Puget Sound Power & Light Company
Docket No. UE-920499
Response to Bench Request #5

Request

Provide the calculations of marginal costs in all rates
incorporating marginal costs.

Response by Mr. Hoff

The company used estimates of marginal cost to develop the
tail blocks of the residential rate (schedule 7) and the voluntary
large power rates (schedules 30 and 48). In addition, marginal
costs were used to estimate the benefits from having a customer on
an interruptible rate for large power (schedules 36, 38, and 39)
and for interruptible water heat (schedule 6).

Attachment I shows the derivation of the schedule 30 and 48 rates.
Table 1 shows the avoided cost allocated to energy and demand
using the 83/17 peak credit. This is the basis of the marginal
cost calculations. Table 2 levelizes the avoided cost using a ten
year horizon. The marginal production costs are adjusted for
each schedule using the loss factors shown in Table 3. The losses
adjusted marginal cost are used in the tail blocks shown in Table
4. The first block rates are set so that the weighted average
rate of the two blocks equals the flat rate in the associated
schedule (31/49).

Attachment II shows the derivation of the marginal cost tail block
for schedule 7. The marginal production costs, from Puget Power's
avoided cost, are shown in Table 7. These marginal costs are
applied to the water heat load shape and the loss adjustment
factors shown in Table 6. The result is the table of summer and
winter combined energy and demand costs shown in the last two
columns in Table 8. These numbers are levelized using a twelve
year time horizon, the typical life of a water heater.

Attachment III shows the derivation of the value of large power
interruptions based upon a one and five year estimate of marginal
costs. The one year marginal cost is based upon the San Diego
peak capacity contract and the calculations are shown in lines 1 -
8. The thirty year marginal cost is based upon the assumptions
used to value capacity in the peak credit method. These costs are
shown in lines 9 - 10. The five year marginal cost of capacity is
assumed to be 1/4 of the way between the one and thirty year
capacity values. This calculation is shown in lines 11-13. The
remainder of the worksheet shows the application of these marginal
costs to the large power interruptible rate design.

The derivation of the value of the water heater interruptions is
shown in DWH-8, Exhibit 15.

UE92-0499 Rec

Discount Rate: 10.22%
Base Year: 1991

Table 1. Avoided Costs

Year		Winter mills/kWh	Summer mills/kWh	Capacity $/kw-mon	Total $/mWh
1	1992	28.67	23.84	3.98	32.10
2	1993	23.36	21.14	0.00	22.44
3	1994	25.09	23.01	0.00	24.22
4	1995	26.51	23.84	0.00	25.40
5	1996	46.96	39.04	6.53	52.58
6	1997	49.90	41.48	6.93	55.87
7	1998	53.11	44.15	7.38	59.46
8	1999	56.61	47.06	7.87	63.38
9	2000	60.44	50.25	8.40	67.67
10	2001	62.71	52.13	8.71	70.21
11	2002	65.19	54.20	9.06	72.99
12	2003	67.74	56.32	9.41	75.85
13	2004	70.42	58.55	9.79	78.85
14	2005	73.24	60.89	10.18	82.00
15	2006	76.18	63.34	10.59	85.30
16	2007	79.34	65.96	11.02	88.83
17	2008	82.72	68.77	11.49	92.62
18	2009	86.28	71.73	11.99	96.60
19	2010	90.01	74.83	12.51	100.78
20	2011	93.93	78.09	13.05	105.17

Based Upon September, 1991 RFP For Resources. Modified for 17% Peak Credit

UE92-0499

Table 2. Levelized Avoided Costs

Time Frame		Winter $/kWh	Summer $/kWh	Capacity $/kW-mon	Total $/mWh
	10	0.03583	0.03042	3.82	38.80

Table 3. Loss Factors (Used to adjust marginal energy and demand costs.)

Schedule	Energy	Demand
31	5%	7%
49	3%	4%

Table 4. Marginal Rate Calculations for Schedules 30 & 48

Rate	Block Factor	Block (1)	Block 2 - Winter $ / kWh	Block 2 - Summer $ / kWh	Block 1 $ /kW	Block 2 $ /kW
49		none	0.02517	0.02288	2.79	2.79
48	75%	0.02056	0.03690	0.03133	2.40	3.97
31 (a)		none	0.02827	0.02570	4.51	4.51
30 (b)	75%	0.02439	0.03762	0.03194	4.29	5.16
30	75%	0.02439	0.03762	0.03194	4.65	4.09

(a) Demand rate is class weighted average summer / winter demand

(b) Demand tail block set at $1 above marginal cost in order to have an inverted demand rate

    $1 adder based upon marginal distribution cost of $12.04 /kW-year from marginal cost distribution model

Rate Design Case UE-920499 - Bench Request #5
Calculation Of Levelized Cost For Residential Marginal Cost Rate

Table 5. Water Heat Load Shape

	Water Heat	
	kWh	kW
Jan	452	1.259
Feb	403	1.32
March	418	1.247
April	383	1.242
May	377	1.177
June	347	0.977
July	325	0.73
August	314	0.739
September	331	1.091
October	365	1.141
November	391	1.151
December	436	1.274
Seasonal Totals		
Summer	2077	1.242
Winter	2465	1.32

Energy Losses	8.00%
Demand Losses	12.00%
Discount Rate	10.22%

Table 7. Firm Power Avoided Cost - Peak Credit 17%

	Year	Winter $/mWh	Summer $/mWh	Capacity $/kW-mon	Total $/mWh
1	1992	28.67	23.84	3.98	32.10
2	1993	23.36	21.14	0.00	22.44
3	1994	25.09	23.01	0.00	24.22
4	1995	26.51	23.84	0.00	25.40
5	1996	46.96	39.04	6.53	52.58
6	1997	49.90	41.48	6.93	55.87
7	1998	53.11	44.15	7.38	59.46
8	1999	56.61	47.06	7.37	63.38
9	2000	60.44	50.25	8.40	67.67
10	2001	62.71	52.13	8.71	70.21
11	2002	65.19	54.20	9.06	72.99
12	2003	67.74	56.32	9.41	75.85
13	2004	70.42	58.55	9.79	78.85
14	2005	73.24	60.89	10.18	82.00
15	2006	76.18	63.34	10.59	85.30
16	2007	79.34	65.96	11.02	88.83
17	2008	82.72	68.77	11.49	92.62
18	2009	86.28	71.73	11.99	96.60
19	2010	90.01	74.83	12.51	100.78
20	2011	93.93	78.09	13.05	105.17

Rate Design Case UE-920499 - Bench Request #5
Calculation Of Levelized Cost For Residential Marginal Cost Rate

Table 8. Water Heat Customer Marginal Costs

Year	Winter Energy $	Summer Energy $	Annual Capacity $	Total	$/ kWh	Winter Capacity $	Summer Capacity $	Winter Total	Summer Total	Winter $ /kWh	Summer $/kWh
1992	$76.33	$53.48	$70.61	$200.41	0.044124	$37.39	$33.22	$113.72	$86.69	0.046132	0.041740
1993	$62.19	$47.42	$0.00	$109.61	0.024132	$0.00	$0.00	$62.19	$47.42	0.025229	0.022831
1994	$66.79	$51.62	$0.00	$118.41	0.026070	$0.00	$0.00	$66.79	$51.62	0.027097	0.024851
1995	$70.57	$53.48	$0.00	$124.05	0.027312	$0.00	$0.00	$70.57	$53.48	0.028631	0.025747
1996	$125.02	$87.57	$115.85	$328.44	0.072311	$61.35	$54.50	$186.36	$142.07	0.075604	0.068403
1997	$132.84	$93.05	$122.94	$348.83	0.076802	$65.10	$57.84	$197.95	$150.89	0.080303	0.072646
1998	$141.39	$99.04	$130.93	$371.35	0.081760	$69.33	$61.60	$210.72	$160.63	0.085485	0.077338
1999	$150.71	$105.56	$139.62	$395.89	0.087162	$73.94	$65.68	$224.64	$171.25	0.091133	0.082450
2000	$160.90	$112.72	$149.02	$422.64	0.093053	$78.91	$70.11	$239.82	$182.83	0.097289	0.088025
2001	$166.95	$116.94	$154.52	$438.40	0.096522	$81.83	$72.70	$248.77	$189.63	0.100922	0.091301
2002	$173.55	$121.58	$160.73	$455.86	0.100365	$85.11	$75.62	$258.66	$197.20	0.104934	0.094943
2003	$180.34	$126.33	$166.94	$473.61	0.104274	$88.40	$78.54	$268.74	$204.87	0.109022	0.098639
2004	$187.47	$131.34	$173.68	$492.49	0.108431	$91.97	$81.71	$279.44	$213.05	0.113365	0.102574
2005	$194.98	$136.59	$180.60	$512.17	0.112762	$95.64	$84.96	$290.62	$221.55	0.117897	0.106669
2006	$202.81	$142.08	$187.88	$532.76	0.117297	$99.49	$88.39	$302.29	$230.47	0.122635	0.110962
2007	$211.22	$147.96	$195.50	$554.68	0.122123	$103.53	$91.98	$314.75	$239.93	0.127686	0.115520
2008	$220.22	$154.26	$203.84	$578.32	0.127327	$107.94	$95.90	$328.16	$250.16	0.133128	0.120443
2009	$229.69	$160.90	$212.71	$603.31	0.132829	$112.64	$100.07	$342.34	$260.97	0.138878	0.125649
2010	$239.62	$167.86	$221.94	$629.42	0.138577	$117.53	$104.41	$357.15	$272.27	0.144889	0.131087
2011	$250.06	$175.17	$231.52	$656.75	0.144594	$122.60	$108.92	$372.66	$284.09	0.151180	0.136777

Levelized Cost
12 Years   0.055   0.057496   0.052038

Large Power Interruptible Rates
San Diego Contract Model

Line	Item	Calculation	Cost
1	Escalation Rate 1991 - 1993		5.60%
2	Contract Cost / kW-Month		2.00
3	Number of Months (Nov - Feb)		4.00
4	Annual Capacity Cost	(L1*L2*L3)	8.45
5	Energy Cost (mills/kWh)		36
6	Wheeling Cost (mills/kWh)		4
7	Total Energy Cost (mills/kWh)	(L5+L6)*L1	42
8	Annual Cost - 200 hours		16.90

Peak Allocation of Combustion Turbine (30 Years)

Line	Item	Calculation	Cost
9	1/2 Fixed CT Cost ($/kW Year) - Peak Credit Number 1991$		53.06
10	1/2 Cost CT in 1993 $	(1 + L1)*L8	56.03

5 Year Contract Value

Line	Item	Calculation	Cost
11	5 Year Value Adjustment - 1/4 Between 1 and 30 Contract ($/yr)	(0.75*L8)+0.25*L10	27
12	Capacity Payment ($/kw-Yr)	(0.55 * L11)	14.67
13	Energy Payment (mills / kWh)	(L11 - L12)/5	60

Additional Monthly Charge Calculations

Line	Item	Calculation	Cost
14	Printer / Modem Capital Cost		1200.00
15	Printer Life		5
16	Fixed Charge Rate		34.42%
17	Annual Printer Cost	(L14*L16)	412.99
18	Printer/Modem/Customer Maintenance		340.00
19	Sched 24 / 31 Meter Upgrade		200.00
20	Meter Life		30
21	Fixed Charge Rate		19.99%
22	Meter Annual Cost	(L19*L21)	39.99

Additional Monthly Charges If An Interruption

Line	Item	Calculation	Cost
23	Meter Reading - Schedule 49		$0.00
24	Meter Reading - Schedule 24 & 31		$11
25	Data Processing - Schedule 49		$0.00
26	Data Processing - Schedule 24 & 31		$11

Additional Charges Per Interruption

Line	Item	Calculation	Cost
27	Notification Call		$1.50

Large Power Interruptible Rates
Lost Revenues

Line	Item	Calculation	Cost
28	Winter Schedule 26 ($/kWh)		0.032990
29	Winter Schedule 31 ($/kWh)		0.028190
30	Winter Schedule 49 ($/kWh)		0.025180

Value of Interruptible Load

Line	Interruptle Demand Type	Calculation	$/kW -Year	$/kWh
31	Short Term Firm, 1 Year Contract	L4 & L7	$8.45	0.0422
32	Long Term Firm, 5 Year Contract	L12 & L13	$14.67	0.0600
33	Non-Firm - 50% of 1 Year Contract		$0.00	0.0422
34	Short Term Firm, 1 Year Contract - Restated		9	0.0410
35	Long Term Firm, 5 Year Contract - Restated		15	0.0600
36	Non-Firm - 50% of 1 Year Contract - Restated			0.0410

Credits By Schedule

Line	Interruptle Demand Type	Calculation	$/kW -Year	$/kWh
37	Schedule 36 - Short Term Firm, 1 Year Contract	L34 & L34 - L28	9	0.0080
38	Schedule 36 - Long Term Firm, 5 Year Contract	L35 & L35 - L28	15	0.0270
39	Schedule 36 - Non-Firm - 50% of 1 Year Contract	L36 - L28	0	0.0080
40	Schedule 38 - Short Term Firm, 1 Year Contract	L34 & L34 - L29	9	0.0128
41	Schedule 38 - Long Term Firm, 5 Year Contract	L35 & L35 - L29	15	0.0318
42	Schedule 38 - Non-Firm - 50% of 1 Year Contract	L36 - L29	0	0.0128
43	Schedule 39 - Short Term Firm, 1 Year Contract	L34 & L34 - L30	9	0.0158
44	Schedule 39 - Long Term Firm, 5 Year Contract	L35 & L35 - L30	15	0.0348
45	Schedule 39 - Non-Firm - 50% of 1 Year Contract	L36 - L30	0	0.0158