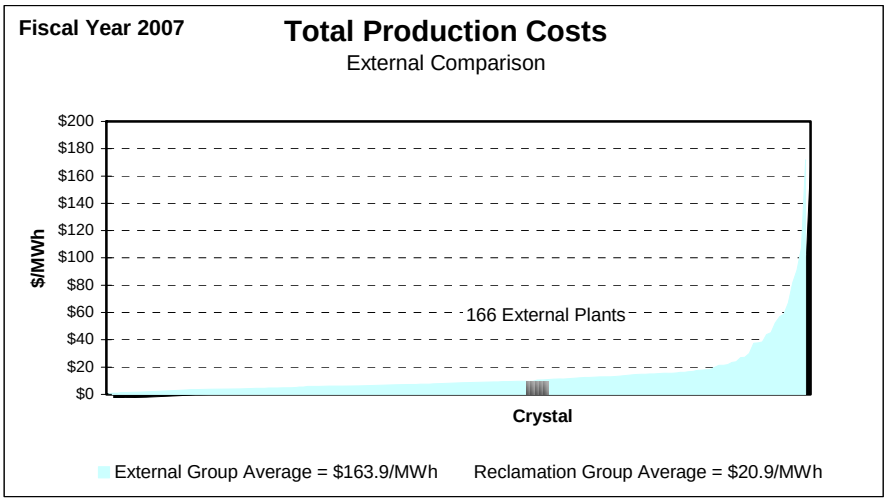


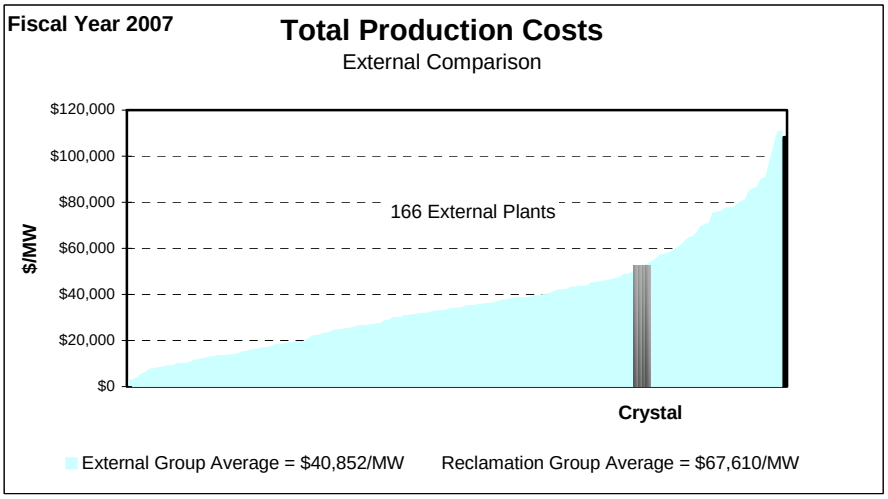


Benchmark 3
Production Cost



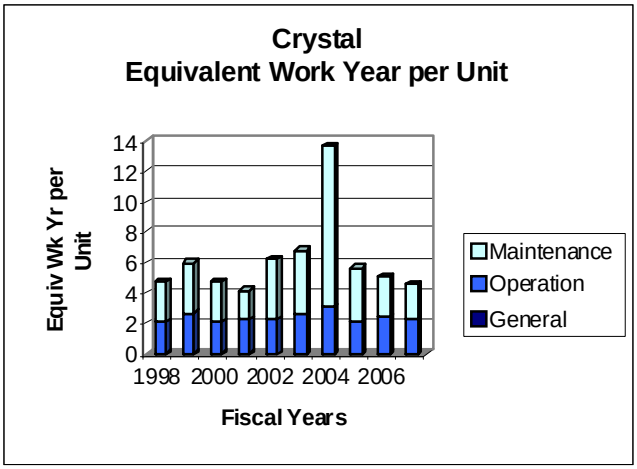


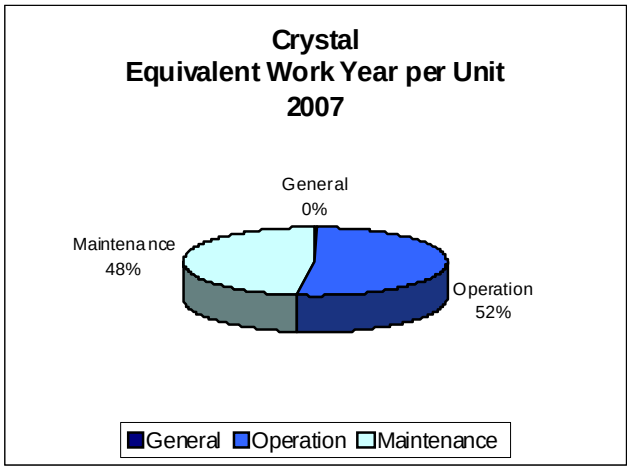


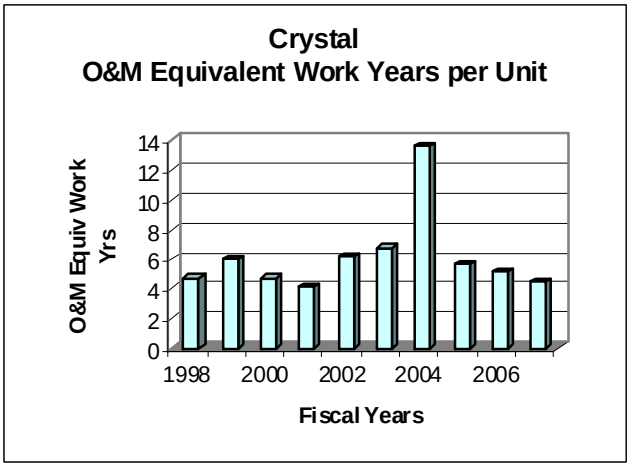


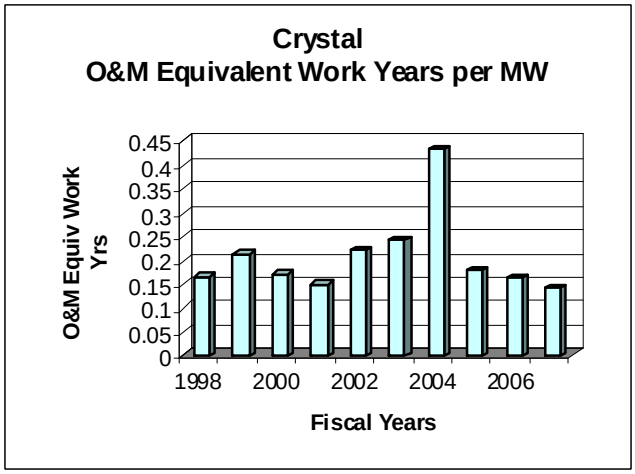
Benchmark 4
Workforce Deployment

Crystal FY 2007 Equivalent Work Staffing Year Levels						
	Equivalent Work Year Staffing Charged to Powerplant	Leave Additive	Denver and Washington Equivalent Work Year Staffing Additive	Total Equivalent Work Year Allocated to Powerplant	Total Equivalent Staffing Work Year per Generating Unit	Total Equivalent Work Year Staffing per Megawatt
General	0.00	0.00	0.02	0.02	0.02	0.00
Operation	2.11	0.23	0.00	2.34	2.34	0.07
Maintenance	1.95	0.21	0.00	2.16	2.16	0.07
Total Staffing	4.06	0.43	0.02	4.51	4.51	0.14

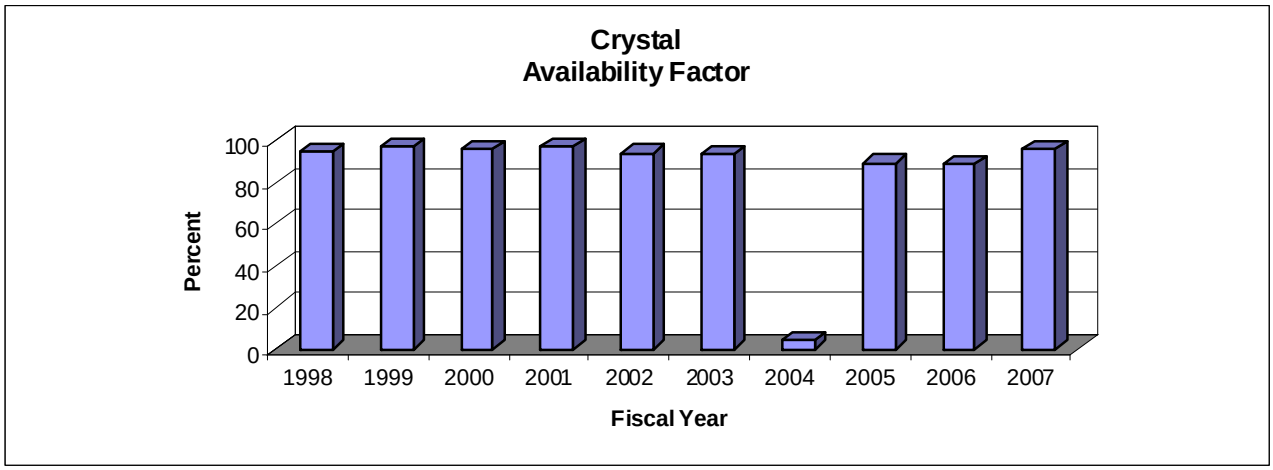




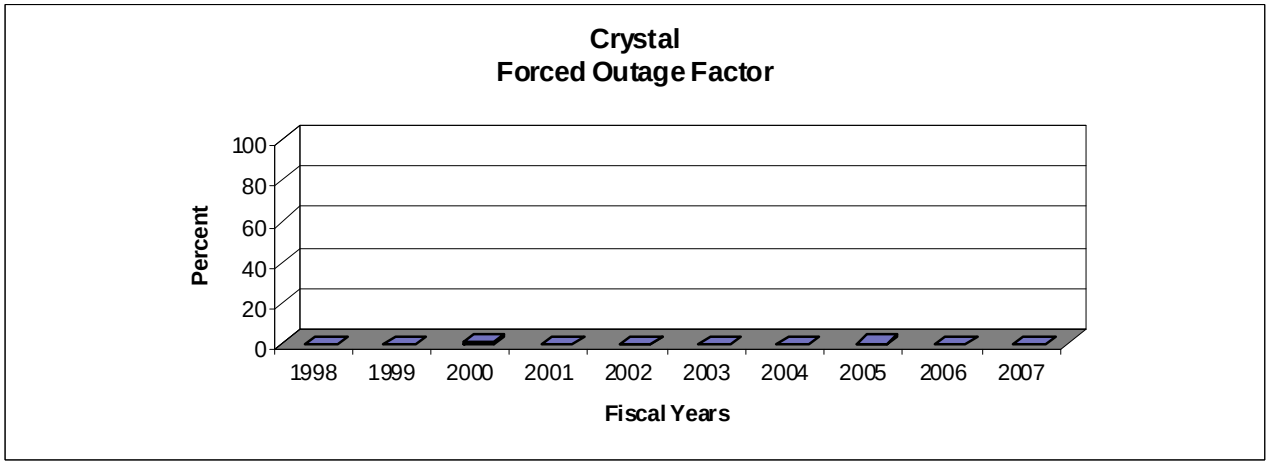




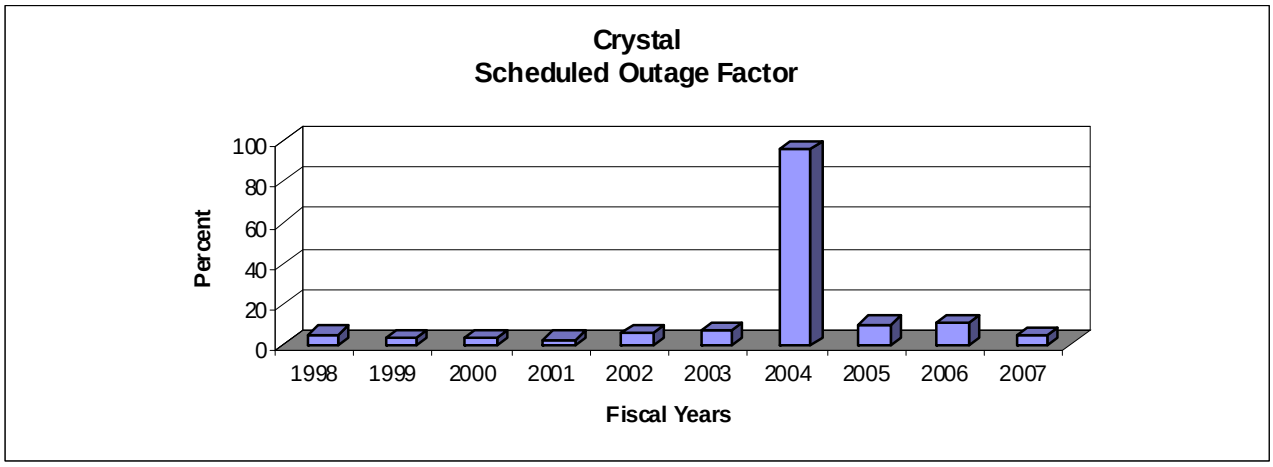
Benchmark 5
Availability Factor



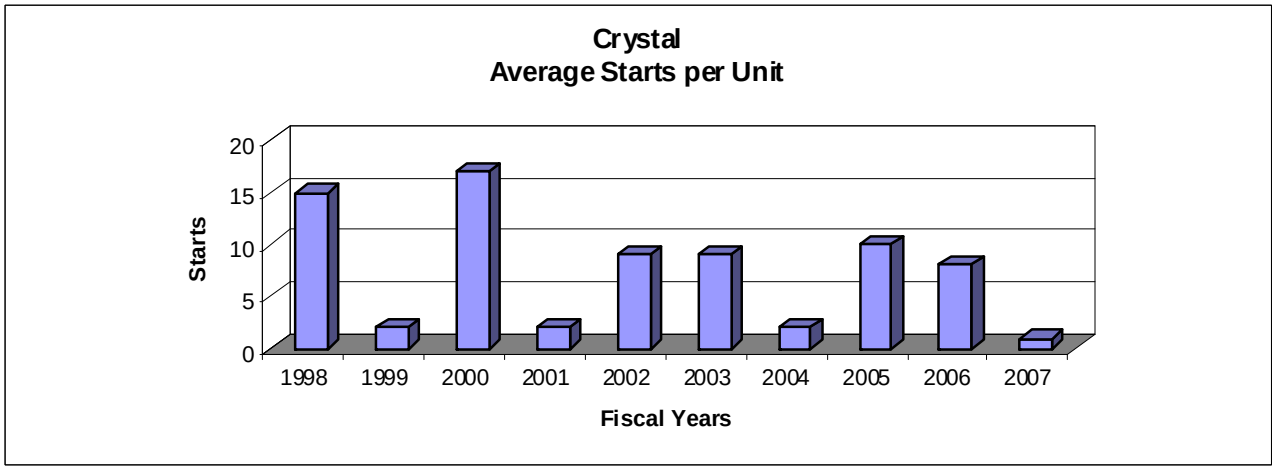
Benchmark 6
Forced Outage Factor



Benchmark 7
Scheduled Outage Factor



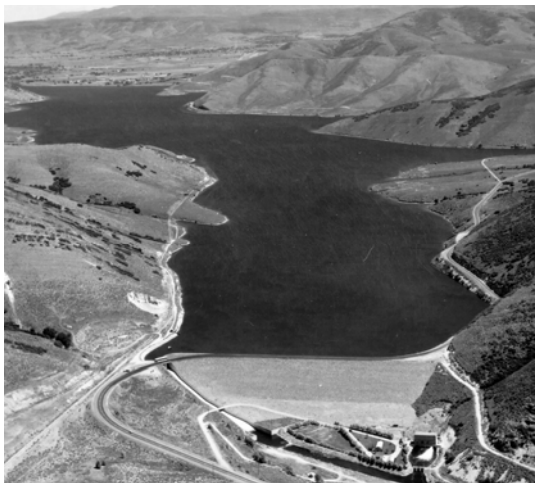
Starts



Benchmark Data Comparison					
Fiscal Year 2007	**Crystal Powerplant**	**Reclamation Average 10-30 MW Group**	**Total Reclamation Average**	**Industry Average**	**Best Performers**
Wholesale Firm Rate Mills/kWh	20.7	Not Applicable	*22.45	Not Available	Not Available
Production Cost as Percentage of Wholesale Firm Rate	1.70%	Not Applicable	12.1%	Not Applicable	Not Applicable
O&M Cost $/MWh	9.83	16.40	2.76	***163.95	1.00
O&M Costs $/MW	52,516.16	62,731.30	7,846.62	***40,852	2,897.28
O&M Equiv Work Year per MW	0.14	0.22	0.03	Not Available	0.00
Availability Factor	95.8	88.5	82.3	**88.64	98.54
Forced Outage Factor	0.00	0.1	2.6	**2.61	0.00
Scheduled Outage Factor	4.2	11.4	15.1	**8.74	0.00

*Weighted by Net Generation
**2006 NERC Average
***Energy Information Administration Data

Deer Creek Powerplant
Provo River Project



Plant Contact:
Max Spiker
Deputy Area Manager
Upper Colorado Regional Office

Plant Address:
Deer Creek Powerplant
Heber UT

Telephone Numbers:
Phone: (801) 524-3745
Fax: (801) 524-3828

E-Mail Address:
mspiker@uc.usbr.gov

Reclamation Region: Upper Colorado

NERC Region: Western Electricity Coordinating Council, Rocky Mountain Power Area

PMA Service Area: Western Area Power Administration, Colorado River Storage Project Management Center

Project Authorization: Construction of the project was initiated under the provisions of the National Industrial Recovery Act of June 16, 1933. The President approved the Provo River Project on November 16, 1935, under the terms of subsection B of section 4 of the Act of December 5, 1942 (43 Stat. 701). The President approved the Salt Lake Aqueduct on October 24, 1938. The Secretary of the Interior authorized the Deer Creek Powerplant on August 20, 1951, under the Reclamation Project Act of 1939.

Project Purposes: The Provo River Project provides a supplemental water supply for irrigation of 48,156 acres of highly developed farmlands in Utah, Salt Lake, and Wasatch Counties. The key structure of the project, Deer Creek Dam, is located on the Provo River east of the project lands.

Plant Location: The Deer Creek Powerplant is located on the Provo River in Wasatch County, Utah, about 16 miles northeast of Provo, Utah.

Plant Facts: The Deer Creek Powerplant was constructed on the substructure provided during the construction of Deer Creek Dam. Deer Creek is a zoned earthfill dam 235 feet high and 35 feet wide at the crest. The crest is 1,304 feet long. The powerplant has two 2,475-kilowatt generators and was placed in operation in 1958.

Plant Purpose: The powerplant provides replacement energy for energy lost at other non-government plants through the storage and diversion of water for irrigation during the winter storage season. The powerplant provides revenues during the summer irrigation season for operation, maintenance, and replacement costs and for irrigation project repayment purposes. Power not used for replacement purposes, is marketed to two preference power entities.

Plant History: The project is essentially an irrigation project with production of power limited to the capacity of the plant during the irrigation season. Maintenance is normally performed during the winter season when water flows are low. Since 1958, the powerplant has been operated and maintained by a contract with the Provo River Water Users Association.

Present Activities: Two new digital governors were purchased from the General Electric Company and one installed on Generating Unit No. 1 by the company under contract administered by the water district.

Future Planned Activities: Installation of the second digital governor on Generating Unit No. 2 and re-programming and alignment of both governors is planned to be accomplished with help from the Denver Technical Service Group in the early spring of 2007.

Special Issues: Operation and maintenance of the powerplant is accomplished by contract with the Local Water Users. Cost for operations and maintenance includes all government and contract costs. As the plant is operated 24 hours a day, operation costs, though shared with the other water entities operating the dam, generally exceed the maintenance costs.

River:	Provo River	**Plant Type:**	Conventional
Powerhouse Type:	Above Ground	**Turbine Type:**	Francis
Original Nameplate Capacity:	4,950 kW	**Installed Capacity:**	4,950 kW
Year of Initial Operation:	1958	**Age:**	50 years
Net Generation (FY-2007):	23.7 GWh	**Rated Head:**	120 feet
Annual Plant Factor (FY-2007):	55.2 percent	**Remotely Operated:**	No
Production Mode:	Intermediate		

Ancillary Services

Deer Creek
Ancillary Services

Spinning Reserve	No
Non-Spinning Reserve	No
Replacement Reserve	No
Regulation/Load Following	No
Black Start	Yes
Voltage Support	Yes

Black Start not probable, plant not in Western Area Power Administration's Black Start Plan.

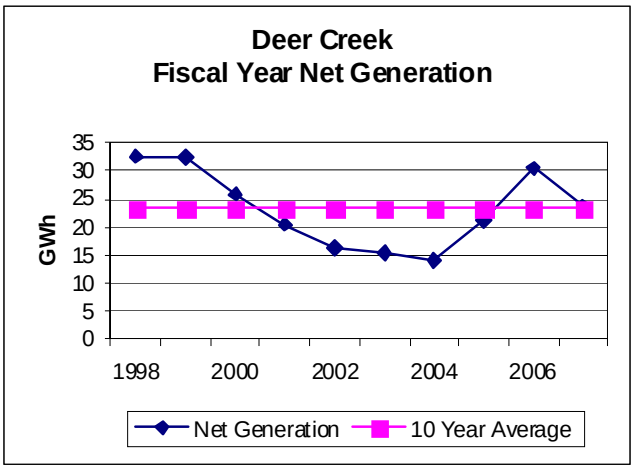
Generators

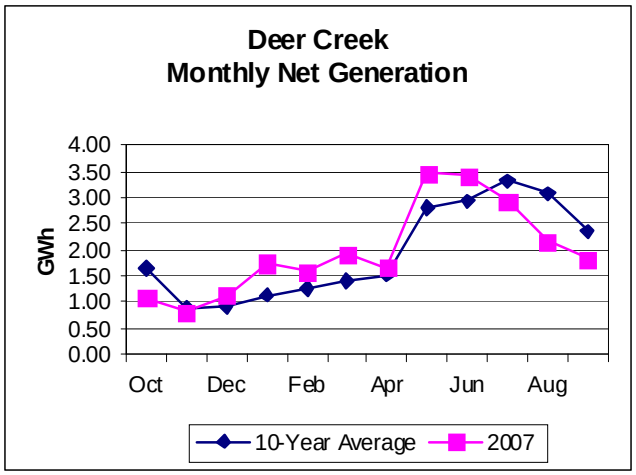
Deer Creek Generators

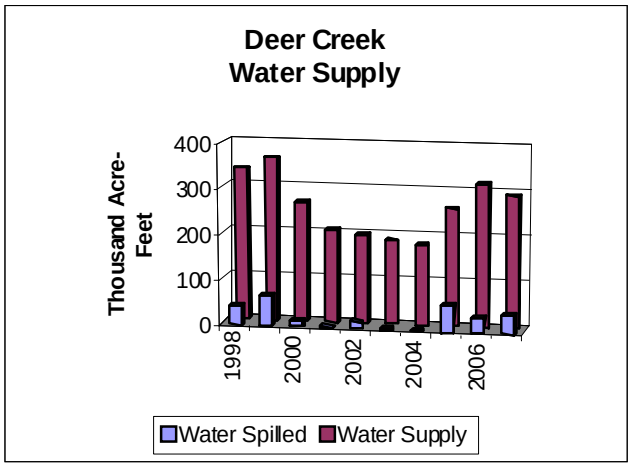
Existing Number and Capacity

Unit #	Original Capacity (kW)	Capacity Increased (kW)	Present Capacity (kW)
1	2,475	-	2,475
2	2,475	-	2,475
2 units	4,950	-	4,950

Generation


Deer Creek
Fiscal Year Net Generation
GWh
35
30
25
20
15
10
5
0
1998
2000
2002
2004
2006
Net Generation
10 Year Average


Deer Creek
Monthly Net Generation
GWh
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
Oct
Dec
Feb
Apr
Jun
Aug
10-Year Average
2007


Deer Creek
Water Supply
Thousand Acre-Feet
400
300
200
100
0
1998
2000
2002
2004
2006
Water Spilled
Water Supply

Prime Laboratory Benchmarks

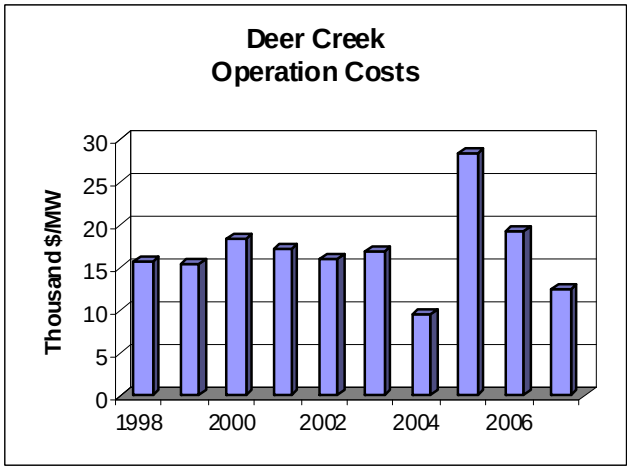
Benchmark 1
Wholesale Firm Rate

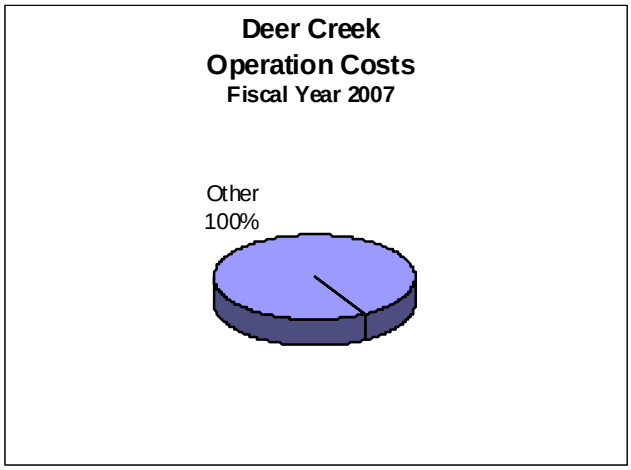
There is no fixed rate. Customers of electricity from this plant have contracts to pay annual costs regardless of energy production.

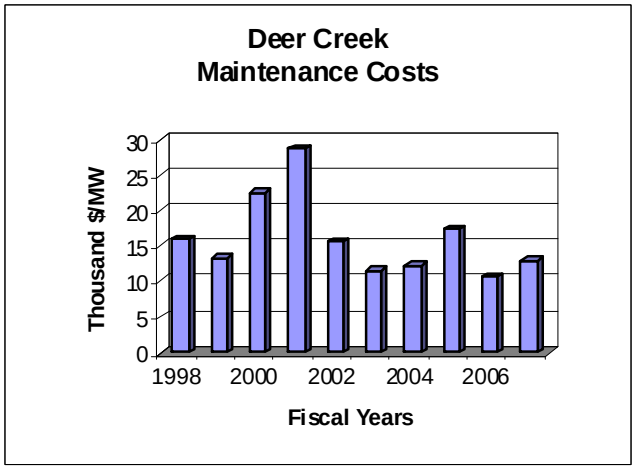
Benchmark 2
Reclamation's Production Cost as Percentage of Wholesale Firm Rate

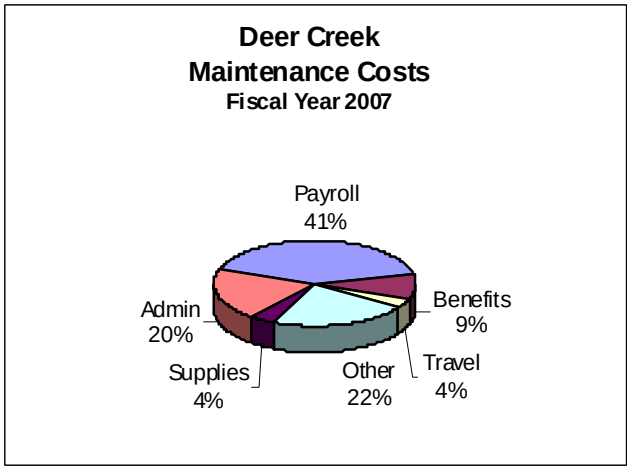
Not Applicable.

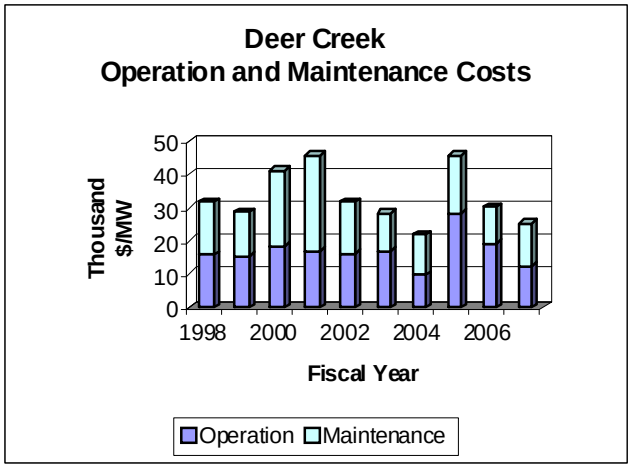
Benchmark 3
Production Cost

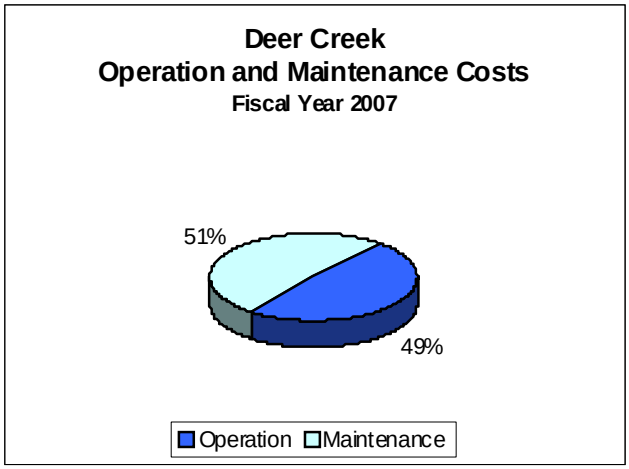






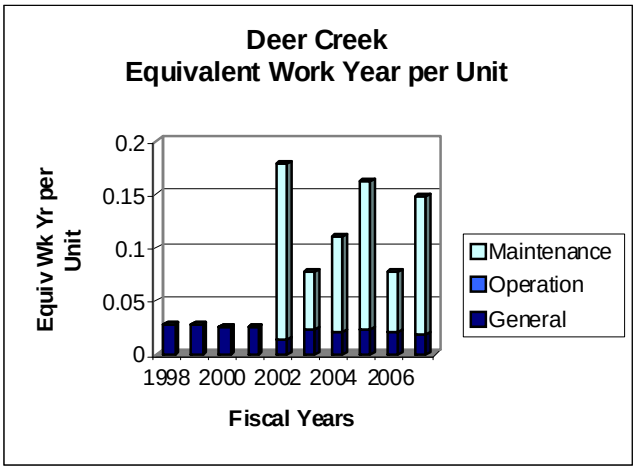


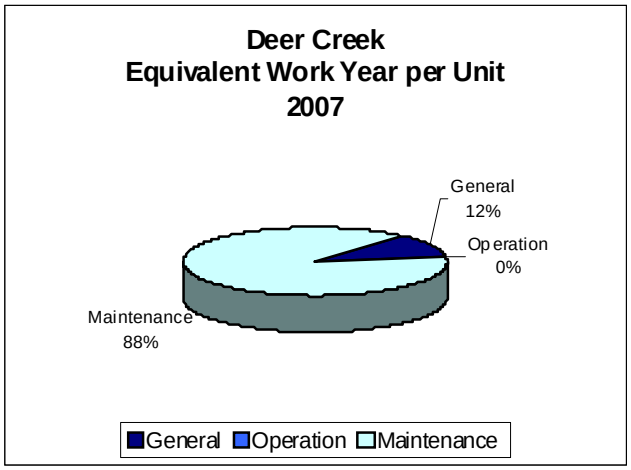


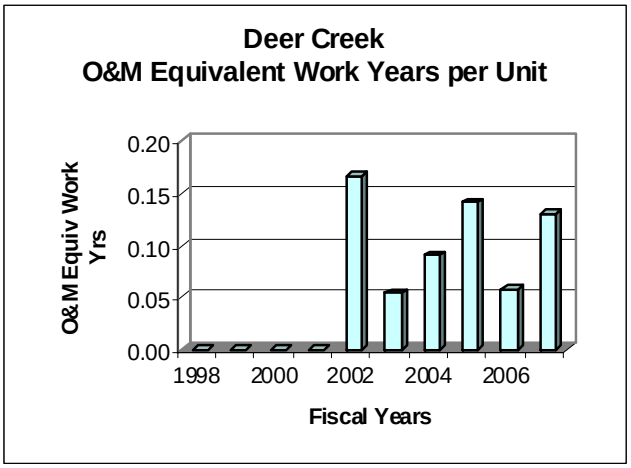


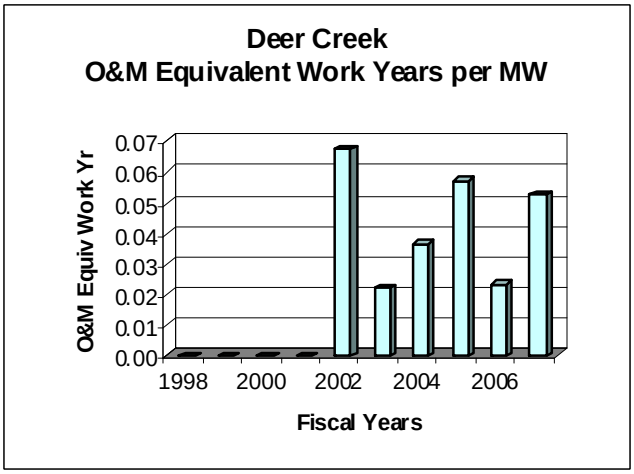
Benchmark 4
Workforce Deployment

Deer Creek FY 2007 Equivalent Work Staffing Year Levels						
	Equivalent Work Year Staffing Charged to Powerplant	Leave Additive	Denver and Washington Equivalent Work Year Staffing Additive	Total Equivalent Work Year Allocated to Powerplant	Total Equivalent Staffing Work Year per Generating Unit	Total Equivalent Work Year Staffing per Megawatt
General	0.00	0.00	0.04	0.04	0.02	0.01
Operation	0.00	0.00	0.00	0.00	0.00	0.00
Maintenance	0.23	0.03	0.00	0.26	0.13	0.05
Total Staffing	0.23	0.03	0.04	0.30	0.15	0.06

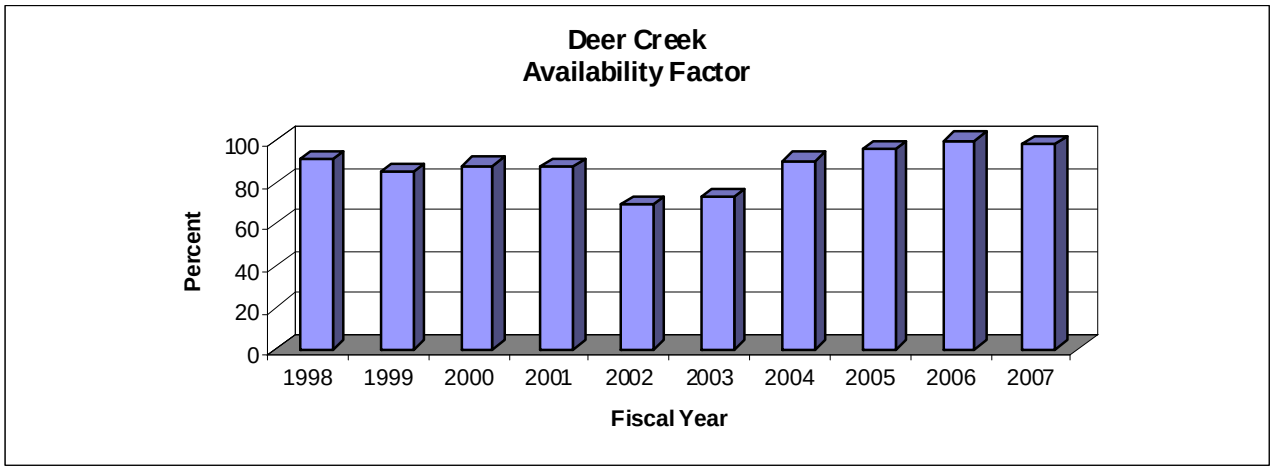




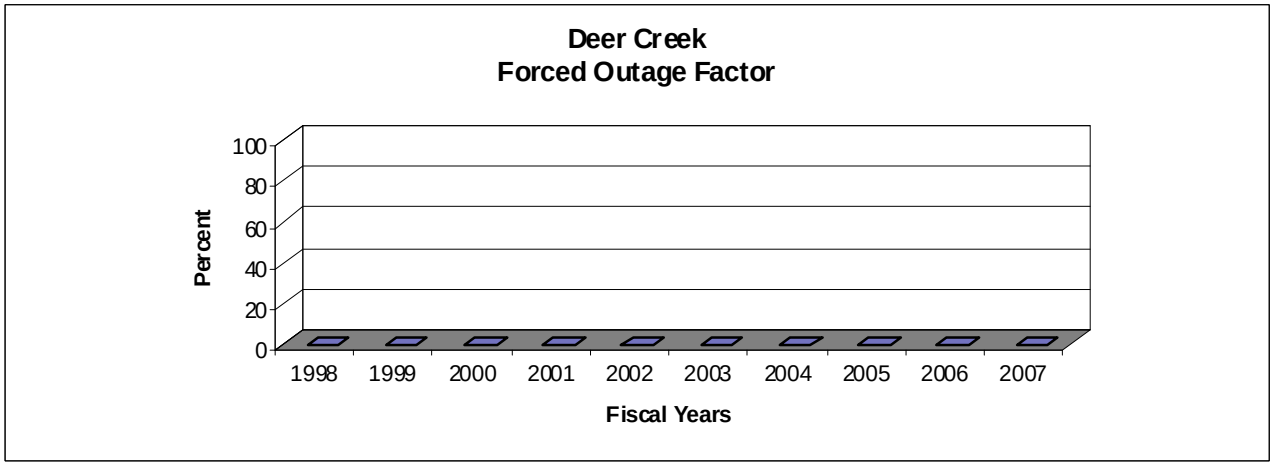




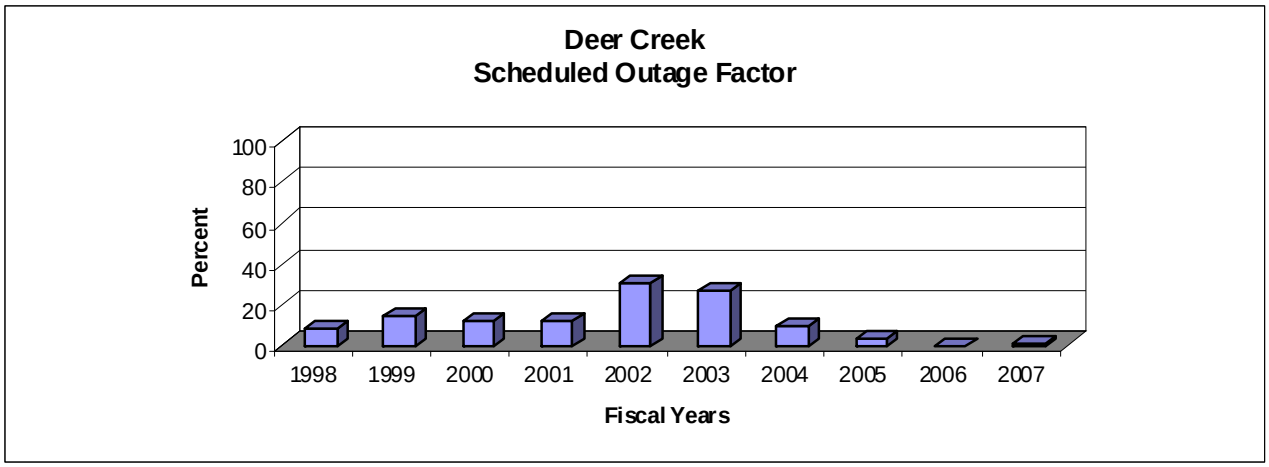
Benchmark 5
Availability Factor



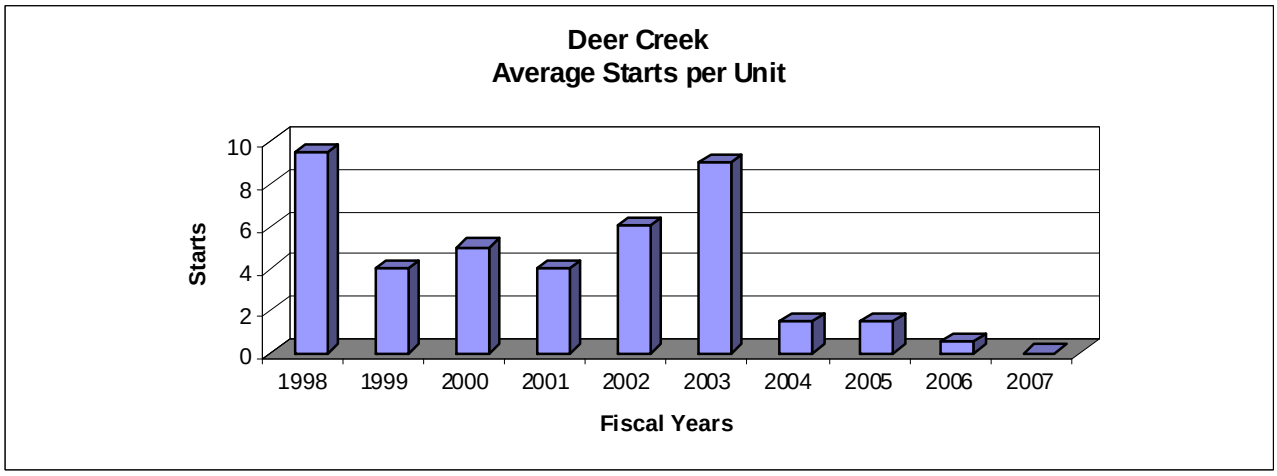
Benchmark 6
Forced Outage Factor



Benchmark 7
Scheduled Outage Factor



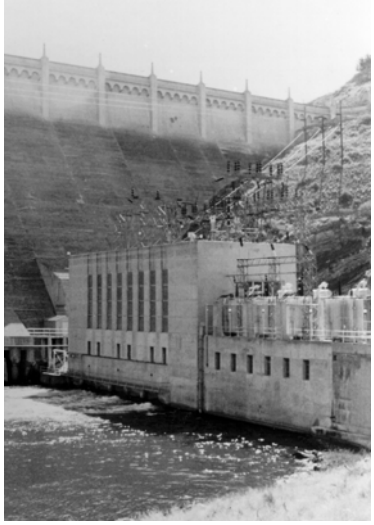
Starts



Benchmark Data Comparison				
Fiscal Year 2007	**Deer Creek Powerplant**	**Total Reclamation Average**	**Industry Average**	**Best Performers**
Wholesale Firm Rate Mills/kWh	Not Applicable	*22.45	Not Available	Not Available
Production Cost as Percentage of Wholesale Firm Rate	Not Applicable	12.1%	Not Applicable	Not Applicable
O&M Cost $/MWh	5.29	2.76	Not Applicable	1.00
O&M Costs $/MW	25,360	7,847	Not Applicable	2,897
O&M Equiv Work Year per MW	0.05	0.03	Not Available	0.00
Availability Factor	***100.0	82.3	**88.3	98.54
Forced Outage Factor	***0.00	2.6	**1.8	0.00
Scheduled Outage Factor	***0.00	15.1	**9.9	0.00

*Weighted by Net Generation
**2006 NERC Average
***Insufficient data for calculation

Elephant Butte Powerplant
Rio Grande Project



Plant Contact:
James Powell
Manager, Elephant Butte Field Division

Plant Address:
Elephant Butte Powerplant
HC32, Box 312
Truth or Consequences NM 87901-9802

Telephone Numbers:
Phone: (505) 894-6661
Fax: (505) 864-3651

E-Mail Address:
jpowell@uc.usbr.gov

Reclamation Region: Upper Colorado

NERC Region: Western Electricity Coordinating Council, Rocky Mountain Power Area

PMA Service Area: Western Area Power Administration, Colorado River Storage Project Management Center

Project Authorization: The Secretary of the Interior authorized the Rio Grande Project on December 2, 1905, under the provision of the Reclamation Act, and funds were allocated to initiate construction of the first diversion unit. The Reclamation Act was extended to the entire State of Texas on June 12, 1906, following a partial extension for Engle (Elephant Butte) Dam in 1905.

Congress authorized the construction of Elephant Butte Dam on February 25, 1905, and on May 4, 1907, $1 million of non-reimbursable funds were appropriated as the State Department's share for allocation of 60,000 acre-feet of water annually to Mexico by treaty. Additional project works authorized under congressional action include Caballo Dam, a combined flood control and power regulating structure and the Elephant Butte power development.

Project Purposes: The Rio Grande Project furnishes a full irrigation water supply for about 178,000 acres of land and electric power for communities and industries in the area. Drainage water from project lands provides a supplemental supply for 18,000 acres in Hudspeth County, Texas. Project lands occupy the river bottom land of the Rio Grande Valley in south-central New Mexico and west Texas.

Plant Location: Elephant Butte Powerplant is located on the Rio Grande River in Sierra County, New Mexico, 4 miles east of Truth or Consequences, New Mexico, and 125 miles north of El Paso, Texas.

Plant Facts: Elephant Butte Dam can store 2,065,010 acre-feet of water to provide irrigation and year-round power generation. A court order has restricted power generations during non-irrigation months. This is a concrete gravity dam 301 feet high and 1,674 feet long, including the spillway. It contains 618,785 cubic yards of concrete. The dam was completed in 1916, but storage operation began in 1915. The power system consists of a 27,945-kilowatt hydroelectric powerplant at Elephant Butte Dam.

Plant Purpose: Generation of hydroelectric power for the project.

Plant History: A system consisting of 490 miles of 115-kilovolt transmission line and 11 substations totaling 81,750 kilovolt-amperes was developed and operated by the Rio Grande Project until 1977. It was subsequently sold to a private electric company.

Present Activities: Replacement of Unit Hard Wire Logic (HWL) system with Unit Programmable Logic Controls (PLC). Updating plant As-Built-Drawings. Start replacement of penstock gate operators.

Future Planned Activities: Replacement of unit excitation systems. Replacement of unit and station service breakers. Continue working on replacement of penstock gate operators.

Special Issues: Costs for Elephant Butte Powerplant were not available to be broken down into smaller elements.

River:	Rio Grande River	**Plant Type:**	Conventional
Powerhouse Type:	Above Ground	**Turbine Type:**	Francis
Original Nameplate Capacity:	24,300 kW	**Installed Capacity:**	27,945 kW
Year of Initial Operation:	1940	**Age:**	67 years
Net Generation (FY-2007):	56.0 GWh	**Rated Head:**	140 feet
Average Plant Factor (FY-2007):	23.2 percent (seasonal)	**Remotely Operated:**	No
Production Mode:	Base Load		

Ancillary Services

Elephant Butte
Ancillary Services

Spinning Reserve	No
Non-Spinning Reserve	No
Replacement Reserve	No
Regulation/Load Following	No
Black Start	Yes
Voltage Support	Yes

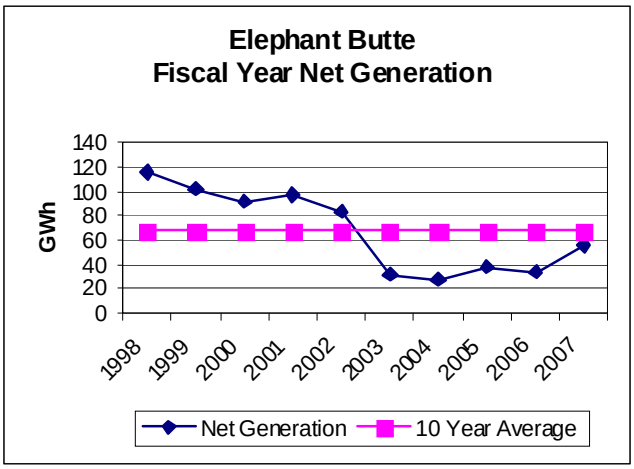
Generators

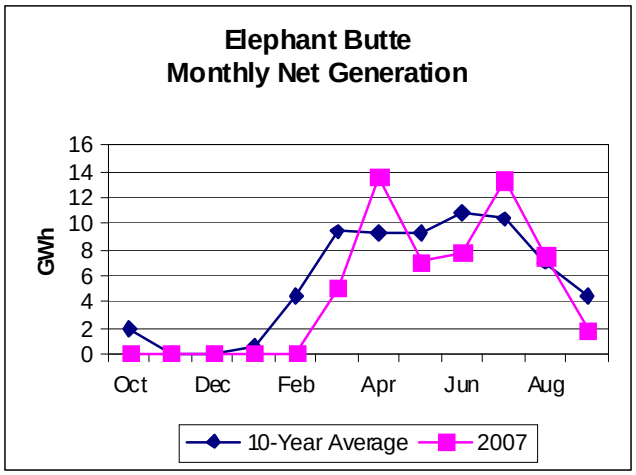
Elephant Butte Generators

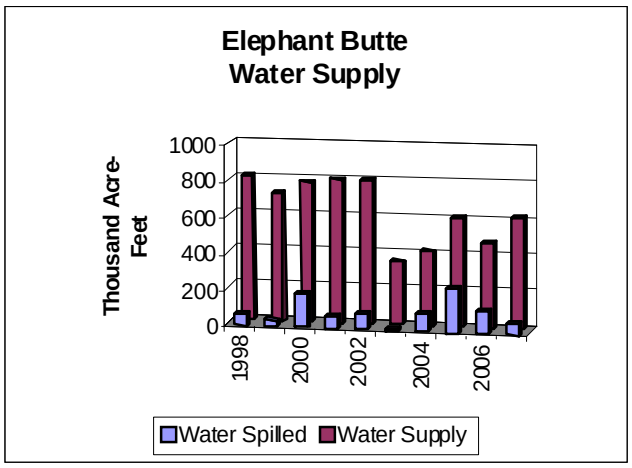
Existing Number and Capacity

Unit #	Original Capacity (kW)	Capacity Increased (kW)	Present Capacity (kW)
1	8,100	1,215	9,315
2	8,100	1,215	9,315
3	8,100	1,215	9,315
3 units	24,300	3,645	27,945

Generation

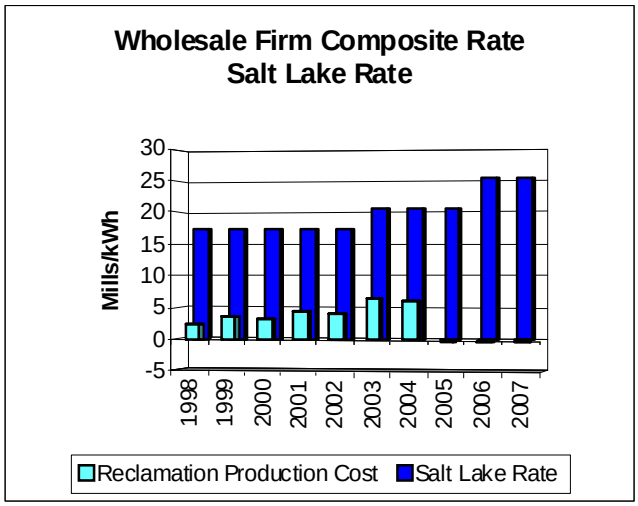

Elephant Butte
Fiscal Year Net Generation
GWh
140
120
100
80
60
40
20
0
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
Net Generation
10 Year Average


Elephant Butte
Monthly Net Generation
GWh
16
14
12
10
8
6
4
2
0
Oct
Dec
Feb
Apr
Jun
Aug
10-Year Average
2007

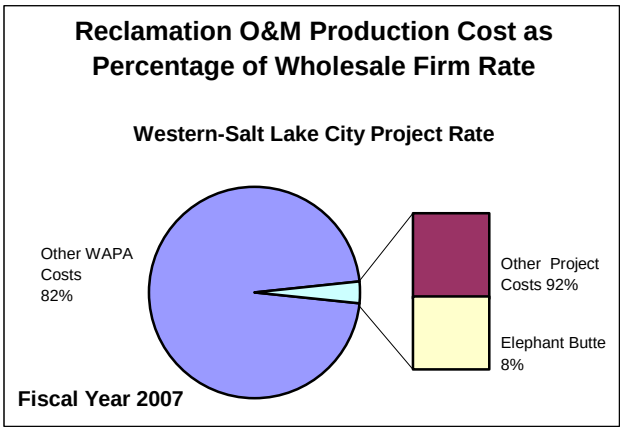

Elephant Butte
Water Supply
Thousand Acre-Feet
1000
800
600
400
200
0
1998
2000
2002
2004
2006
Water Spilled
Water Supply

Prime Laboratory Benchmarks

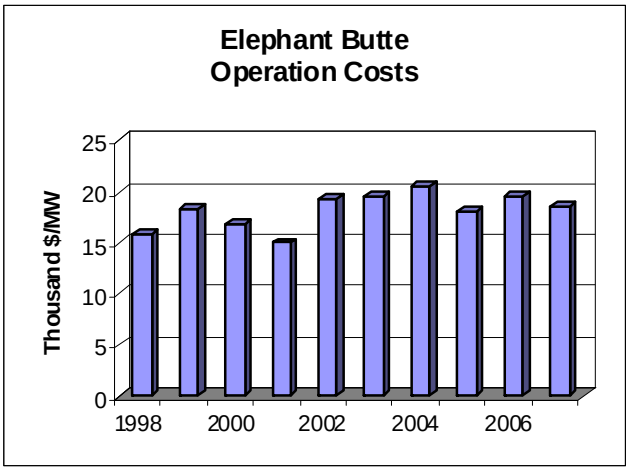
Benchmark 1
Wholesale Firm Rate

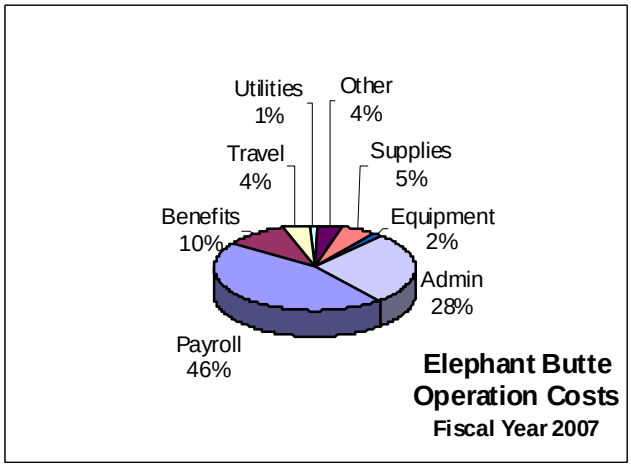


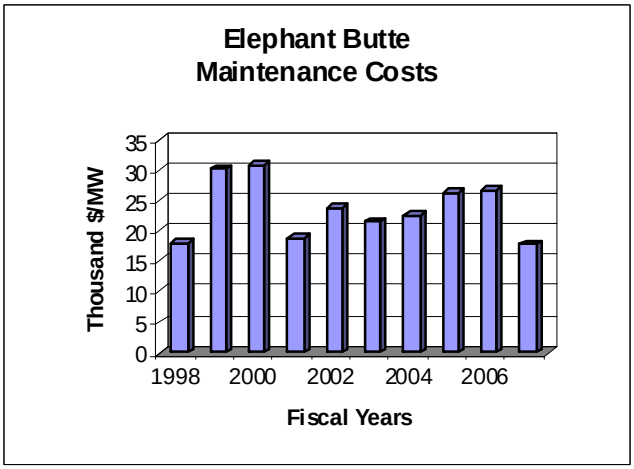
Benchmark 2
Reclamation's Production Cost as Percentage of Wholesale Firm Rate

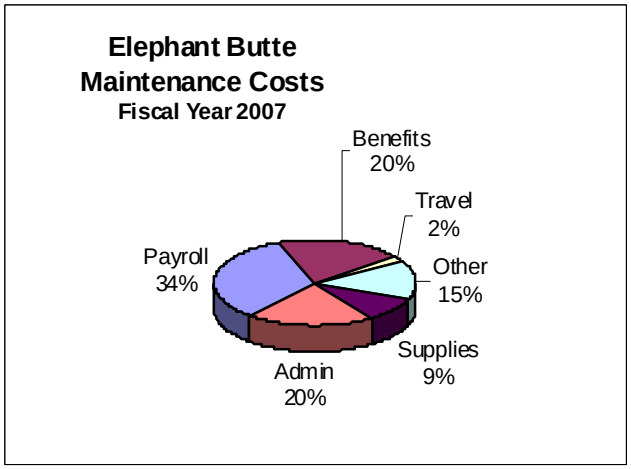


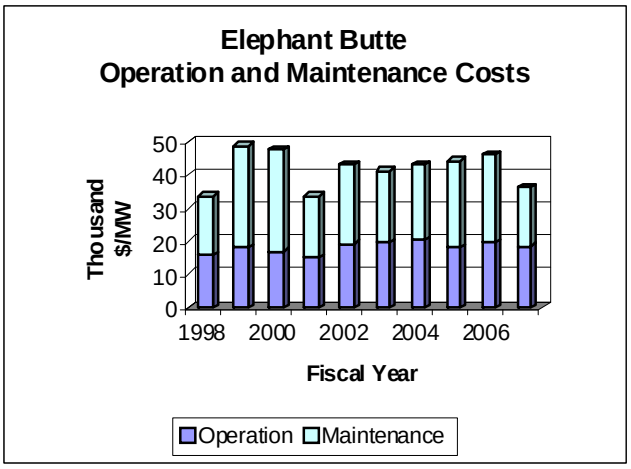
Benchmark 3
Production Cost

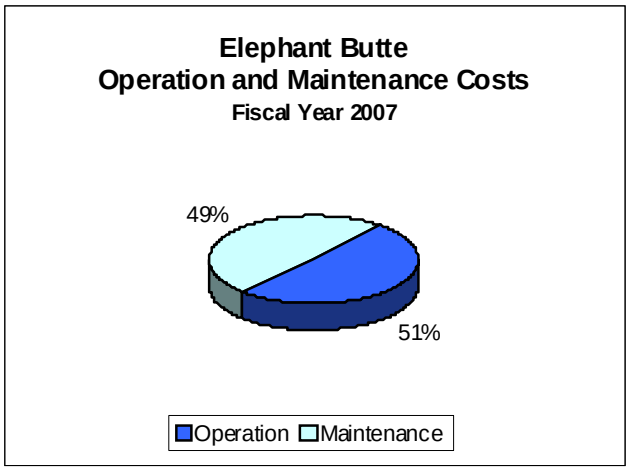






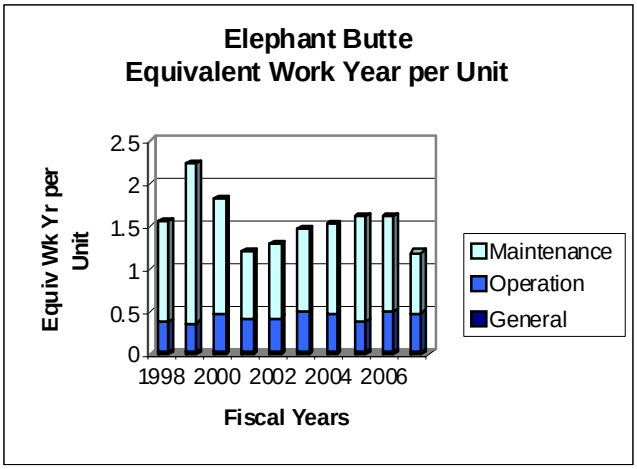


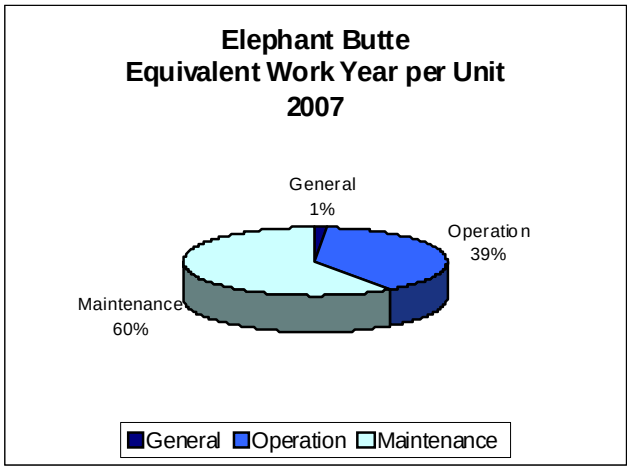


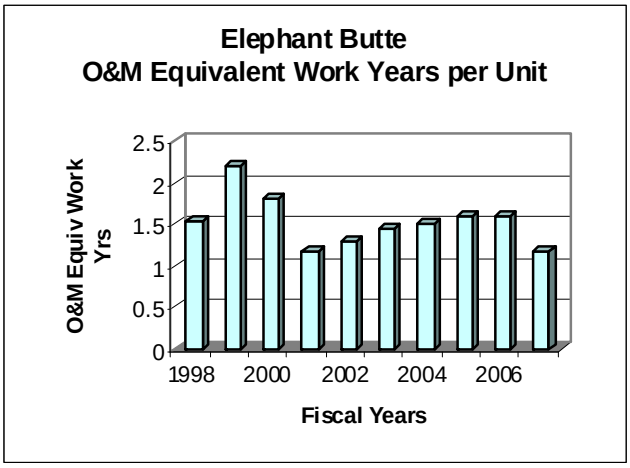


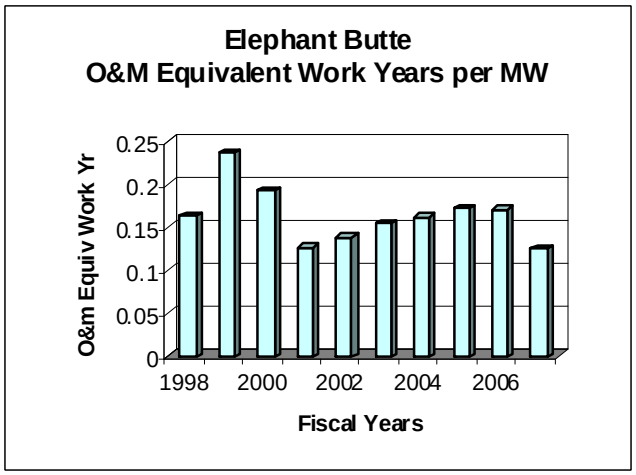
Benchmark 4
Workforce Deployment

Elephant Butte FY 2007 Equivalent Work Staffing Year Levels						
	Equivalent Work Year Staffing Charged to Powerplant	Leave Additive	Denver and Washington Equivalent Work Year Staffing Additive	Total Equivalent Work Year Allocated to Powerplant	Total Equivalent Staffing Work Year per Generating Unit	Total Equivalent Work Year Staffing per Megawatt
General	0.00	0.00	0.05	0.05	0.02	0.00
Operation	1.25	0.13	0.00	1.38	0.46	0.05
Maintenance	1.93	0.21	0.00	2.14	0.71	0.08
Total Staffing	3.18	0.34	0.05	3.58	1.19	0.13

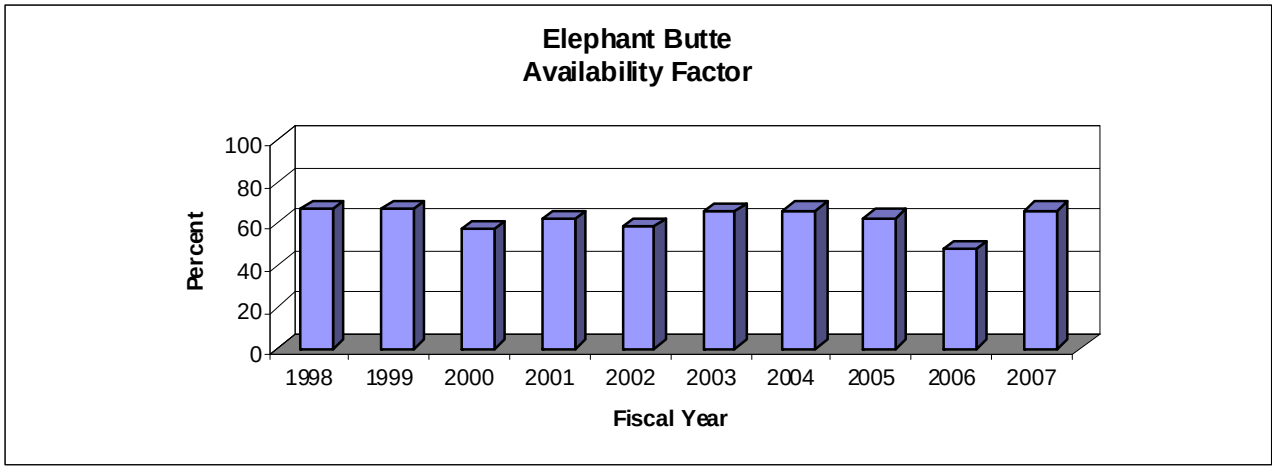




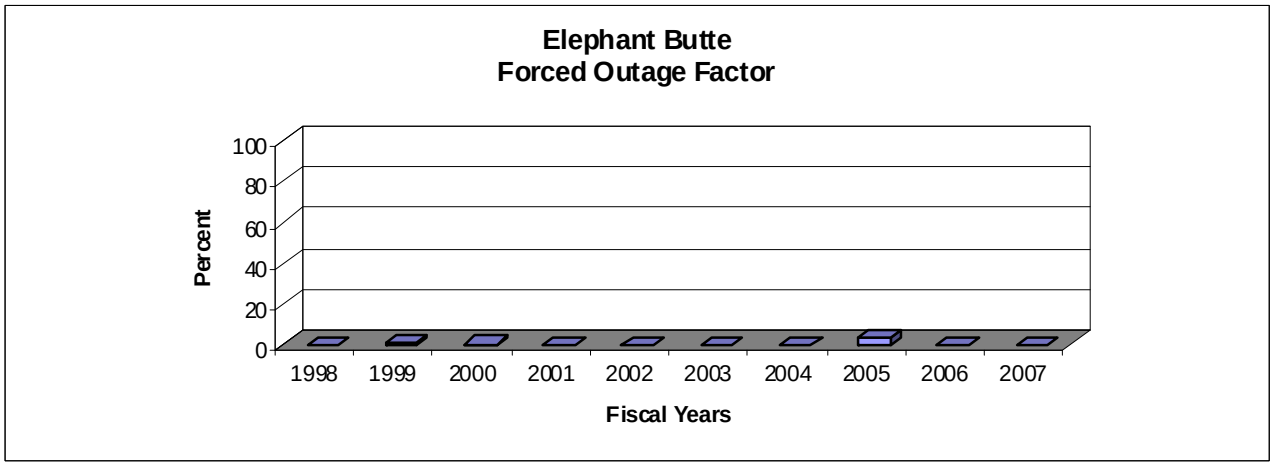




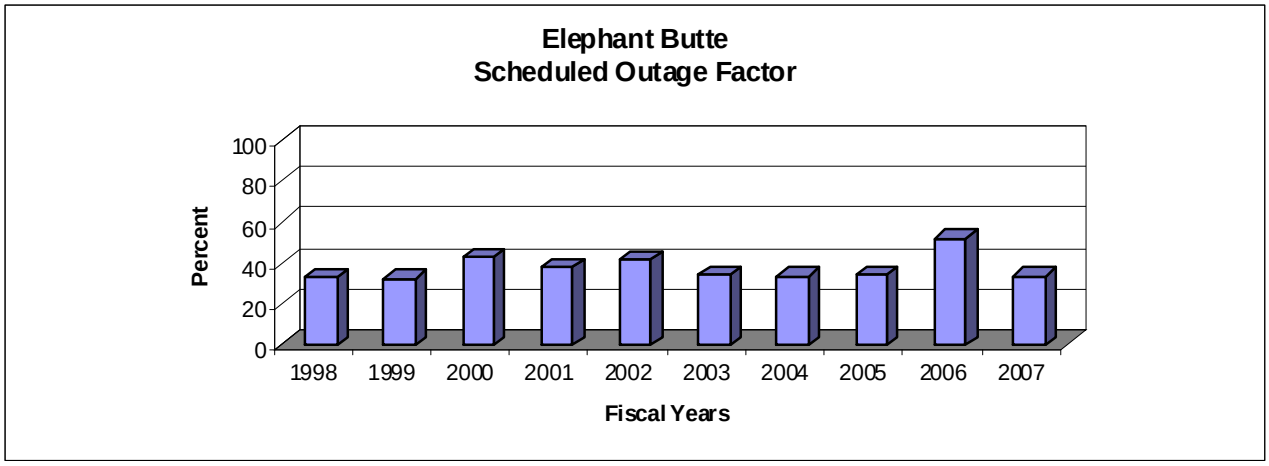
Benchmark 5
Availability Factor



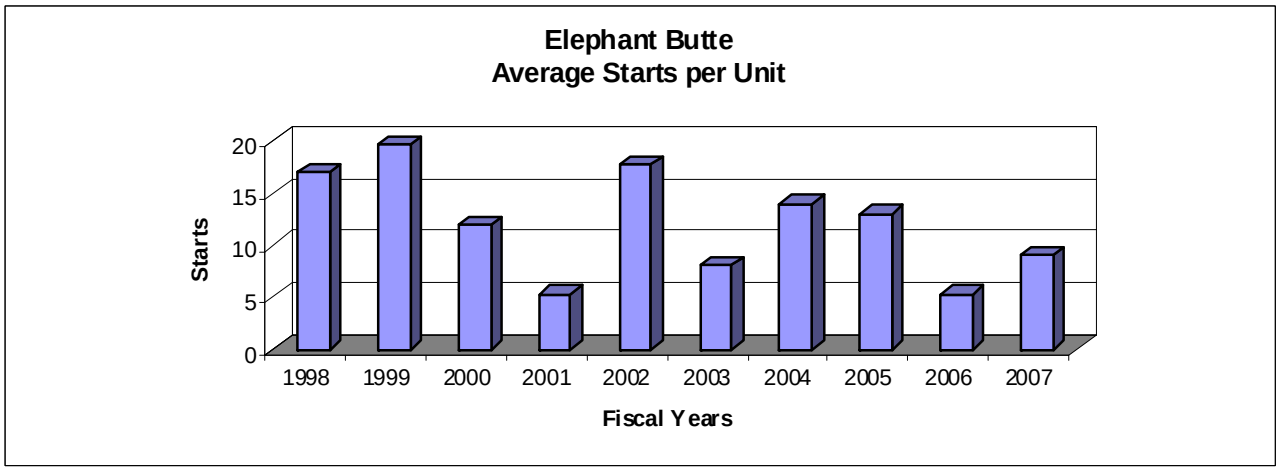
Benchmark 6
Forced Outage Factor



Benchmark 7
Scheduled Outage Factor



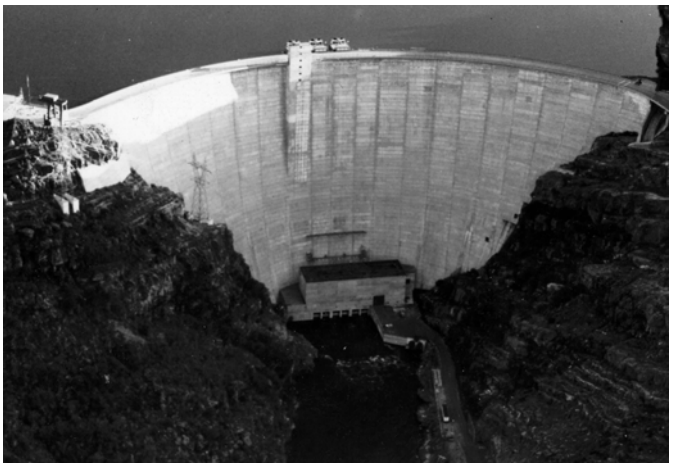
Starts



Benchmark Data Comparison				
Fiscal Year 2007	**Elephant Butte Powerplant**	**Total Reclamation Average**	**Industry Average**	**Best Performers**
Wholesale Firm Rate Mills/kWh	20.7	*22.45	Not Available	Not Available
Production Cost as Percentage of Wholesale Firm Rate	1.0%	12.1%	Not Applicable	Not Applicable
O&M Cost $/MWh	18.21	2.76	Not Applicable	1.00
O&M Costs $/MW	36,484	7,847	Not Applicable	2,897
O&M Equiv Work Year per MW	0.13	0.03	Not Available	0.00
Availability Factor	66.3	82.3	**88.64	98.54
Forced Outage Factor	0.00	2.6	**2.61	0.00
Scheduled Outage Factor	33.7	15.1	**8.74	0.00

*Weighted by Net Generation
**2006 NERC Average

Flaming Gorge Powerplant
Colorado River Storage Project
Flaming Gorge Storage Unit



Plant Contact:
C. Steven Hulet, Manager
Flaming Gorge Field Division

Plant Address:
Flaming Gorge Field Division
5995 Flaming Gorge Visitor Center
Dutch John UT 84023

Telephone Numbers:
Phone: (435) 885-3231
Fax: (435) 885-3224

E-Mail Address:
shulet@uc.usbr.gov

Reclamation Region: Upper Colorado

NERC Region: Western Electricity Coordinating Council, Rocky Mountain Power Area

PMA Service Area: Western Area Power Administration, Colorado River Storage Project Management Center

Project Authorization: The Congress authorized construction of four storage units in the Colorado River Storage Project and 11 participating projects on April 11, 1956 under Public Law 485, 84th Congress, 70 Stat. 105. Additional projects have been added since the original legislation was adopted.

Project Purposes: The Colorado River Storage Project provides for the comprehensive development of the Upper Colorado River Basin. The project furnishes the long-time regulatory storage needed to permit States in the upper basin to meet their flow obligation at Lees Ferry, Arizona, (as defined in the Colorado River Compact) and still use their apportioned water.

Plant Location: The Flaming Gorge Powerplant is located on the Green River in Daggett County, Utah, 26 miles downstream from the Utah-Wyoming border.

Plant Facts: The Flaming Gorge Powerplant has three 10-foot-diameter penstock pipes near the center of the dam, which convey water to the powerplant. The powerplant is at the downstream toe of the dam and houses three 50,650-kilowatt generators driven by three 50,000-horsepower Francis-type turbines.

Plant Purpose: As the Flaming Gorge Dam is on a major tributary to the Colorado River, it was constructed for long-term storage of water and controlled releases to meet downstream commitments. The powerplant's purpose is to use this stored water for the economical generation of electricity and provide the revenue for repayment of the project.

Plant History: Construction was authorized on April 11, 1956, and construction began in 1958 with road building, a diversion tunnel, and other preparatory work. The first unit went on the line September 27, 1963, and the third and final unit in February 1964. The Flaming Gorge Reservoir first filled in August 1974 at elevation 6,040 with 3,749,000 acre feet of live storage. The plant was automated in 1973 and 1974 and was then controlled by the Colorado River Storage Project Dispatch Center located in Montrose, Colorado. Selective withdrawal structures were installed on the turbine penstock intakes during the winters of 1977 and 1978 to provide temperature control of the water released down the Green River to improve fishery habitat. A temperature of 55 degrees Fahrenheit can be maintained from mid-June into October. On August 11, 1977, the Unit 2 turbine seized up when the lower seal ring failed. This incident lead to the replacement of seal rings on all three units. The newly designed and installed seal rings also failed and were again replaced on each unit. Generator up-rates began in August 1990 and were completed in April 1992. The generators were up rated from 36,000 kW to 50,650 kW.

Three unit transformers were replaced in 2002 and 2003.

Present Activities: On February 16, 2006, the Regional Director of Reclamation's Upper Colorado Region signed a Record of Decision (Flaming Gorge ROD) for the Operation of Flaming Gorge Dam Final Environmental Impact Statement. The Flaming Gorge ROD adopted the Action Alternative as the Federal Action to modify the operation of Flaming Gorge Dam.

Flaming Gorge upgraded the turbines in each of its three generating units beginning with Unit 3 in October of 2005 and finishing with Unit 1 in April of 2008. The upgraded turbines provided an efficiency increase of 4 to 6 percent.

Future Planned Activities: None.

Special Issues: Privatization of the community of Dutch John, the residential facility built to support the construction and operation of the Flaming Gorge Dam and Power plant, has been completed. It should be noted that Flaming Gorge's net generation, unit availability, and scheduled outages reflect the unit up rates, which took place in 1990 through

1992. Data for fiscal year 1991 is most affected, because two units were down during that year.

River:	Green River	**Plant Type:**	Conventional
Powerhouse Type:	Above Ground	**Turbine Type:**	Francis
Original Nameplate Capacity:	108,000 kW	**Installed Capacity:**	151,950 kW
Year of Initial Operation:	1963	**Age:**	44 years
Net Generation (FY-2007):	292.8 GWh	**Rated Head:**	400 feet
Average Plant Factor (FY-2007):	22.2 percent	**Remotely Operated:**	Yes
Production Mode:	Intermediate		

Ancillary Services

Flaming Gorge
Ancillary Services

Spinning Reserve	Yes
Non-Spinning Reserve	Yes
Replacement Reserve	Yes
Regulation/Load Following	Yes
Black Start	Yes
Voltage Support	Yes

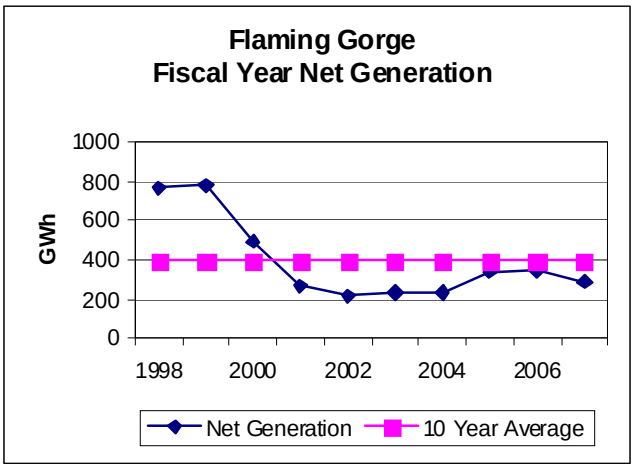
Generators

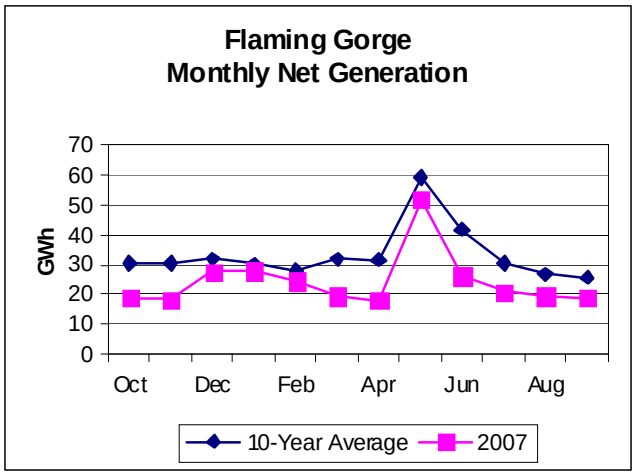
Flaming Gorge Generators

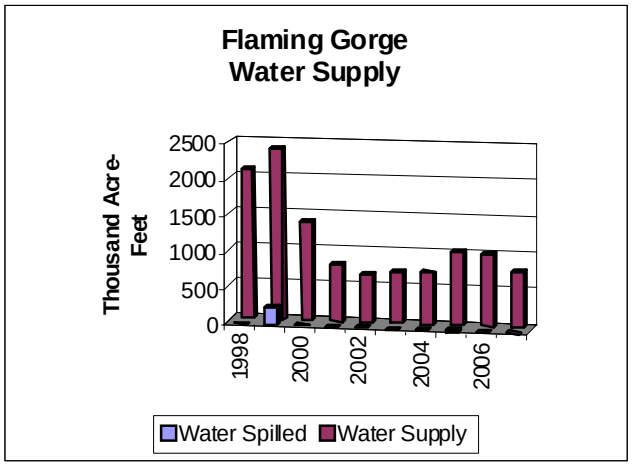
Existing Number and Capacity

Unit #	Original Capacity (kW)	Capacity Increased (kW)	Present Capacity (kW)
1	36,000	14,650	50,650
2	36,000	14,650	50,650
3	36,000	14,650	50,650
3 units	108,000	43,950	151,950

Generation

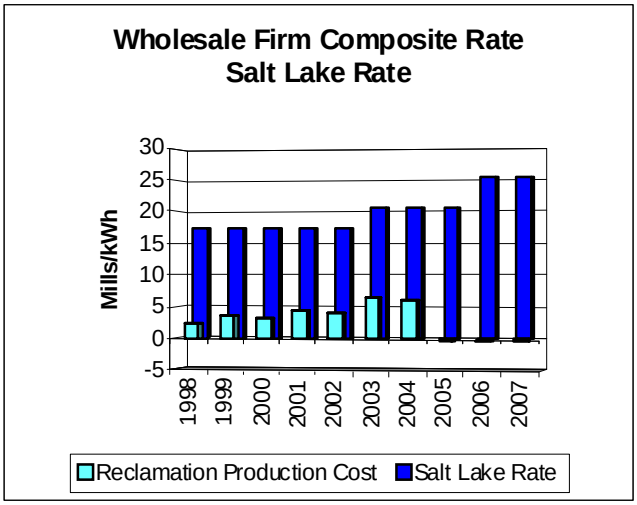

Flaming Gorge
Fiscal Year Net Generation
GWh
1000
800
600
400
200
0
1998
2000
2002
2004
2006
Net Generation
10 Year Average


Flaming Gorge
Monthly Net Generation
GWh
70
60
50
40
30
20
10
0
Oct
Dec
Feb
Apr
Jun
Aug
10-Year Average
2007

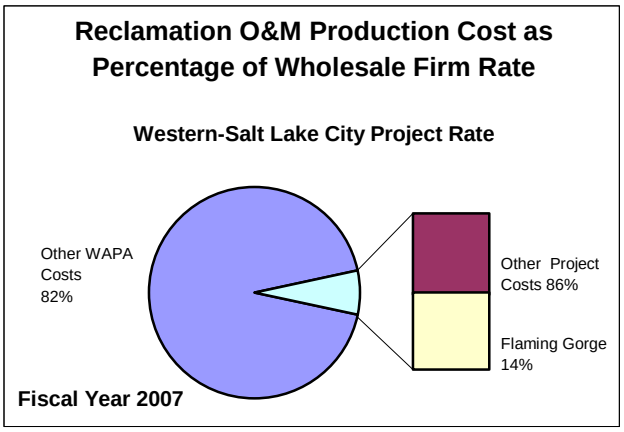

Flaming Gorge
Water Supply
Thousand Acre-Feet
2500
2000
1500
1000
500
0
1998
2000
2002
2004
2006
Water Spilled
Water Supply

Prime Laboratory Benchmarks

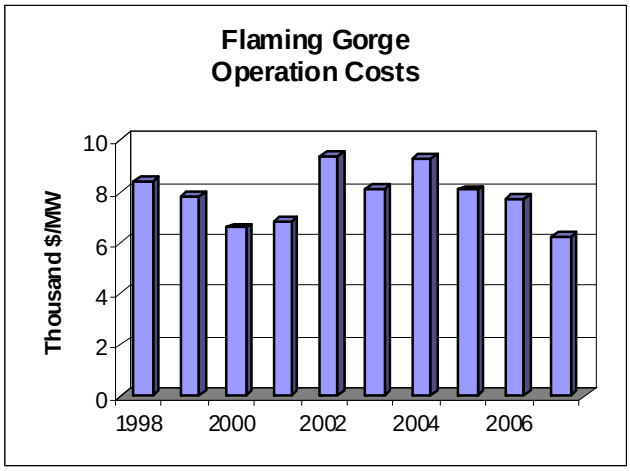
Benchmark 1
Wholesale Firm Rate

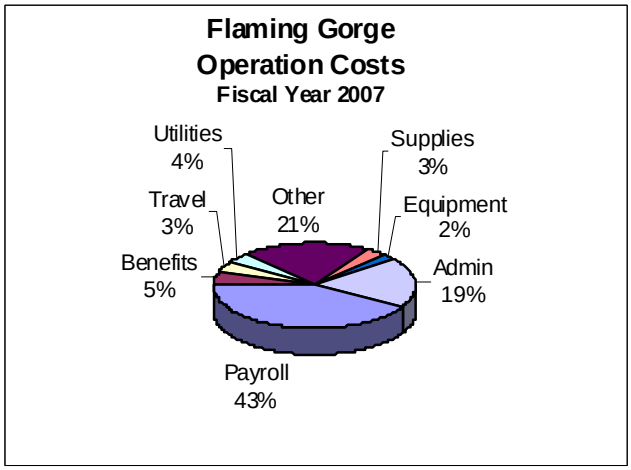


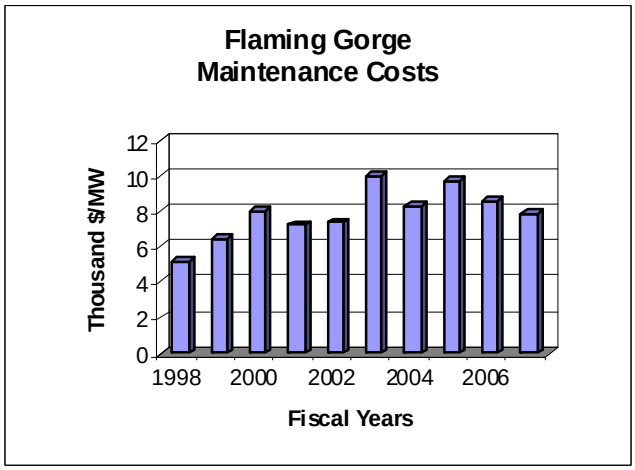
Benchmark 2
Reclamation's Production Cost as Percentage of Wholesale Firm Rate

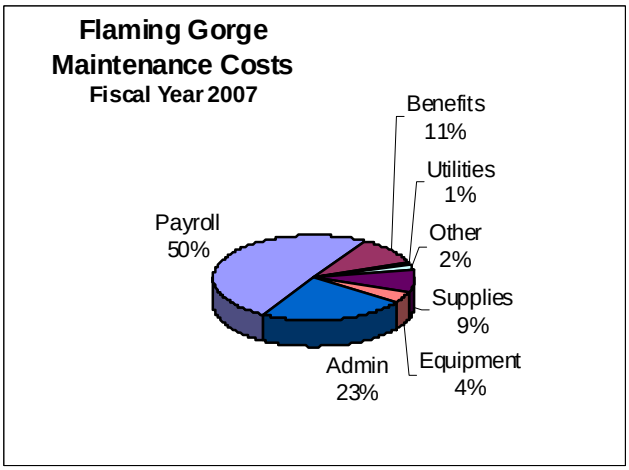


Benchmark 3
Production Cost

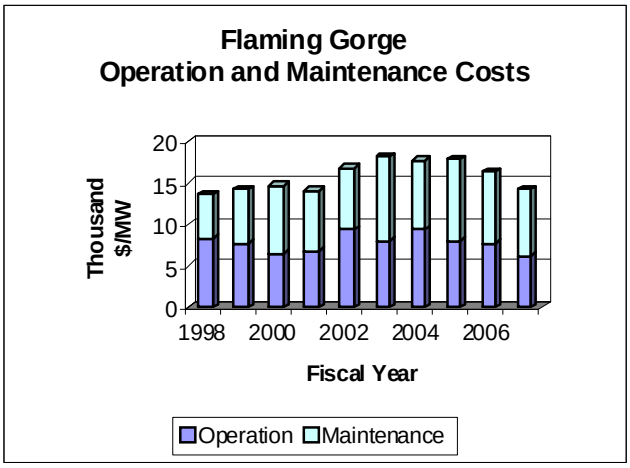


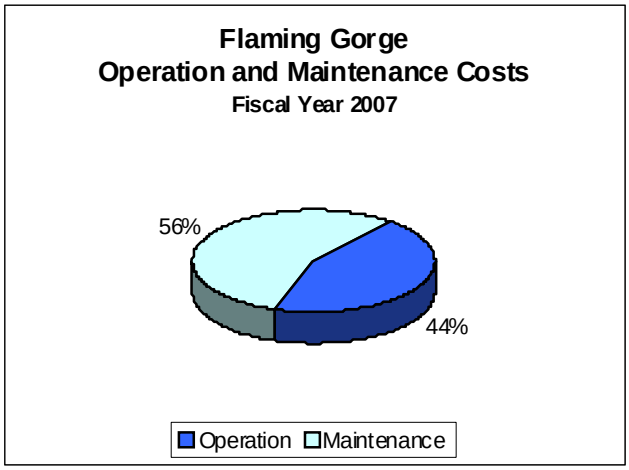


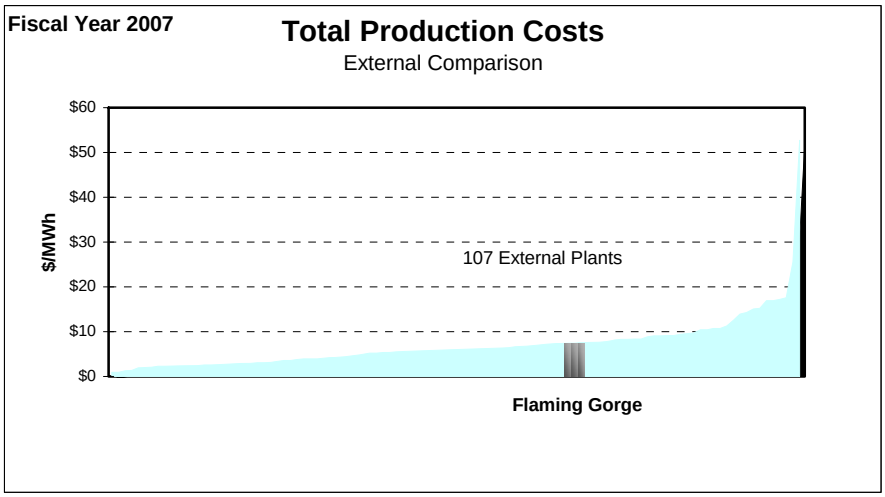


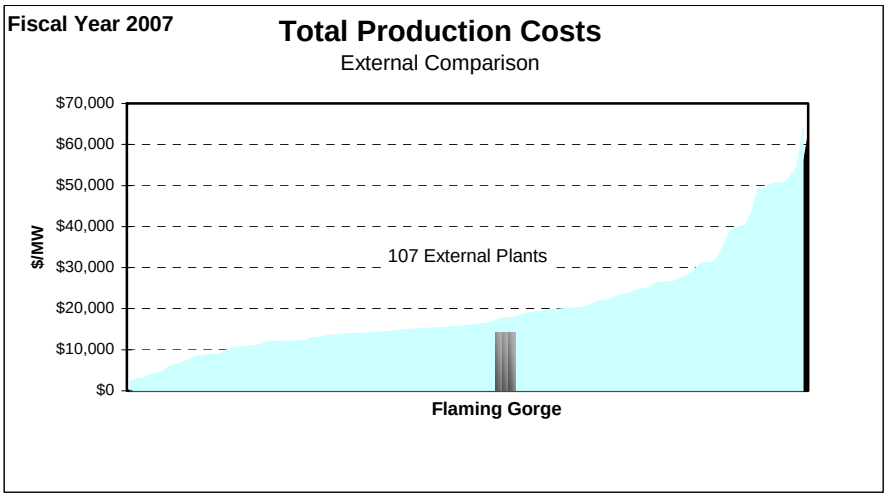


Benchmark 3
Production Cost



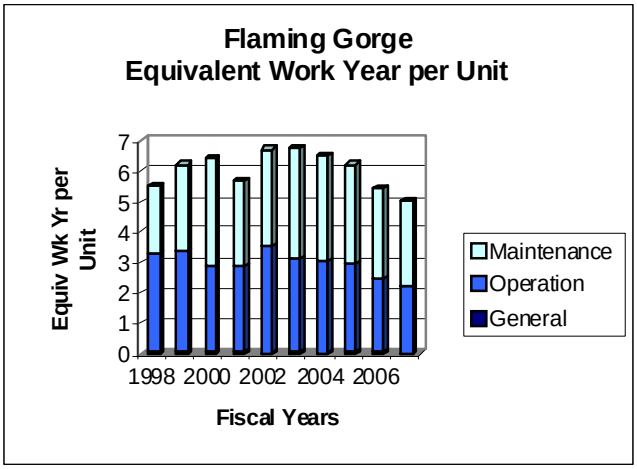


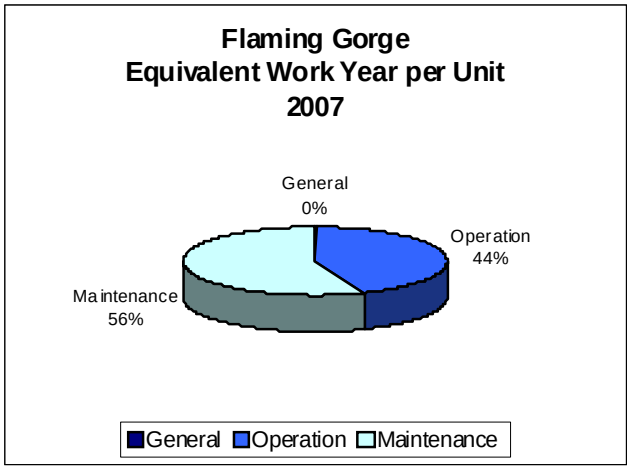


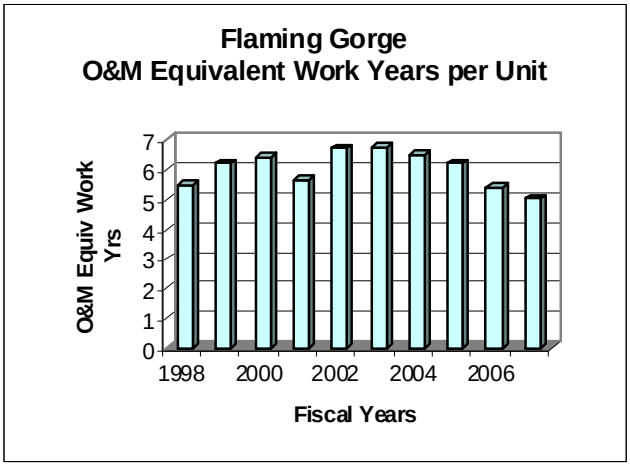


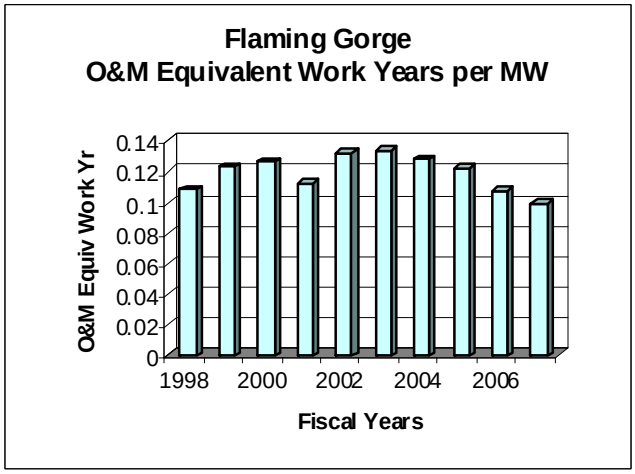
Benchmark 4
Workforce Deployment

Flaming Gorge FY 2007 Equivalent Work Staffing Year Levels						
	Equivalent Work Year Staffing Charged to Powerplant	Leave Additive	Denver and Washington Equivalent Work Year Staffing Additive	Total Equivalent Work Year Allocated to Powerplant	Total Equivalent Staffing Work Year per Generating Unit	Total Equivalent Work Year Staffing per Megawatt
General	0.00	0.00	0.05	0.05	0.02	0.00
Operation	5.96	0.63	0.00	6.59	2.20	0.04
Maintenance	7.65	0.81	0.00	8.47	2.82	0.06
Total Staffing	13.61	1.45	0.05	15.11	5.04	0.10

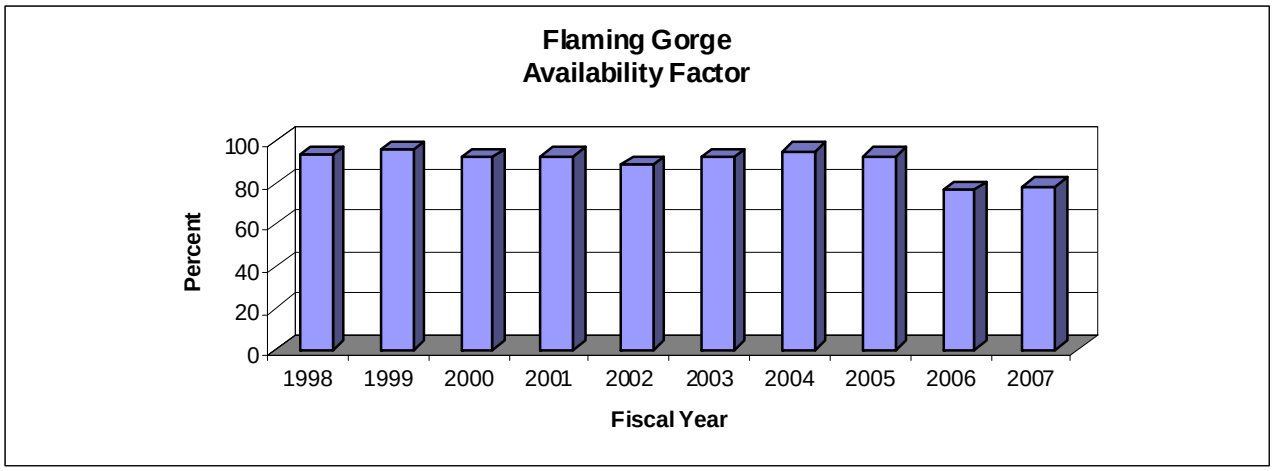




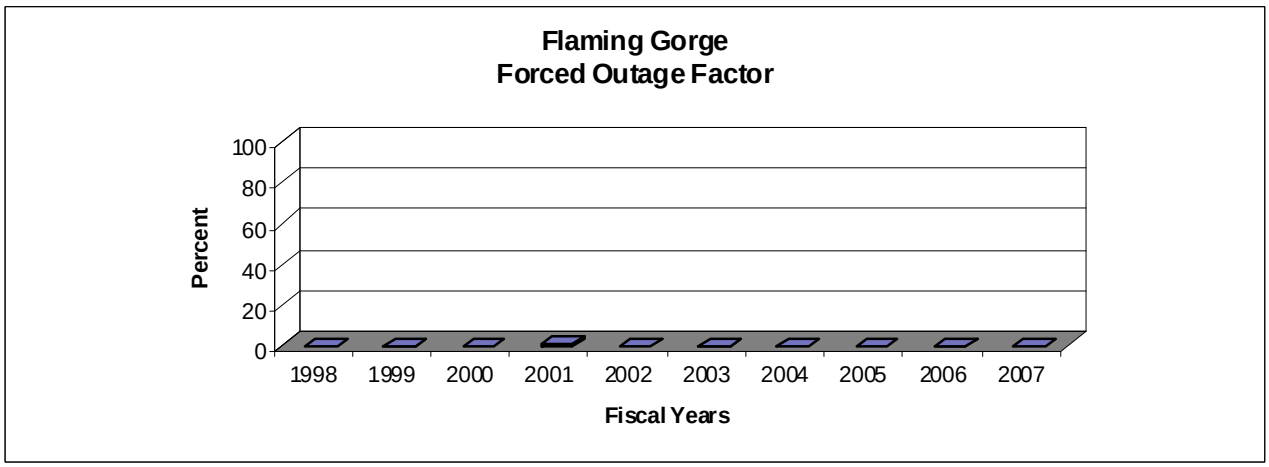




Benchmark 5
Availability Factor

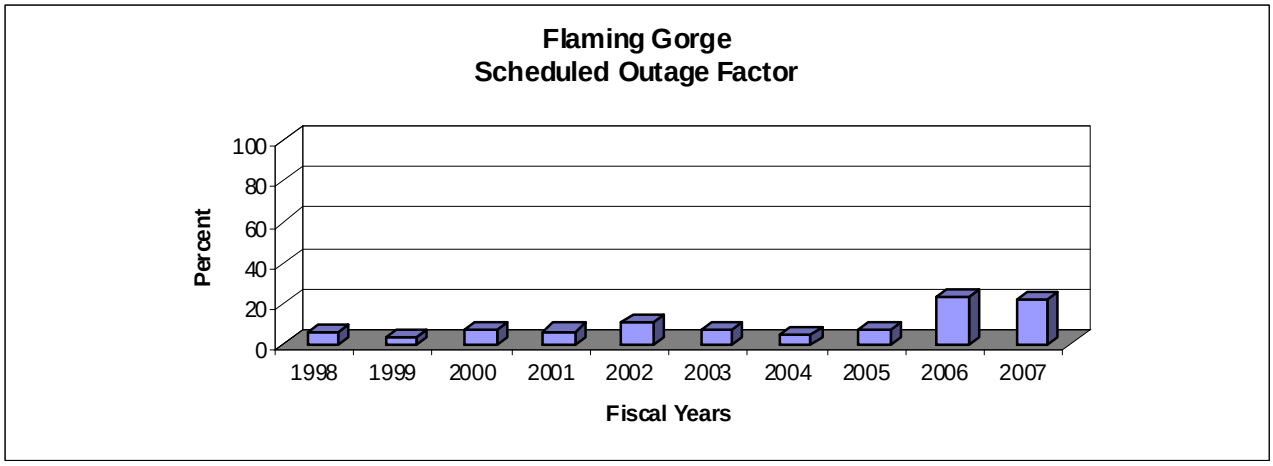


Benchmark 6
Forced Outage Factor

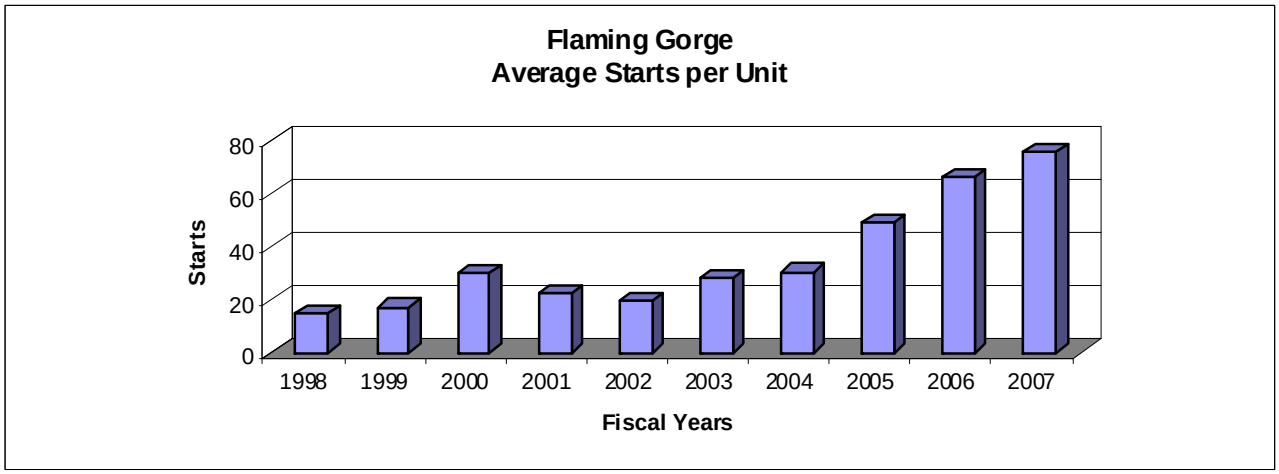


FY-97 - Units out due to plant flooding

Benchmark 7
Scheduled Outage Factor



Starts



Benchmark Data Comparison					
Fiscal Year 2007	**Flaming Gorge Powerplant**	**Reclamation Average 100-500 MW Group**	**Total Reclamation Average**	**Industry Average**	**Best Performers**
Wholesale Firm Rate Mills/kWh	20.7	Not Applicable	*22.45	Not Available	Not Available
Production Cost as Percentage of Wholesale Firm Rate	2.2%	Not Applicable	12.1%	Not Applicable	Not Applicable
O&M Cost $/MWh	7.35	4.44	2.76	***63.88	1.00
O&M Costs $/MW	14,171	10,502	7,847	***21,167	2,897
O&M Equiv Work Year per MW	0.10	0.04	0.03	Not Available	0.0
Availability Factor	78.4	83.5	82.3	**88.64	98.5
Forced Outage Factor	0.1	1.2	2.6	**2.61	0.0
Scheduled Outage Factor	21.5	15.4	15.1	**8.74	0.0

*Weighted by Net Generation
**2006 NERC Average
*** Energy Information Administration Data

Fontenelle Powerplant
Seedskadee Project

Plant Contact:
C. Steven Hulet, Manager
Flaming Gorge Field Division

Charles (Chuck) Green
Fontenelle Plant Supervisor

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#38 Fontenelle Dam, Hwy 316
Fontenelle WY 83101

Telephone Numbers:
Phone: (307) 877-3561
Fax: (307) 877-3686

E-Mail Address:
cgreen@uc.usbr.gov

Reclamation Region: Upper Colorado

NERC Region: Western Electricity Coordinating Council, Rocky Mountain Power Area

PMA Service Area: Western Area Power Administration, Colorado River Storage Project Management Center

Project Authorization: Seedskadee Project is one of the initial group of participating projects authorized with the Colorado River Storage Project on April 11, 1956 (70 Stat. 105).

Project Purposes: The Seedskadee Project, a participating project of the Colorado River Storage Project, is in the Upper Green River Basin in southwestern Wyoming. It provides storage and regulation of the flows of the Green River for power generation, municipal and industrial use, fish and wildlife, and recreation.

Plant Location: Fontenelle Powerplant is located on the Green River in Lincoln County, Wyoming, 24 miles southeast of LaBarge, Wyoming.

Plant Facts: Fontenelle Powerplant is located adjacent to the toe of the dam, with a 10-foot power penstock branching from one of three river outlet works discharge conduits. The turbine has a water discharge capacity of 1,585 cubic feet per second.

Plant Purpose: Fontenelle Powerplant provides maximum generation of power from regulated base load river flows depending upon water availability. Flows/generation vary from 350 cubic feet per second/1 megawatt at low seasonal head to 1,550 cubic feet per second/11 megawatt at peak runoff periods.

Plant History: During 1986-1989, the powerplant was shutdown when the reservoir was being drained to install a diaphragm cutoff wall for the length of the dam. In June 1989, the unit began generating again at new low-head capabilities. This was in part due to the addition of additional rip-rap being placed on the upstream face of the dam.

Present Activities: Normal operations

Future Planned Activities: Future plans include major stilling basin inspection and repairs and a generator exciter replacement.

Special Issues: The powerplant was shut down 33 percent of the 10-year review period to construct and install the diaphragm cutoff wall.

River:	Green River	**Plant Type:**	Conventional
Powerhouse Type:	Above Ground	**Turbine Type:**	Francis
Original Nameplate Capacity:	10,000 kW	**Installed Capacity:**	10,000 kW
Year of Initial Operation:	1968	**Age:**	39 years
Net Generation (FY-2007):	39.7 GWh	**Rated Head:**	94 feet
Average Plant Factor (FY-2007):	45.9 percent	**Remotely Operated:**	Yes
Production Mode:	Base Load		

Ancillary Services

Fontenelle
Ancillary Services

Spinning Reserve	Yes
Non-Spinning Reserve	Yes
Replacement Reserve	Yes
Regulation/Load Following	Yes
Black Start	Yes
Voltage Support	Yes

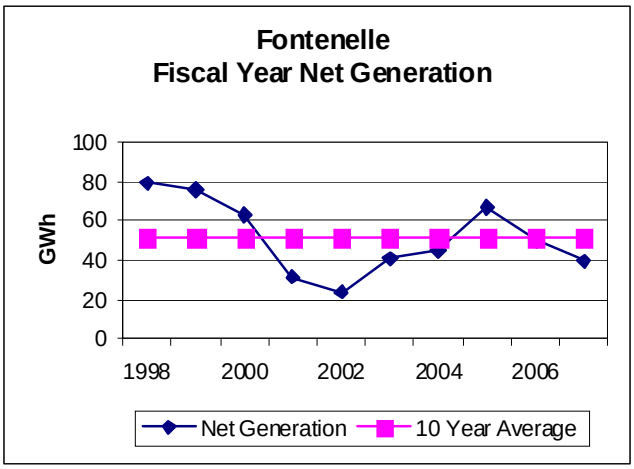
Generators

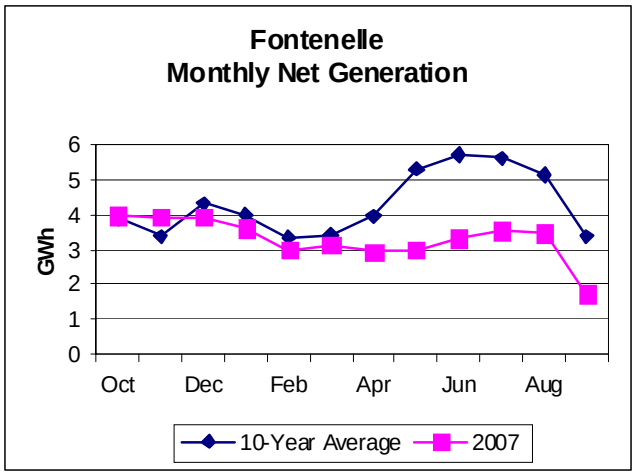
Fontenelle Generators

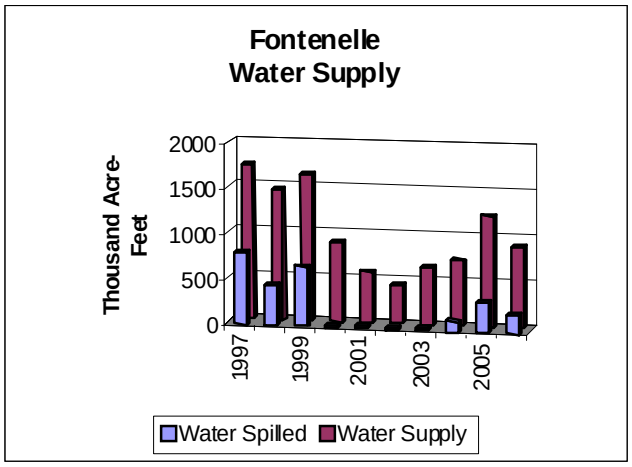
Existing Number and Capacity

Unit #	Original Capacity (kW)	Capacity Increased (kW)	Present Capacity (kW)
1	10,000	-	10,000
1 Unit	10,000	-	10,000

Generation

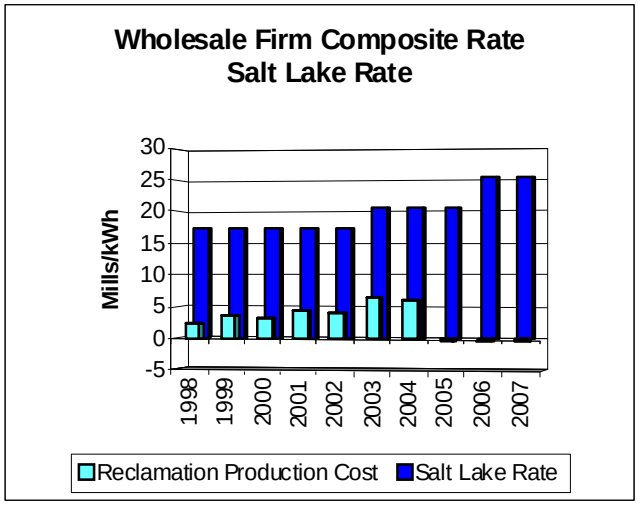

Fontenelle
Fiscal Year Net Generation
GWh
100
80
60
40
20
0
1998
2000
2002
2004
2006
Net Generation
10 Year Average


Fontenelle
Monthly Net Generation
GWh
6
5
4
3
2
1
0
Oct
Dec
Feb
Apr
Jun
Aug
10-Year Average
2007

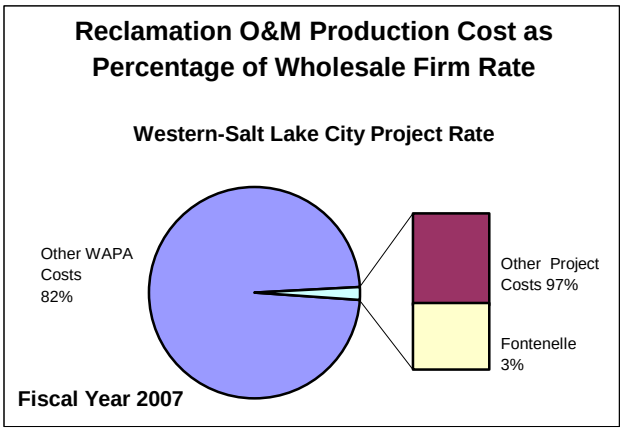

Fontenelle
Water Supply
Thousand Acre-Feet
2000
1500
1000
500
0
1997
1999
2001
2003
2005
Water Spilled
Water Supply

Prime Laboratory Benchmarks

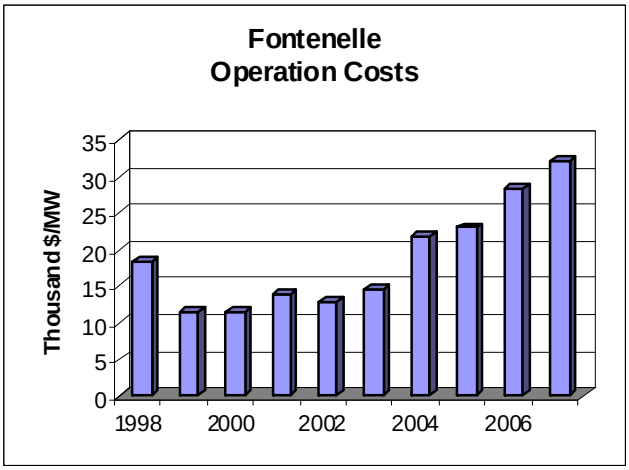
Benchmark 1
Wholesale Firm Rate

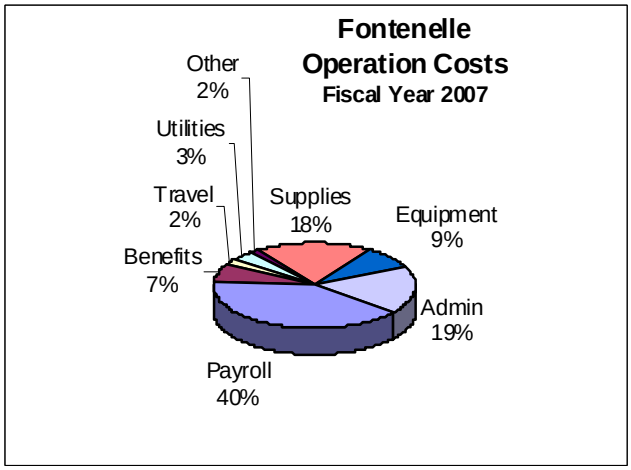


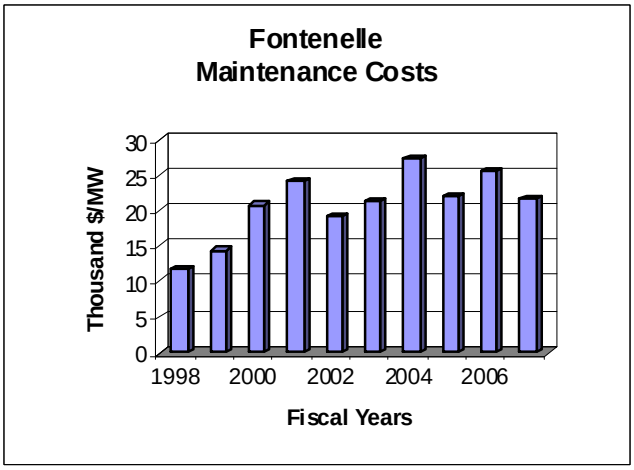
Benchmark 2
Reclamation's Production Cost as Percentage of Wholesale Firm Rate

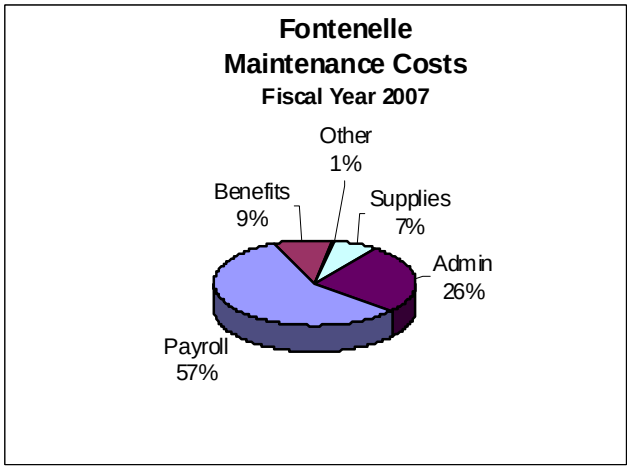


Benchmark 3
Production Cost

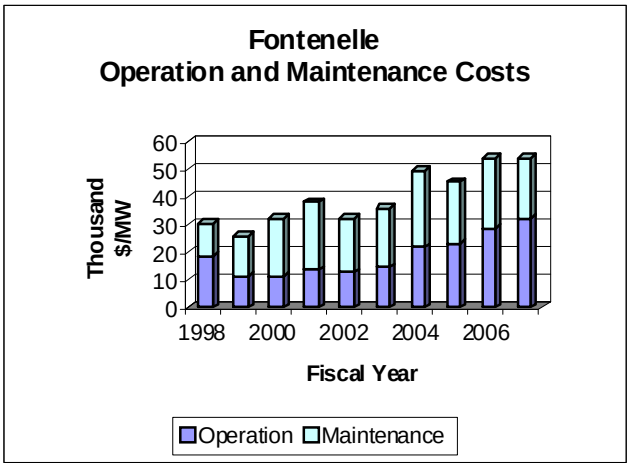


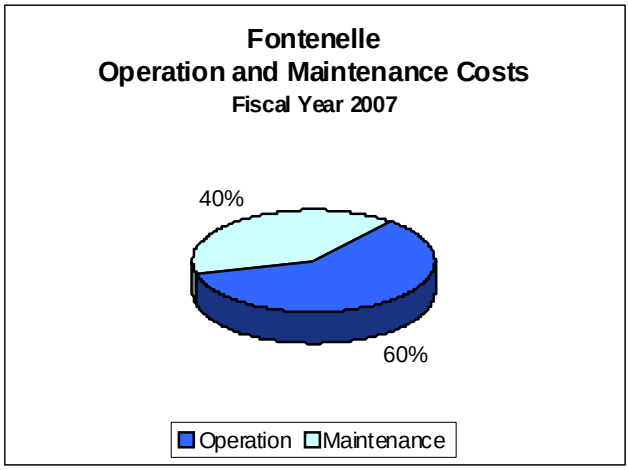


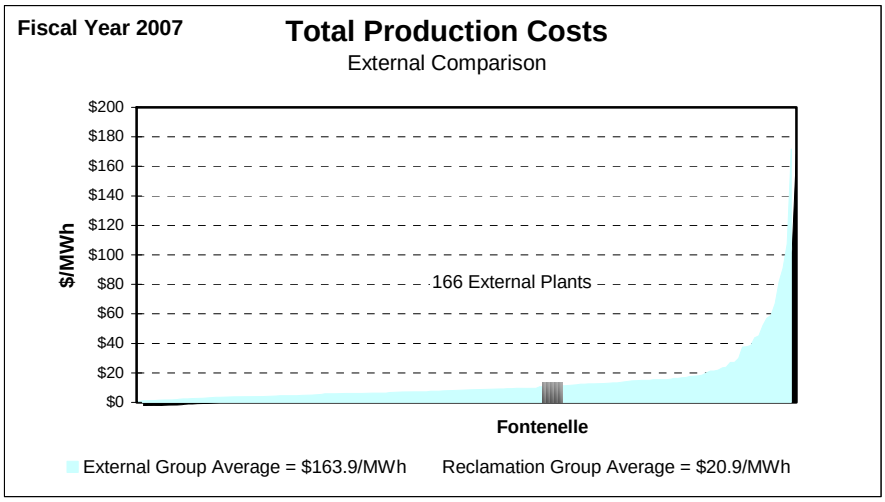


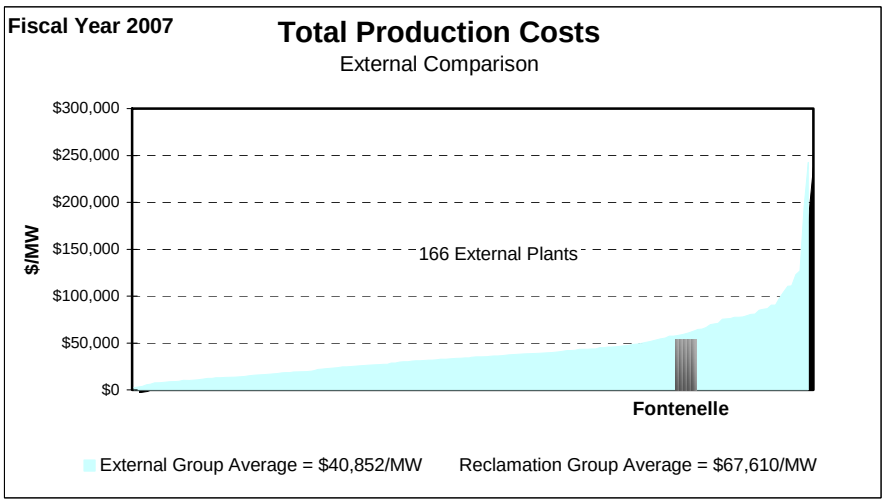


Benchmark 3
Production Cost



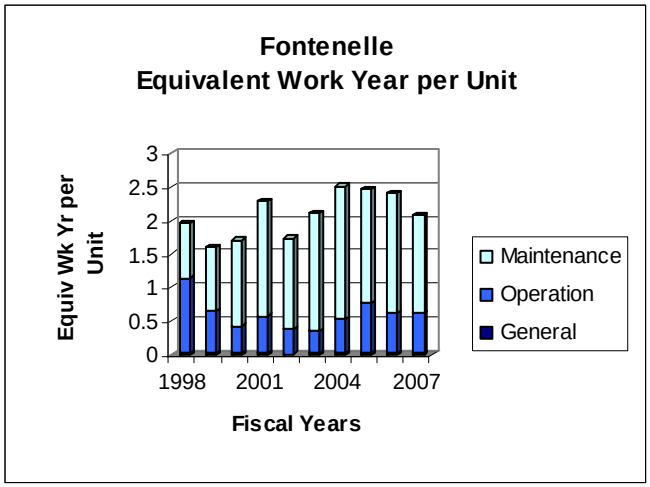


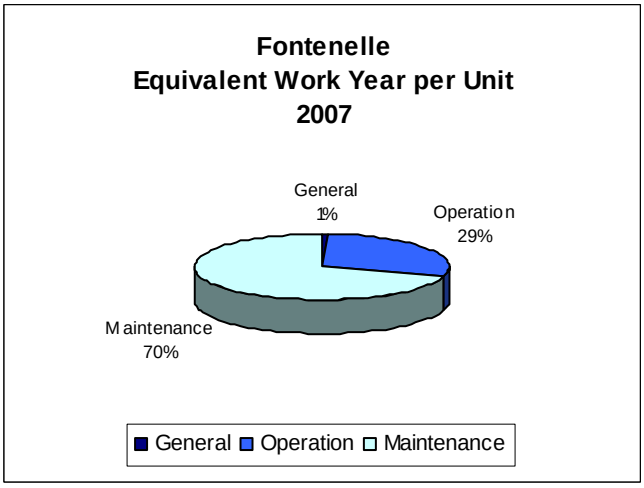


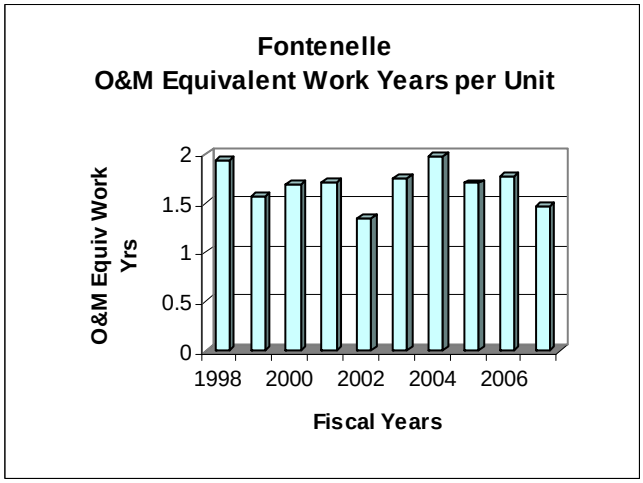


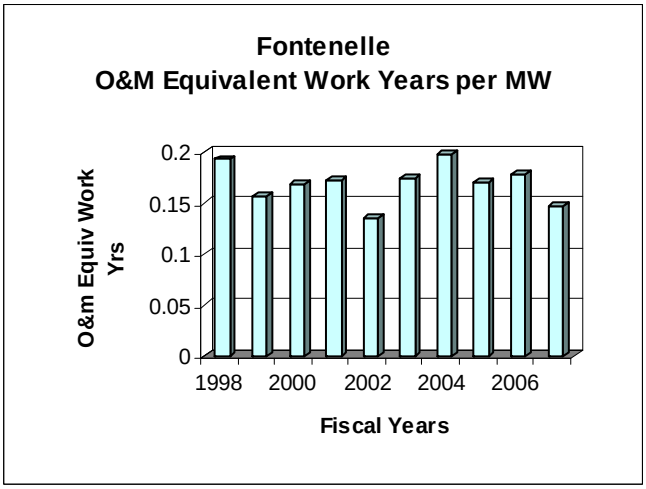
Benchmark 4
Workforce Deployment

Fontenelle FY 2007 Equivalent Work Staffing Year Levels						
	Equivalent Work Year Staffing Charged to Powerplant	Leave Additive	Denver and Washington Equivalent Work Year Staffing Additive	Total Equivalent Work Year Allocated to Powerplant	Total Equivalent Staffing Work Year per Generating Unit	Total Equivalent Work Year Staffing per Megawatt
General	0.00	0.00	0.02	0.02	0.02	0.00
Operation	0.54	0.06	0.00	0.60	0.60	0.06
Maintenance	1.33	0.14	0.00	1.47	1.47	0.15
Total Staffing	1.87	0.20	0.02	2.09	2.09	0.21

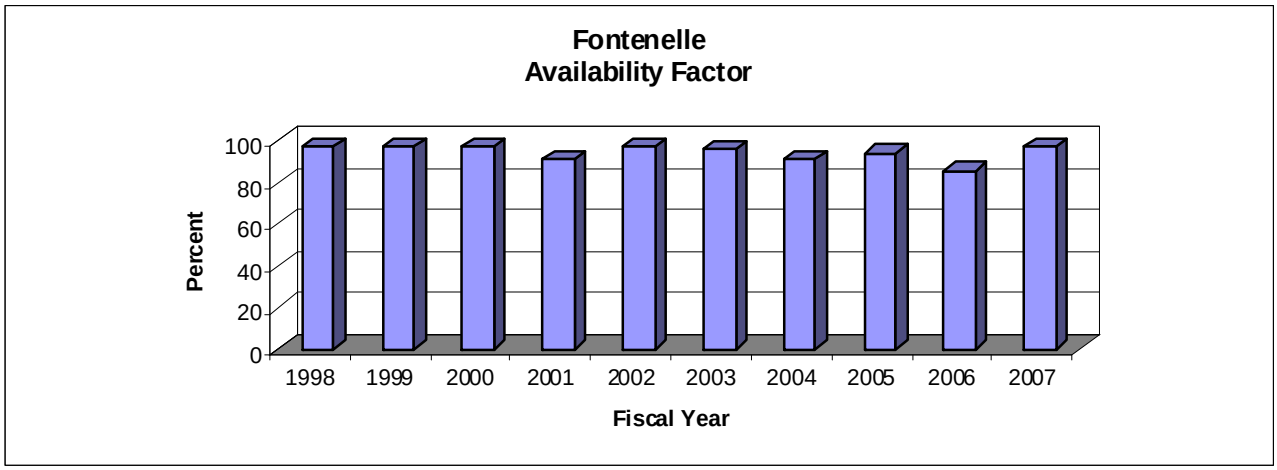




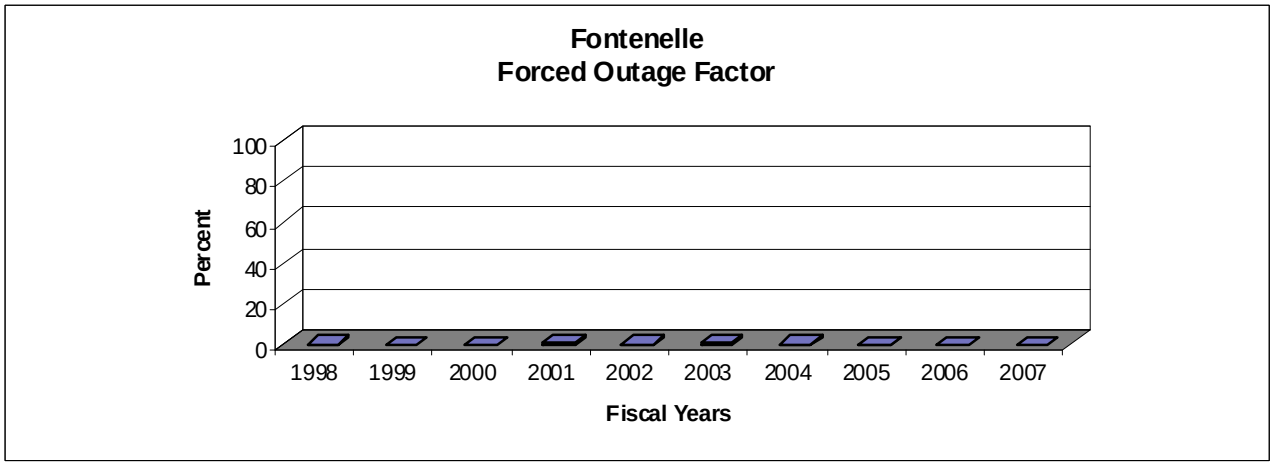




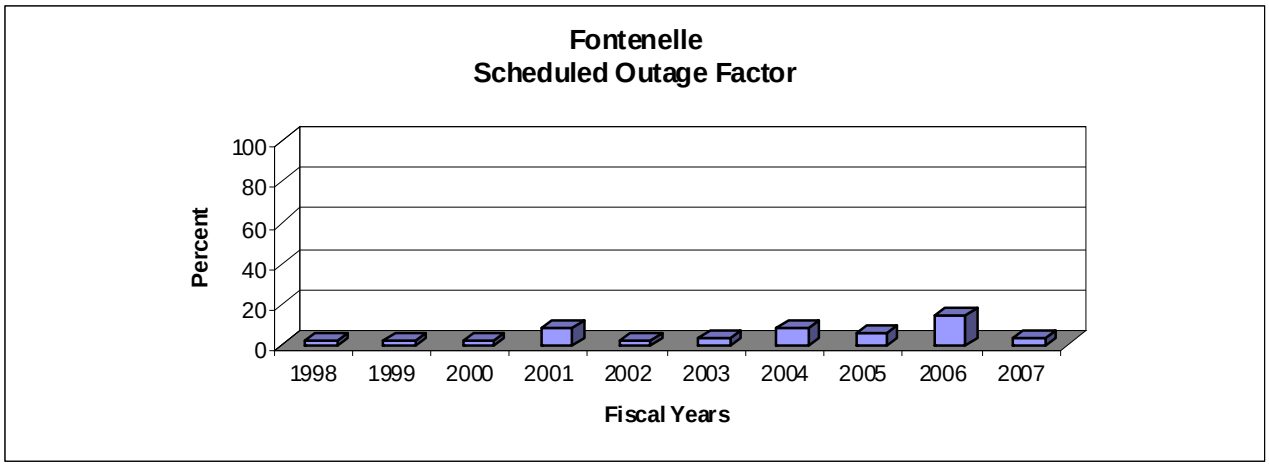
Benchmark 5
Availability Factor



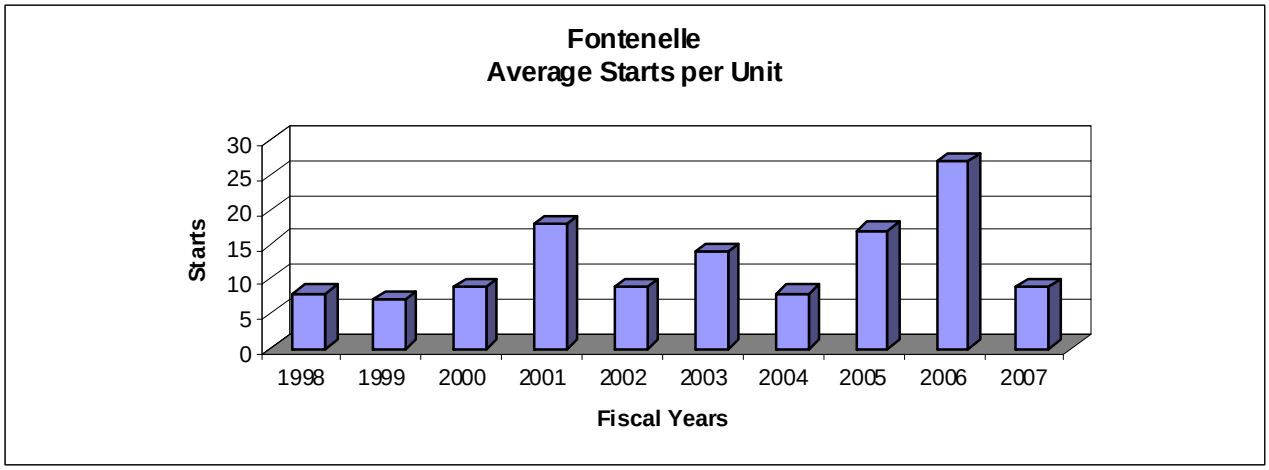
Benchmark 6
Forced Outage Factor



Benchmark 7
Scheduled Outage Factor



Starts



Benchmark Data Comparison

Fiscal Year 2007	Fontenelle Powerplant	Reclamation Average 10-30 MW Group	Total Reclamation Average	Industry Average	Best Performers
Wholesale Firm Rate Mills/kWh	20.7	Not Applicable	*22.45	Not Available	Not Available
Production Cost as Percentage of Wholesale Firm Rate	0.56%	Not Applicable	12.1%	Not Applicable	Not Applicable
O&M Cost $/MWh	13.59	16.40	2.76	***163.95	1.00
O&M Costs $/MW	53,929	62,731	7,847	***40,852	2,897
O&M Equiv Work Year per MW	0.15	0.22	0.03	Not Available	0.00
Availability Factor	96.9	88.5	82.3	**88.64	98.54
Forced Outage Factor	0.0	0.1	2.6	**2.61	0.00
Scheduled Outage Factor	3.1	11.4	15.1	**8.74	0.00

Benchmark Data Comparison

Fiscal Year 2007	Fontenelle Powerplant	Reclamation Average 10-30 MW Group	Total Reclamation Average	Industry Average	Best Performers
Wholesale Firm Rate Mills/kWh	20.7	Not Applicable	*22.45	Not Available	Not Available
Production Cost as Percentage of Wholesale Firm Rate	0.56%	Not Applicable	12.1%	Not Applicable	Not Applicable
O&M Cost $/MWh	13.59	16.40	2.76	***163.95	1.00
O&M Costs $/MW	53,929	62,731	7,847	***40,852	2,897
O&M Equiv Work Year per MW	0.15	0.22	0.03	Not Available	0.00
Availability Factor	96.9	88.5	82.3	**88.64	98.54
Forced Outage Factor	0.0	0.1	2.6	**2.61	0.00

Scheduled Outage Factor	3.1	11.4	15.1	**8.74	0.00

*Weighted by Net Generation
**2006 NERC Average
***Energy Information Administration Data

Glen Canyon Powerplant
Colorado River Storage Project
Glen Canyon Storage Unit

Plant Contact:
Kerry McCalman
Area Manager
Upper Colorado Regional Office

Plant Address:
Glen Canyon Powerplant
805 Bureau Street
PO Box 1477
Page AZ 86040-1477

Telephone Numbers:
Phone: (801) 524-3620
Fax: (801) 524-3828

E-Mail Address:
kmccalman@uc.usbr.gov

Reclamation Region: Upper Colorado

NERC Region: Western Electricity Coordinating Council, Rocky Mountain Power Area

PMA Service Area: Western Area Power Administration, Colorado River Storage project Management Center

Project Authorization: The Congress authorized construction of four storage units in the Colorado River Storage Project and 11 participating projects on April 11, 1956, under Public Law 485, 84th Congress, 70 Stat. 105. Additional projects have been added since the original legislation was adopted.

Project Purposes: The Colorado River Storage Project provides for the comprehensive development of the Upper Colorado River Basin. The project furnishes the long-time regulatory storage needed to permit States in the upper basin to meet their flow obligation at Lees Ferry, Arizona, (as defined in the Colorado River Compact) and still use their apportioned water.

Plant Location: The Glen Canyon Powerplant is located on the Colorado River in Coconino County, Arizona, near the Utah border. It is 15 miles upstream from Lees Ferry.

Plant Facts: The Glen Canyon Powerplant, at the toe of the dam, consists of eight generators, driven by eight 155,500-horsepower turbines. Total nameplate generating capacity for the powerplant is 1,320,000 kilowatts. Eight penstocks through the dam convey water to the turbines.

The Glen Canyon Dam is a 710-foot-high structure which provides more storage capacity than all other storage features of the Colorado River Storage Project combined. The concrete arch dam has a crest length of 1,560 feet and contains 4,901,000 cubic yards of concrete. The dam is 25 feet wide at the crest and 300 feet wide at the maximum base.

Plant Purpose: Generation of hydroelectric power for the project.

Plant History: The first generator uprating was completed between 1984 and 1987 and four generators were rated at 165,000 kW each and four generators were rated at 157,000 kW each. The four generators rated at 157,00 kW have since been rewound to the 165,000 kw capacity as of 2006. Air blast power circuit breakers were replaced with SF6 gas insulated units in 2000.

Present Activities: Unit 7 was rewound to 165,000 kW completing the last upgrade from 157,000 kW.

Future Planned Activities: Unit 8 turbine is the first of the original eight turbines scheduled to be replaced with a more efficient stainless steel turbine. The eight turbines will be replaced over the next eight years, starting in fiscal year 2007.

Special Issues: Glen Canyon Powerplant is operating under the Glen Canyon Dam Final Environmental Impact Statement and Record of Decision. Which limits Glen Canyons' maximum and minimum generation/flow along with limits on up and down ramps.

River:	Colorado River	**Plant Type:**	Conventional
Powerhouse Type:	Above Ground	**Turbine Type:**	Francis
Original Nameplate Capacity:	950,000 kW	**Installed Capacity:**	1,320,000 kW
Year of Initial Operation:	1964	**Age:**	43 years
Net Generation (FY-2007):	3,454.8 GWh	**Rated Head:**	510 feet
Average Plant Factor (FY-2007):	30.0 percent	**Remotely Operated:**	No
Production Mode:	Intermediate		

Ancillary Services

Glen Canyon
Ancillary Services

Spinning Reserve	Yes
Non-Spinning Reserve	Yes
Replacement Reserve	Yes
Regulation/Load Following	Yes
Black Start	Yes
Voltage Support	Yes

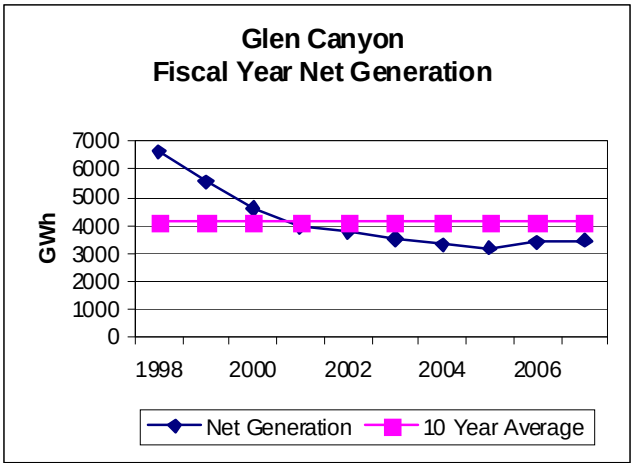
Generators

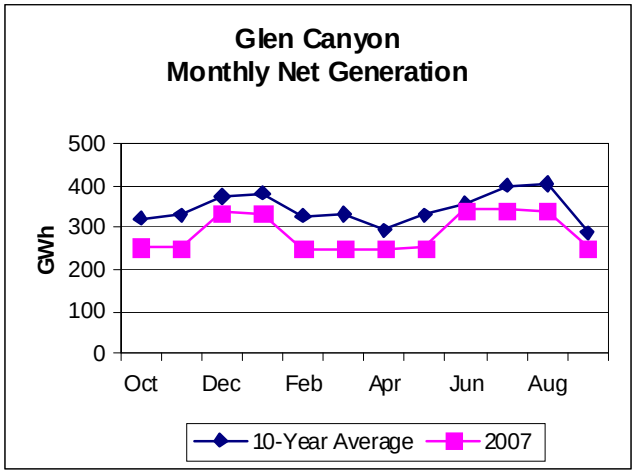
Glen Canyon Generators

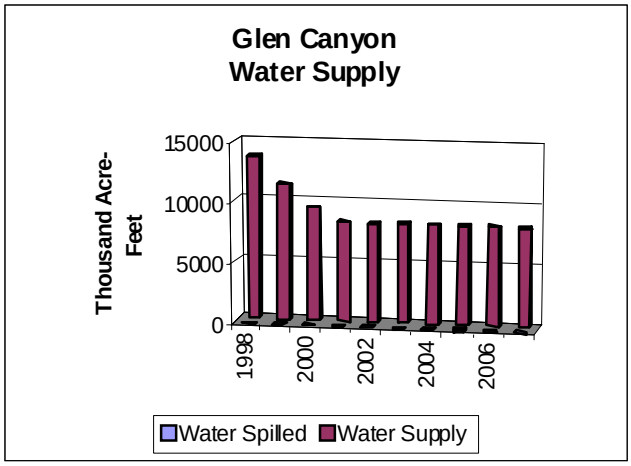
Existing Number and Capacity

Unit #	Original Capacity (kW)	Capacity Increased (kW)	Present Capacity (kW)
1	118,750	46,250	165,000
2	118,750	46,250	165,000
3	118,750	46,250	165,000
4	118,750	46,250	165,000
5	118,750	46,250	165,000
6	118,750	46,250	165,000
7	118,750	46,250	165,000
8	118,750	46,250	165,000
8 Units	950,000	370,000	1,320,000

Generation

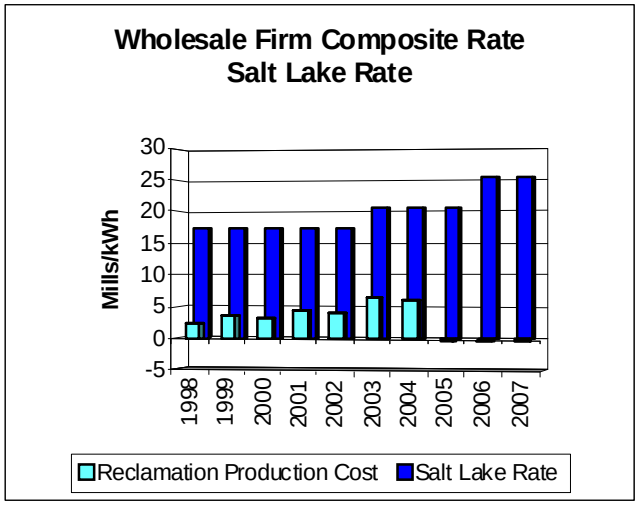

Glen Canyon
Fiscal Year Net Generation
GWh
7000
6000
5000
4000
3000
2000
1000
0
1998
2000
2002
2004
2006
Net Generation
10 Year Average


Glen Canyon
Monthly Net Generation
GWh
500
400
300
200
100
0
Oct
Dec
Feb
Apr
Jun
Aug
10-Year Average
2007

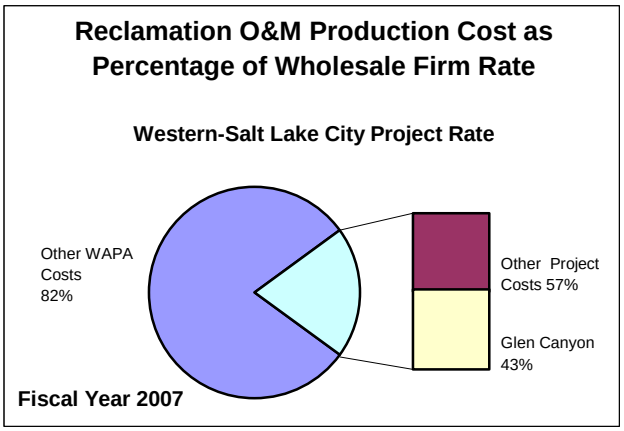

Glen Canyon
Water Supply
Thousand Acre-Feet
15000
10000
5000
0
1998
2000
2002
2004
2006
Water Spilled
Water Supply

Prime Laboratory Benchmarks

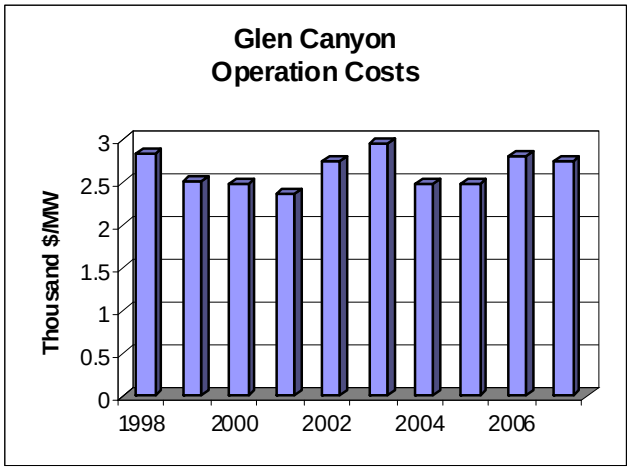
Benchmark 1
Wholesale Firm Rate

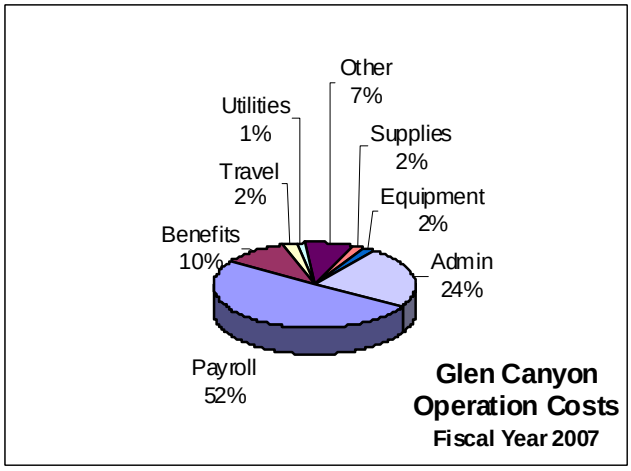


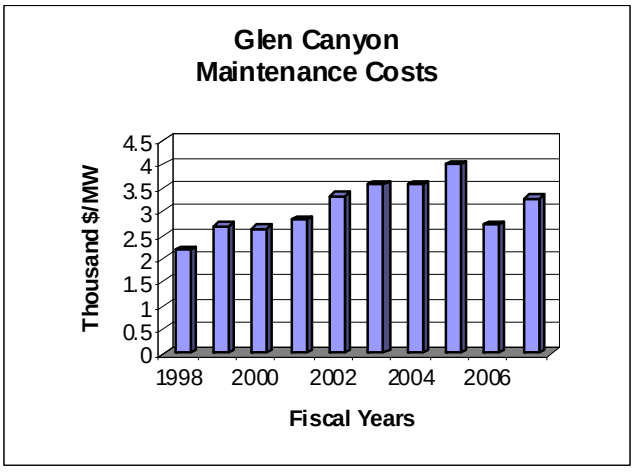
Benchmark 2
Reclamation's Production Cost as Percentage of Wholesale Firm Rate

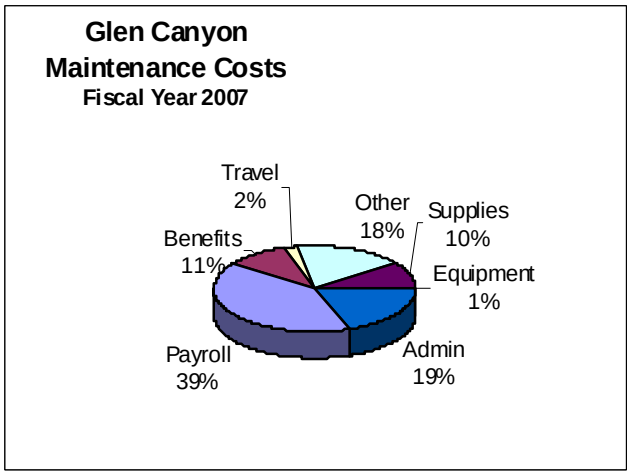


Benchmark 3
Production Cost

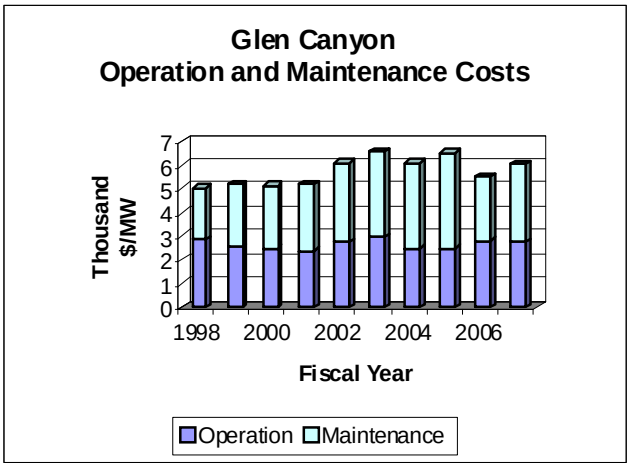


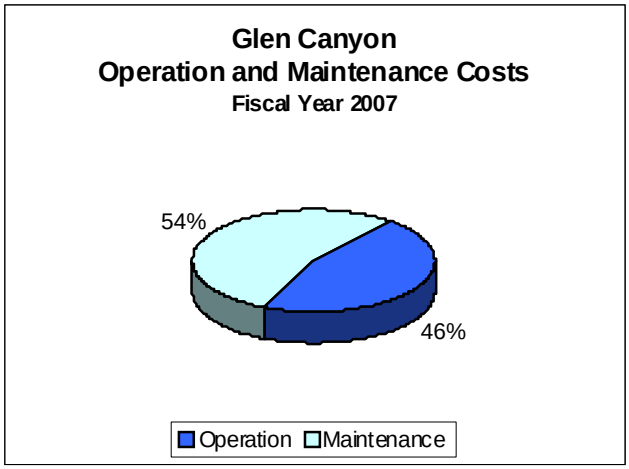


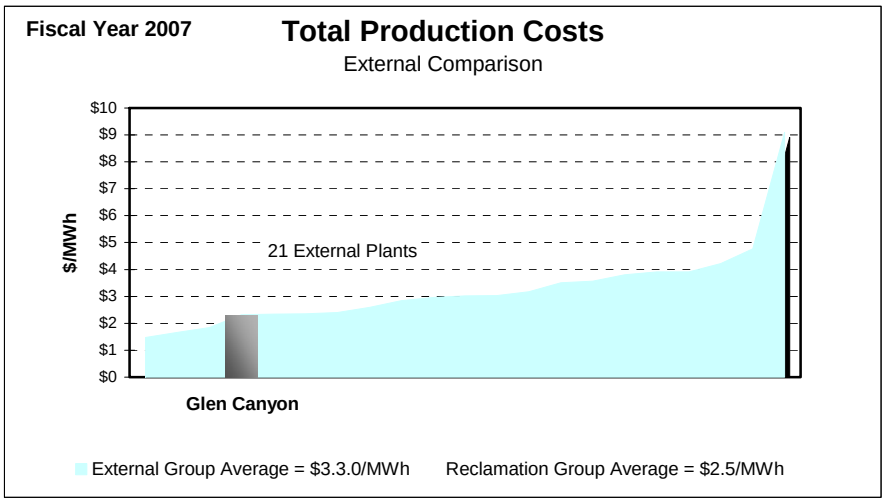


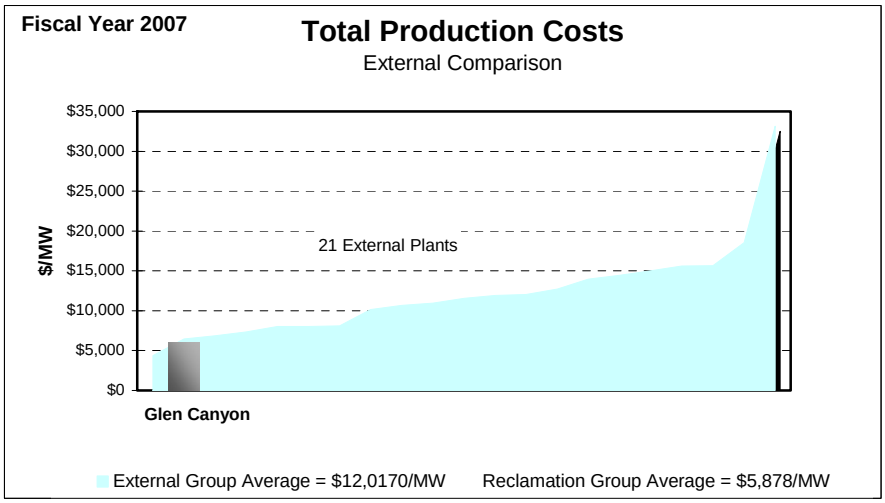


Benchmark 3
Production Cost



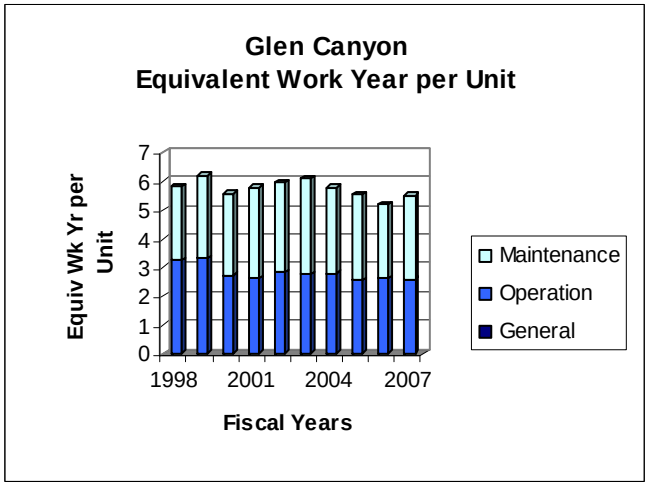


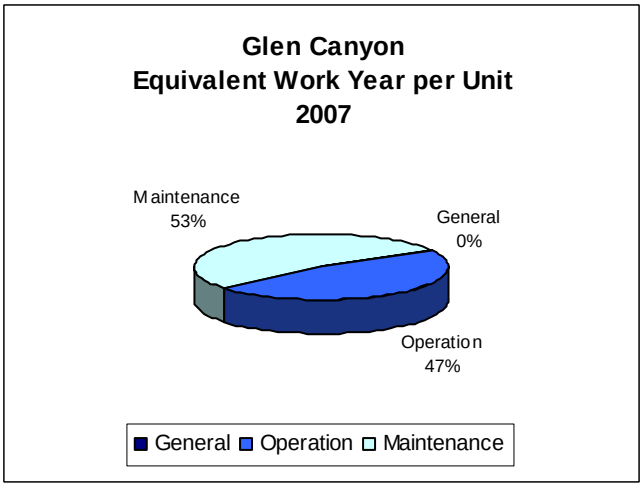


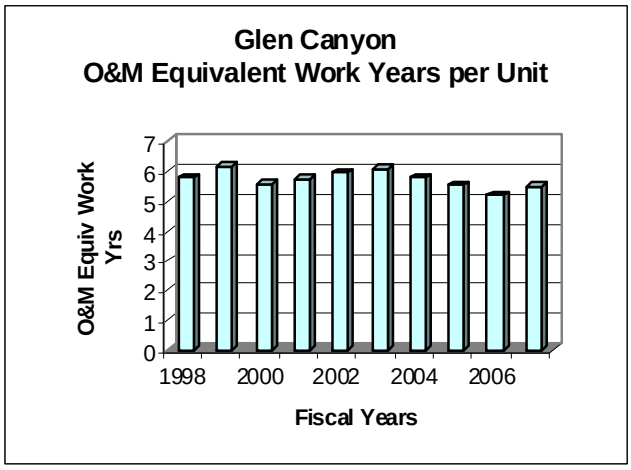


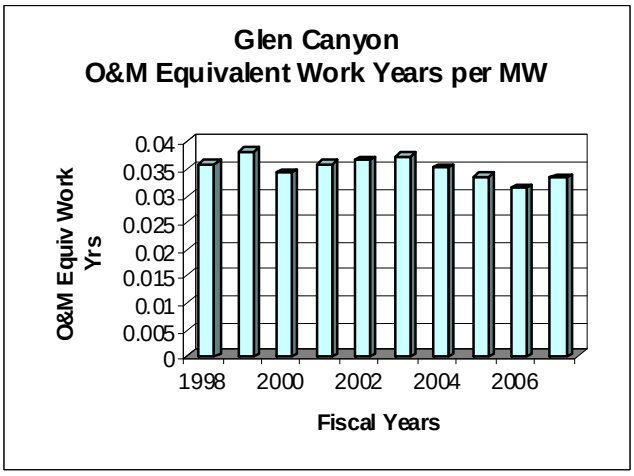
Benchmark 4
Workforce Deployment

Glen Canyon FY 2007 Equivalent Work Staffing Year Levels						
	Equivalent Work Year Staffing Charged to Powerplant	Leave Additive	Denver and Washington Equivalent Work Year Staffing Additive	Total Equivalent Work Year Allocated to Powerplant	Total Equivalent Staffing Work Year per Generating Unit	Total Equivalent Work Year Staffing per Megawatt
General	0.00	0.00	0.14	0.14	0.02	0.00
Operation	18.67	1.99	0.00	20.66	2.58	0.02
Maintenance	21.13	2.25	0.00	23.38	2.92	0.02
Total Staffing	39.80	4.24	0.14	44.18	5.52	0.03

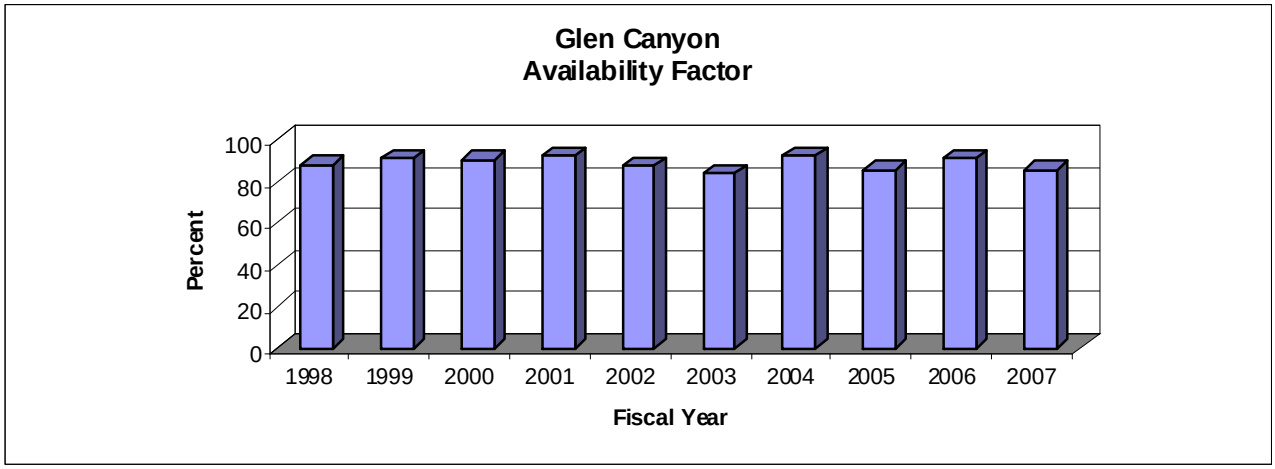




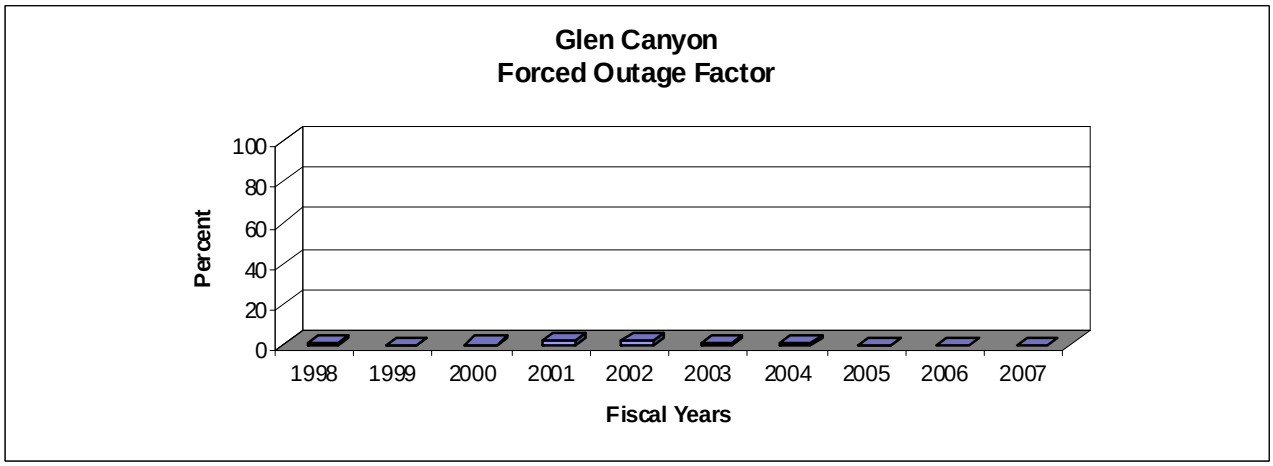




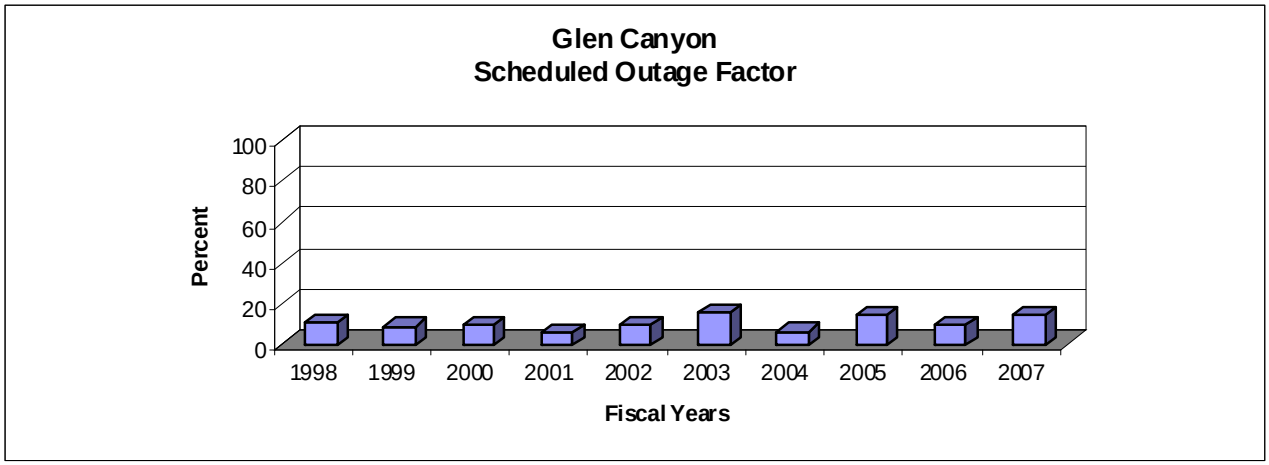
Benchmark 5
Availability Factor



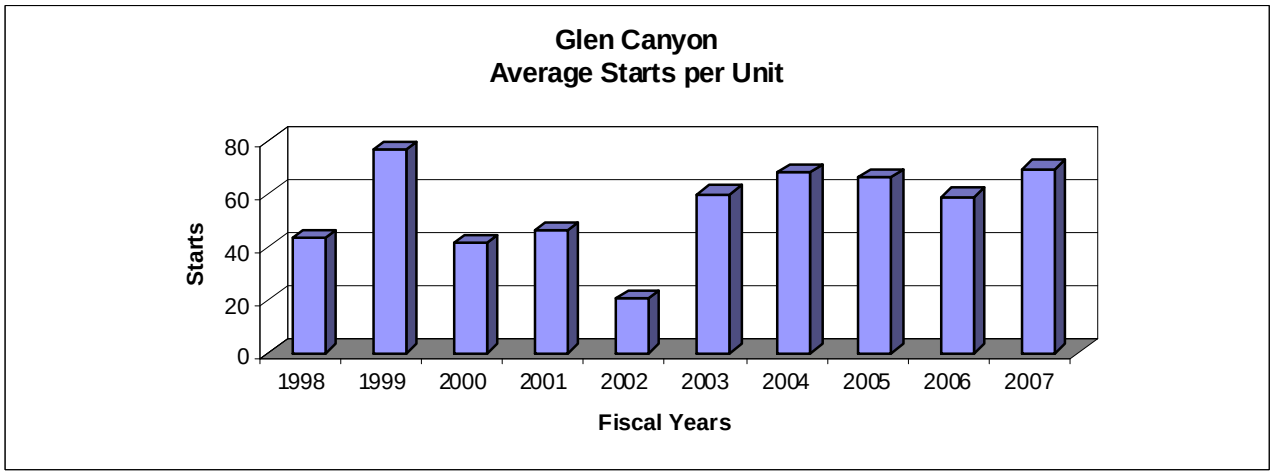
Benchmark 6
Forced Outage Factor



Benchmark 7
Scheduled Outage Factor



Starts



Benchmark Data Comparison

Fiscal Year 2007	Glen Canyon Powerplant	Reclamation Average 500+ MW Group	Total Reclamation Average	Industry Average	Best Performers
Wholesale Firm Rate Mills/kWh	20.7	Not Applicable	*22.45	Not Available	Not Available
Production Cost as Percentage of Wholesale Firm Rate	8.2%	Not Applicable	12.1%	Not Applicable	Not Applicable
O&M Cost $/MWh	2.31	1.65	2.76	***3.28	1.00
O&M Costs $/MW	6,043	4,863	7,847	***12,0170	2,897
O&M Equiv Work Year per MW	0.03	0.02	0.03	Not Available	0.0
Availability Factor	85.5	81.9	82.3	**88.64	98.5
Forced Outage Factor	0.0	3.2	2.6	**2.61	0.0
Scheduled Outage Factor	14.4	14.9	15.1	**8.74	0.0

*Weighted by Net Generation
**2006 NERC Average
***Energy Information Administration Data

Lower Molina Powerplant
Collbran Project

Plant Contact:
Donald Phillips, Manager
Curecanti Field Division

Plant Address:
Lower Molina Powerplant
Molina CO

Telephone Numbers:
Phone: (970) 240-6300
Fax: (970) 240-6304

E-Mail Address:
dphillips@uc.usbr.gov

Reclamation Region: Upper Colorado

NERC Region: Western Electricity Coordinating Council, Rocky Mountain Power Area

PMA Service Area: Western Area Power Administration, Colorado River Storage Project Management Center

Project Authorization: The Congress authorized the Collbran Project on July 3, 1952, under Public Law 445, 82nd Congress, 2nd Session.

Project Purposes: The Collbran Project, in west-central Colorado, developed a major part of the unused water in Plateau Creek and its principal tributaries. Supplemental irrigation service is furnished and electrical energy is generated for use in west-central Colorado.

The project also rehabilitated and modified the operation of 15 small privately owned storage reservoirs on the Grand Mesa in the Cottonwood Creek and Big Creek watersheds. These reservoirs provide water for power generation through exchanging storage water on Grand Mesa for irrigation water from Vega Reservoir.

Both the Lower and Upper Molina Power plants are operated in conjunction with Colorado River Storage Project power operations.

Plant Location: The Lower Molina Powerplant is located in Mesa County, Colorado, on the south bank of Plateau Creek near Molina, Colorado.

Plant Facts: The Lower Molina penstock extends 4.7 miles from the Molina Equalizing Reservoir to the Lower Molina Powerplant. The penstock consists of steel pipe ranging in diameter from 36 inches at its upper end to 30 inches at the lower section. It has a maximum capacity of 50 cubic feet per second.

The single-unit Lower Molina Powerplant has an installed capacity of 4,860 kilowatts at a design head of 1,400 feet and a maximum water discharge of 50 cubic feet per second.

Power generated at both power plants is transformed to a transmission voltage of 115 kilovolts at two substations constructed adjacent to the plants. A 5.5-mile transmission line leads from the substation at the Upper Molina Powerplant, delivers energy produced at the plant to the substation at Lower Molina Power, and then connects to Xcel Energy.

Plant Purpose: Electrical energy is generated for use in west-central Colorado.

Plant History: In FY-2003 the unit control system was upgraded to an Ethernet based Distributed Control System. A digital governor and digital protective relays were also installed. In FY-2005 a new, more efficient, turbine runner was installed and new flow control programming was added to make the Upper Molina unit ramp up with the lower unit, so that they effectively act as a single unit.

Present Activities: Communicating analog data to the RTU in digital format to lessen the errors in the data and installing transfer trip relaying to the Upper Molina plant.

Future Planned Activities: Purchase and install a new generator step up transformer.

Special Issues: None

River Name:	Plateau Creek	**Plant Type:**	Conventional
Powerhouse Type:	Above Ground	**Turbine Type:**	Pelton Impulse
Original Nameplate Capacity:	4,860 kW	**Installed Capacity:**	4,860 kW
Year of Initial Operation:	1962	**Age:**	45 years
Net Generation (FY-2007):	16.4 GWh	**Rated Head:**	1,400 feet
Average Plant Factor (FY-2007):	38.5 percent	**Remotely Operated:**	Yes
Production Mode:	Peaking		

Ancillary Services

Lower Molina
Ancillary Services

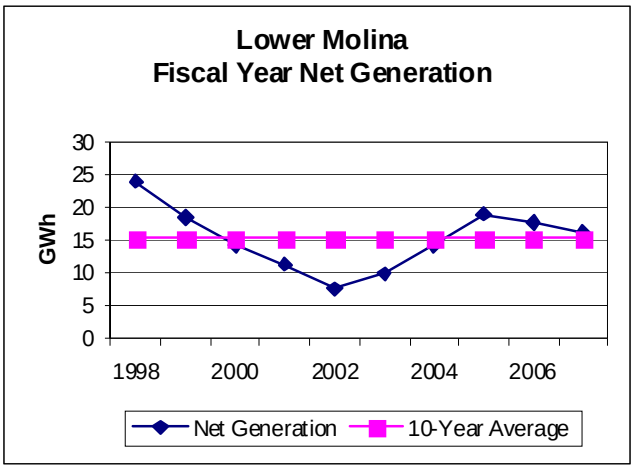
Spinning Reserve	No
Non-Spinning Reserve	No
Replacement Reserve	No
Regulation/Load Following	No
Black Start	Yes
Voltage Support	Yes

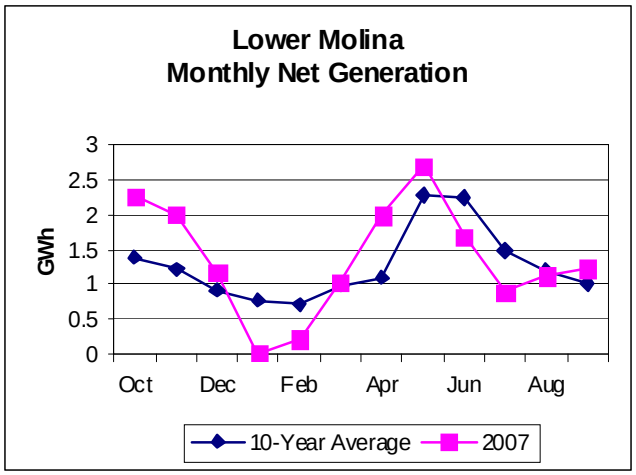
Generators

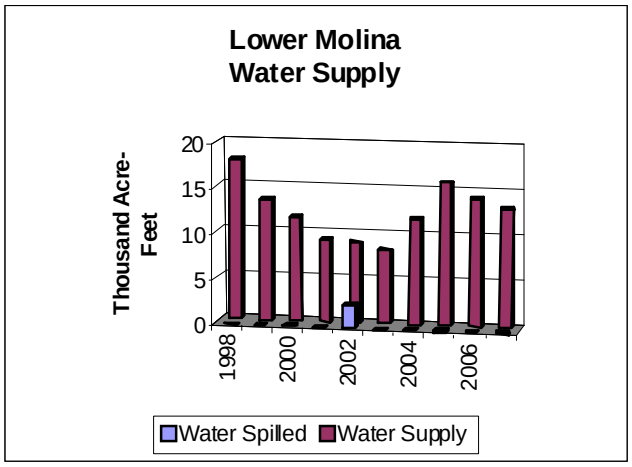
Lower Molina Generators
Existing Number and Capacity

Unit #	Original Capacity (kW)	Capacity Increased (kW)	Present Capacity (kW)
1	4,860	-	4,860
1 Unit	4,860	-	4,860

Generation

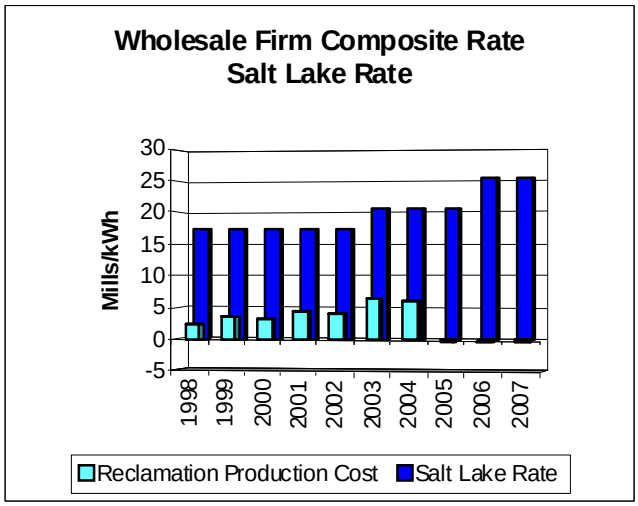

Lower Molina
Fiscal Year Net Generation
GWh
30
25
20
15
10
5
0
1998
2000
2002
2004
2006
Net Generation
10-Year Average


Lower Molina
Monthly Net Generation
GWh
3
2.5
2
1.5
1
0.5
0
Oct
Dec
Feb
Apr
Jun
Aug
10-Year Average
2007

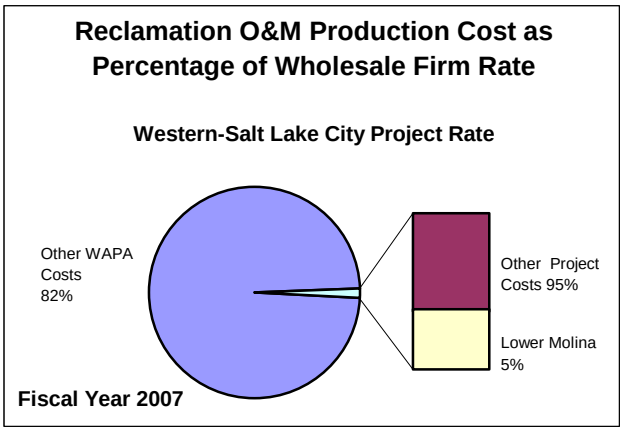

Lower Molina
Water Supply
Thousand Acre-Feet
20
15
10
5
0
1998
2000
2002
2004
2006
Water Spilled
Water Supply

Prime Laboratory Benchmarks

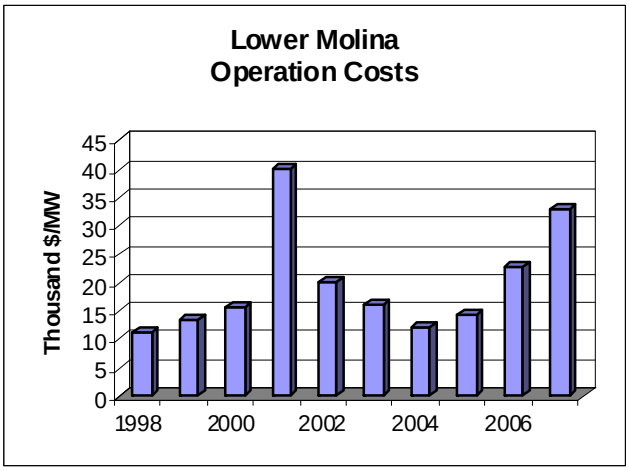
Benchmark 1
Wholesale Firm Rate

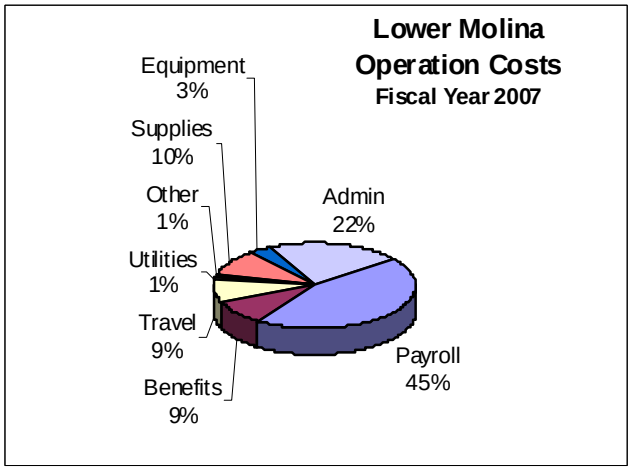


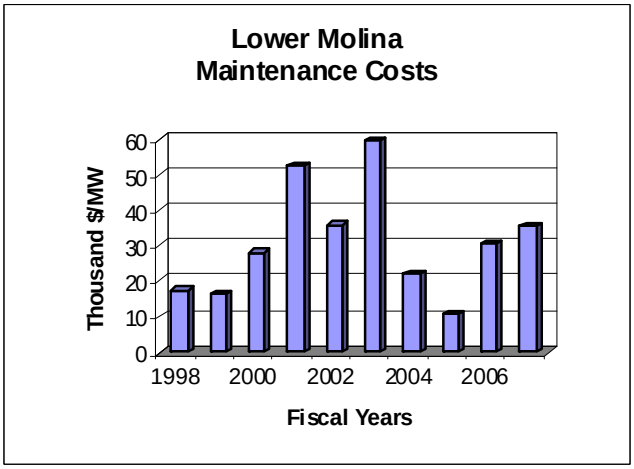
Benchmark 2
Reclamation's Production Cost as Percentage of Wholesale Firm Rate

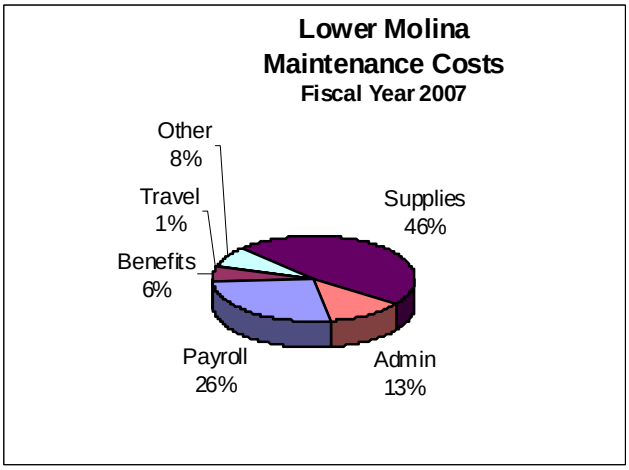


Benchmark 3
Production Cost

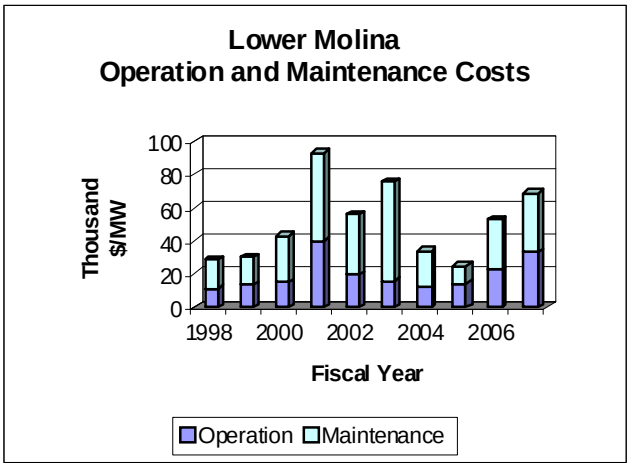


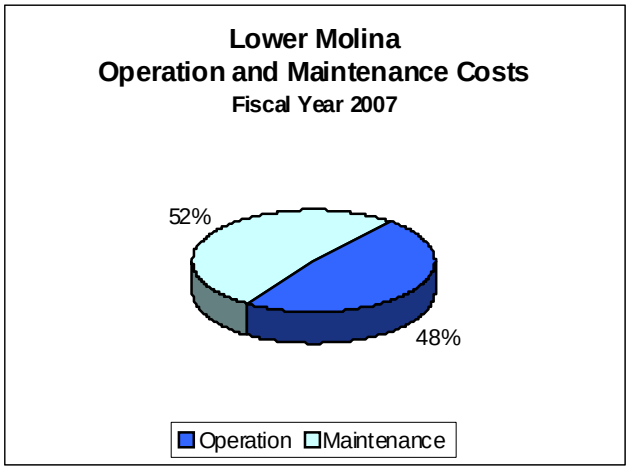


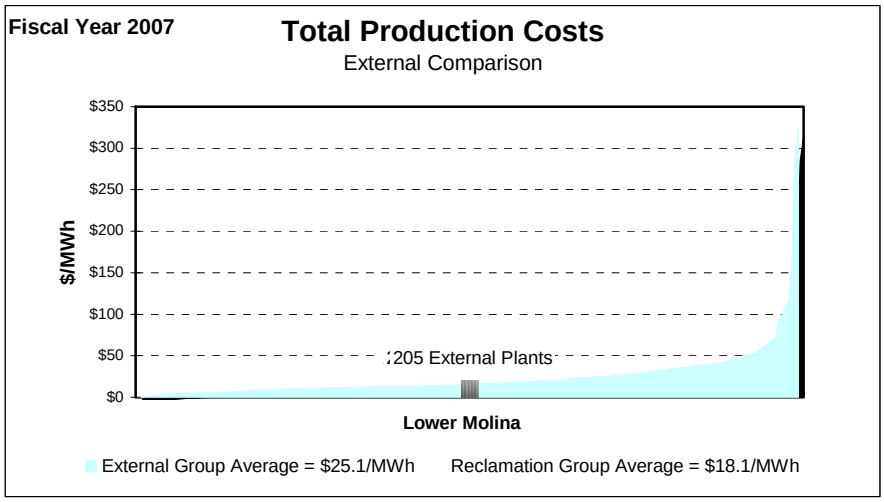


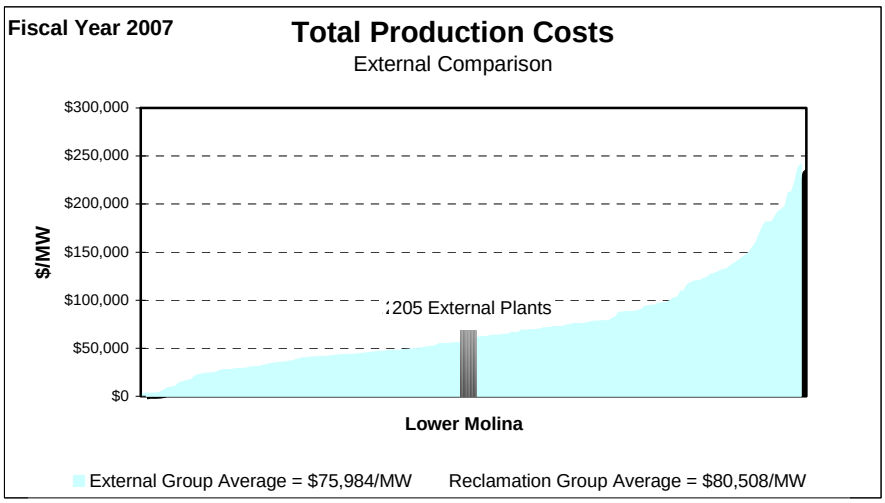


Benchmark 3
Production Cost



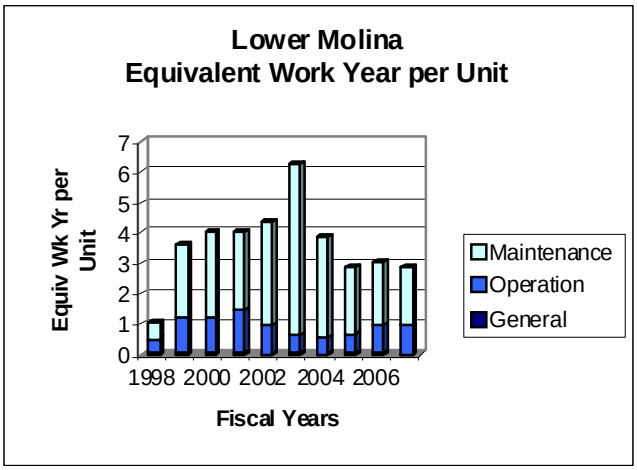


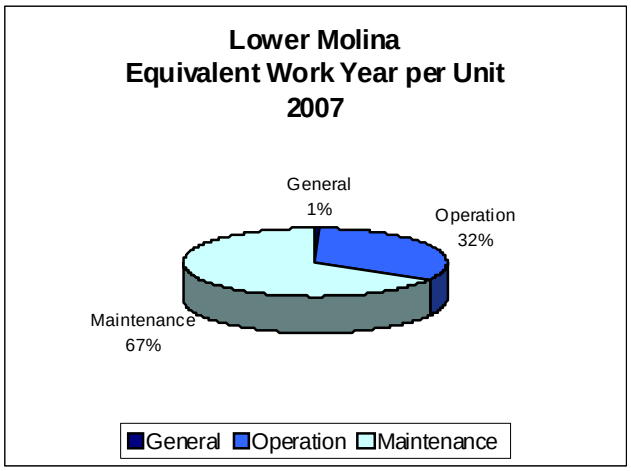


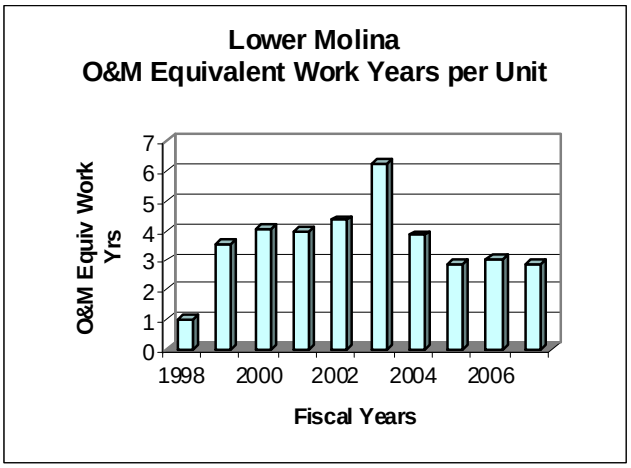


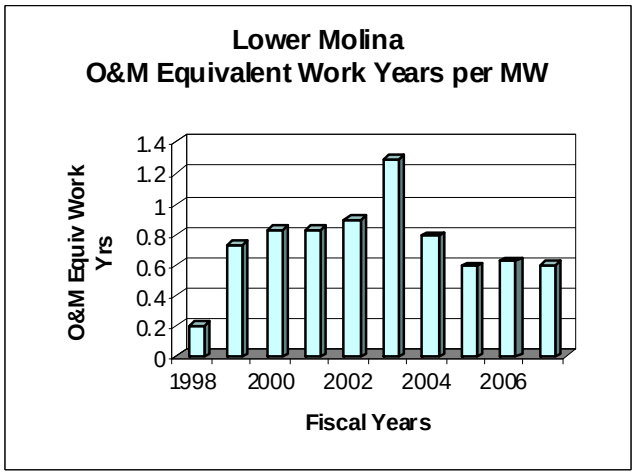
Benchmark 4
Workforce Deployment

Lower Molina FY 2007 Equivalent Work Staffing Year Levels						
	Equivalent Work Year Staffing Charged to Powerplant	Leave Additive	Denver and Washington Equivalent Work Year Staffing Additive	Total Equivalent Work Year Allocated to Powerplant	Total Equivalent Staffing Work Year per Generating Unit	Total Equivalent Work Year Staffing per Megawatt
General	0.00	0.00	0.02	0.02	0.02	0.00
Operation	0.85	0.09	0.00	0.94	0.94	0.19
Maintenance	1.76	0.19	0.00	1.95	1.95	0.40
Total Staffing	2.61	0.28	0.02	2.90	2.90	0.60

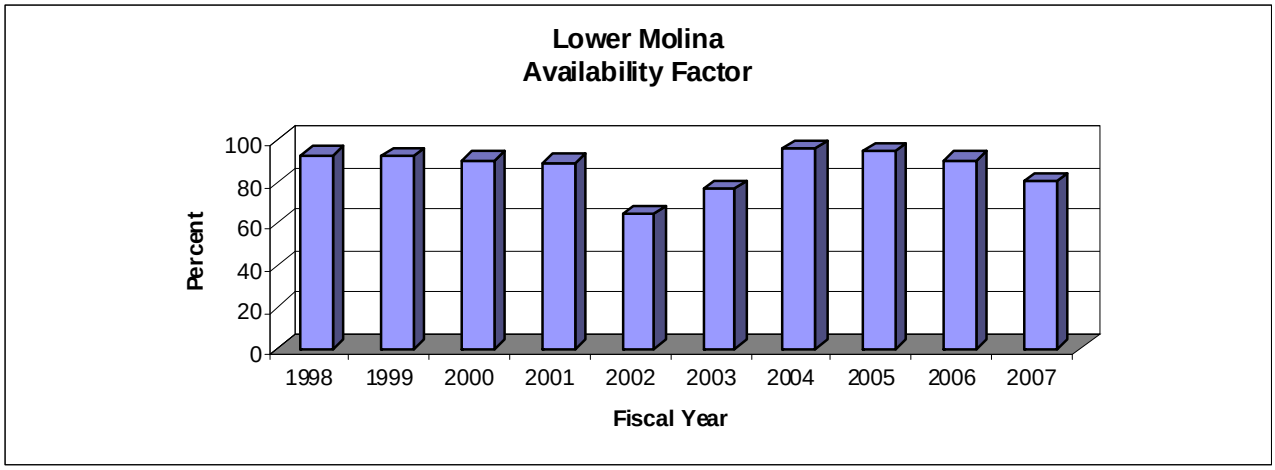




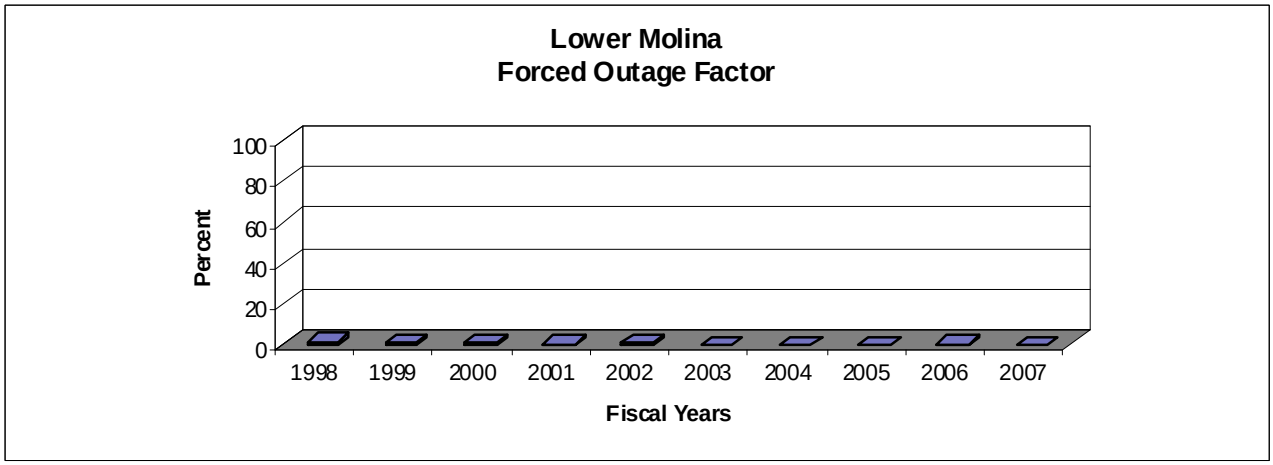




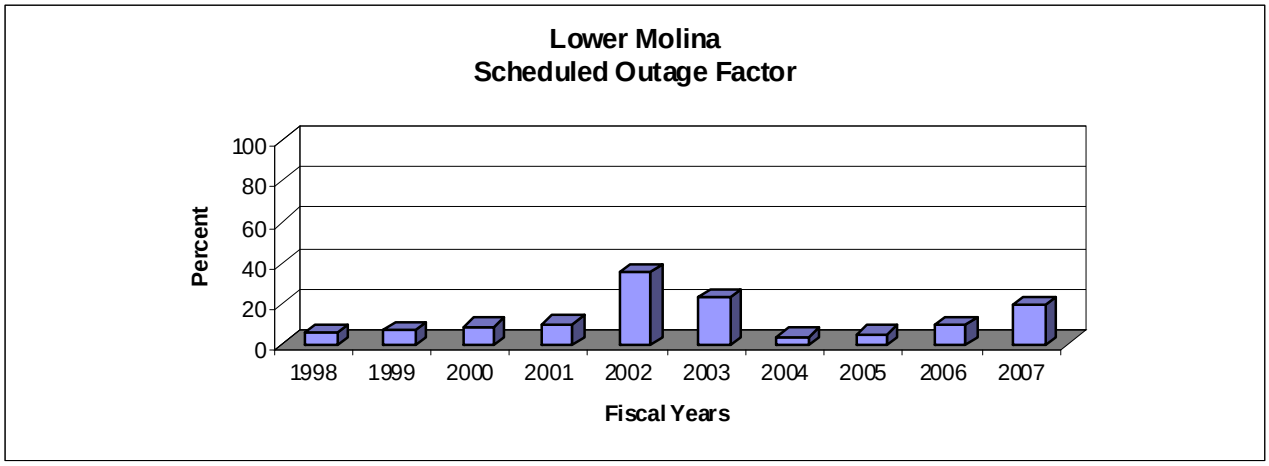
Benchmark 5
Availability Factor



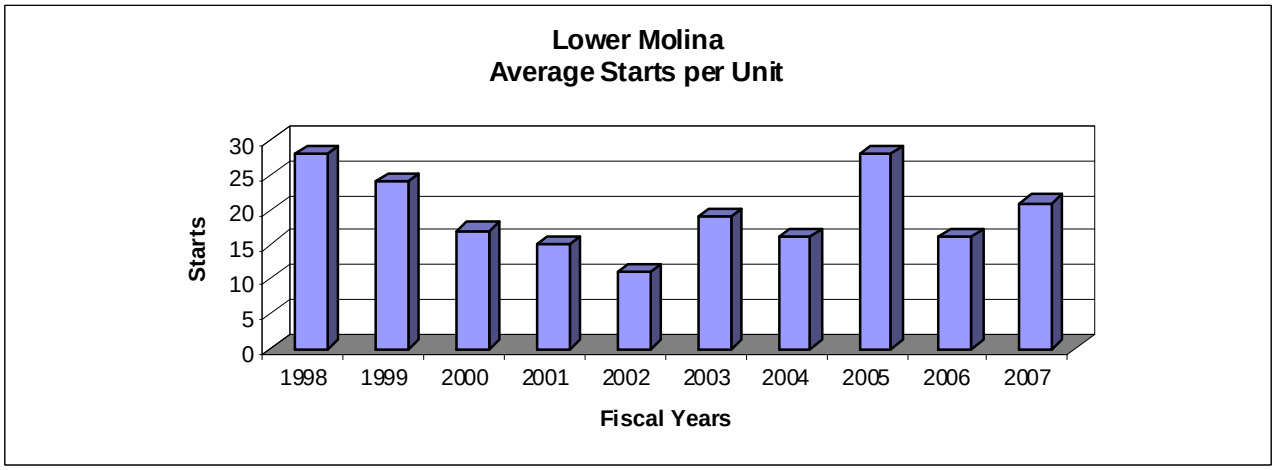
Benchmark 6
Forced Outage Factor



Benchmark 7
Scheduled Outage Factor



Starts



Benchmark Data Comparison					
Fiscal Year 2007	**Lower Molina Powerplant**	**Reclamation Average 0-10 MW Group**	**Total Reclamation Average**	**Industry Average**	**Best Performers**
Wholesale Firm Rate Mills/kWh	20.7	Not Applicable	*22.45	Not Available	Not Available
Production Cost as Percentage of Wholesale Firm Rate	0.3%	Not Applicable	12.1%	Not Applicable	Not Applicable
O&M Cost $/MWh	20.33	14.71	2.76	***25.9	1.00
O&M Costs $/MW	68,514	60,518	7,847	***75,984	2,897
O&M Equiv Work Year per MW	0.59	0.39	0.03	Not Available	0
Availability Factor	80.5	88.7	82.3	**88.64	98.54
Forced Outage Factor	0.0	0.9	2.6	**2.61	0.00
Scheduled Outage Factor	19.5	10.4	15.1	**8.74	0.00

*Weighted by Net Generation
**2006 NERC Average
***Energy Information Administration Data

McPhee Powerplant
Dolores Project

Plant Contact:
Vern Harrell
Cortez Project Office

Plant Address:
McPhee Powerplant
McPhee Dam CO

Telephone Numbers:
Phone: (970) 565-0865

E-Mail Address:
vharrell@uc.usbr.gov

Reclamation Region: Upper Colorado

NERC Region: Western Electricity Coordinating Council, Rocky Mountain Power Area

PMA Service Area: Western Area Power Administration, Colorado River Storage Project Management Center

Project Authorization: The Congress authorized the Dolores Project under the Colorado River Basin Act of September 30, 1968 (Public Law 90-537), as a participating project under the Colorado River Storage Project Act of April 11, 1956 (Public Law 84-485).

Project Purposes: The Dolores Project, located in the Dolores River Basin in southwestern Colorado, develops water from the Dolores River for irrigation, municipal and industrial use, recreation, fish and wildlife, and production of hydroelectric power. It also provides flood control and aids economic redevelopment.

Power plants are located on McPhee Dam and the Towaoc Canal to generate an annual average of 36,578,000 kilowatt-hours, which enters the Colorado River Storage Project power transmission system. The McPhee Dam facility operates year-round on fishery releases from McPhee Reservoir.

Plant Location: McPhee Powerplant is located 10 miles north of Dolores, Colorado, in Montezuma County, Colorado, on the Dolores River.

Plant Facts: McPhee Dam is a rolled earth, sand, gravel, and rockfill structure with a volume of approximately 5,029,000 cubic yards. The crest of the dam is 270 feet above streambed, 1,300 feet long and 30 feet wide. A gated spillway located in the right abutment includes a concrete chute leading to a stilling basin.

The McPhee Dam Powerplant consists of a penstock located within the River-Outlet-Works tunnel of the dam, two turbines and a generator at the base of the dam, and a 4.5-mile, 12.5-kilovolt transmission line to Great Cut Switchyard.

Plant Purpose: McPhee Powerplant provides energy for project use.

Plant History: The powerplant is operated and maintained under a contract with the Dolores Water Conservancy District. The powerplant was out of service from September 1994 to January 1997 due to a turbine problem.

Present Activities: Normal operations

Future Planned Activities: None

Special Issues: Shutdown in May 2002 through the rest of the water year due to lack of water.

River:	Dolores River	**Plant Type:**	Conventional
Powerhouse Type:	Above Ground	**Turbine Type:**	Francis
Original Nameplate Capacity:	1,283 kW	**Installed Capacity:**	1,283 kW
Year of Initial Operation:	1993	**Age:**	15 years
Net Generation (FY-2007):	5.3 GWh	**Rated Head:**	215 feet
Average Plant Factor (FY-2007):	47.5 percent	**Remotely Operated:**	Yes
Production Mode:	Peaking		

Ancillary Services

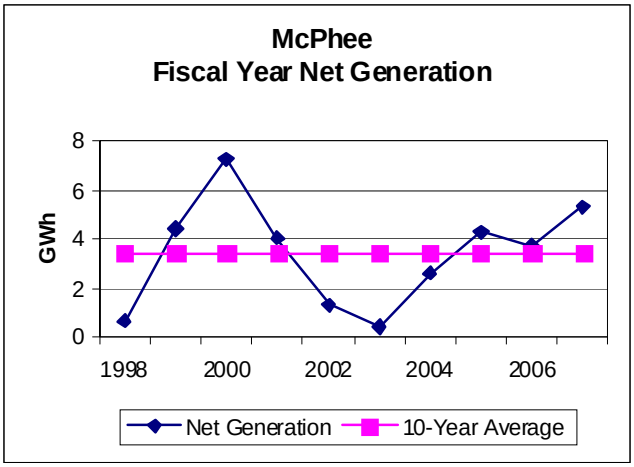
McPhee Ancillary Services	
Spinning Reserve	No
Non-Spinning Reserve	No
Replacement Reserve	No
Regulation/Load Following	No
Black Start	Yes
Voltage Support	Yes

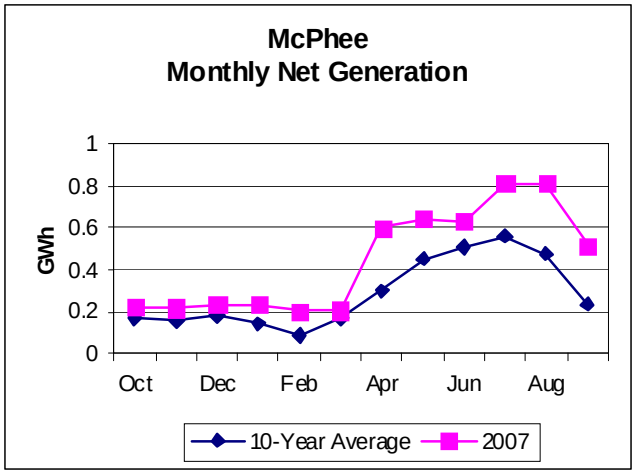
Black Start not probable, plant not in Western Area Power Administration's Black Start Plan.

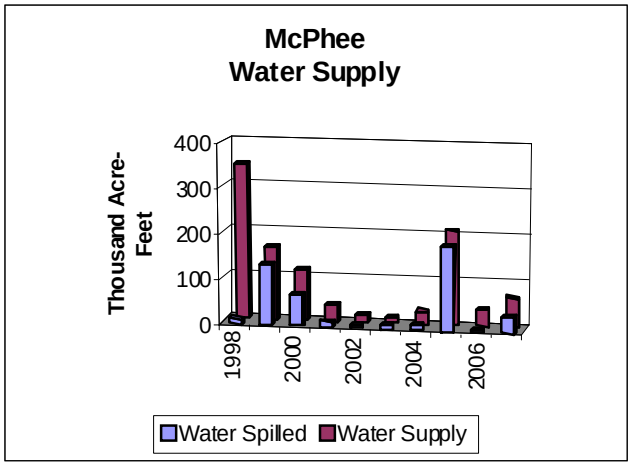
Generators

McPhee Generators Existing Number and Capacity			
Unit #	Original Capacity (kW)	Capacity Increased (kW)	Present Capacity (kW)
1	1,282	1	1,283
1 Unit	1,282	1	1,283

Generation

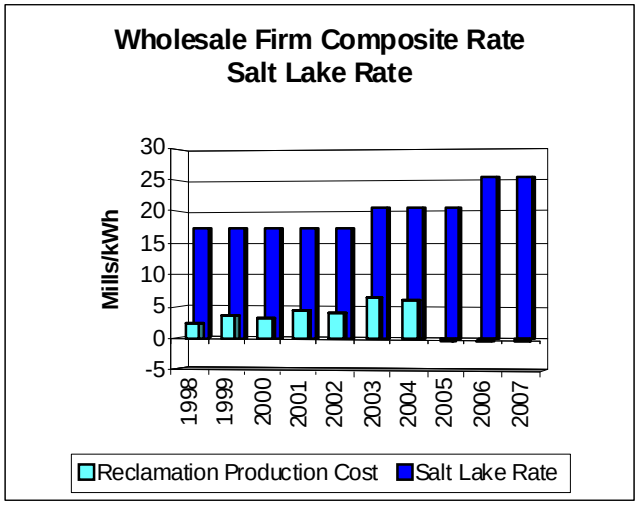

McPhee
Fiscal Year Net Generation
GWh
8
6
4
2
0
1998
2000
2002
2004
2006
Net Generation
10-Year Average


McPhee
Monthly Net Generation
GWh
1
0.8
0.6
0.4
0.2
0
Oct
Dec
Feb
Apr
Jun
Aug
10-Year Average
2007

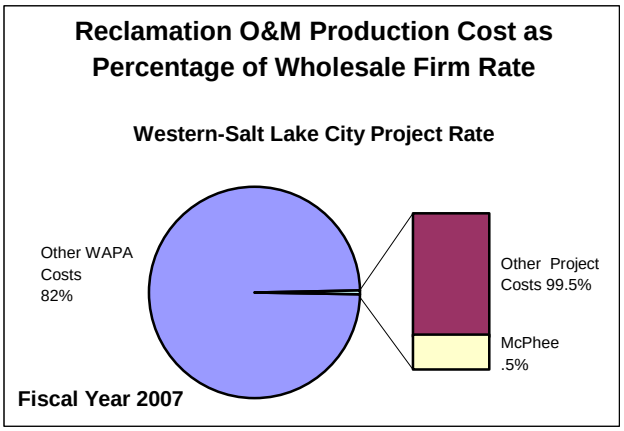

McPhee
Water Supply
Thousand Acre-Feet
400
300
200
100
0
1998
2000
2002
2004
2006
Water Spilled
Water Supply

Prime Laboratory Benchmarks

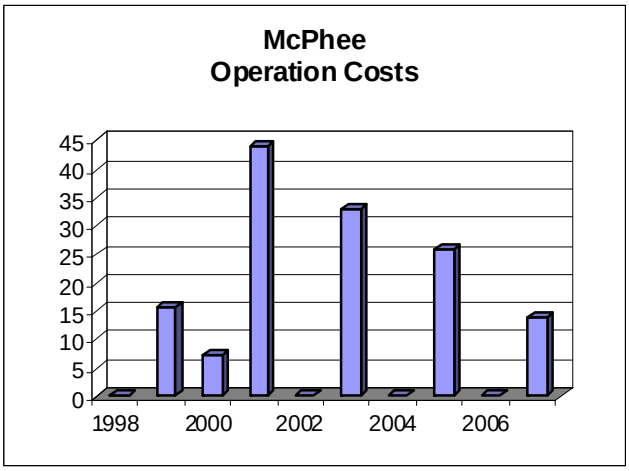
Benchmark 1
Wholesale Firm Rate

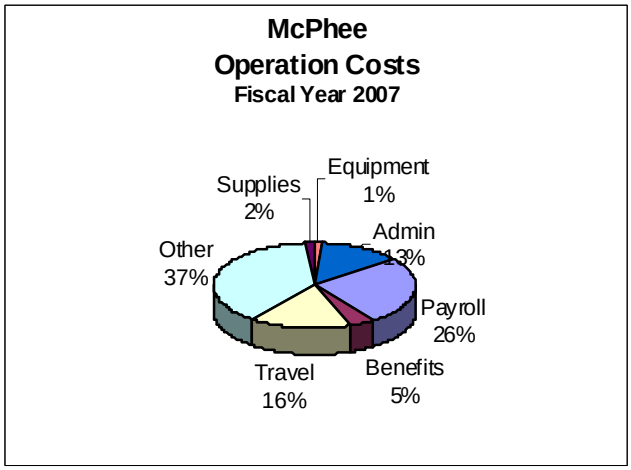


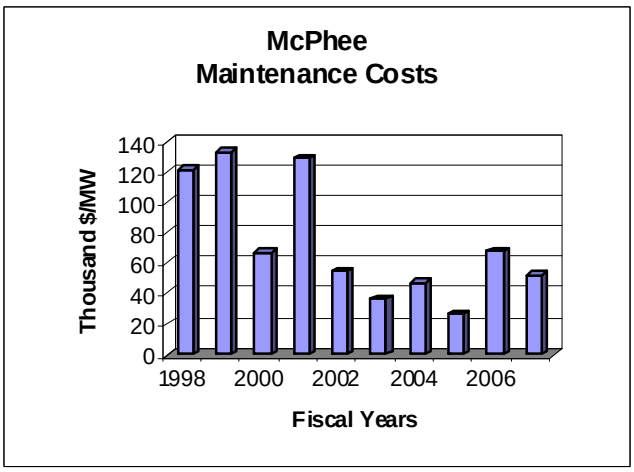
Benchmark 2
Reclamation's Production Cost as Percentage of Wholesale Firm Rate

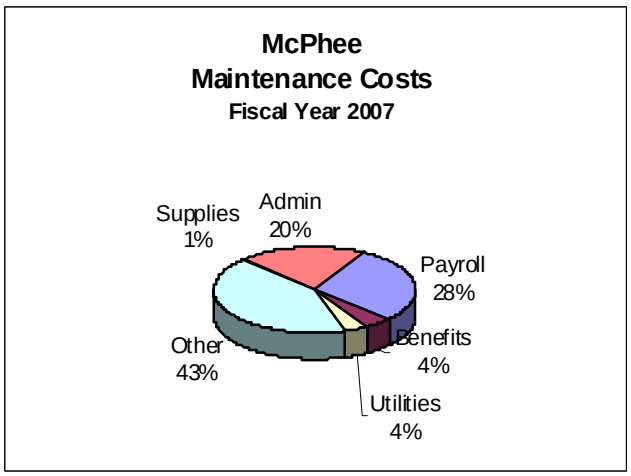


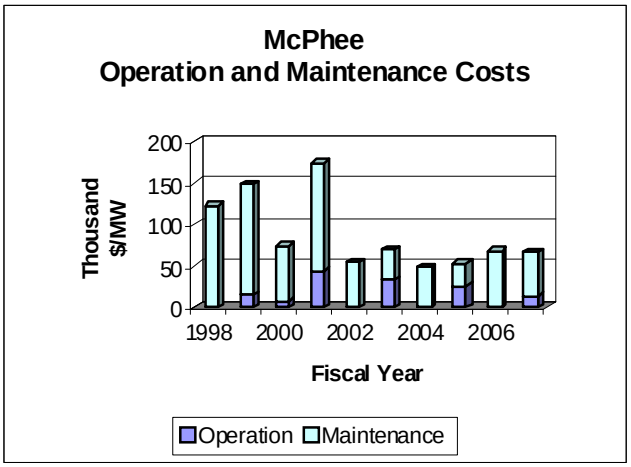
Benchmark 3
Production Cost

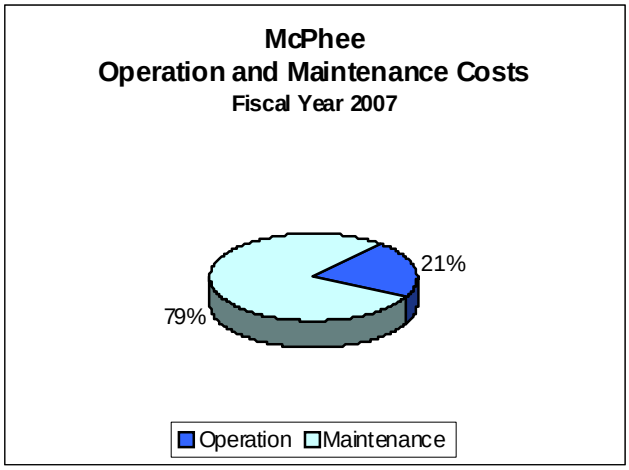






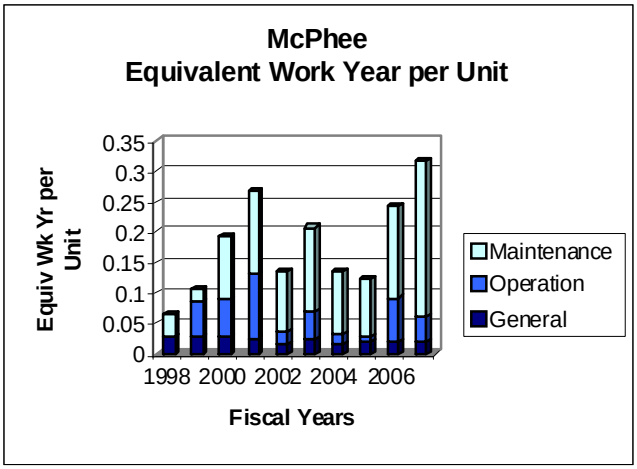


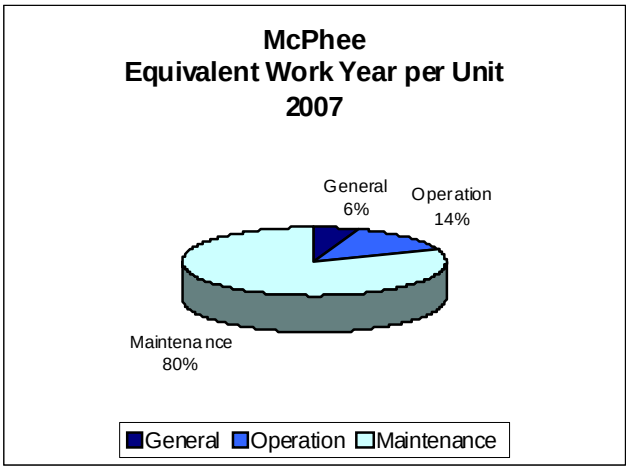


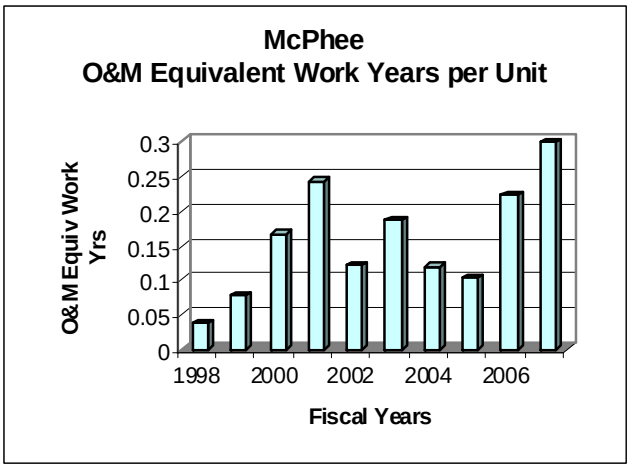


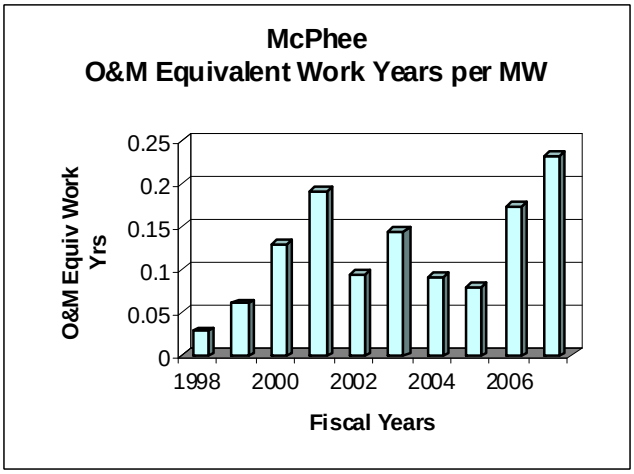
Benchmark 4
Workforce Deployment

McPhee FY 2007 Equivalent Work Staffing Year Levels						
	Equivalent Work Year Staffing Charged to Powerplant	Leave Additive	Denver and Washington Equivalent Work Year Staffing Additive	Total Equivalent Work Year Allocated to Powerplant	Total Equivalent Staffing Work Year per Generating Unit	Total Equivalent Work Year Staffing per Megawatt
General	0.00	0.00	0.02	0.02	0.02	0.01
Operation	0.04	0.00	0.00	0.04	0.04	0.03
Maintenance	0.23	0.02	0.00	0.25	0.25	0.20
Total Staffing	0.27	0.03	0.02	0.32	0.32	0.25

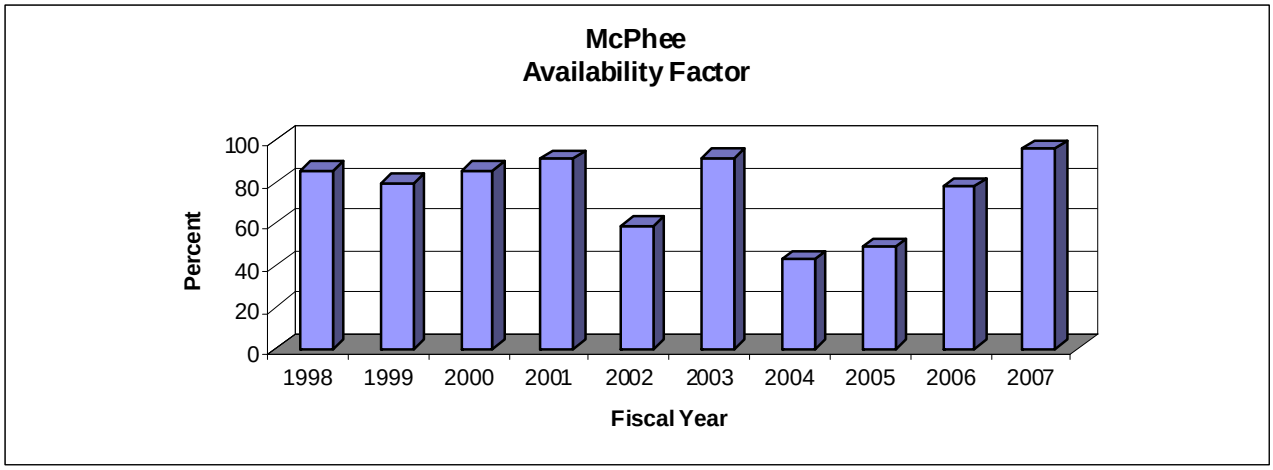




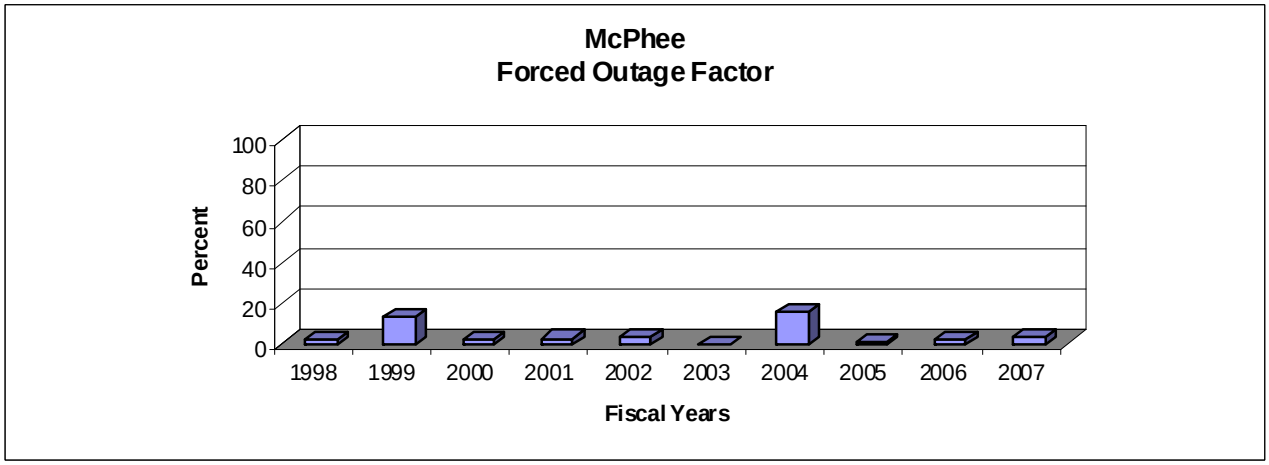




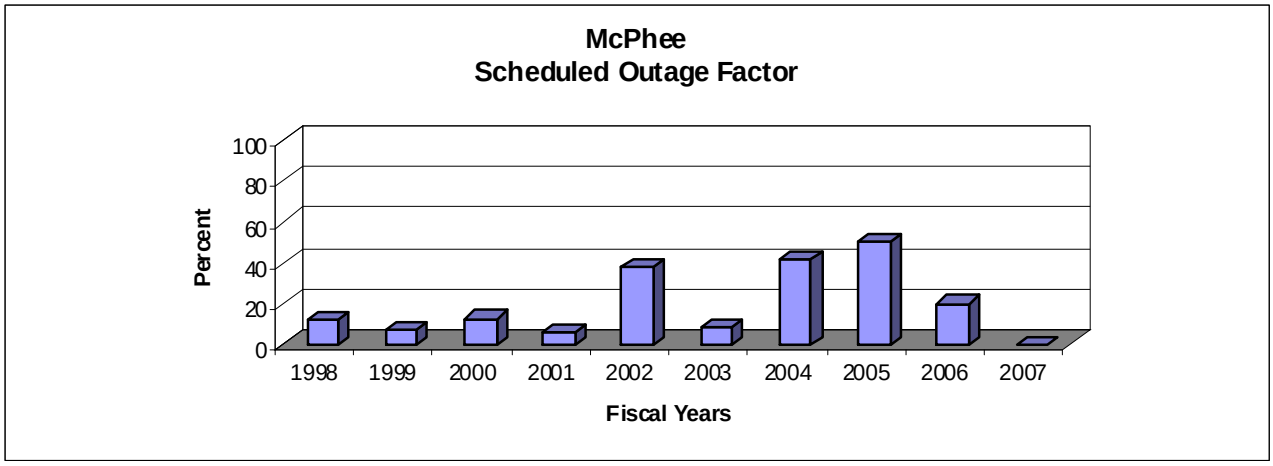
Benchmark 5
Availability Factor



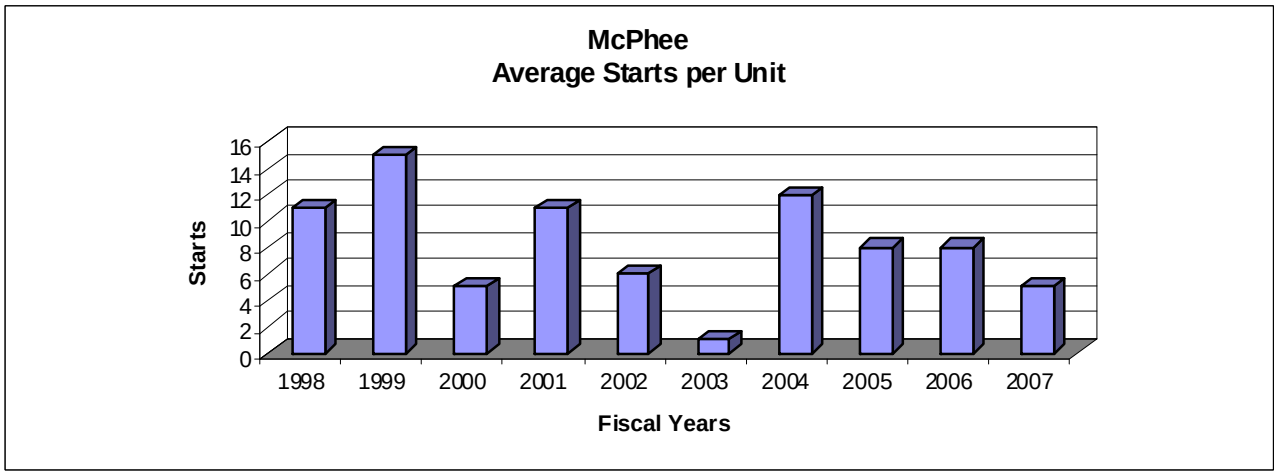
Benchmark 6
Forced Outage Factor



Benchmark 7
Scheduled Outage Factor



Starts



Benchmark Data Comparison

Fiscal Year 2007	McPhee Powerplant	Total Reclamation Average	Industry Average	Best Performers
Wholesale Firm Rate Mills/kWh	20.7	*22.45	Not Available	Not Available
Production Cost as Percentage of Wholesale Firm Rate	0.1%	12.1%	Not Applicable	Not Applicable
O&M Cost $/MWh	16.02	2.76	***25.9	1.00
O&M Costs $/MW	66,594	7,847	***75,984	2,897
O&M Equiv Work Year per MW	0.23	0.03	Not Available	0.00
Availability Factor	****78.2	82.3	**88.64	98.54
Forced Outage Factor	****1.8	2.6	**2.61	0.00
Scheduled Outage Factor	****20.0	15.1	**8.74	0.00

*Weighted by Net Generation
**2006 NERC Average
*** Energy Information Administration Data
**** Insufficient date to calculate

Morrow Point Powerplant
Colorado River Storage Project
Wayne N. Aspinall Storage Unit

Plant Contact:
Donald Phillips, Manager
Curecanti Field Division

Plant Address:
Morrow Point Powerplant
Montrose CO

Telephone Numbers:
Phone: (970) 240-6300
Fax: (970) 240-6304

E-Mail Address:
dphillips@uc.usbr.gov

Reclamation Region: Upper Colorado

NERC Region: Western Electricity Coordinating Council, Rocky Mountain Power Area

PMA Service Area: Western Area Power Administration, Colorado River Storage Project Management Center

Project Authorization: The Congress authorized construction of four storage units in the Colorado River Storage Project and 11 participating projects on April 11, 1956 under Public Law 485, 84th Congress, 70 Stat. 105. Additional projects have been added since the original legislation was adopted.

Project Purposes: The Colorado River Storage Project provides for the comprehensive development of the Upper Colorado River Basin. The project furnishes the long-time regulatory storage needed to permit States in the upper basin to meet their flow obligation at Lees Ferry, Arizona, (as defined in the Colorado River Compact) and still use their apportioned water.

Plant Location: The Morrow Point Powerplant is located on the Gunnison River in Montrose County, Colorado, 22 miles east of Montrose, Colorado.

Plant Facts: The Morrow Point Powerplant chamber is tunneled into the canyon wall in the left abutment about 400 feet below the ground surface. The powerplant chamber is 231 feet long and 57 feet wide with a height ranging from 65 to 134 feet. There are two 86,667-kilowatt generators driven by two 83,000-horsepower turbines. The power penstocks consist of 13.5-foot-diameter steel lines in 18-foot-diameter tunnels.

The Morrow Point Dam is Reclamation's first thin-arch, double-curvature dam. It is 468 feet high, 52 feet thick at the base, and 12 feet thick at the crest. The dam has a crest length of 724 feet and a volume of 365,180 cubic yards of concrete.

Plant Purpose: Generation of hydroelectric power for the upper basin and adjacent areas.

Plant History: The generators were up rated from 60,000 kW to 86,667 kW in 1992 and 1993. Replaced the three single-phase transformers in FY-1996 and the 230 kilovolt cable in FY-1998. Also replaced the unit circuit breakers in FY-1992. In 2002, surge arresters were replaced in switchyard for new 230Kv underground cable and new governors were installed. In addition, cleaned trash racks and dredged river in 2002. In 2003 additional river material was removed. Guard Rail installed on access road to top of Dam in 2004. Replaced powerplant and transformer duplex strainers, replaced UPS system and Battery chargers for powerplant in 2005. Changed the old data logger to PLC trending and monitoring.

Present Activities: Replacing all 480V and 208V power panels in the plant , dam and visitor center.

Future Planned Activities: New plant fire alarm system, new switchyard CCVT's. Replace generator vibration monitors. Install new SEL protection for both units and for plant station service

Special Issues: None

River:	Gunnison River	**Plant Type:**	Conventional
Powerhouse Type:	Below Ground	**Turbine Type:**	Francis
Original Nameplate Capacity:	120,000 kW	**Installed Capacity:**	173,334 kW
Year of Initial Operation:	1970	**Age:**	37 years
Net Generation (FY-2007):	292.9 GWh	**Rated Head:**	396 feet
Average Plant Factor (FY-2007):	19.4 percent	**Remotely Operated:**	Yes
Production Mode:	Peaking		

Ancillary Services

Morrow Point
Ancillary Services

Spinning Reserve	Yes
Non-Spinning Reserve	Yes
Replacement Reserve	Yes
Regulation/Load Following	Yes
Black Start	Yes
Voltage Support	Yes

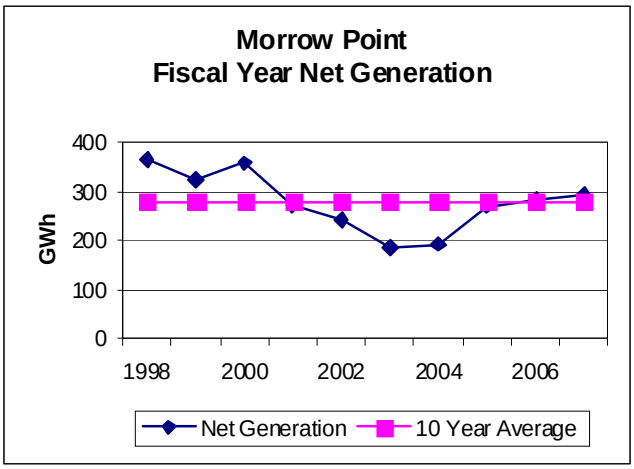
Generators

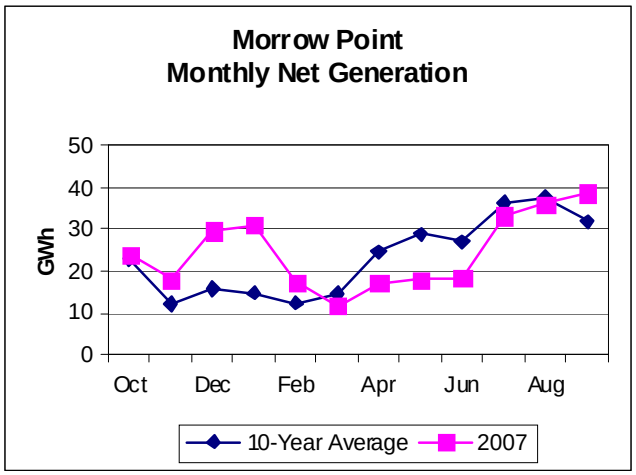
Morrow Point Generators

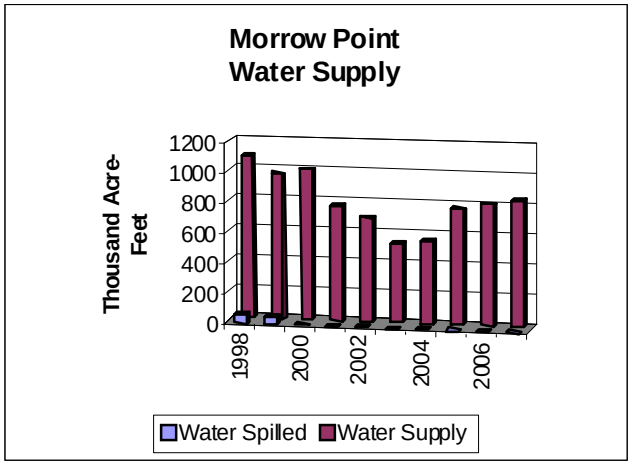
Existing Number and Capacity

Unit #	Original Capacity (kW)	Capacity Increased (kW)	Present Capacity (kW)
1	60,000	26,667	86,667
2	60,000	26,667	86,667
2 units	120,000	53,334	173,334

Generation

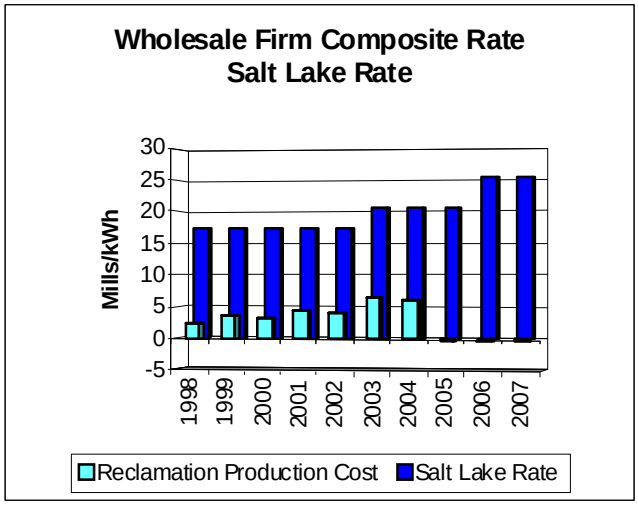

Morrow Point
Fiscal Year Net Generation
GWh
400
300
200
100
0
1998
2000
2002
2004
2006
Net Generation
10 Year Average


Morrow Point
Monthly Net Generation
GWh
50
40
30
20
10
0
Oct
Dec
Feb
Apr
Jun
Aug
10-Year Average
2007

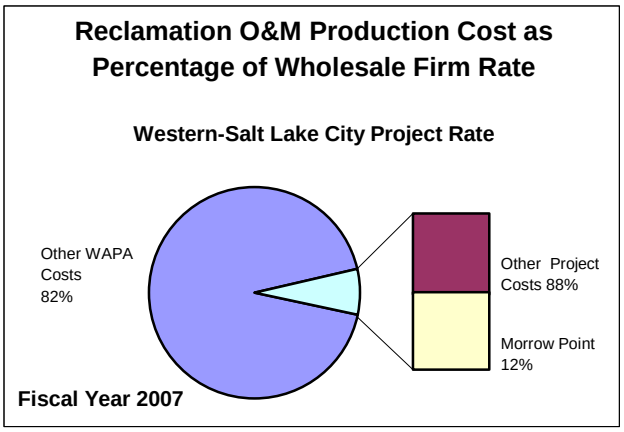

Morrow Point
Water Supply
Thousand Acre-Feet
1200
1000
800
600
400
200
0
1998
2000
2002
2004
2006
Water Spilled
Water Supply

Prime Laboratory Benchmarks

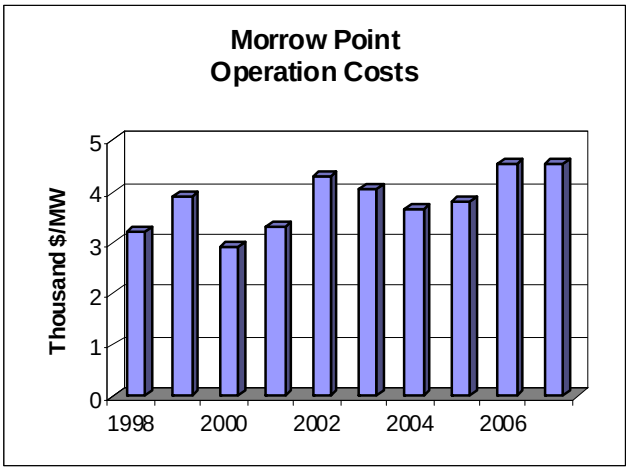
Benchmark 1
Wholesale Firm Rate

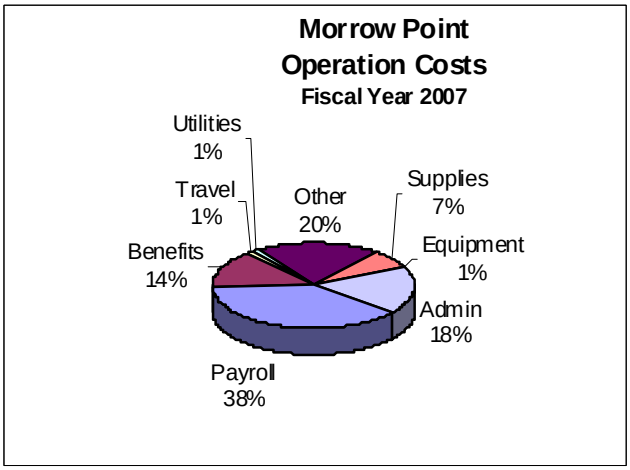


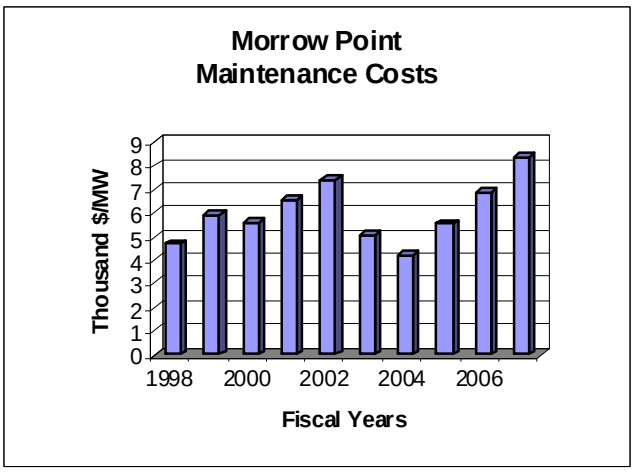
Benchmark 2
Reclamation's Production Cost as Percentage of Wholesale Firm Rate

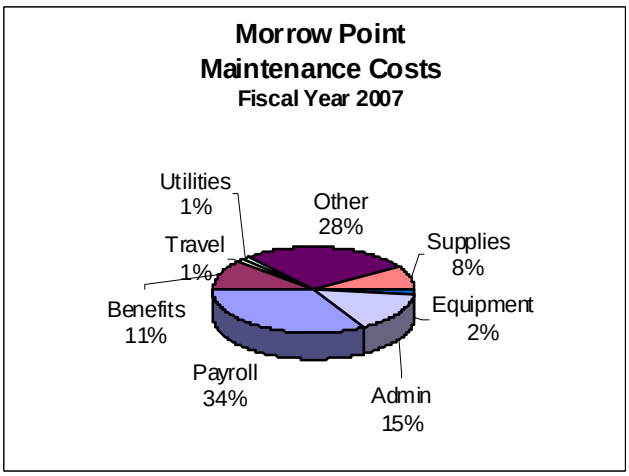


Benchmark 3
Production Cost

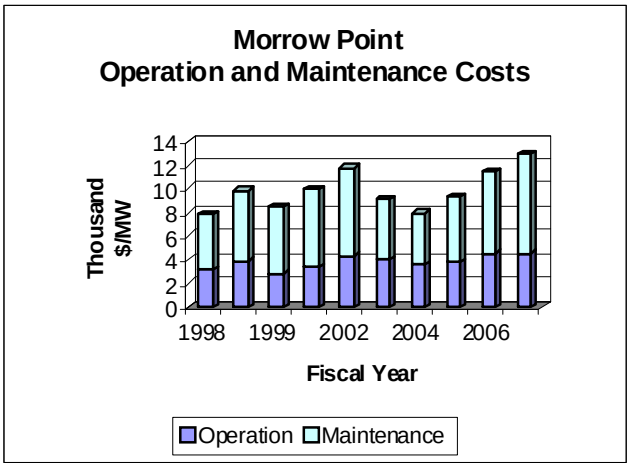


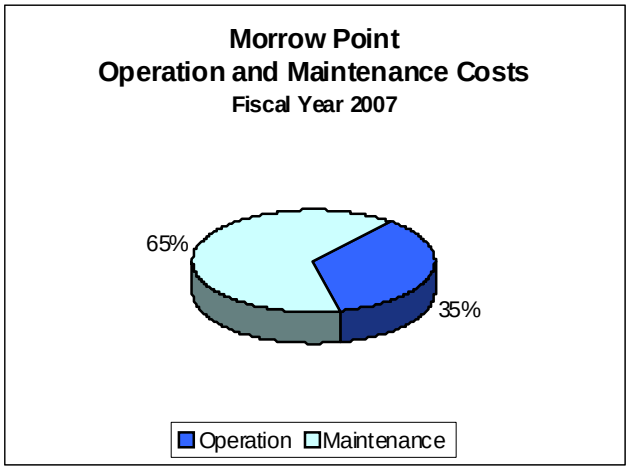


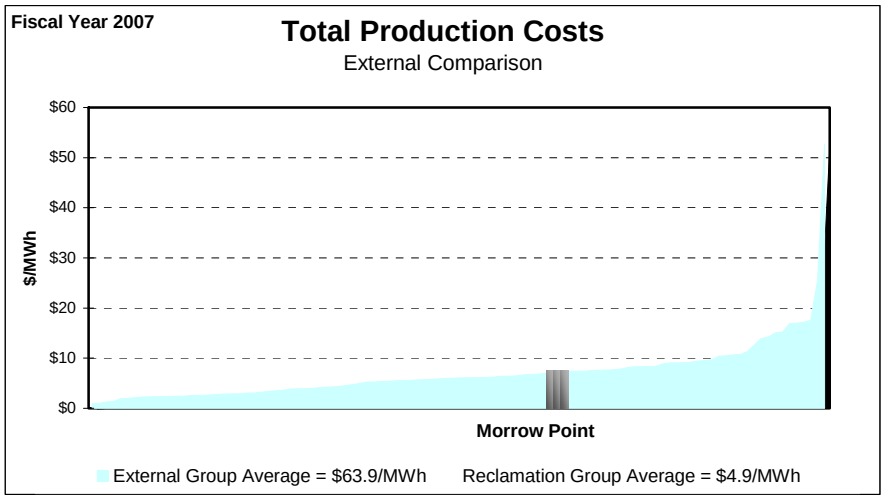


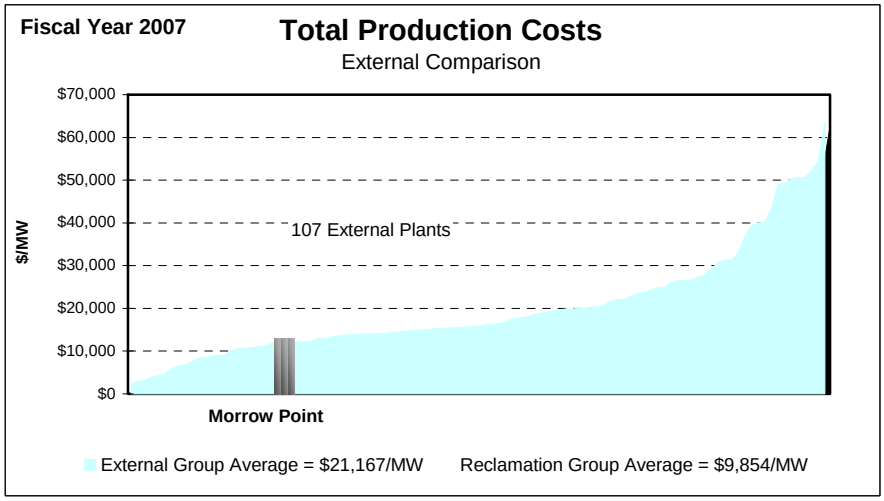


Benchmark 3
Production Cost



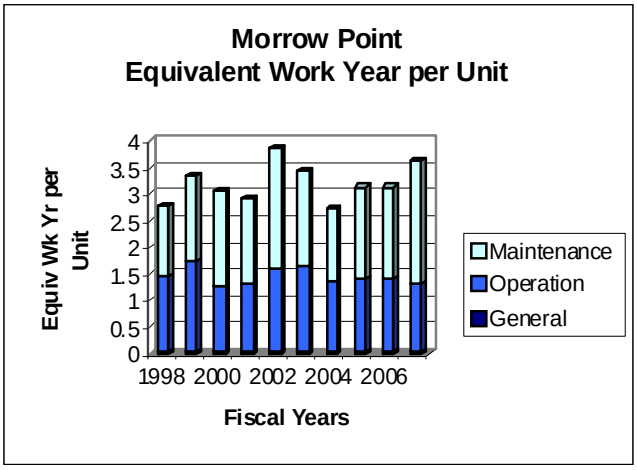


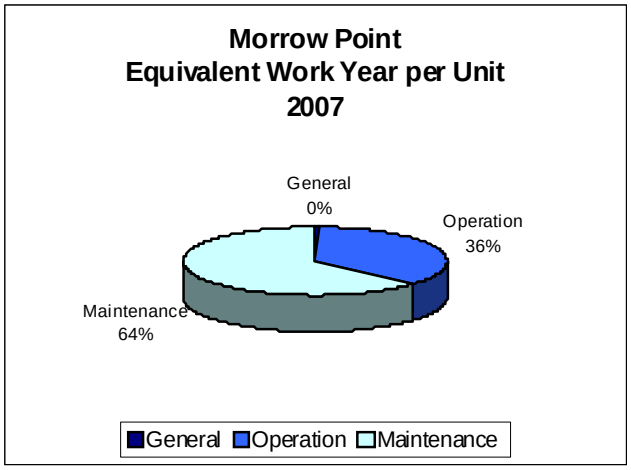


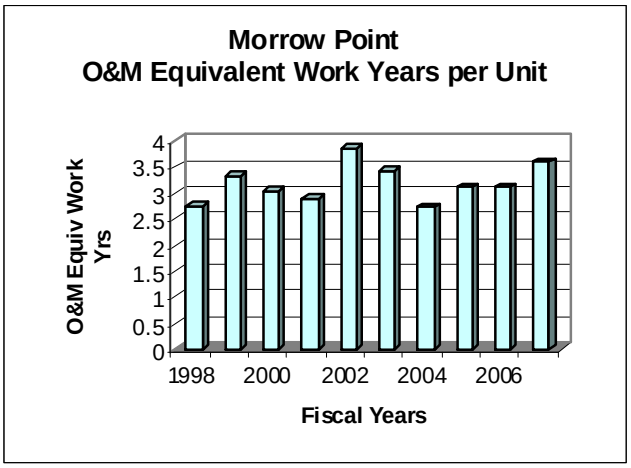


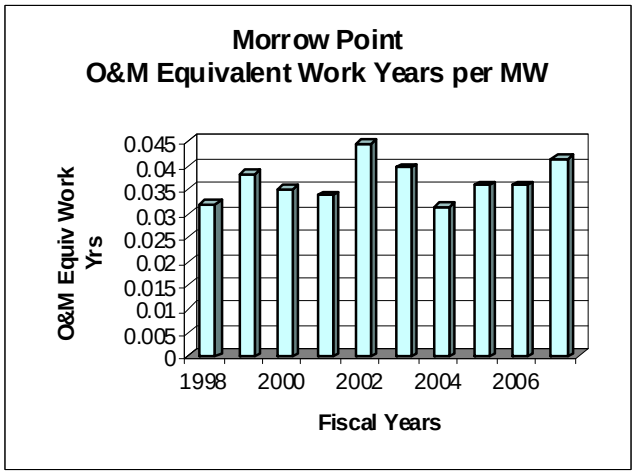
Benchmark 4
Workforce Deployment

Morrow Point FY 2007 Equivalent Work Staffing Year Levels						
	Equivalent Work Year Staffing Charged to Powerplant	Leave Additive	Denver and Washington Equivalent Work Year Staffing Additive	Total Equivalent Work Year Allocated to Powerplant	Total Equivalent Staffing Work Year per Generating Unit	Total Equivalent Work Year Staffing per Megawatt
General	0.00	0.00	0.04	0.04	0.02	0.00
Operation	2.37	0.25	0.00	2.62	1.31	0.02
Maintenance	4.15	0.44	0.00	4.59	2.29	0.03
Total Staffing	6.52	0.69	0.04	7.25	3.62	0.04

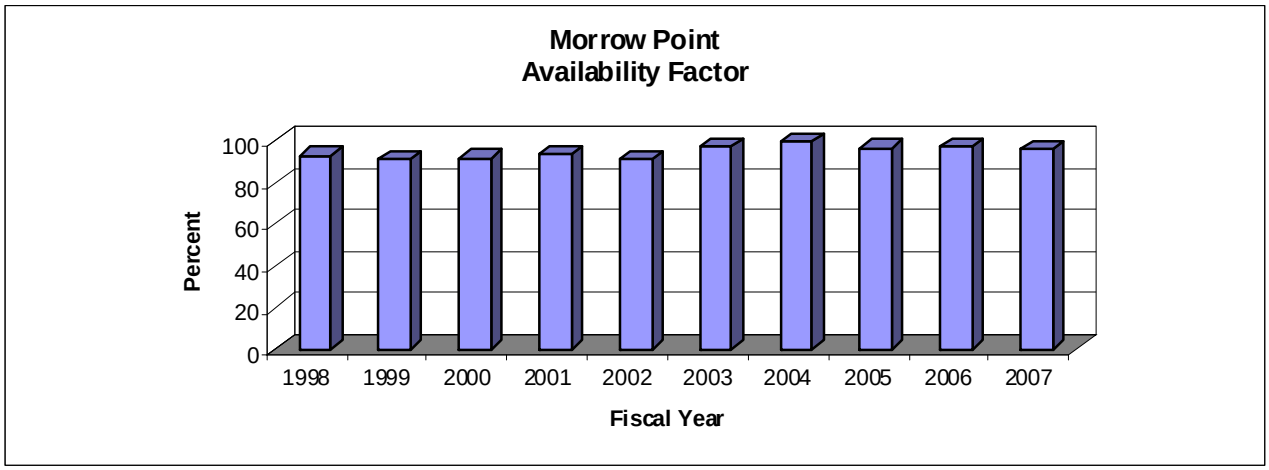




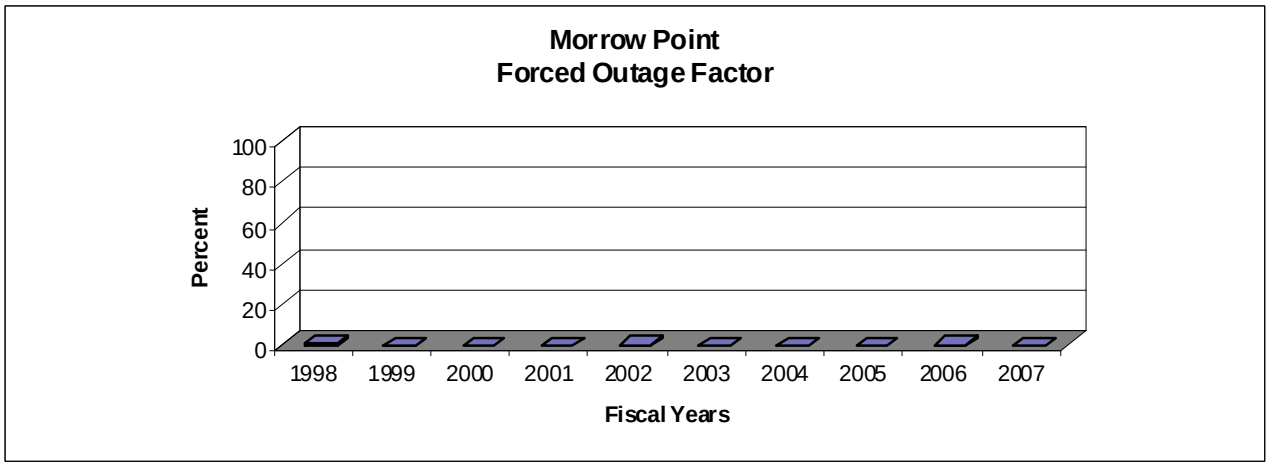




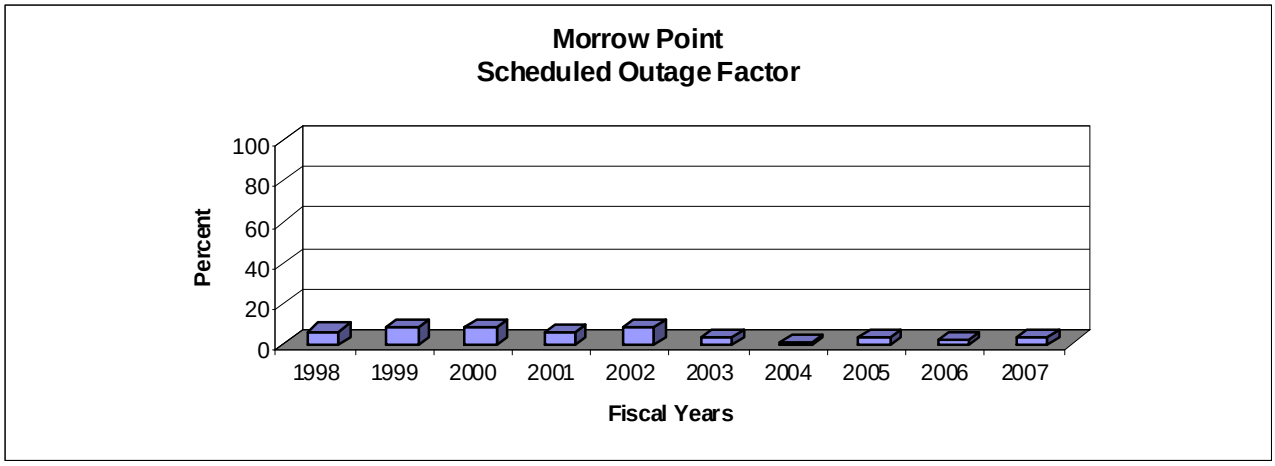
Benchmark 5
Availability Factor



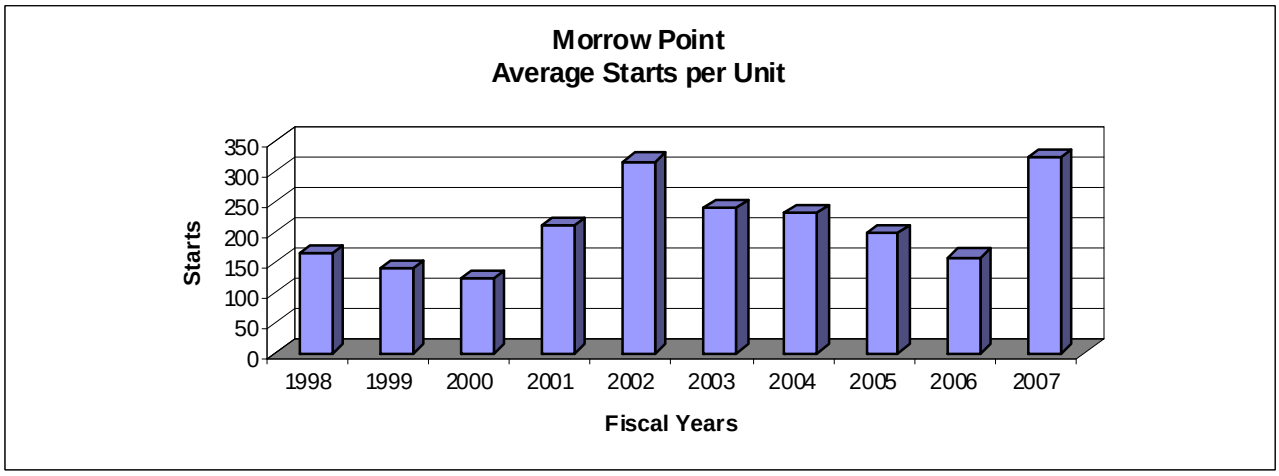
Benchmark 6
Forced Outage Factor



Benchmark 7
Scheduled Outage Factor



Starts



Benchmark Data Comparison					
Fiscal Year 2007	**Morrow Point Powerplant**	**Reclamation Average 100-500 MW Group**	**Total Reclamation Average**	**Industry Average**	**Best Performers**
Wholesale Firm Rate Mills/kWh	20.7	Not Applicable	*22.45	Not Available	Not Available
Production Cost as Percentage of Wholesale Firm Rate	2.3%	Not Applicable	12.1%	Not Applicable	Not Applicable
O&M Cost $/MWh	7.66	4.44	2.76	***63.88	1.00
O&M Costs $/MW	12,941	10,502	7,847	***21,167	2,897
O&M Equiv Work Year per MW	0.04	0.04	0.03	Not Available	0.0
Availability Factor	96.3	83.5	82.3	**88.64	98.5
Forced Outage Factor	0.1	1.2	2.6	**2.61	0.0
Scheduled Outage Factor	3.6	15.4	15.1	**8.74	0.0

*Weighted by Net Generation
**2006 NERC Average
***Energy Information Administration Data

Towaoc Powerplant
Dolores Project

Plant Contact:
Vernon Harrell
Cortez Project Office

Plant Address:
Towaoc Powerplant
Cortez CO

Telephone Numbers:
Phone: (970) 565-0865

E-Mail Address:
vharrell@uc.usbr.gov

Reclamation Region: Upper Colorado

NERC Region: Western Electricity Coordinating Council, Rocky Mountain Power Area

PMA Service Area: Western Area Power Administration, Colorado River Storage Project Management Center

Project Authorization: The Dolores Project was authorized by the Colorado River Basin Act of September 30, 1968 (Public Law 90-537), as a participating project under the Colorado River Storage Project Act of April 11, 1956 (Public Law 84-485).

Project Purposes: The Dolores Project, located in the Dolores River Basin in southwestern Colorado, develops water from the Dolores River for irrigation, municipal and industrial use, recreation, fish and wildlife, and production of hydroelectric power. It also provides flood control and aids economic redevelopment.

Powerplants located on McPhee Dam and the Towaoc Canal generate an annual average of 16,500,000 kilowatt-hours, which enters the Colorado River Storage Project power transmission system. The Towaoc Powerplant operates from April to October on the irrigation water supply conveyed through the canal.

Plant Location: Towaoc Powerplant is located on the Towaoc Canal, 5 miles north of Cortez, Colorado, in Montezuma County, Colorado.

Plant Facts: Towaoc Canal heads the Dolores Canal 1.1 miles below the outlet of the Dolores Tunnel and extends southward for 39.5 miles to the full service lands in the Towaoc area. The canal is earth lined for 38 miles and concrete lined for 1.5 miles. It has an initial capacity of 420 cubic feet per second and a terminal capacity of 135 cubic feet per second.

A 78-inch-diameter, buried concrete-lined steel pipe penstock heads at a project works on the Dolores Canal and extends southwest into Hartman Draw to the powerhouse. The powerhouse consists of one turbine connected to a 11.495-megawatt generator.

Plant Purpose: Towaoc Powerplant provides energy to project facilities. Power is sold to Western Area Power Administration and the Project receives power from the Colorado River Storage Project for project pumping at a reduced rate.

Plant History: The powerplant is operated and maintained under a contract with the Dolores Water Conservancy District. The switchyard is maintained under a contract with Empire Electric Association Inc.

Present Activities: Normal operations

Future Planned Activities: None

Special Issues: Shutdown in August 2002 through the rest of the water year due to the lack of water.

River Name:	Towaoc Canal	**Plant Type:**	Conventional
Powerhouse Type:	Above Ground	**Turbine Type:**	Francis
Original Nameplate Capacity:	11,495 kW	**Installed Capacity:**	11,495 kW
Year of Initial Operation:	1993	**Age:**	14 years
Net Generation (FY-2007):	3.2 GWh	**Rated Head:**	415 feet
Annual Plant Factor (FY-2007):	3.6 percent (seasonal)	**Remotely Operated:**	Yes
Production Mode:	Base		

Ancillary Services

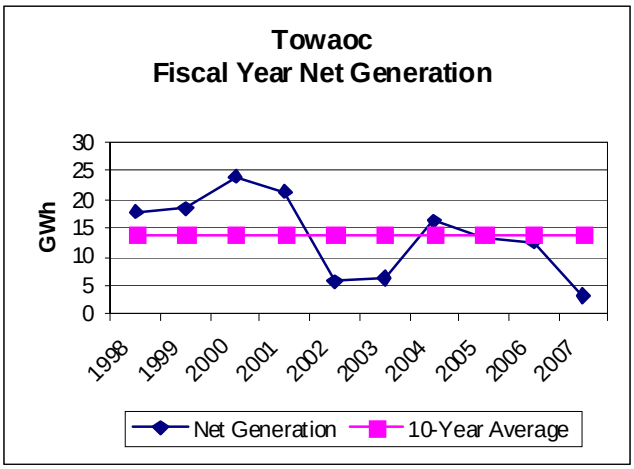
Towaoc Ancillary Services	
Spinning Reserve	No
Non-Spinning Reserve	No
Replacement Reserve	No
Regulation/Load Following	No
Black Start	Yes
Voltage Support	Yes

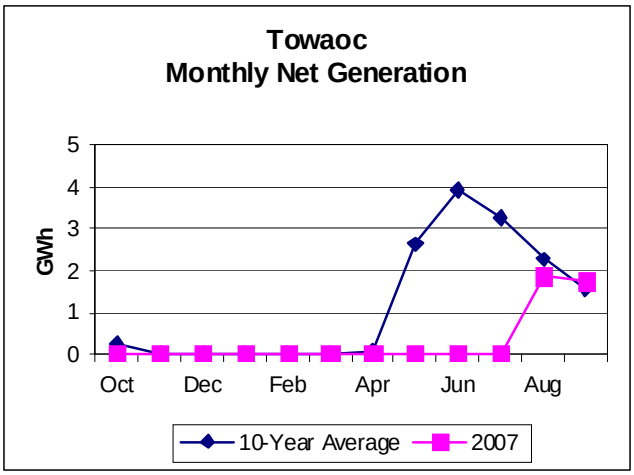
Black Start not probable, plant not in Western Area Power Administration's Black Start Plan.

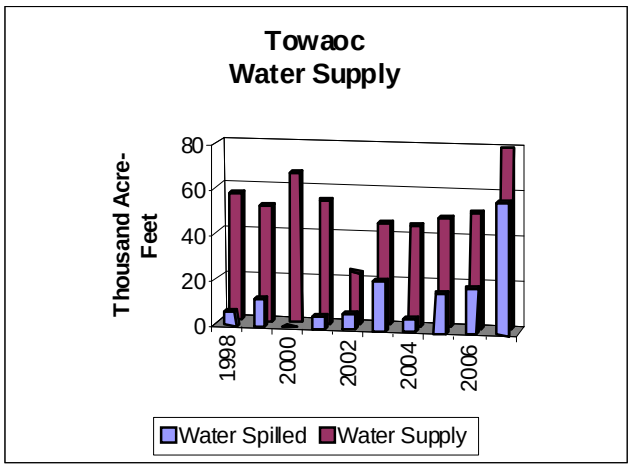
Generators

Towaoc Generators Existing Number and Capacity			
Unit #	Original Capacity (kW)	Capacity Increased (kW)	Present Capacity (kW)
2	11,495	-	11,495
1 unit	11,495	-	11,495

Generation

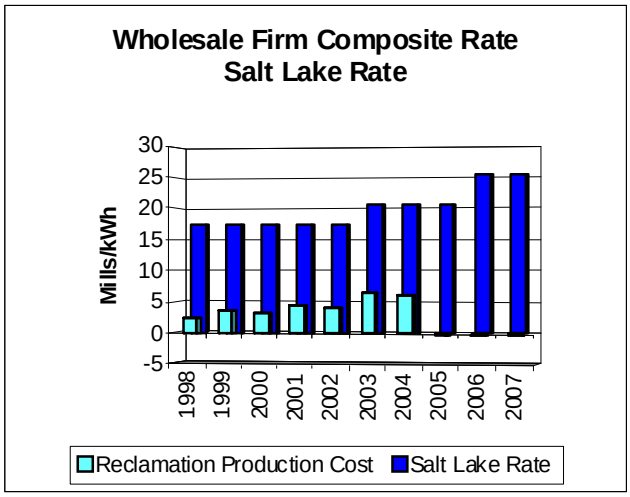

Towaoc
Fiscal Year Net Generation
GWh
30
25
20
15
10
5
0
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
Net Generation
10-Year Average


Towaoc
Monthly Net Generation
GWh
5
4
3
2
1
0
Oct
Dec
Feb
Apr
Jun
Aug
10-Year Average
2007

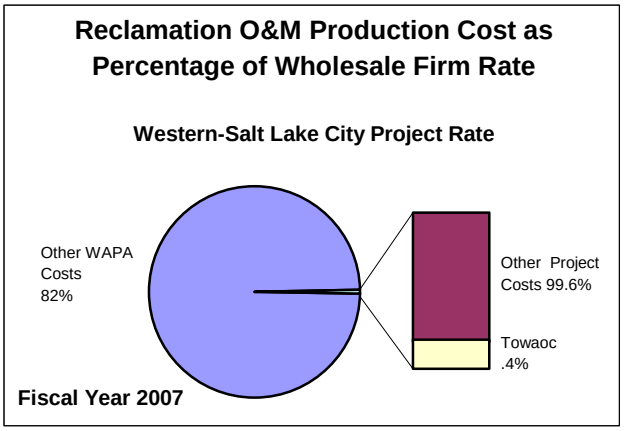

Towaoc
Water Supply
Thousand Acre-Feet
80
60
40
20
0
1998
2000
2002
2004
2006
Water Spilled
Water Supply

Prime Laboratory Benchmarks

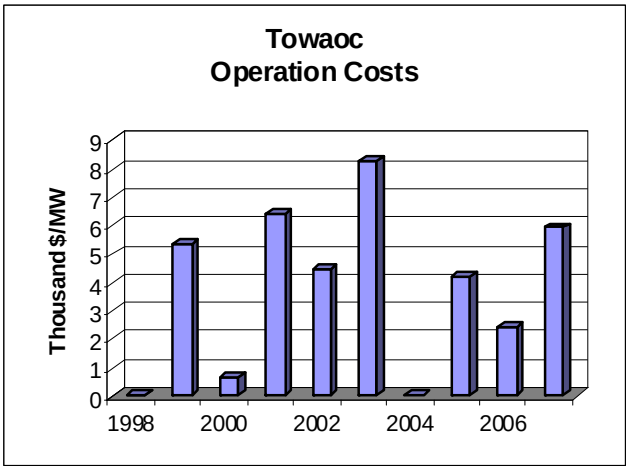
Benchmark 1
Wholesale Firm Rate

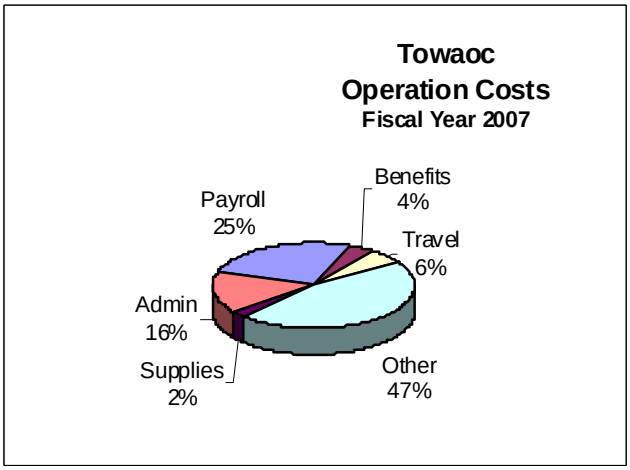


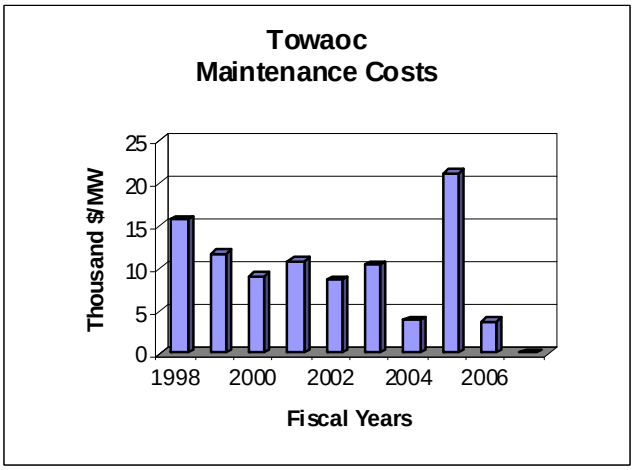
Benchmark 2
Reclamation's Production Cost as Percentage of Wholesale Firm Rate

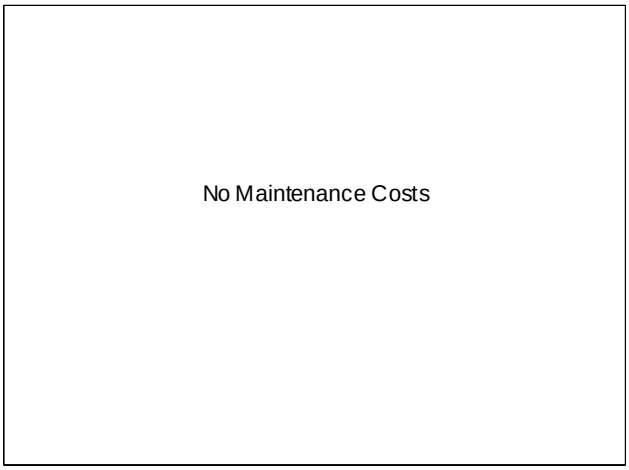


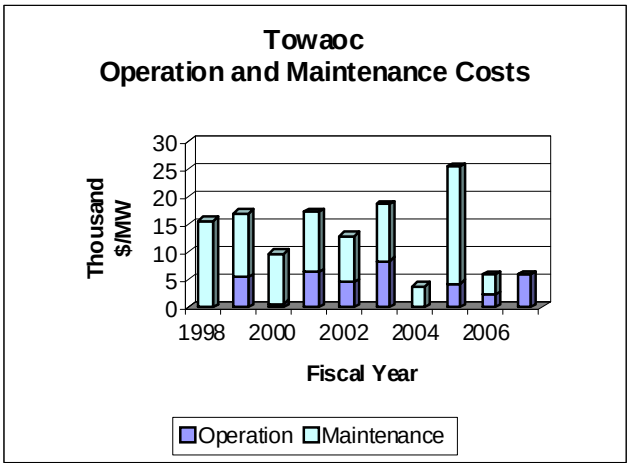
Benchmark 3
Production Cost

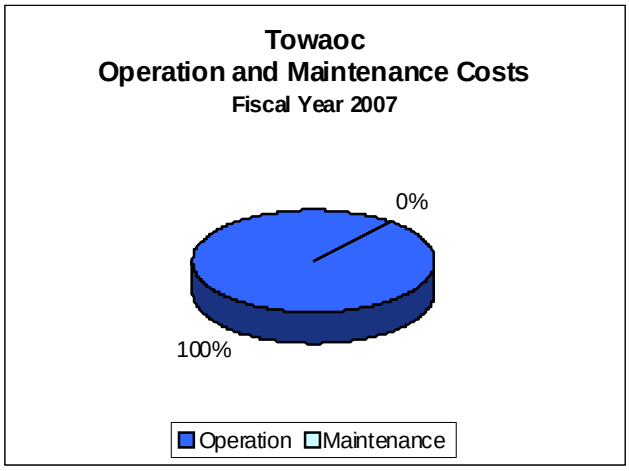






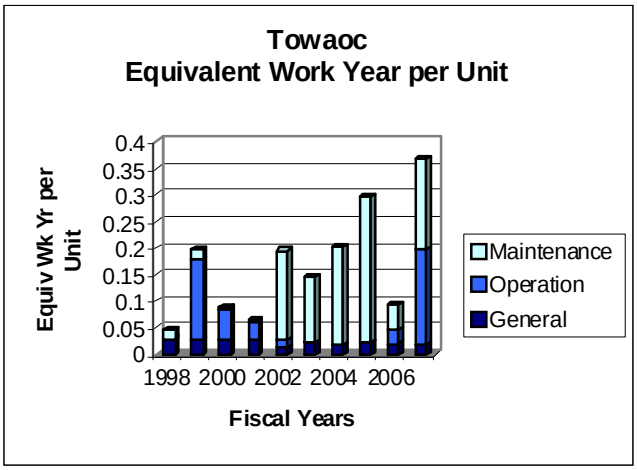


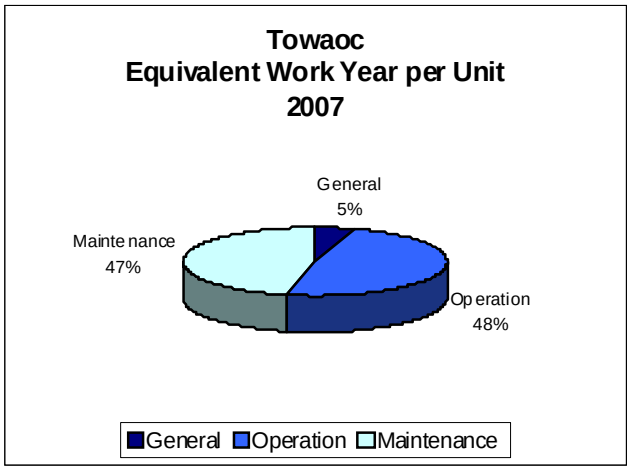


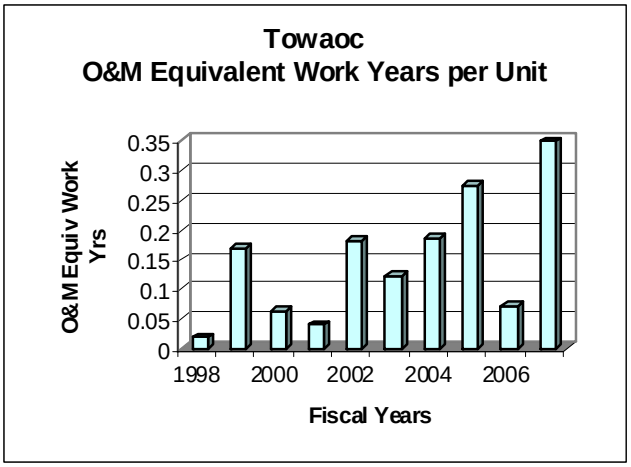


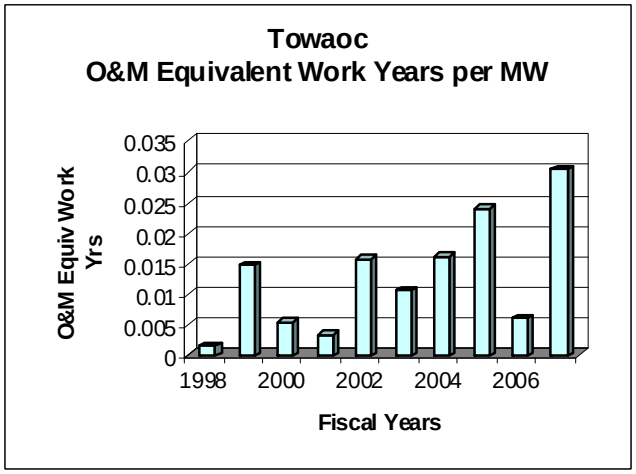
Benchmark 4
Workforce Deployment

Towaoc FY 2007 Equivalent Work Staffing Year Levels						
	Equivalent Work Year Staffing Charged to Powerplant	Leave Additive	Denver and Washington Equivalent Work Year Staffing Additive	Total Equivalent Work Year Allocated to Powerplant	Total Equivalent Staffing Work Year per Generating Unit	Total Equivalent Work Year Staffing per Megawatt
General	0.00	0.00	0.02	0.02	0.02	0.00
Operation	0.16	0.02	0.00	0.18	0.18	0.02
Maintenance	0.15	0.02	0.00	0.17	0.17	0.01
Total Staffing	0.32	0.03	0.02	0.37	0.37	0.03

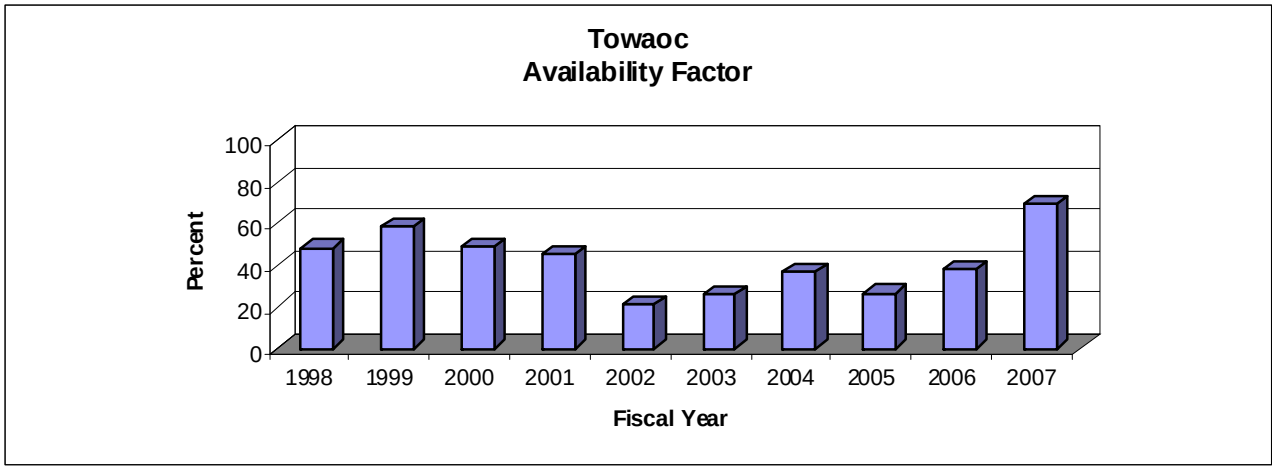






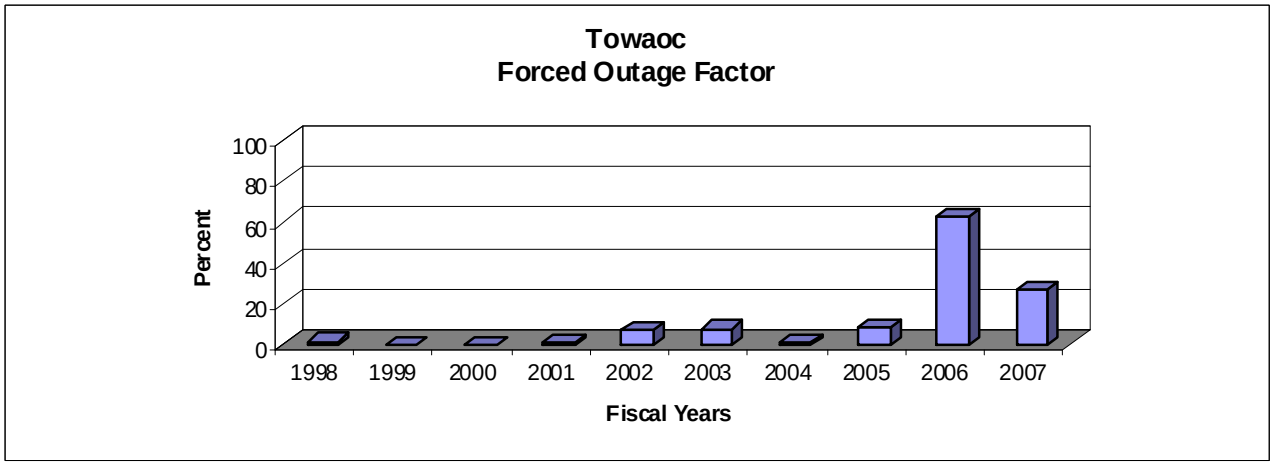


Benchmark 5
Availability Factor

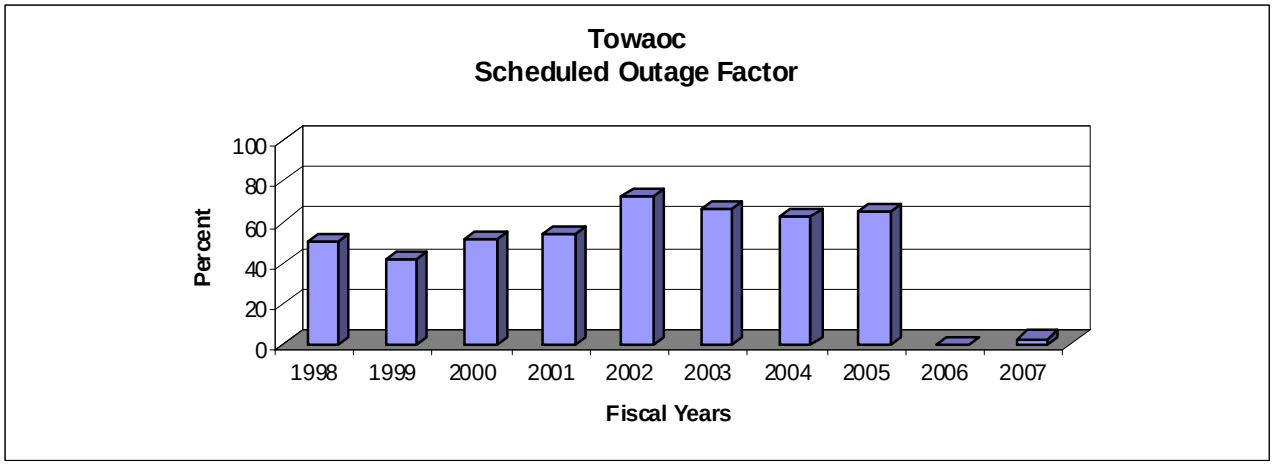


Plant is shut down through the non-irrigation season

Benchmark 6
Forced Outage Factor

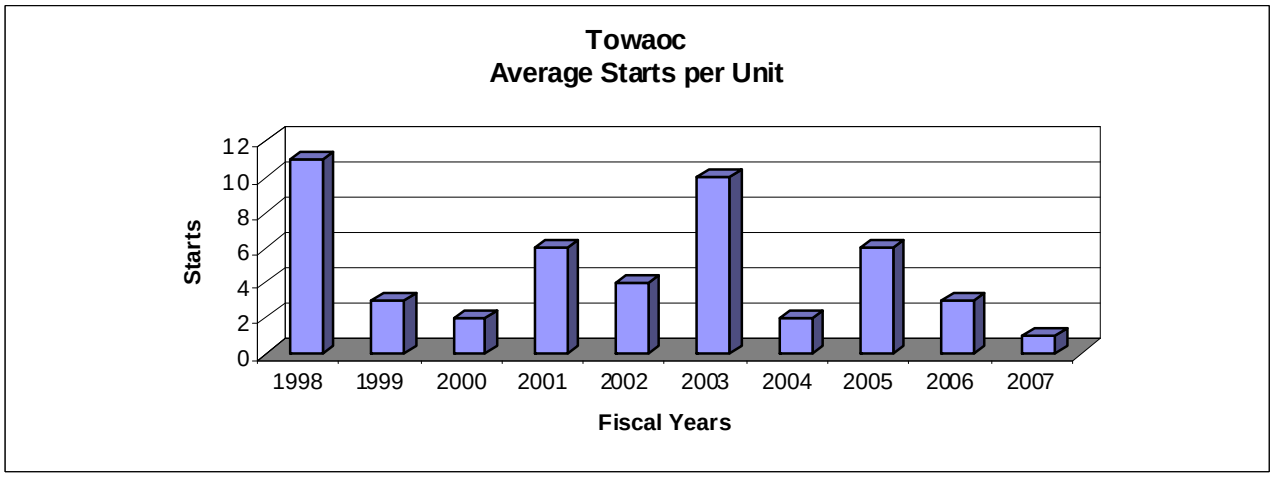


Benchmark 7
Scheduled Outage Factor



Plant is shut down through the non-irrigation season

Starts



Benchmark Data Comparison

Fiscal Year 2007	Towaoc Powerplant	Total Reclamation Average	Industry Average	Best Performers
Wholesale Firm Rate Mills/kWh	20.7	*22.45	Not Available	Not Available
Production Cost as Percentage of Wholesale Firm Rate	0.1%	12.1%	Not Applicable	Not Applicable
O&M Cost $/MWh	19.55	2.76	***163.95	1.00
O&M Costs $/MW	5,406	7,847	***40,852	2,897
O&M Equiv Work Year per MW	0.030	0.03	Not Available	0.00
Availability Factor	****37.7	82.3	**88.64	98.54
Forced Outage Factor	****62.3	2.6	**2.61	0.00
Scheduled Outage Factor	****0.0	15.1	**8.74	0.00

*Weighted by Net Generation
**2006 NERC Average
***Energy Information Administration Data
****Insufficient Data to Calculate

Upper Molina Powerplant
Collbran Project

Plant Contact:
Donald Phillips, Manager
Curecanti Field Division

Plant Address:
Upper Molina Powerplant
Molina CO

Telephone Numbers:
Phone: (970) 240-6300
Fax: (970) 240-6304

E-Mail Address:
dphillips@uc.usbr.gov

Reclamation Region: Upper Colorado

NERC Region: Western Electricity Coordinating Council, Rocky Mountain Power Area

PMA Service Area: Western Area Power Administration, Colorado River Storage Project Management Center

Project Authorization: The Congress authorized the Collbran Project July 3, 1952, under Public Law 445, 82nd Congress, 2nd Session.

Project Purposes: The Collbran Project, in west-central Colorado, has developed a major part of the unused water in Plateau Creek and its principal tributaries. It furnishes supplemental irrigation service and generates electrical energy for use in west-central Colorado.

The project also rehabilitated and modified the operation of 15 small privately owned storage reservoirs on the Grand Mesa situated in the Cottonwood Creek and Big Creek watersheds. These reservoirs provide water for power generation through the exchange of storage water on Grand Mesa for irrigation water from Vega Reservoir.

Plant Location: The Upper Molina Powerplant is located in Mesa County, Colorado, on the east bank of Cottonwood Creek about 7 miles southeast of Molina, Colorado, and about 23 miles northeast of Palisade, Colorado.

Plant Facts:

The Upper Molina penstock extends from the junction of the Bonham and Cottonwood pipelines, continues approximately 2.4 miles down the north slope of Grand Mesa, and terminates at the Upper Molina Powerplant. The penstock consists of welded steel pipe with a capacity of 50 cubic feet per second, ranging in diameter from 36 inches at the junction with the Bonham-Cottonwood collection system to 30 inches at the lower section.

The Bonham Reservoir acts as a fore bay for the Upper Molina Powerplant, which controls releases up to a maximum capacity of 50 cubic feet per second from the reservoir. Upper Molina Powerplant consists of a single 8,640-kilowatt generating unit. This unit operates at a design head of 2,490 feet with power tail water discharges up to 50 cubic feet per second into the Molina Equalizing Reservoir. Both the Lower and Upper Molina Power plants are operated in conjunction with Colorado River Storage Project power operations.

Power generated at both power plants is transformed to a transmission voltage of 115 kilovolts at two substations constructed adjacent to the plants. A 5.5-mile transmission line leads from the substation at the Upper Molina Powerplant, delivers energy produced at the plant to the substation at Lower Molina Powerplant, and connects to the Xcel Energy.

Plant Purpose:

Electrical energy is generated for use in west-central Colorado.

Plant History:

In FY-2005 the unit control system was upgraded to an Ethernet-based Distributed Control System. A digital governor and digital protective relays were also installed and new flow control programming was added to make the Lower Molina unit ramp up with the upper unit, so that they effectively act as a single unit.

Present Activities:

The bearing cooling system is being upgraded to eliminate some problems. Communicating analog data to the RTU in digital format to lessen the errors in the data is being implemented and installing transfer trip relaying to the Lower Molina Plant.

Future Planned Activities:

Purchase and install new generator step up transformer.

Special Issues:

None

River:	Cottonwood Creek	**Plant Type:**	Conventional
Powerhouse Type:	Above Ground	**Turbine Type:**	Pelton Impulse
Original Nameplate Capacity:	8,640 kW	**Installed Capacity:**	8,640 kW
Year of Initial Operation:	1962	**Age:**	45 years
Net Generation (FY-2007):	28.0 GWh	**Rated Head:**	2,490 feet
Average Plant Factor (FY-2007):	37.0 percent	**Remotely Operated:**	Yes
Production Mode:	Peaking		

Ancillary Services

Upper Molina
Ancillary Services

Spinning Reserve	No
Non-Spinning Reserve	No
Replacement Reserve	No
Regulation/Load Following	No
Black Start	Yes
Voltage Support	Yes

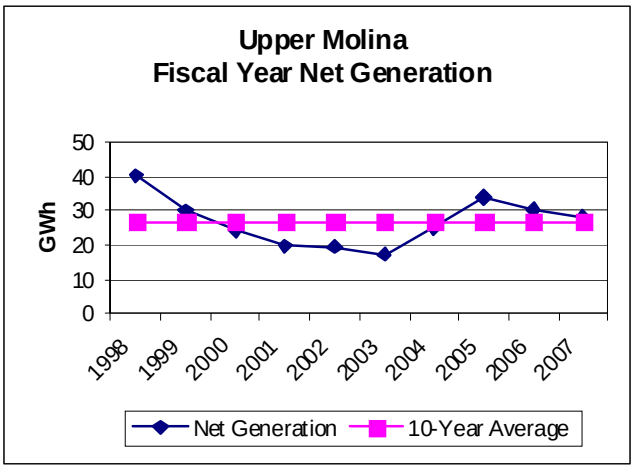
Generators

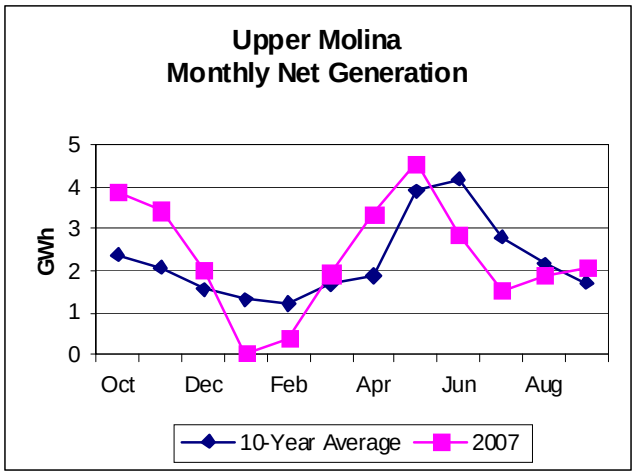
Upper Molina Generators

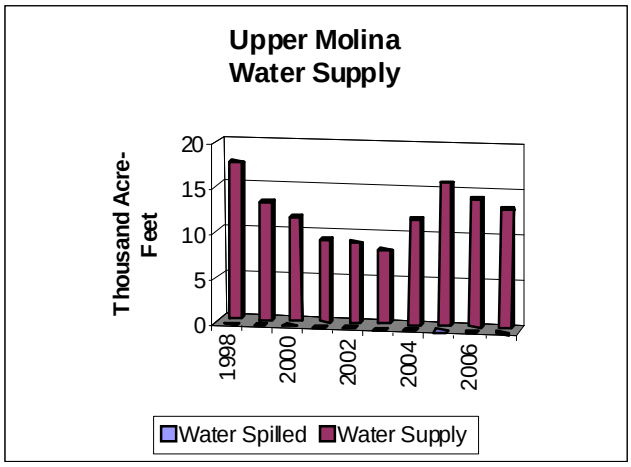
Existing Number and Capacity

Unit #	Original Capacity (kW)	Capacity Increased (kW)	Present Capacity (kW)
1	8,640	-	8,640
1 Unit	8,640	-	8,640

Generation

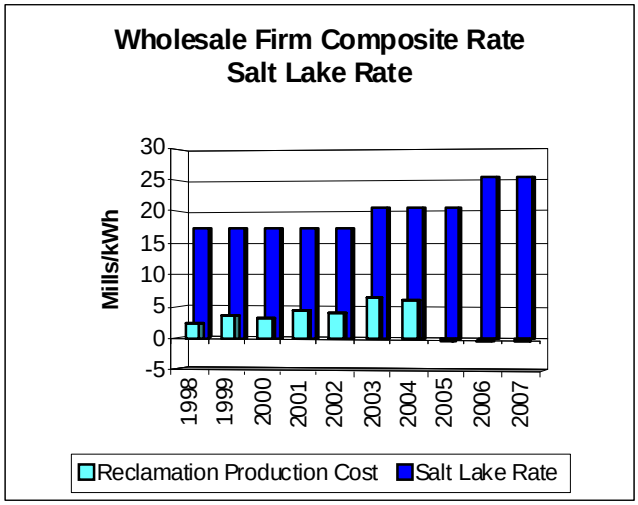

Upper Molina
Fiscal Year Net Generation
GWh
50
40
30
20
10
0
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
Net Generation
10-Year Average


Upper Molina
Monthly Net Generation
GWh
5
4
3
2
1
0
Oct
Dec
Feb
Apr
Jun
Aug
10-Year Average
2007

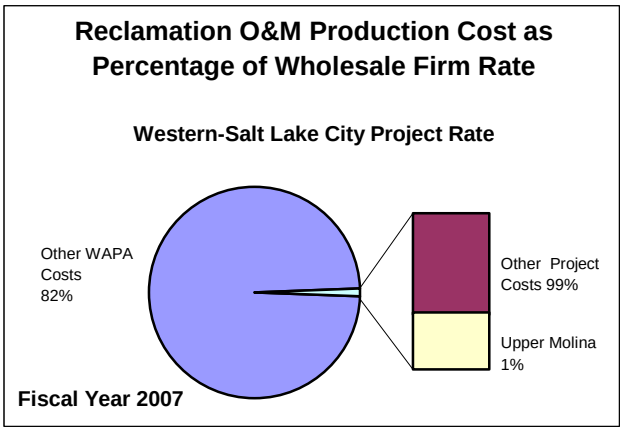

Upper Molina
Water Supply
Thousand Acre-Feet
20
15
10
5
0
1998
2000
2002
2004
2006
Water Spilled
Water Supply

Prime Laboratory Benchmarks

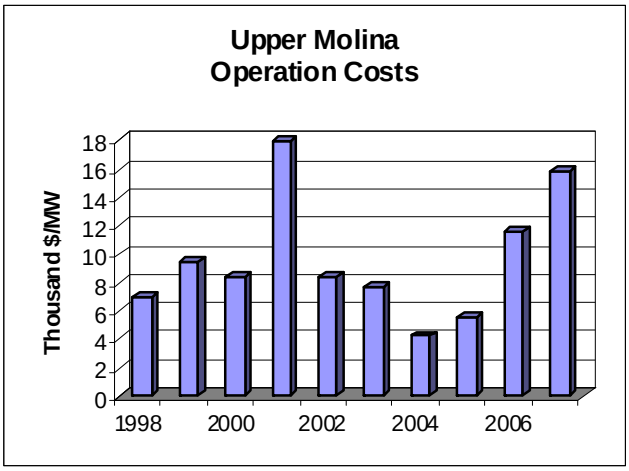
Benchmark 1
Wholesale Firm Rate

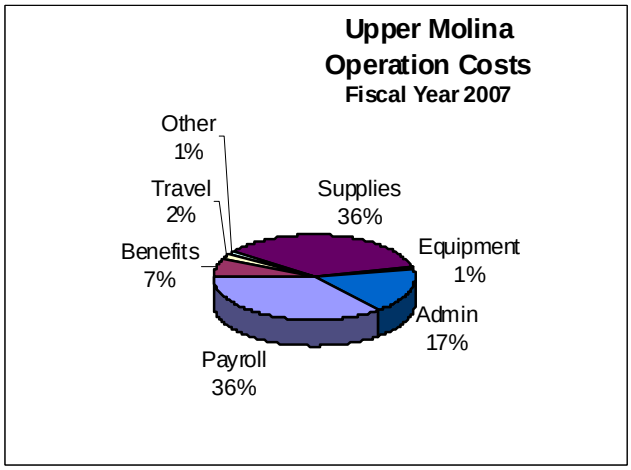


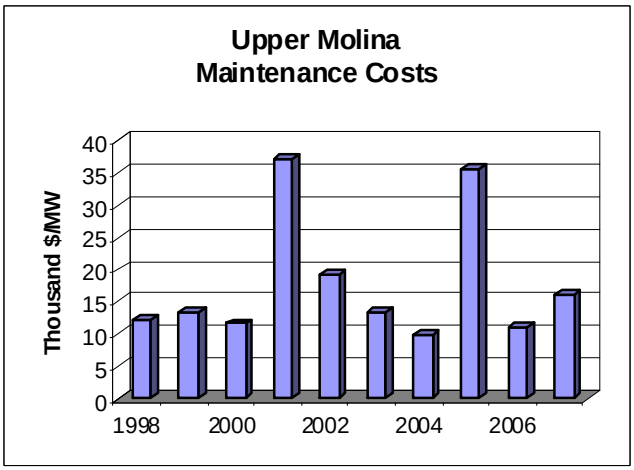
Benchmark 2
Reclamation's Production Cost as Percentage of Wholesale Firm Rate

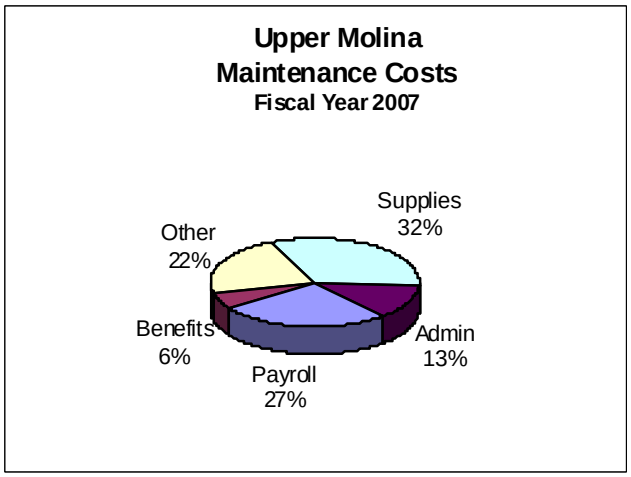


Benchmark 3
Production Cost

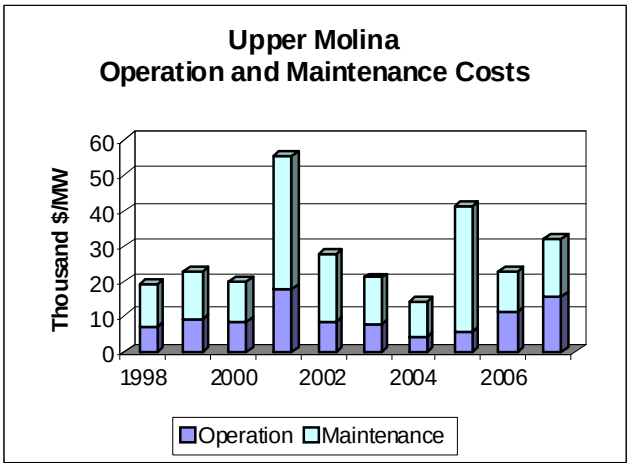


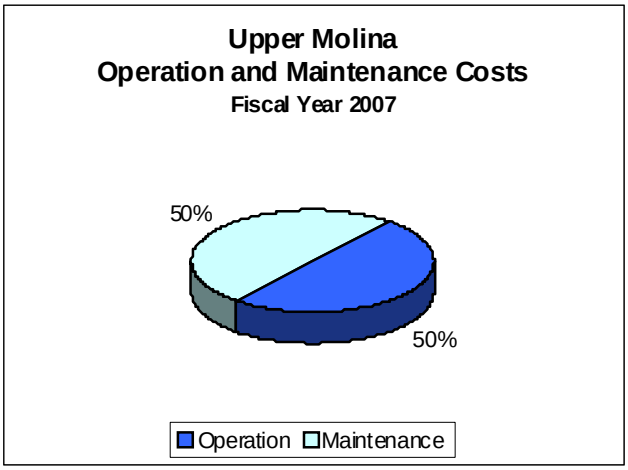


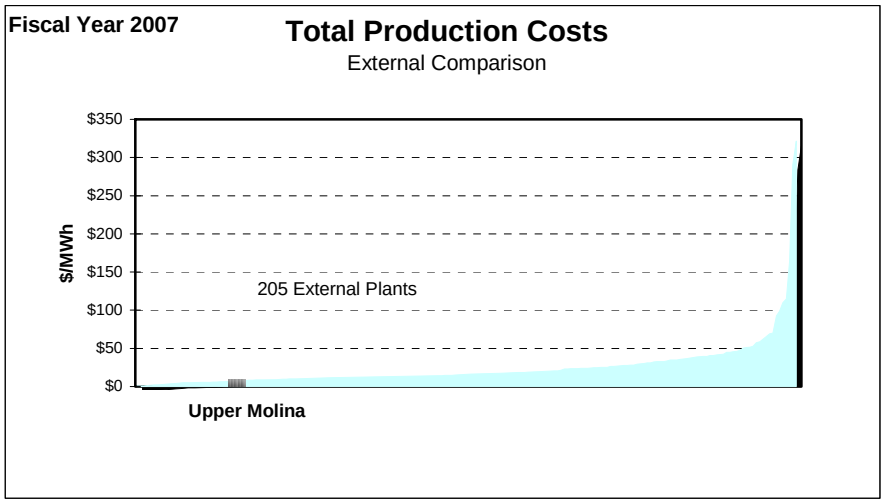


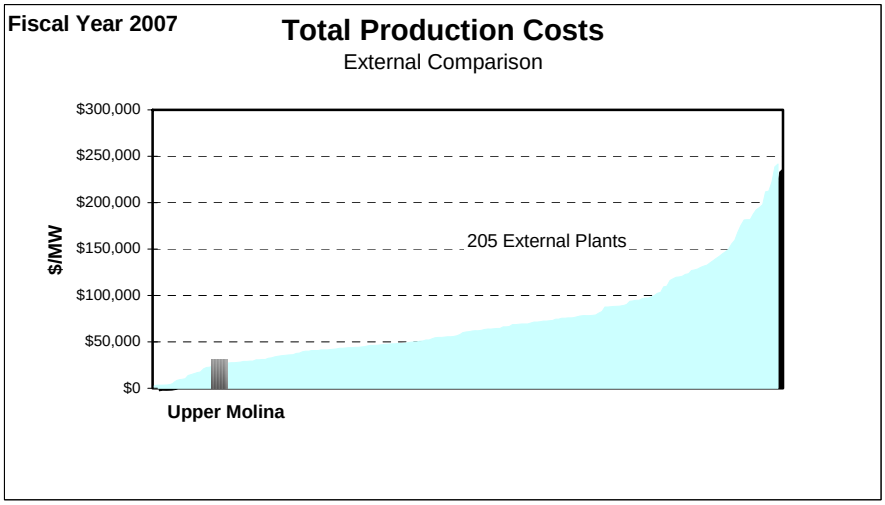


Benchmark 3
Production Cost



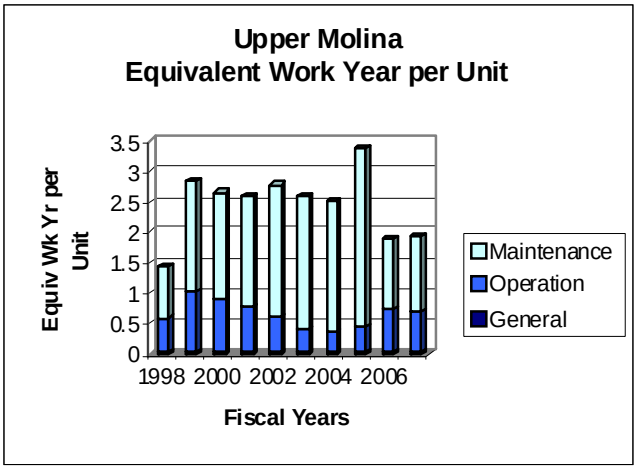


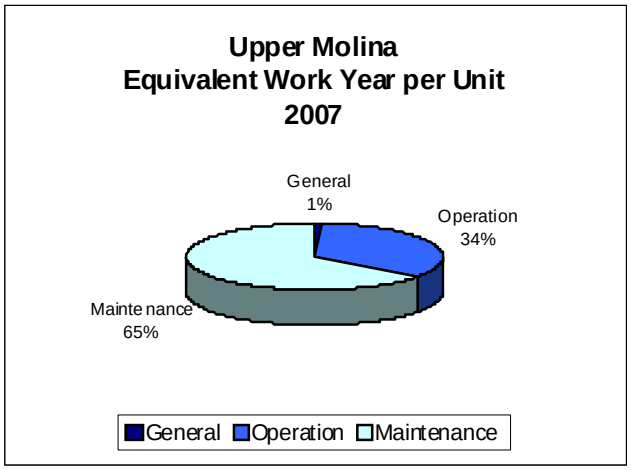


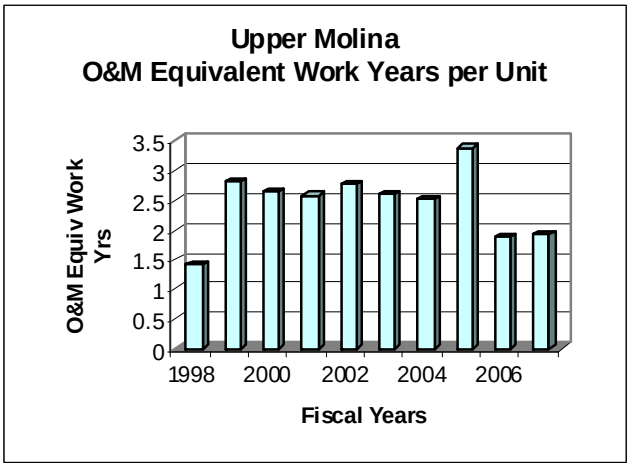


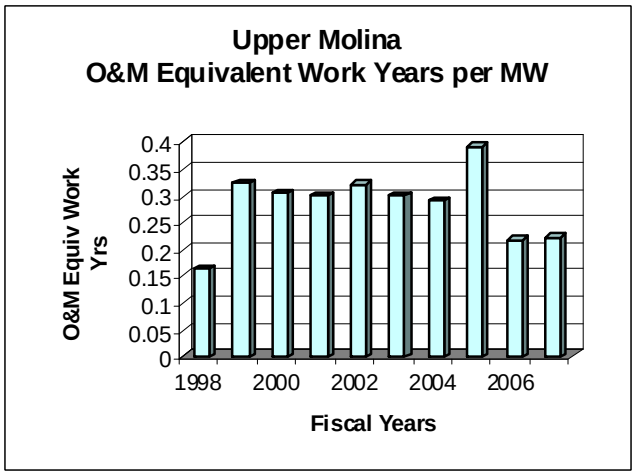
Benchmark 4
Workforce Deployment

Upper Molina FY 2007 Equivalent Work Staffing Year Levels						
	Equivalent Work Year Staffing Charged to Powerplant	Leave Additive	Denver and Washington Equivalent Work Year Staffing Additive	Total Equivalent Work Year Allocated to Powerplant	Total Equivalent Staffing Work Year per Generating Unit	Total Equivalent Work Year Staffing per Megawatt
General	0.00	0.00	0.02	0.02	0.02	0.00
Operation	0.60	0.06	0.00	0.66	0.66	0.08
Maintenance	1.14	0.12	0.00	1.26	1.26	0.15
Total Staffing	1.74	0.18	0.02	1.94	1.94	0.22

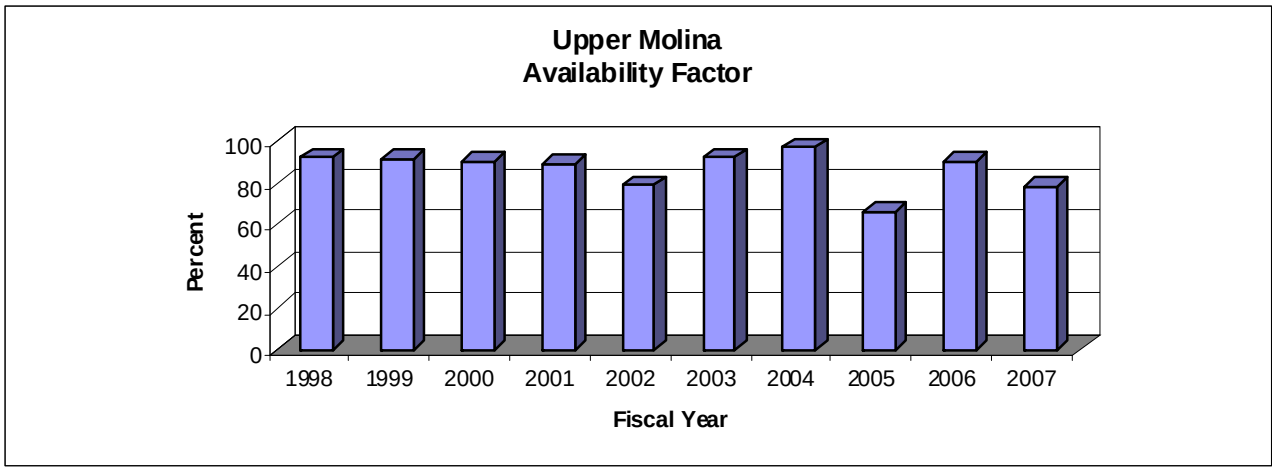




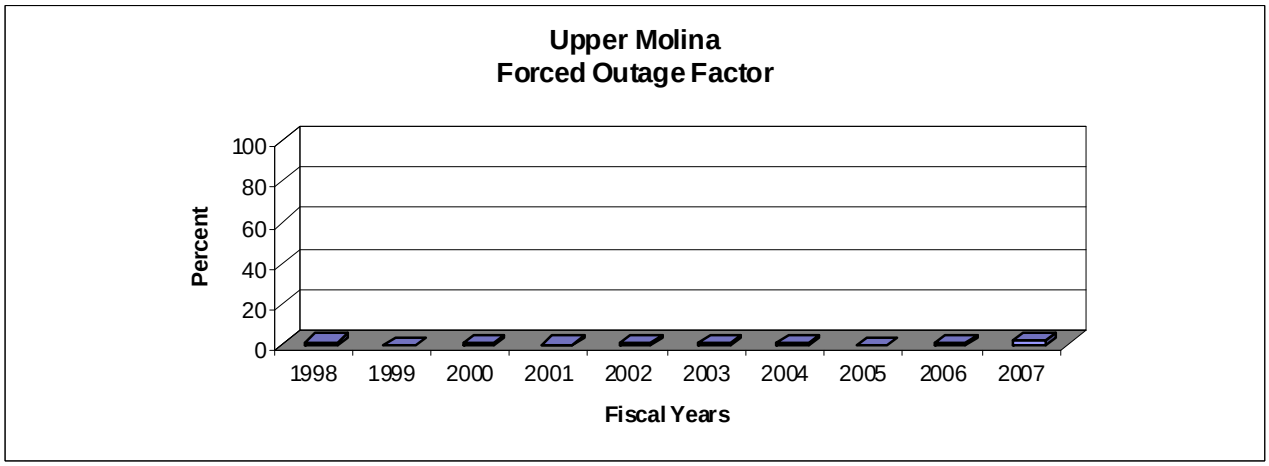




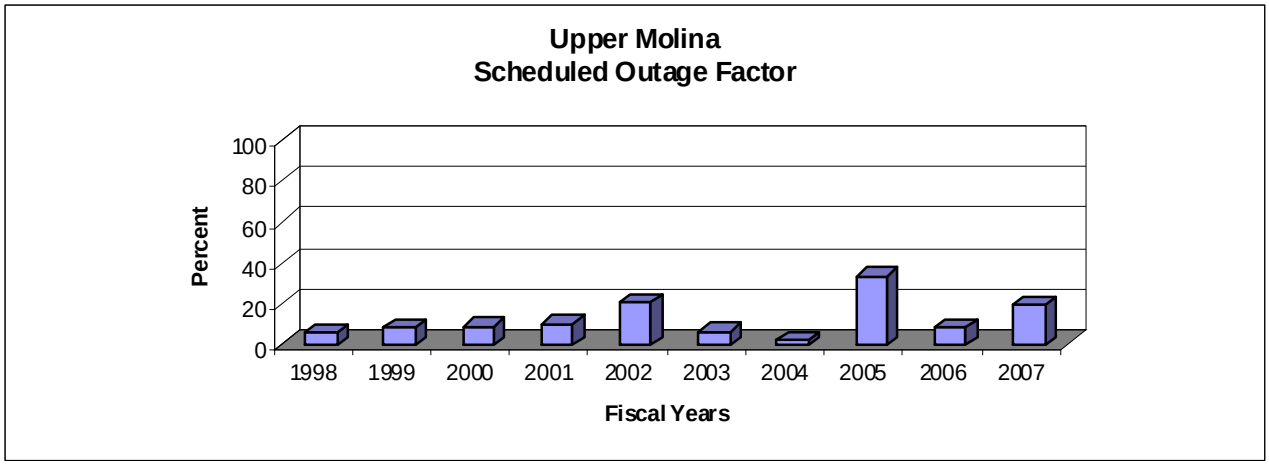
Benchmark 5
Availability Factor



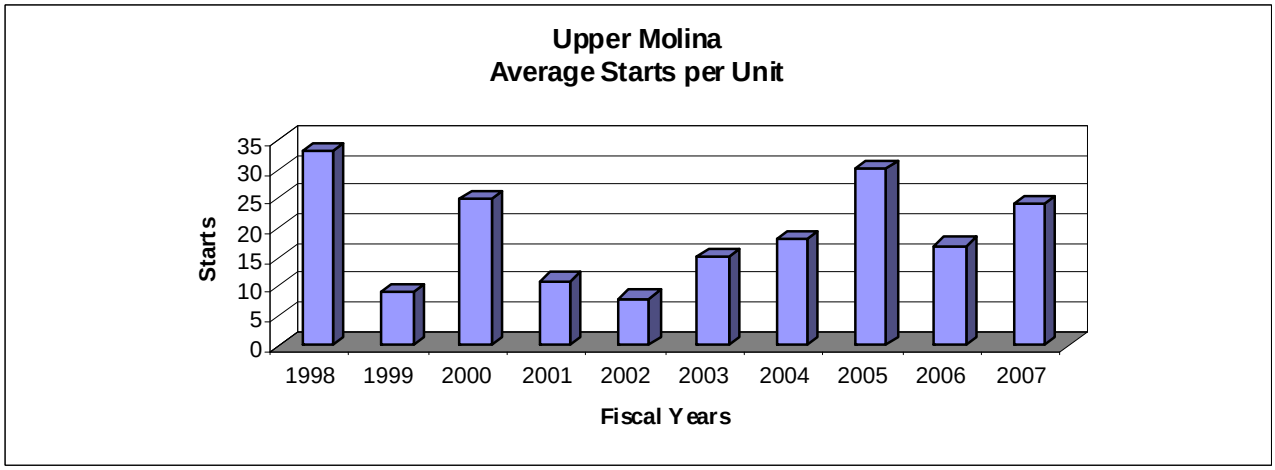
Benchmark 6
Forced Outage Factor



Benchmark 7
Scheduled Outage Factor



Starts



Benchmark Data Comparison

Fiscal Year 2007	Upper Molina Powerplant	Reclamation Average 0-10 MW Group	Total Reclamation Average	Industry Average	Best Performers
Wholesale Firm Rate Mills/kWh	20.7	Not Applicable	*22.45	Not Available	Not Available
Production Cost as Percentage of Wholesale Firm Rate	0.3%	Not Applicable	12.1%	Not Applicable	Not Applicable
O&M Cost $/MWh	9.83	14.71	2.76	***25.9	1.00
O&M Costs $/MW	31,804	60,518	7,847	***75,984	2,897
O&M Equiv Work Year per MW	0.22	0.39	0.03	Not Available	0.00
Availability Factor	78.5	88.52	82.3	**88.64	98.54
Forced Outage Factor	1.8	0.11	2.6	**2.61	0.00
Scheduled Outage Factor	19.6	11.36	15.1	**8.74	0.00

*Weighted by Net Generation
**2006 NERC Average
*** Energy Information Administration Data