

Attachment 12
California ISO
LEAPS Modeling Results

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From: "Miller, Jeff (ISO)" <JMiller@caiso.com>
To: "David Kates (E-mail)" <dkates@sonic.net>
CC: "Awad, Mohamed" <MAwad@caiso.com>, "Perez, Armando" <APerez@caiso.com>
Date: Thu, January 8, 2004 5:12 pm
Subject: LEAPS with Phase Shifter Results Summary

David,

I received your phone mail message where you expressed difficulty interpreting the LEAPS study results that we produced. In this e-mail I will try to boil the results down into a bottom line conclusion. First, one qualification: Mohamed is in training the rest of the week so I have not had the benefit of passing this by him before sending it on to you (Mohamed - please be sure to correct any mistakes I may have made).

My conclusion from these results is that they indicate that the LEAPS project could provide annual production cost benefits of \$7M to \$11M in all cases except one where the benefits were negative. Most of this benefit comes from the transmission line. About \$2M of this benefit comes from the addition of the pumped storage plant. In addition, there would be other substantial benefits from LEAPS that were not captured in the study like reduced RMR costs, market power mitigation, and improved reliability. We need to quantify all of these. As you know, the ISO is particularly interested in the reliability benefits of the LEAPS Project. We will be initiating a study to assess the reliability of this project as well as the other alternatives (i.e., Imperial Valley-San Diego) in the very near future.

The one negative benefit case includes the addition of LEAPS prior to the upgrade of the Palo Verde-Devers series capacitors and the west of Devers transmission system. Because LEAPS increases the loading on these limiting facilities, it lowers the Arizona to California transfer capability and increases production cost. This should not be an issue in reality as these upgrades are expected to be in place well before your project.

In summary, the LEAPS project shows benefits. As we expected, the benefits from reduced production cost are not substantial enough to justify the project on their own. Additional benefits such as reliability enhancement, market power mitigation, and lower RMR costs may well justify this line. Personally, I find the results to be encouraging.

Jeff Miller

P.S. - Attached is a spreadsheet of the study results that shows how I calculated the numbers in this e-mail.

<<LEAPS with Phase Shifter Results Summary.xls>>

Sensitivity 6a: LEAPS with Pump Storage and Phase Shifter

	Case 1: Miguel Improvements	Case 2: ST Upgrades	Case 3: PVD2
	Cost in k\$	Cost in k\$	Cost in k\$
WECC	\$15,701,542.73	\$15,666,780.02	\$15,647,654.62
Inc. Benefits		\$34,762.71	\$19,125.41
Acc. Benefits		\$34,762.71	\$53,888.12

Sensitivity 7a: LEAPS without Pump Storage with Phase Shifter

	Case 1: Miguel Improvements	Case 2: ST Upgrades	Case 3: PVD2
	Cost in k\$	Cost in k\$	Cost in k\$
WECC	\$15,711,799.88	\$15,668,564.56	\$15,650,145.68
Inc. Benefits		\$43,235.32	\$18,418.88
Acc. Benefits		\$43,235.32	\$61,654.20

Original Case

	Case 1: Miguel Improvements	Case 2: ST Upgrades	Case 3: PVD2
	Cost in k\$	Cost in k\$	Cost in k\$
WECC	\$15,708,827.67	15,676,441.19	15,658,582.68
Inc. Benefits		\$32,386.48	\$17,858.51
Acc. Benefits		\$32,386.48	\$50,244.99

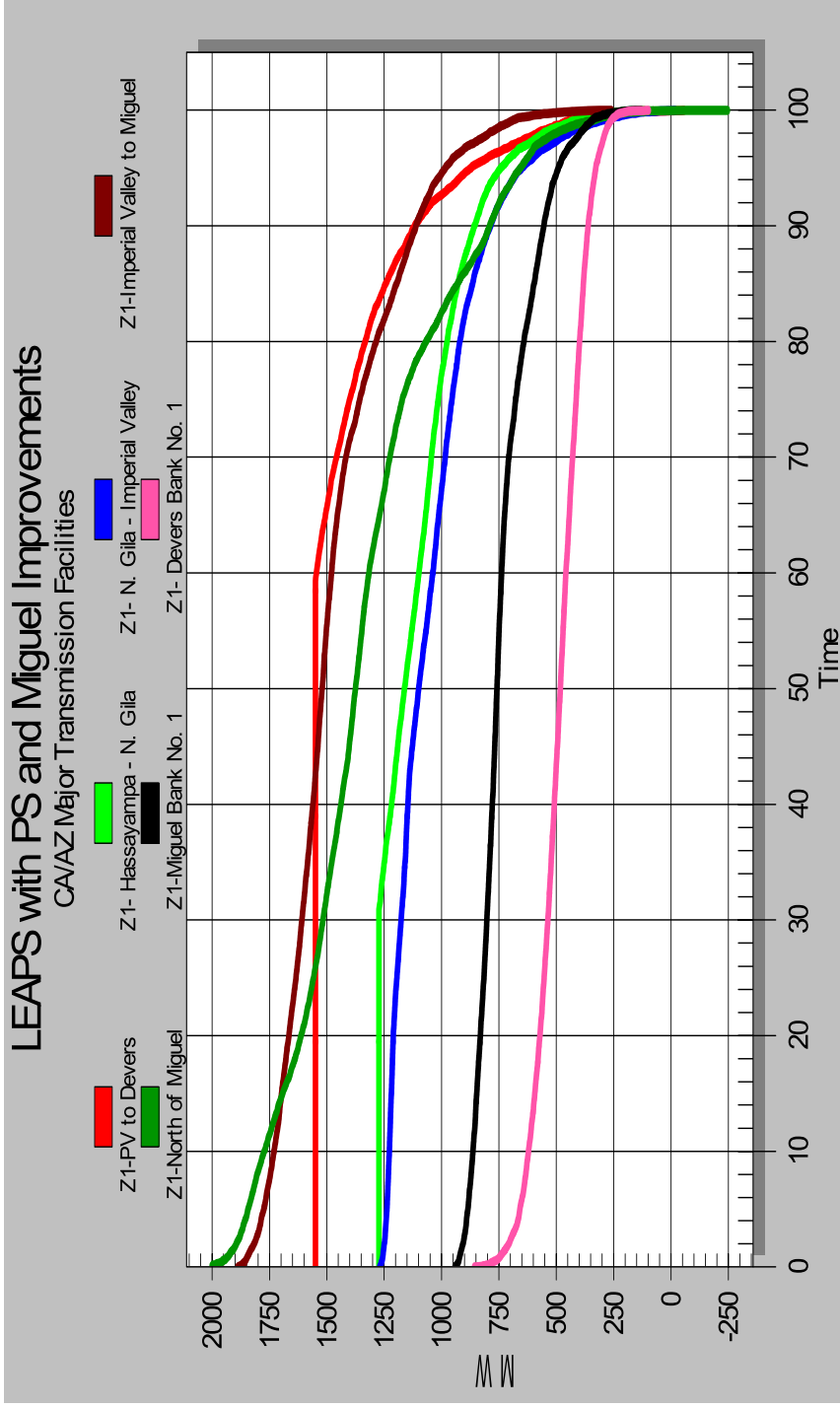
LEAPS with PS and with Phase Shifter With Miguel Improvements

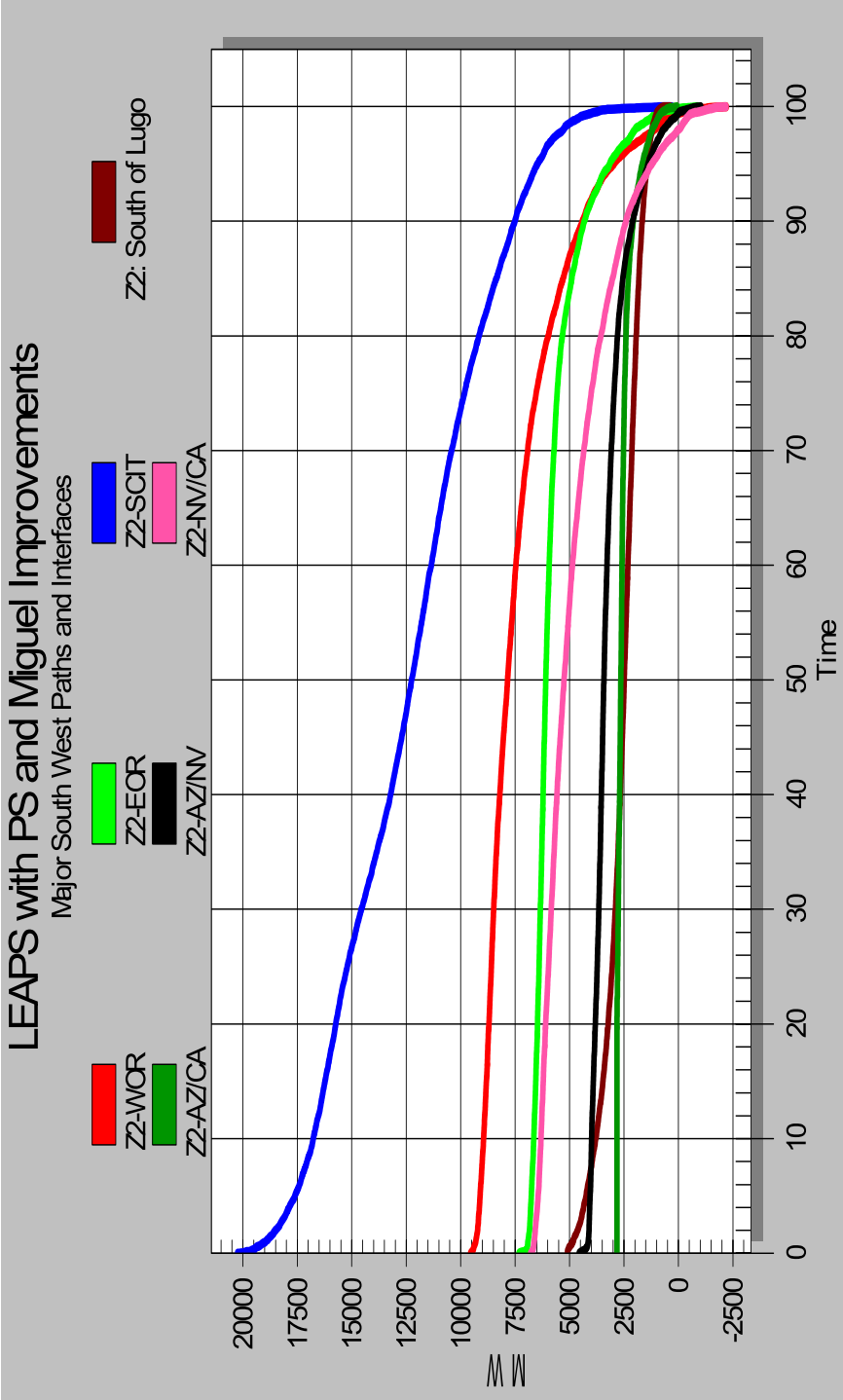
\$4 Fuel Price

AreaID	Name	DemandGWH	DemandK\$	DemandAvgPrice	GenGWH	Gen\$	GenAvgPrice
1	NEW MEXI	21,145.00	\$ 1,009,397.00	\$ 47.74	17,318.00	\$ 811,654.00	\$ 46.87
2	ARIZONA	86,822.00	\$ 4,222,156.00	\$ 48.63	137,050.00	\$ 6,263,841.00	\$ 45.70
3	NEVADA	26,679.00	\$ 1,302,609.00	\$ 48.83	29,020.00	\$ 1,388,612.00	\$ 47.85
4	WAPA L.C	2,225.00	\$ 104,900.00	\$ 47.15	19,017.00	\$ 895,450.00	\$ 47.09
5	MEXICO-C	15,465.00	\$ 764,397.00	\$ 49.43	13,531.00	\$ 668,690.00	\$ 49.42
6	IMPERIAL	3,868.00	\$ 190,920.00	\$ 49.36	3,506.00	\$ 172,192.00	\$ 49.11
7	SANDIEGO	20,406.00	\$ 1,016,991.00	\$ 49.84	7,358.00	\$ 383,973.00	\$ 52.18
8	SOCALIF	98,334.00	\$ 4,913,747.00	\$ 49.97	55,639.00	\$ 2,848,909.00	\$ 51.20
9	LADWP	29,397.00	\$ 1,457,328.00	\$ 49.57	21,028.00	\$ 1,033,936.00	\$ 49.17
10	PG AND E	127,991.00	\$ 6,475,955.00	\$ 50.60	100,499.00	\$ 5,180,552.00	\$ 51.55
11	NORTHWES	168,445.00	\$ 8,331,205.00	\$ 49.46	186,933.00	\$ 9,026,775.00	\$ 48.29
12	B.C.HYDR	62,319.00	\$ 3,267,857.00	\$ 52.44	47,374.00	\$ 2,479,571.00	\$ 52.34
13	AQUILA	3,974.00	\$ 208,323.00	\$ 52.42	4,674.00	\$ 239,250.00	\$ 51.19
14	ALBERTA	60,618.00	\$ 2,575,753.00	\$ 42.49	68,340.00	\$ 2,889,074.00	\$ 42.28
15	IDAHO	17,296.00	\$ 827,369.00	\$ 47.84	25,648.00	\$ 1,193,377.00	\$ 46.53
16	MONTANA	11,949.00	\$ 570,786.00	\$ 47.77	21,732.00	\$ 1,044,746.00	\$ 48.07
17	WAPA U.M	932.00	\$ 45,125.00	\$ 48.42	0.00	\$ 20.00	\$ -
18	SIERRA	11,769.00	\$ 573,224.00	\$ 48.71	6,598.00	\$ 326,437.00	\$ 49.48
19	PACE	36,336.00	\$ 1,728,947.00	\$ 47.58	40,300.00	\$ 1,887,686.00	\$ 46.84
20	PSCOLORA	40,312.00	\$ 1,931,856.00	\$ 47.92	28,750.00	\$ 1,371,138.00	\$ 47.69
21	WAPA R.M	22,461.00	\$ 1,047,824.00	\$ 46.65	34,431.00	\$ 1,605,389.00	\$ 46.63
	Total WECC	868,743.00	\$42,566,669.00	\$ 49.00	868,746.00	\$41,711,272.00	\$ 48.01
	ISO	246,731.00	\$12,406,693.00	\$ 50.28	163,496.00	\$8,413,434.00	\$ 51.46

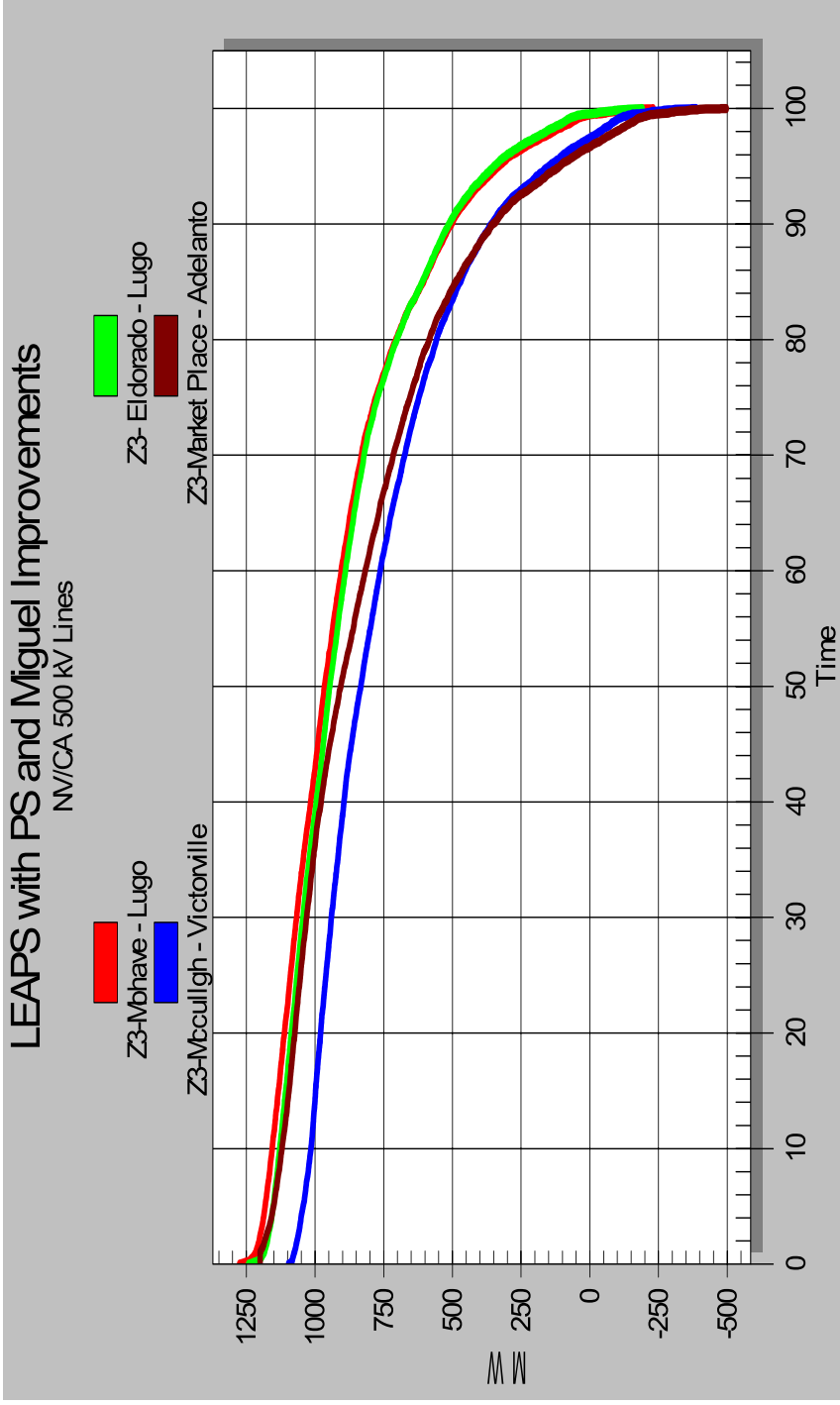
Area	ProductionCostKUSD	EnergyMWH
NEW MEXI	\$ 437,805.61	16,574,202.01
ARIZONA	\$ 3,106,483.29	135,117,835.19
NEVADA	\$ 1,053,010.41	29,018,705.59
WAPA L.C	\$ 501,771.48	12,821,417.75
MEXICO-C	\$ 354,592.31	13,531,147.28
IMPERIAL	\$ 33,938.10	3,308,712.22
SANDIEGO	\$ 334,820.01	7,567,703.60
SOCALIF	\$ 1,500,520.90	47,098,531.96
LADWP	\$ 625,420.21	21,039,759.96
PG AND E	\$ 2,305,177.71	77,696,485.15
NORTHWES	\$ 1,688,194.68	60,241,496.14
B.C.HYDR	\$ 319,208.81	7,355,348.25
AQUILA	\$ 49.00	326.80
ALBERTA	\$ 1,189,548.29	66,572,571.15
IDAHO	\$ 281,760.22	17,086,642.00
MONTANA	\$ 183,978.50	18,563,918.00
WAPA U.M	\$ 20.10	133.70
SIERRA	\$ 159,300.00	6,541,223.97
PACE	\$ 514,353.40	38,132,248.61
PSCOLORA	\$ 578,030.50	28,047,632.42
WAPA R.M	\$ 533,559.20	32,283,046.76
Total WECC	\$15,701,542.73	638,599,088.52
ISO	\$4,140,518.62	132,362,720.71

LEAPS with PS and with Phase Shifter With Miguel Improvements



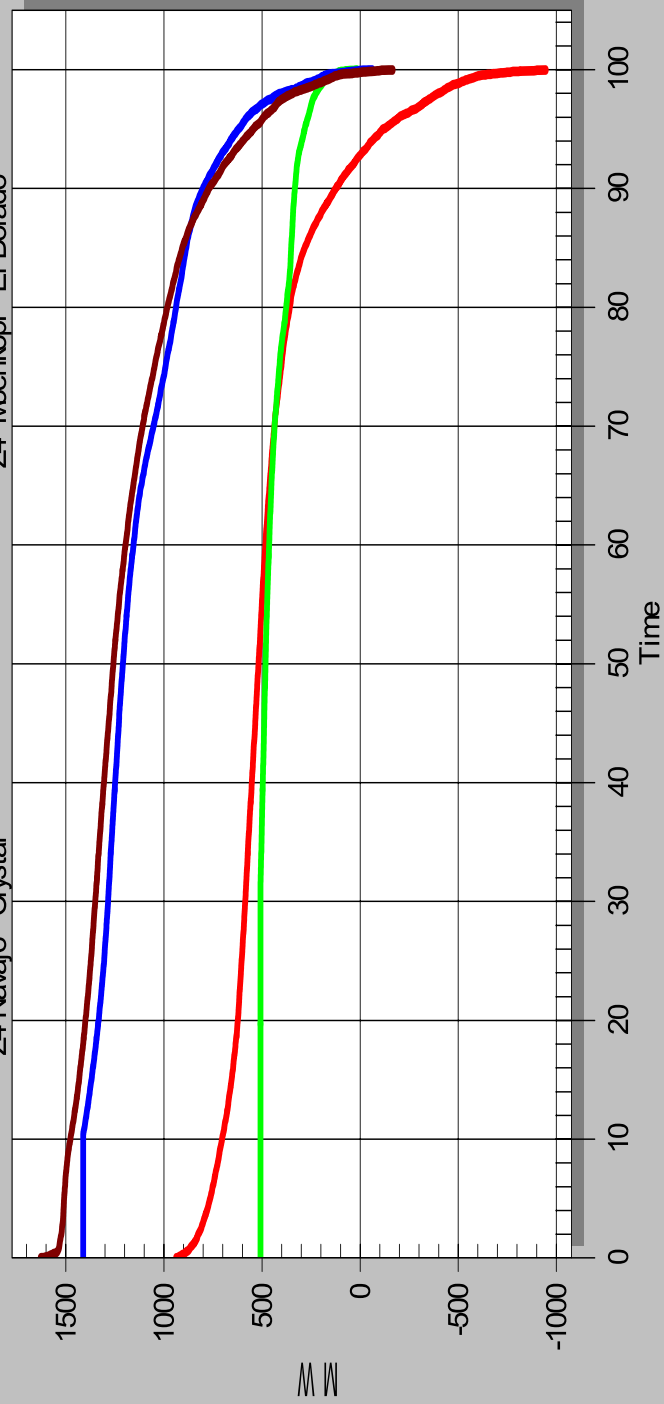


LEAPS with PS and with Phase Shifter With Miguel Improvements

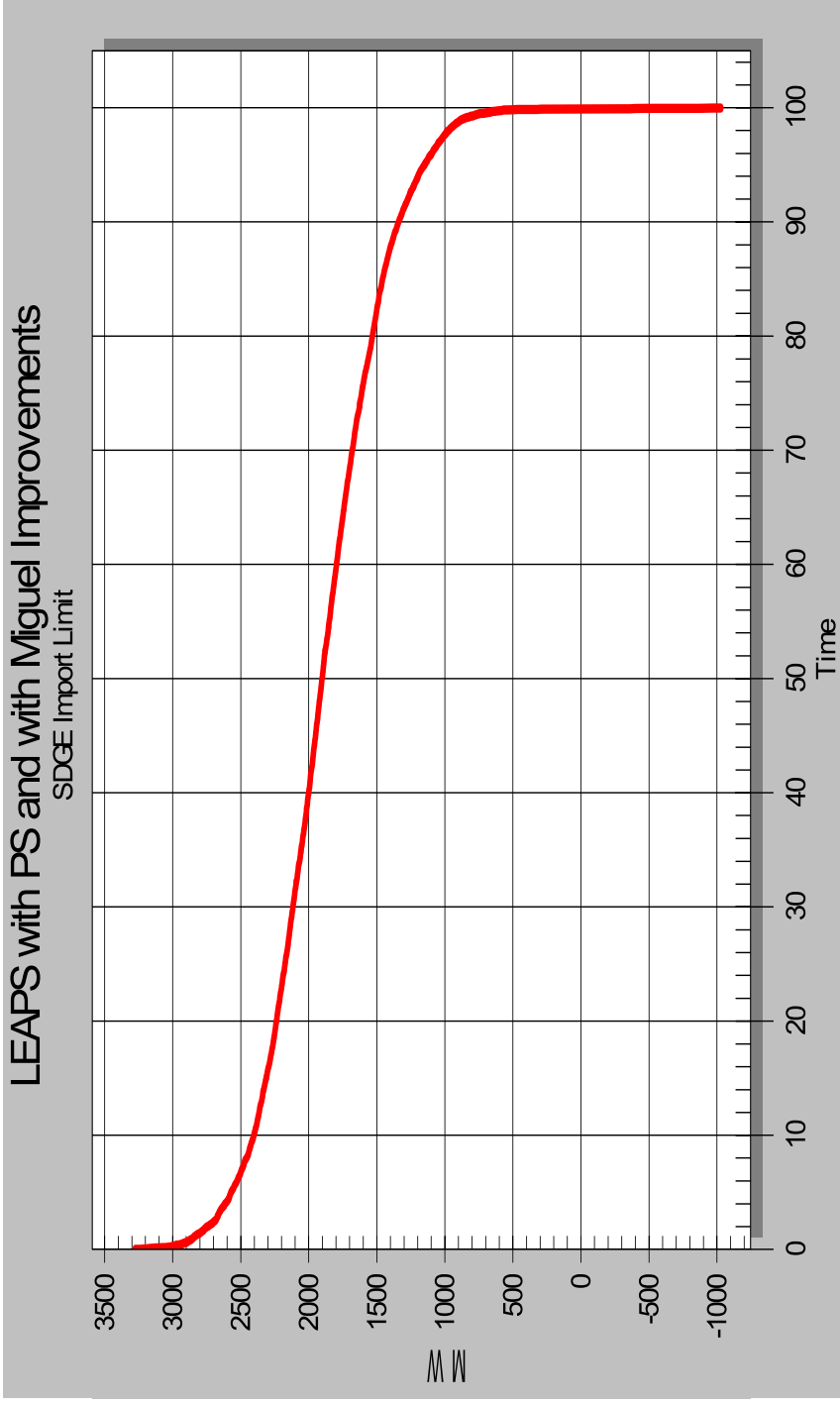


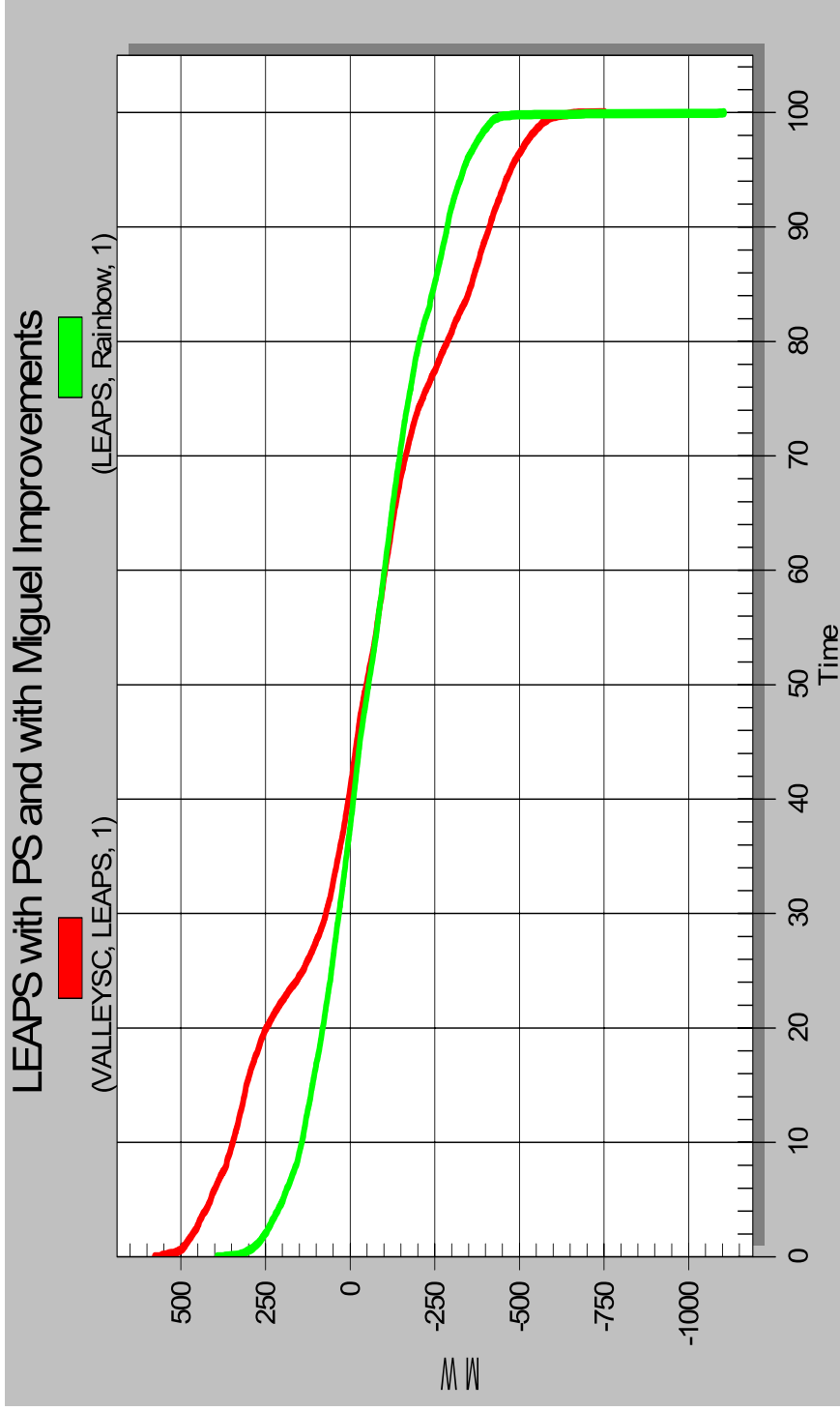
LEAPS with PS and Miguel Improvements

AZINV Lines



LEAPS with PS and with Phase Shifter With Miguel Improvements





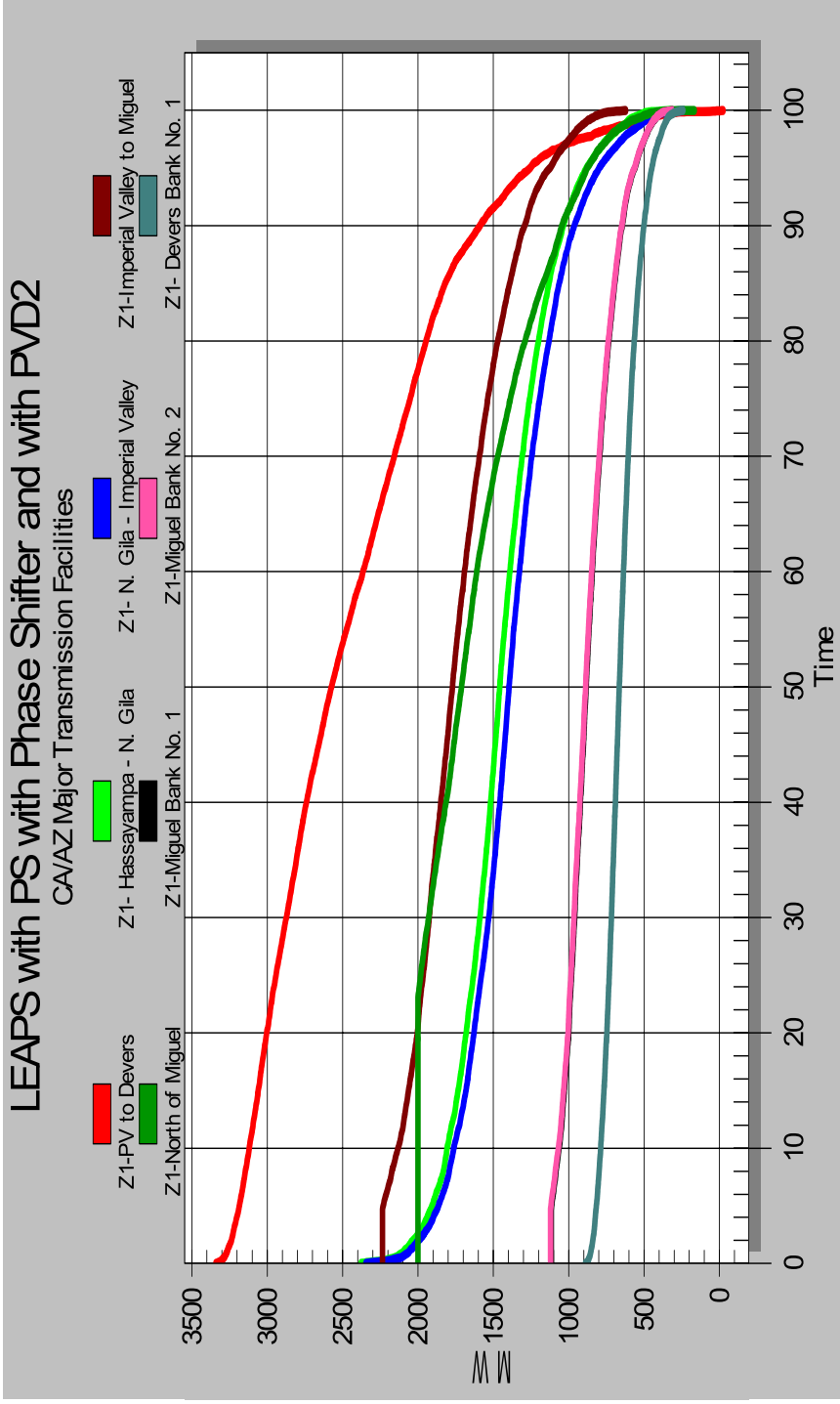
LEAPS with PS and Phase Shifter with PVD2

\$4 Fuel Price

AreaID	Name	DemandGWH	DemandK\$	DemandAvgPrice	GenGWH	Gen\$	GenAvgPrice
1	NEW MEXI	21,145.00	\$ 1,027,889.00	\$ 48.61	17,634.00	\$ 843,675.00	\$ 47.84
2	ARIZONA	86,822.00	\$ 4,295,751.00	\$ 49.48	149,335.00	\$ 7,036,980.00	\$ 47.12
3	NEVADA	26,679.00	\$ 1,288,918.00	\$ 48.31	25,956.00	\$ 1,249,741.00	\$ 48.15
4	WAPA L.C	2,225.00	\$ 107,852.00	\$ 48.47	19,439.00	\$ 924,109.00	\$ 47.54
5	MEXICO-C	15,465.00	\$ 754,505.00	\$ 48.79	13,193.00	\$ 647,492.00	\$ 49.08
6	IMPERIAL	3,868.00	\$ 186,461.00	\$ 48.21	3,490.00	\$ 164,944.00	\$ 47.26
7	SANDIEGO	20,406.00	\$ 1,002,450.00	\$ 49.13	6,992.00	\$ 366,484.00	\$ 52.41
8	SOCALIF	98,334.00	\$ 4,779,832.00	\$ 48.61	48,742.00	\$ 2,447,826.00	\$ 50.22
9	LADWP	29,397.00	\$ 1,438,509.00	\$ 48.93	21,685.00	\$ 1,064,746.00	\$ 49.10
10	PG AND E	127,991.00	\$ 6,411,584.00	\$ 50.09	97,606.00	\$ 4,992,111.00	\$ 51.15
11	NORTHWES	168,445.00	\$ 8,283,627.00	\$ 49.18	187,294.00	\$ 8,981,309.00	\$ 47.95
12	B.C.HYDR	62,319.00	\$ 3,251,980.00	\$ 52.18	47,126.00	\$ 2,456,342.00	\$ 52.12
13	AQUILA	3,974.00	\$ 207,252.00	\$ 52.15	4,676.00	\$ 238,373.00	\$ 50.98
14	ALBERTA	60,618.00	\$ 2,574,073.00	\$ 42.46	68,306.00	\$ 2,885,605.00	\$ 42.25
15	IDAHO	17,296.00	\$ 826,244.00	\$ 47.77	25,625.00	\$ 1,147,104.00	\$ 44.77
16	MONTANA	11,949.00	\$ 562,352.00	\$ 47.06	21,732.00	\$ 1,026,612.00	\$ 47.24
17	WAPA U.M	932.00	\$ 43,619.00	\$ 46.80	0.00	\$ -	\$ -
18	SIERRA	11,769.00	\$ 570,130.00	\$ 48.44	6,606.00	\$ 325,836.00	\$ 49.32
19	PACE	36,336.00	\$ 1,712,887.00	\$ 47.14	40,216.00	\$ 1,868,565.00	\$ 46.46
20	PSCOLORA	40,312.00	\$ 1,929,504.00	\$ 47.86	28,487.00	\$ 1,361,091.00	\$ 47.78
21	WAPA R.M	22,461.00	\$ 1,044,800.00	\$ 46.52	34,602.00	\$ 1,609,255.00	\$ 46.51
	Total WECC	868,743.00	\$42,300,219.00	\$ 48.69	868,742.00	\$41,638,200.00	\$ 47.93
	ISO	246,731.00	\$12,193,866.00	\$ 49.42	153,340.00	\$7,806,421.00	\$ 50.91

Area	ProductionCostKUSD	EnergyMWH
NEW MEXI	\$ 453,977.98	16,890,263.45
ARIZONA	\$ 3,602,907.84	147,402,940.87
NEVADA	\$ 933,083.31	25,956,162.18
WAPA L.C	\$ 518,441.59	13,243,130.50
MEXICO-C	\$ 341,799.42	13,193,180.69
IMPERIAL	\$ 33,191.20	3,292,023.41
SANDIEGO	\$ 321,063.70	7,199,876.35
SOCALIF	\$ 1,151,765.10	40,201,985.40
LADWP	\$ 662,690.48	21,698,486.08
PG AND E	\$ 2,183,435.40	74,805,790.97
NORTHWES	\$ 1,702,893.49	60,602,653.72
B.C.HYDR	\$ 307,116.40	7,108,107.76
AQUILA	\$ 285.60	1,904.30
ALBERTA	\$ 1,187,956.50	66,538,296.65
IDAHO	\$ 281,396.78	17,064,610.00
MONTANA	\$ 183,978.50	18,563,918.00
WAPA U.M	\$ -	0.00
SIERRA	\$ 159,769.50	6,549,407.80
PACE	\$ 509,528.20	38,048,785.21
PSCOLORA	\$ 570,323.21	27,786,366.98
WAPA R.M	\$ 542,050.40	32,454,052.38
Total WECC	\$15,647,654.62	638,601,942.69
ISO	\$3,656,264.20	122,207,652.72

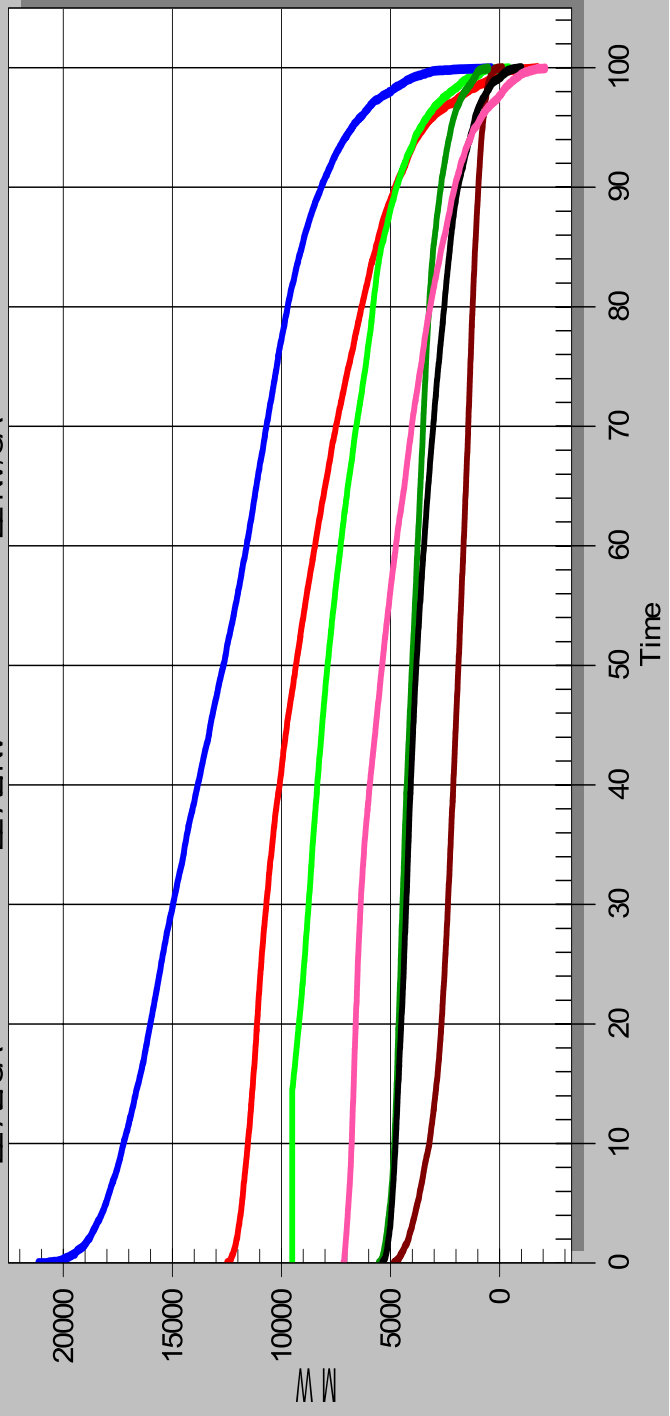
LEAPS with PS and Phase Shifter with PVD2



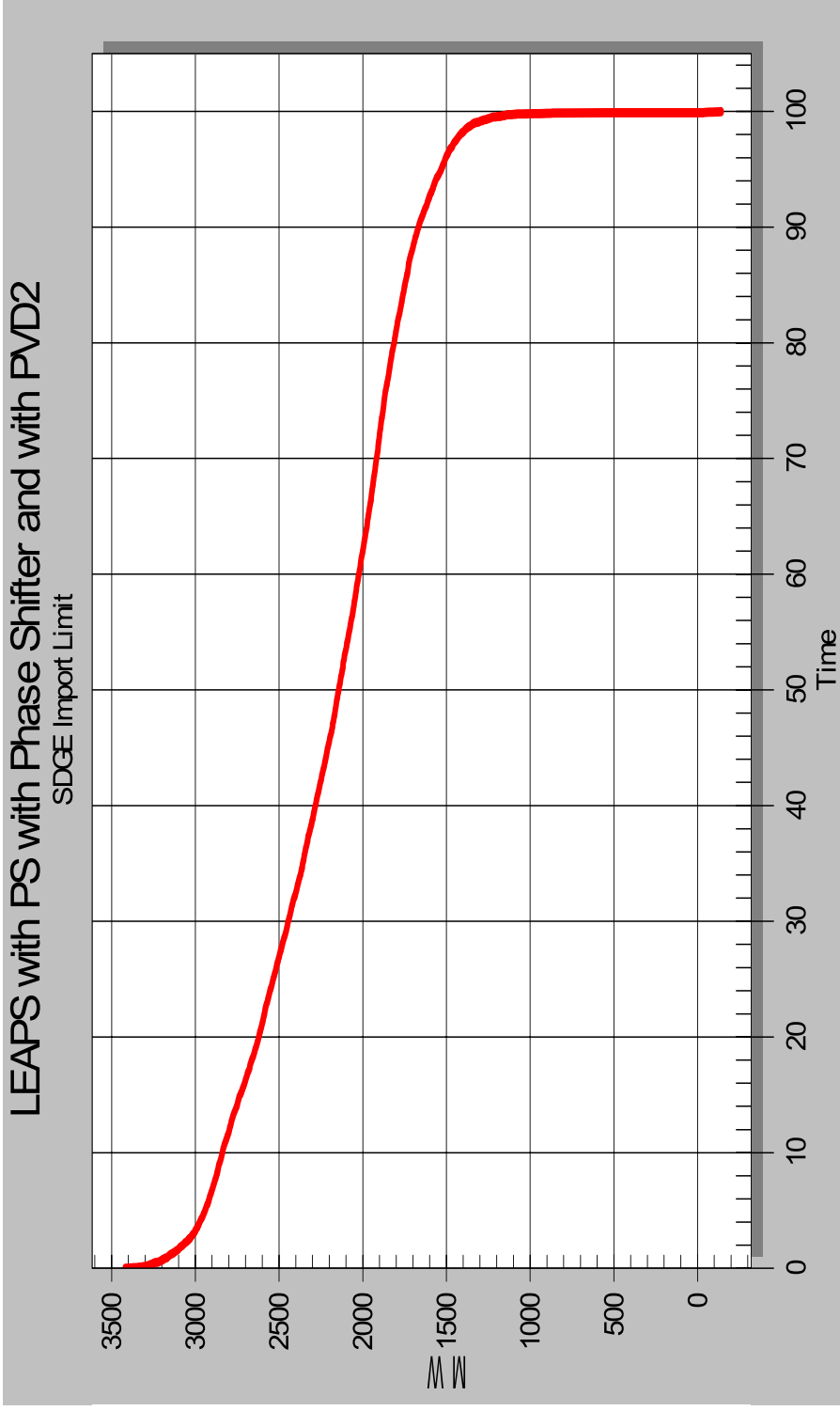
LEAPS with PS with Phase Shifter and with PVD2

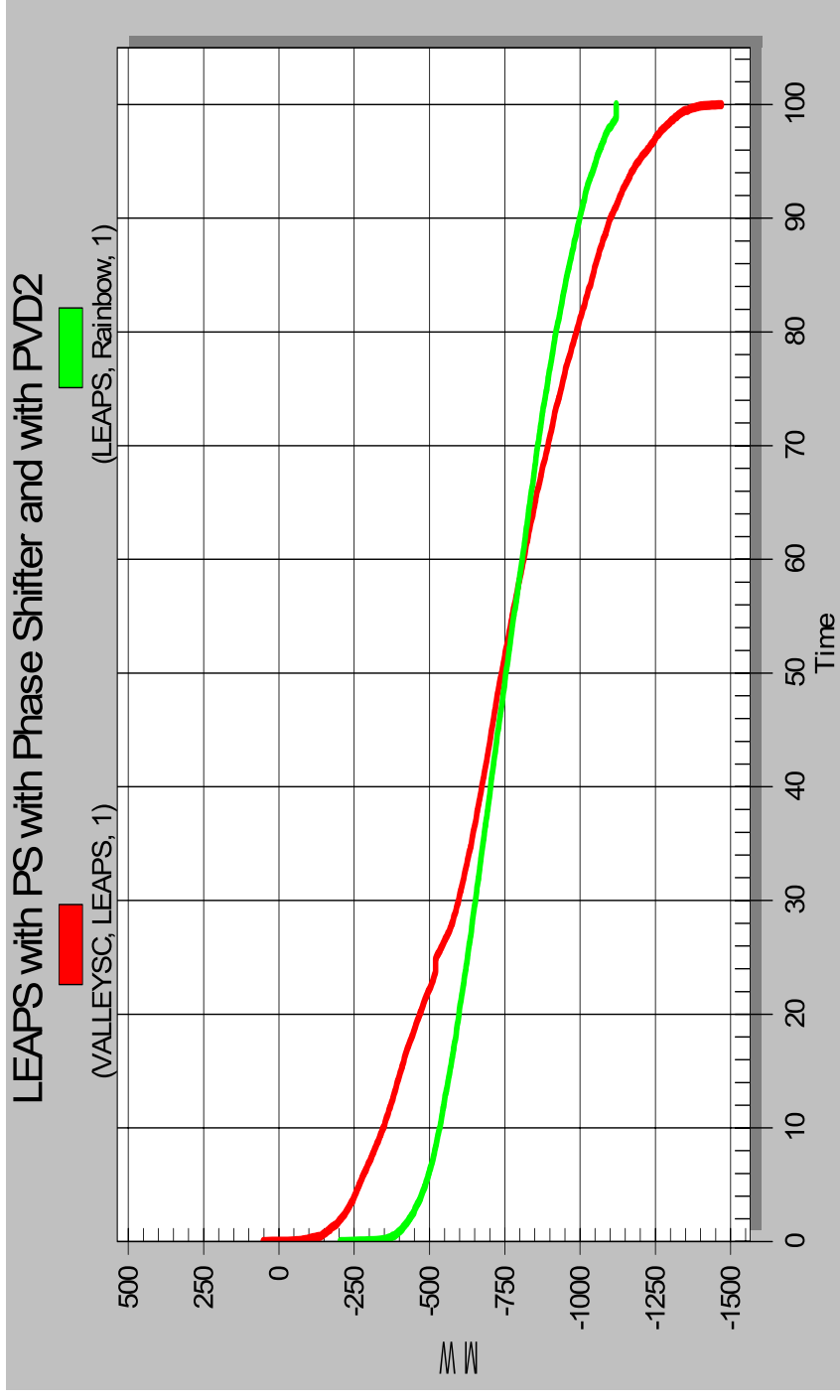
Major South West Paths and Interfaces

- Z2-WOR
- Z2-AZ/CA
- Z2-EOR
- Z2-SCIT
- Z2-AZ/INV
- Z2-INV/CA
- Z2: South of Lugo



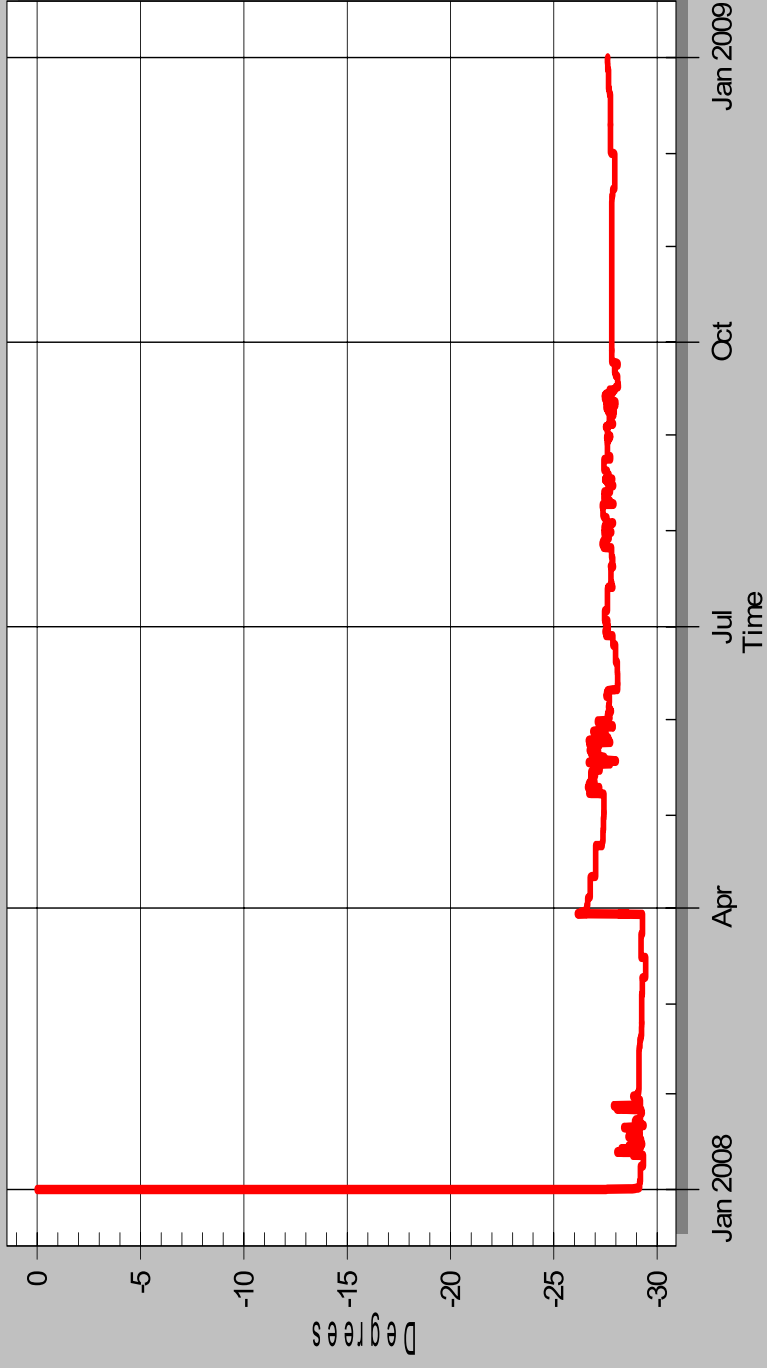
LEAPS with PS and Phase Shifter with PVD2





LEAPS with PS and Phase Shifter with PVD2

LEAPS with PS with Phase Shifter and with PVD2
(VALLEYS - LEAPS)



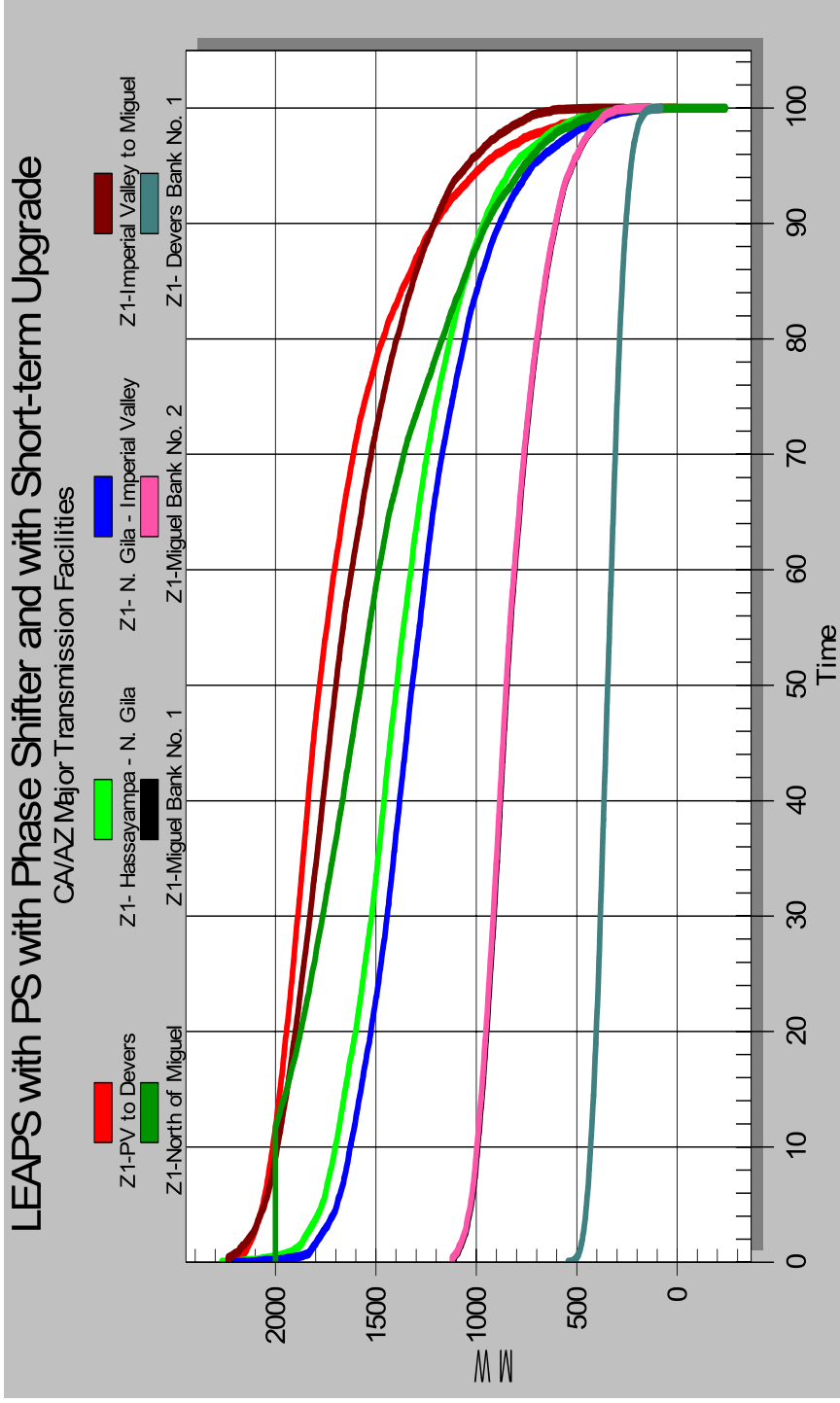
LEAPS with PS and Short Term Upgrade (without enforcing SDG&E SIL)

\$4 Fuel Price

AreaID	Name	DemandGWH	DemandK\$	DemandAvgPrice	GenGWH	Gen\$	GenAvgPrice
1	NEW MEXI	21,145.00	\$ 1,022,868.00	\$ 48.37	17,567.00	\$ 836,315.00	\$ 47.61
2	ARIZONA	86,822.00	\$ 4,272,819.00	\$ 49.21	143,897.00	\$ 6,723,762.00	\$ 46.73
3	NEVADA	26,679.00	\$ 1,289,611.00	\$ 48.34	27,263.00	\$ 1,302,298.00	\$ 47.77
4	WAPA L.C	2,225.00	\$ 107,123.00	\$ 48.15	18,989.00	\$ 895,743.00	\$ 47.17
5	MEXICO-C	15,465.00	\$ 751,230.00	\$ 48.58	13,267.00	\$ 645,220.00	\$ 48.63
6	IMPERIAL	3,868.00	\$ 178,734.00	\$ 46.21	3,244.00	\$ 143,451.00	\$ 44.22
7	SANDIEGO	20,406.00	\$ 1,003,068.00	\$ 49.16	6,469.00	\$ 331,993.00	\$ 51.32
8	SOCALIF	98,334.00	\$ 4,826,008.00	\$ 49.08	51,834.00	\$ 2,615,007.00	\$ 50.45
9	LADWP	29,397.00	\$ 1,448,290.00	\$ 49.27	21,543.00	\$ 1,060,229.00	\$ 49.21
10	PG AND E	127,991.00	\$ 6,445,808.00	\$ 50.36	99,445.00	\$ 5,106,788.00	\$ 51.35
11	NORTHWES	168,445.00	\$ 8,304,419.00	\$ 49.30	187,164.00	\$ 9,004,304.00	\$ 48.11
12	B.C.HYDR	62,319.00	\$ 3,259,900.00	\$ 52.31	47,223.00	\$ 2,466,501.00	\$ 52.23
13	AQUILA	3,974.00	\$ 207,797.00	\$ 52.29	4,675.00	\$ 238,709.00	\$ 51.06
14	ALBERTA	60,618.00	\$ 2,574,437.00	\$ 42.47	68,317.00	\$ 2,886,578.00	\$ 42.25
15	IDAHO	17,296.00	\$ 826,716.00	\$ 47.80	25,649.00	\$ 1,193,118.00	\$ 46.52
16	MONTANA	11,949.00	\$ 567,755.00	\$ 47.51	21,732.00	\$ 1,039,060.00	\$ 47.81
17	WAPA U.M	932.00	\$ 44,874.00	\$ 48.15	1.00	\$ 117.00	\$ 117.00
18	SIERRA	11,769.00	\$ 576,661.00	\$ 49.00	6,664.00	\$ 331,722.00	\$ 49.78
19	PACE	36,336.00	\$ 1,726,392.00	\$ 47.51	40,242.00	\$ 1,884,610.00	\$ 46.83
20	PSCOLORA	40,312.00	\$ 1,937,230.00	\$ 48.06	28,815.00	\$ 1,380,317.00	\$ 47.90
21	WAPA R.M	22,461.00	\$ 1,052,881.00	\$ 46.88	34,744.00	\$ 1,625,129.00	\$ 46.77
	Total WECC	868,743.00	\$42,424,621.00	\$ 48.83	868,744.00	\$41,710,971.00	\$ 48.01
	ISO	246,731.00	\$12,274,884.00	\$ 49.75	157,748.00	\$8,053,788.00	\$ 51.05

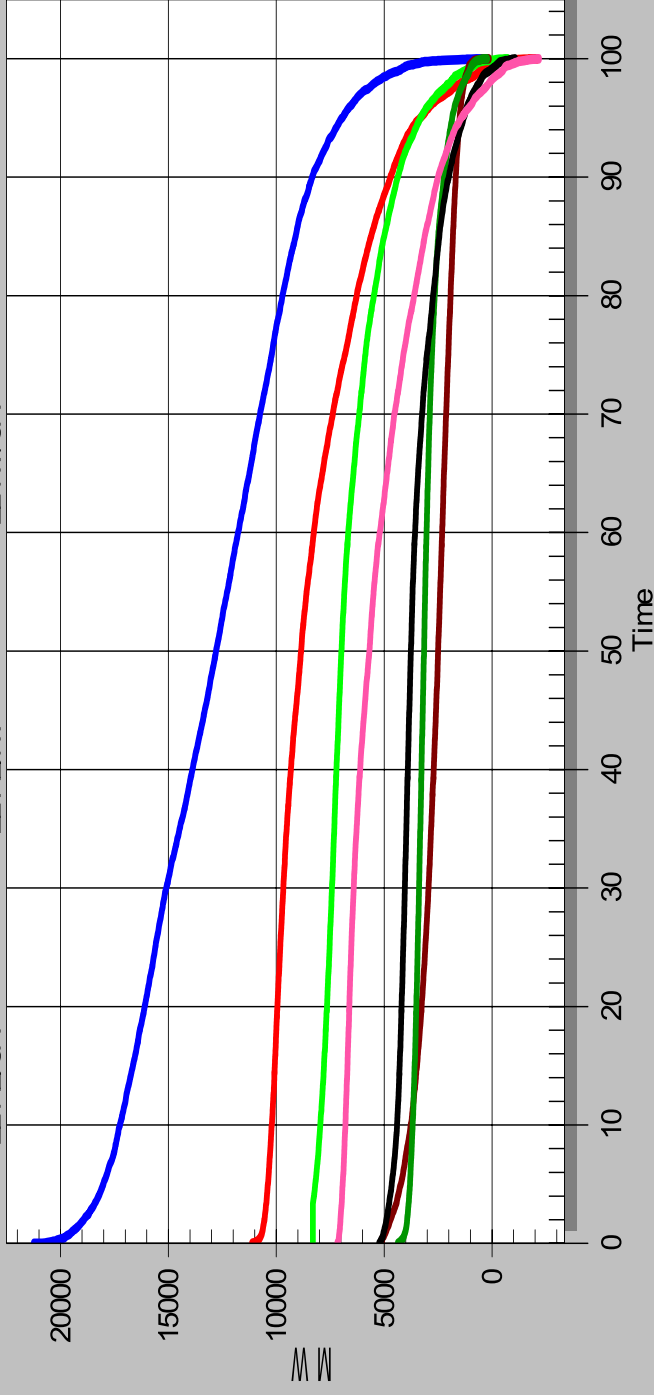
Area	ProductionCostKUSD	EnergyMWH
NEW MEXI	\$ 450,602.81	16,823,302.83
ARIZONA	\$ 3,385,136.44	141,964,601.67
NEVADA	\$ 984,102.90	27,263,258.59
WAPA L.C	\$ 501,095.61	12,793,357.50
MEXICO-C	\$ 343,843.80	13,266,985.88
IMPERIAL	\$ 23,226.00	3,046,198.20
SANDIEGO	\$ 289,676.92	6,678,314.47
SOCALIF	\$ 1,300,245.19	43,294,297.62
LADWP	\$ 654,696.31	21,556,469.05
PG AND E	\$ 2,264,664.07	76,644,292.54
NORTHWES	\$ 1,698,086.78	60,472,301.64
B.C.HYDR	\$ 311,981.80	7,204,365.43
AQUILA	\$ 97.90	653.00
ALBERTA	\$ 1,188,526.99	66,550,056.34
IDAHO	\$ 281,785.59	17,088,184.00
MONTANA	\$ 183,978.50	18,563,918.00
WAPA U.M	\$ 117.50	783.10
SIERRA	\$ 163,045.41	6,607,340.08
PACE	\$ 510,927.50	38,074,311.18
PSCOLORA	\$ 583,537.40	28,113,947.49
WAPA R.M	\$ 547,404.60	32,595,228.32
Total WECC	\$15,666,780.02	638,602,166.91
ISO	\$3,854,586.18	126,616,904.63

LEAPS with PS and Short Term Upgrade (without enforcing SDG&E SIL)

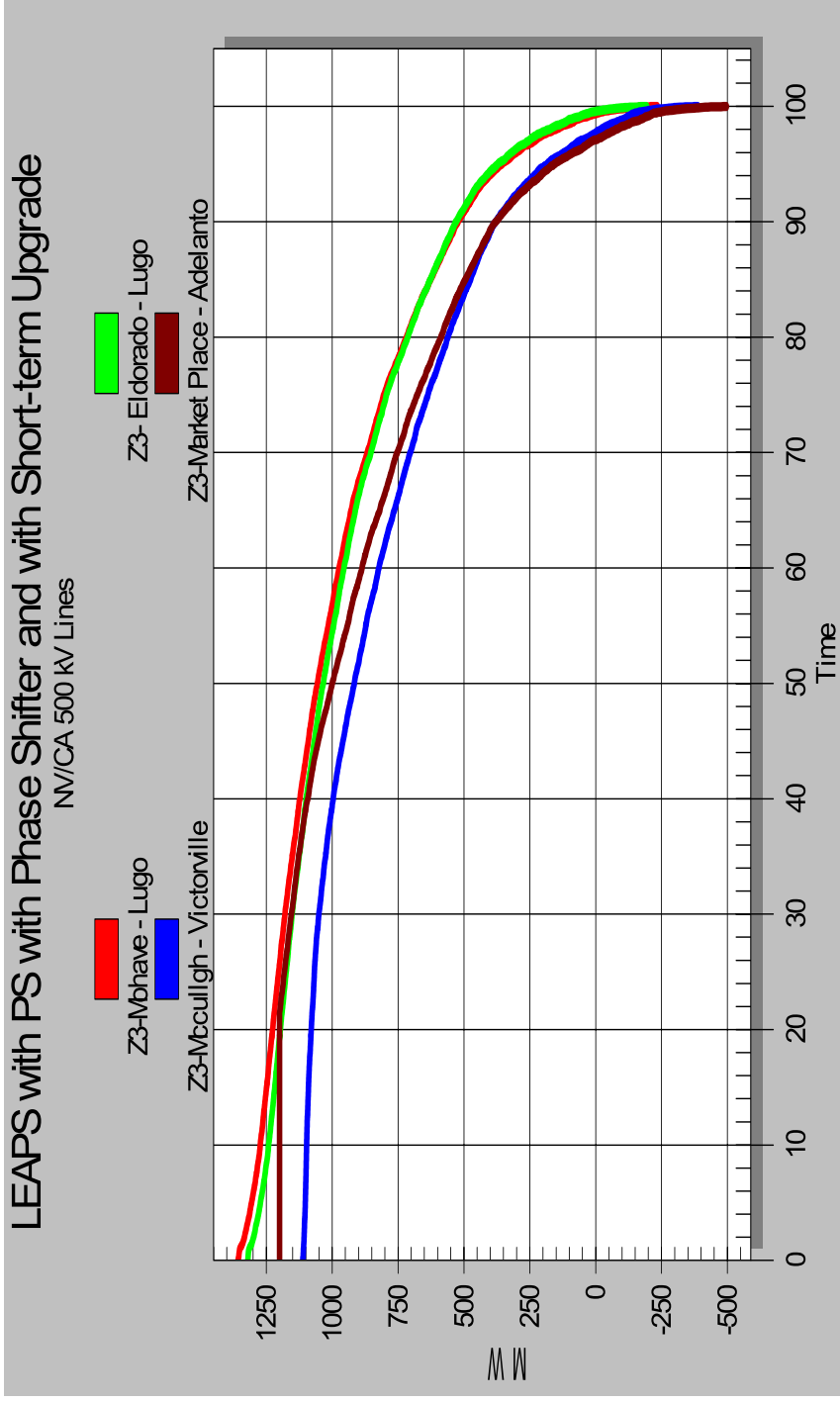


LEAPS with PS with Phase Shifter and with Short-term Upgrade

Major South West Paths and Interfaces

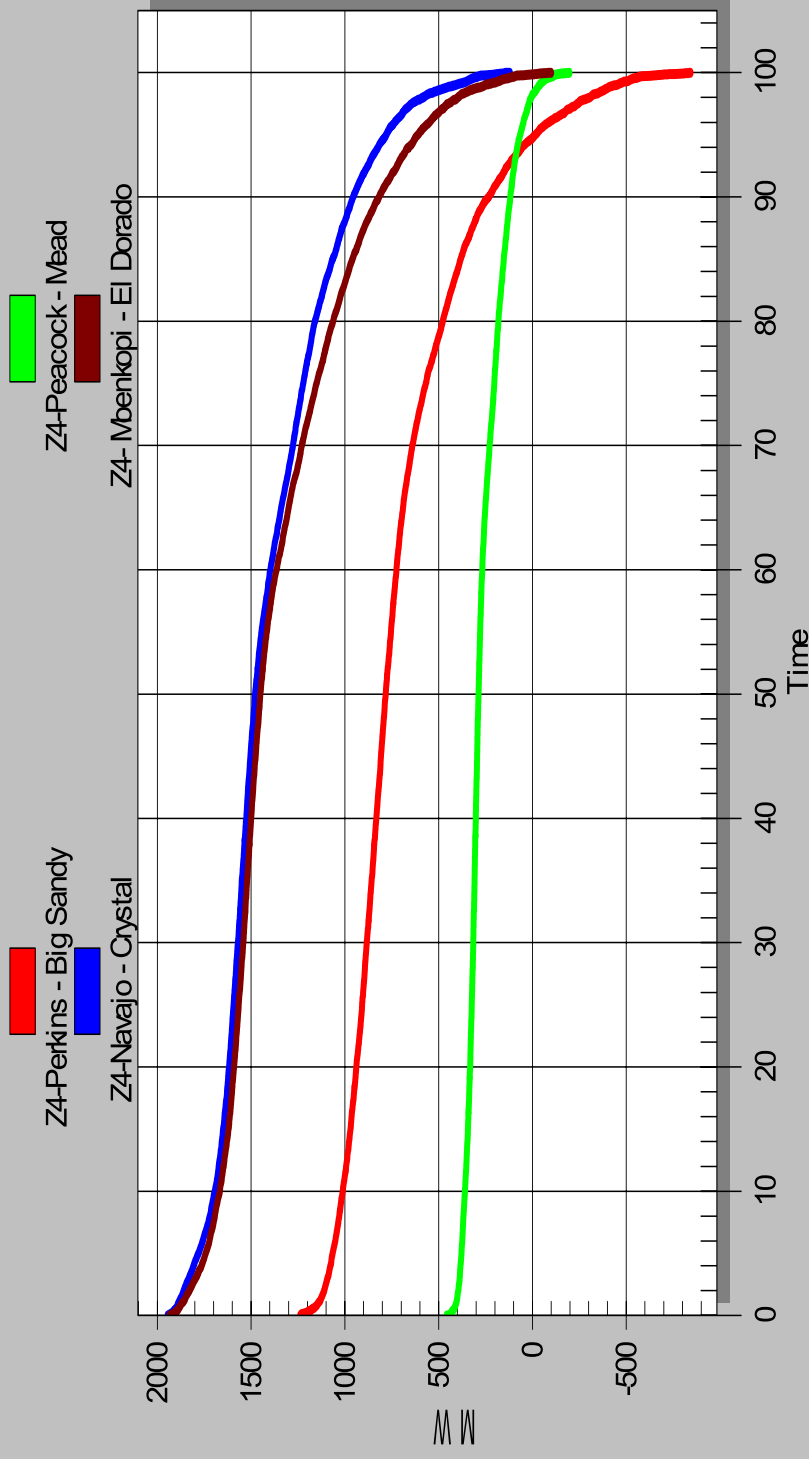


LEAPS with PS and Short Term Upgrade (without enforcing SDG&E SIL)

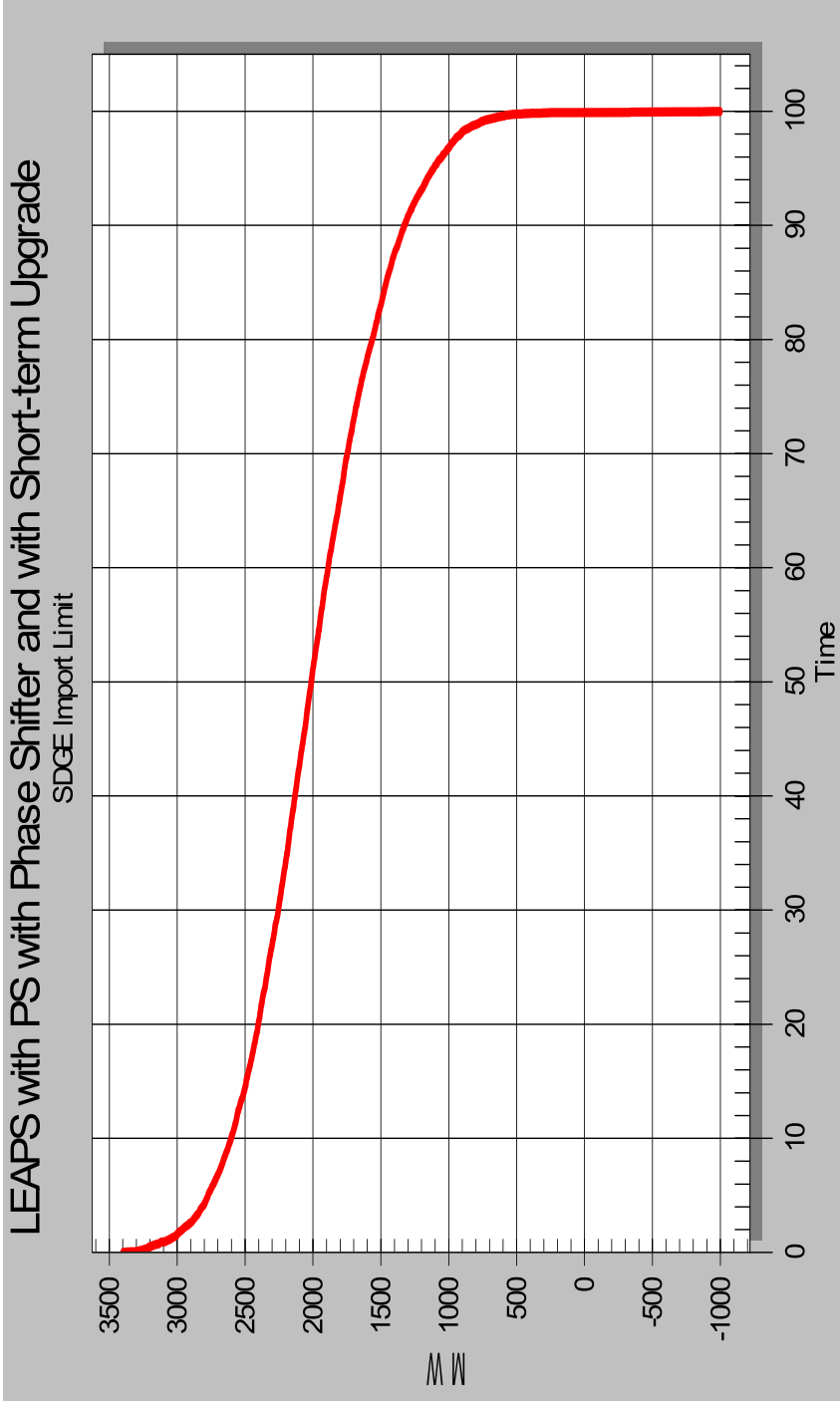


LEAPS with PS with Phase Shifter and with Short-term Upgrade

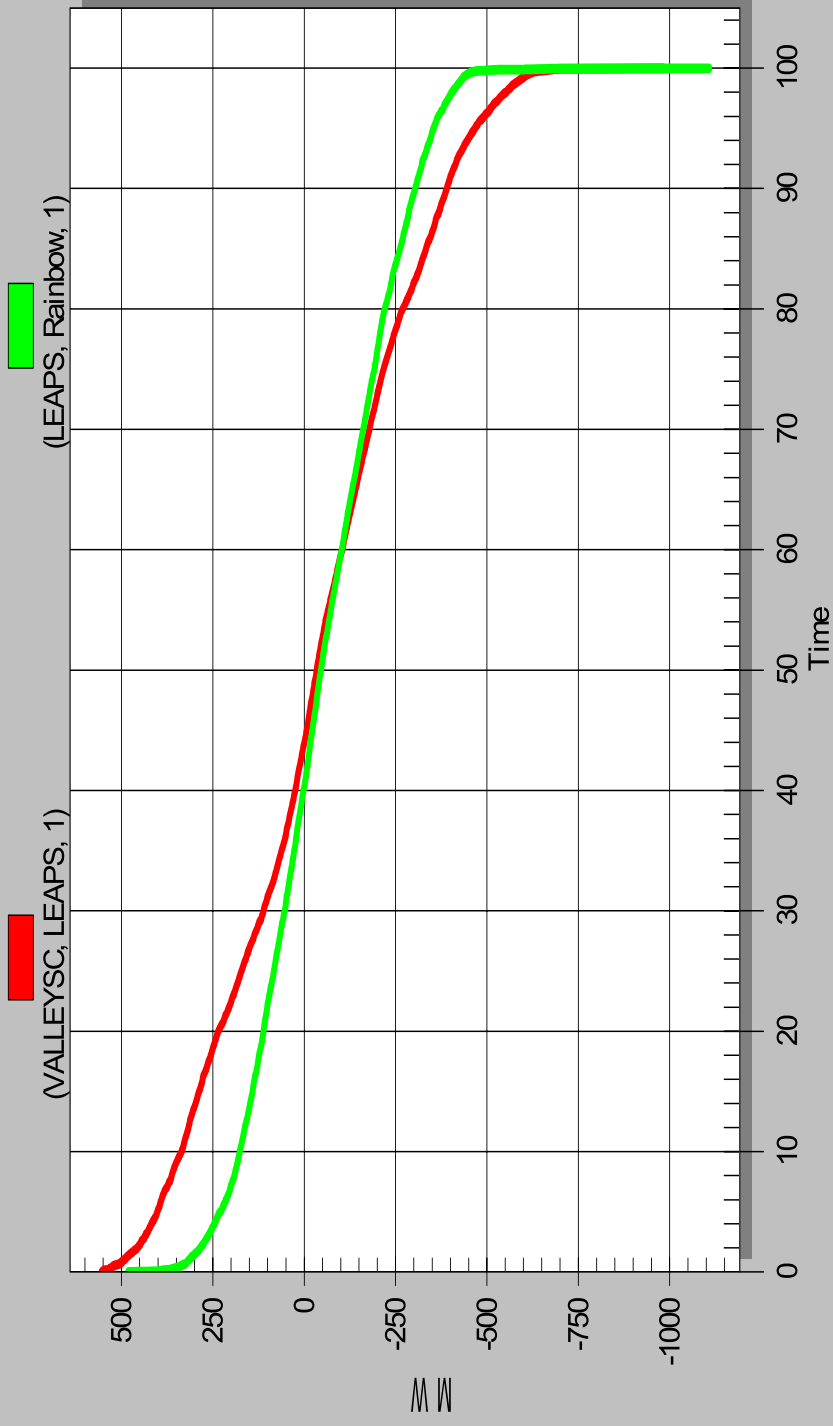
AZ/NV Lines



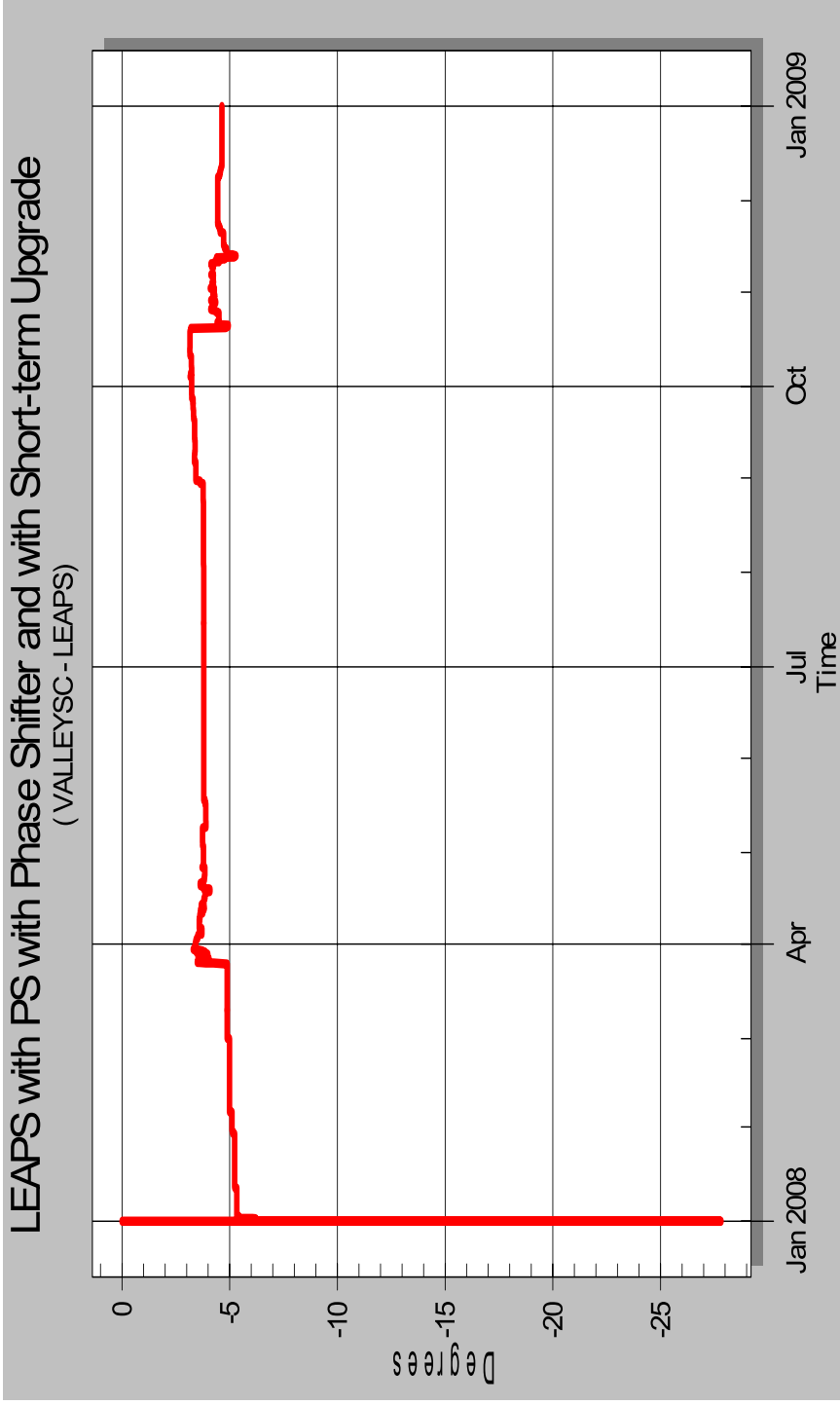
LEAPS with PS and Short Term Upgrade (without enforcing SDG&E SIL)



LEAPS with PS with Phase Shifter and with Short-term Upgrade



LEAPS with PS and Short Term Upgrade (without enforcing SDG&E SIL)



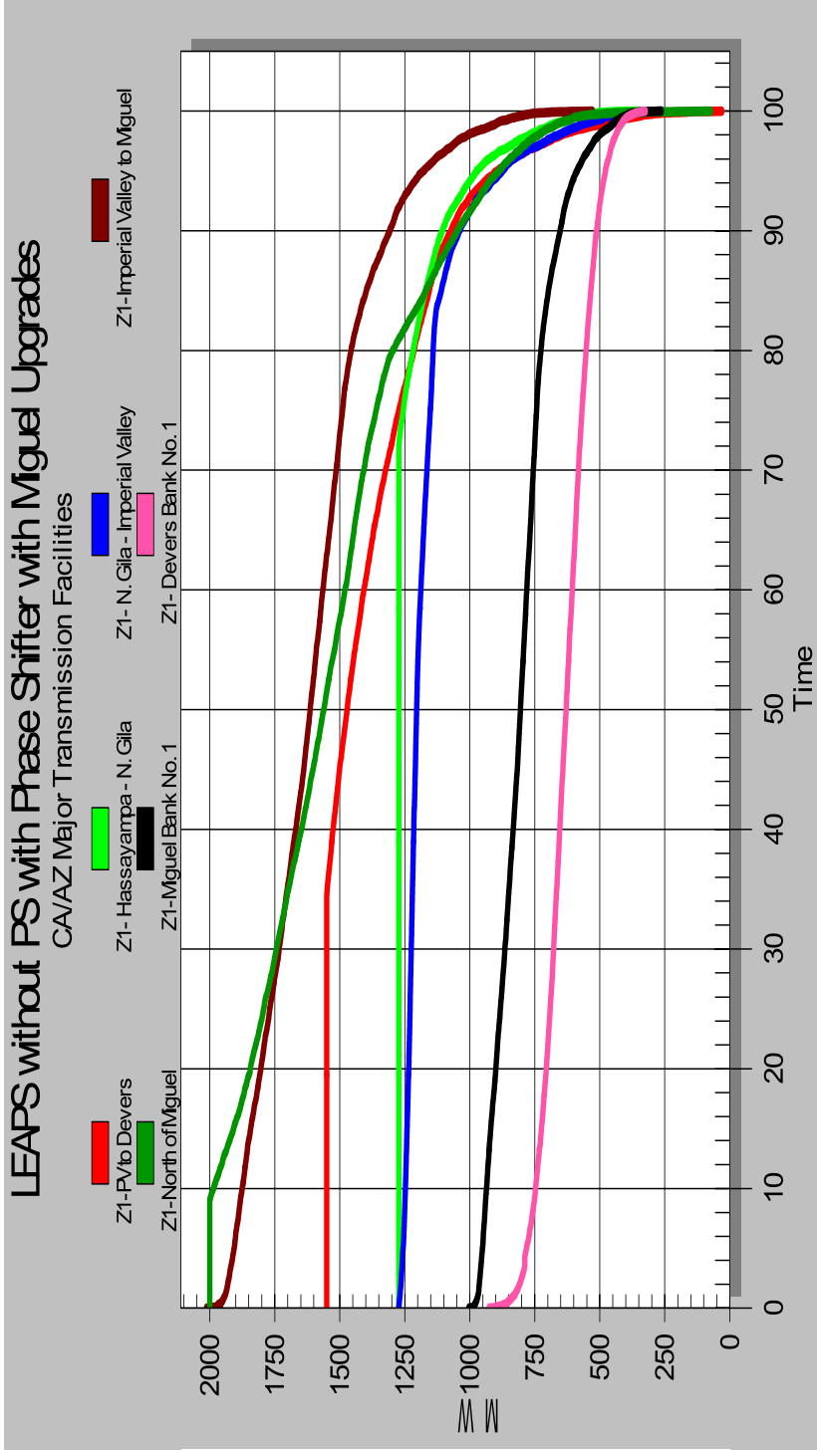
LEAPS without PS with Phase Shifter and With Miguel Improvements

\$4 Fuel Price

AreaID	Name	DemandGWH	DemandK\$	DemandAvgPrice	GenGWH	Gen\$	GenAvgPrice
1	NEW MEXI	21,145.00	\$ 990,306.00	\$ 46.83	17,221.00	\$ 788,257.00	\$ 45.77
2	ARIZONA	86,822.00	\$ 4,150,237.00	\$ 47.80	135,404.00	\$ 6,064,776.00	\$ 44.79
3	NEVADA	26,679.00	\$ 1,312,832.00	\$ 49.21	29,388.00	\$ 1,424,415.00	\$ 48.47
4	WAPA L.C	2,225.00	\$ 103,567.00	\$ 46.55	19,423.00	\$ 922,664.00	\$ 47.50
5	MEXICO-C	15,465.00	\$ 777,644.00	\$ 50.28	13,907.00	\$ 703,109.00	\$ 50.56
6	IMPERIAL	3,868.00	\$ 193,226.00	\$ 49.96	3,588.00	\$ 176,822.00	\$ 49.28
7	SANDIEGO	20,406.00	\$ 1,031,227.00	\$ 50.54	9,563.00	\$ 500,076.00	\$ 52.29
8	SOCALIF	98,334.00	\$ 4,889,067.00	\$ 49.72	53,658.00	\$ 2,694,156.00	\$ 50.21
9	LADWP	29,397.00	\$ 1,458,021.00	\$ 49.60	20,796.00	\$ 1,020,238.00	\$ 49.06
10	PG AND E	127,991.00	\$ 6,497,602.00	\$ 50.77	101,619.00	\$ 5,251,022.00	\$ 51.67
11	NORTHWES	168,445.00	\$ 8,359,741.00	\$ 49.63	187,208.00	\$ 9,070,701.00	\$ 48.45
12	B.C.HYDR	62,319.00	\$ 3,275,271.00	\$ 52.56	47,396.00	\$ 2,486,961.00	\$ 52.47
13	AQUILA	3,974.00	\$ 208,746.00	\$ 52.53	4,675.00	\$ 239,853.00	\$ 51.31
14	ALBERTA	60,618.00	\$ 2,579,550.00	\$ 42.55	68,349.00	\$ 2,893,618.00	\$ 42.34
15	IDAHO	17,296.00	\$ 833,207.00	\$ 48.17	25,634.00	\$ 1,166,180.00	\$ 45.49
16	MONTANA	11,949.00	\$ 567,874.00	\$ 47.52	21,732.00	\$ 1,036,627.00	\$ 47.70
17	WAPA U.M	932.00	\$ 43,958.00	\$ 47.17	0.00	\$ -	\$ -
18	SIERRA	11,769.00	\$ 574,596.00	\$ 48.82	6,544.00	\$ 324,572.00	\$ 49.60
19	PACE	36,336.00	\$ 1,725,032.00	\$ 47.47	40,145.00	\$ 1,872,725.00	\$ 46.65
20	PSCOLORA	40,312.00	\$ 1,912,323.00	\$ 47.44	28,367.00	\$ 1,341,848.00	\$ 47.30
21	WAPA R.M	22,461.00	\$ 1,037,878.00	\$ 46.21	34,128.00	\$ 1,576,808.00	\$ 46.20
	Total WECC	868,743.00	\$42,521,905.00	\$ 48.95	868,745.00	\$41,555,428.00	\$ 47.83
	ISO	246,731.00	\$12,417,896.00	\$ 50.33	164,840.00	\$8,445,254.00	\$ 51.23

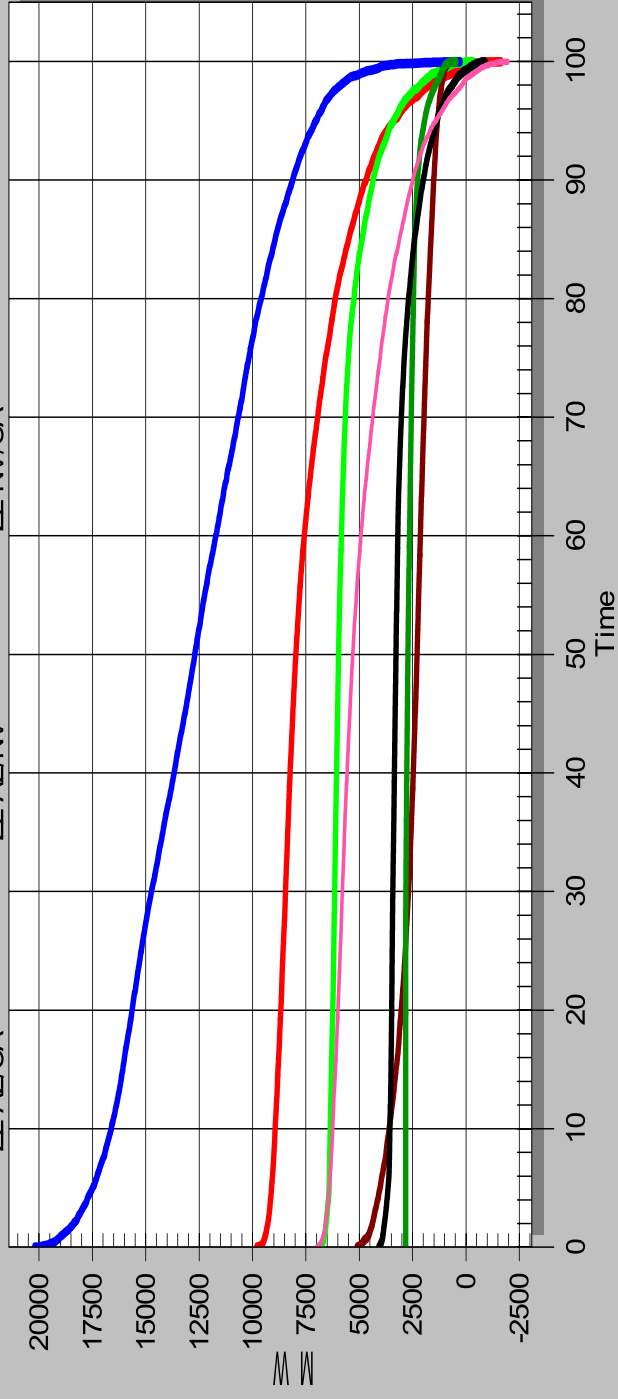
Area	ProductionCostKUSD	EnergyMWH
NEW MEXI	\$ 432,546.70	16,477,393.44
ARIZONA	\$ 3,038,925.48	133,471,410.91
NEVADA	\$ 1,068,778.32	29,387,163.05
WAPA L.C	\$ 517,809.30	13,227,661.25
MEXICO-C	\$ 374,681.11	13,907,559.79
IMPERIAL	\$ 37,864.80	3,390,415.97
SANDIEGO	\$ 441,170.61	9,562,916.78
SOCALIF	\$ 1,401,364.88	45,146,348.22
LADWP	\$ 611,371.40	20,819,031.18
PG AND E	\$ 2,364,556.97	78,899,776.25
NORTHWES	\$ 1,700,491.61	60,516,762.46
B.C.HYDR	\$ 320,217.81	7,378,006.74
AQUILA	\$ 137.00	913.50
ALBERTA	\$ 1,189,966.68	66,581,603.03
IDAHO	\$ 281,532.41	17,072,826.00
MONTANA	\$ 183,978.50	18,563,918.00
WAPA U.M	\$ -	0.00
SIERRA	\$ 156,445.80	6,487,228.32
PACE	\$ 505,889.90	37,977,832.22
PSCOLORA	\$ 562,958.10	27,707,421.14
WAPA R.M	\$ 521,112.51	31,990,001.72
Total WECC	\$15,711,799.88	638,566,189.96
ISO	\$4,207,092.46	133,609,041.24

LEAPS without PS with Phase Shifter and With Miguel Improvements

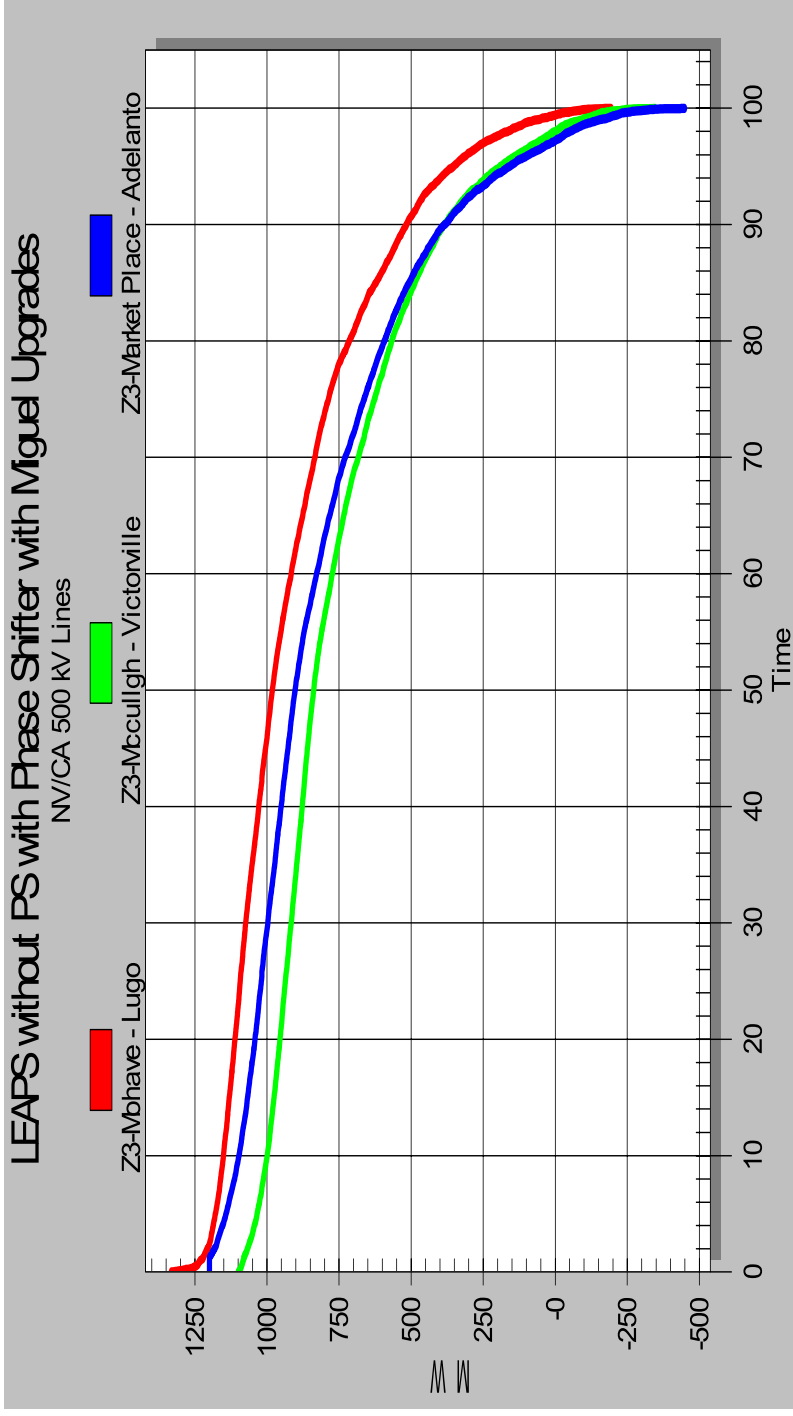


LEAPS without PS with Phase Shifter with Miguel Upgrades

Major South West Paths and Interfaces

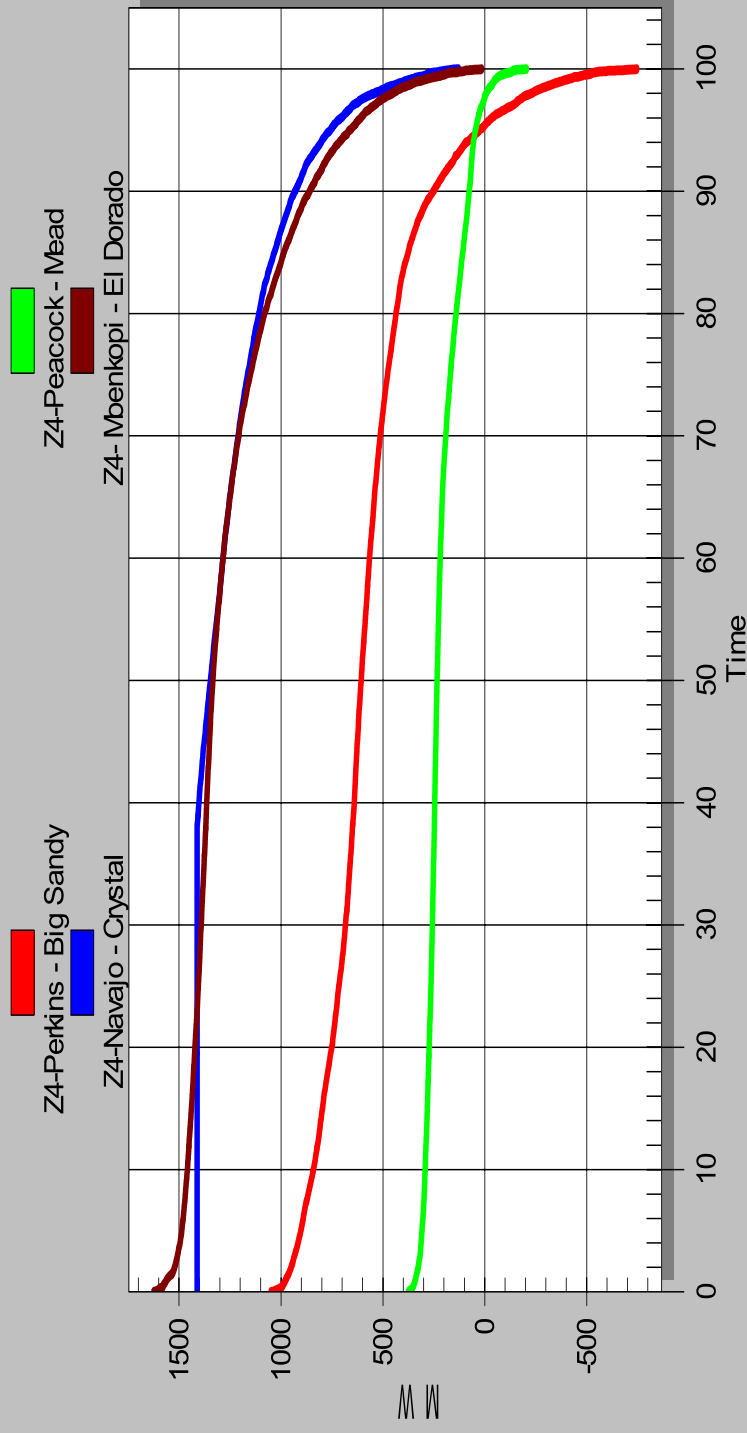


LEAPS without PS with Phase Shifter and With Miguel Improvements

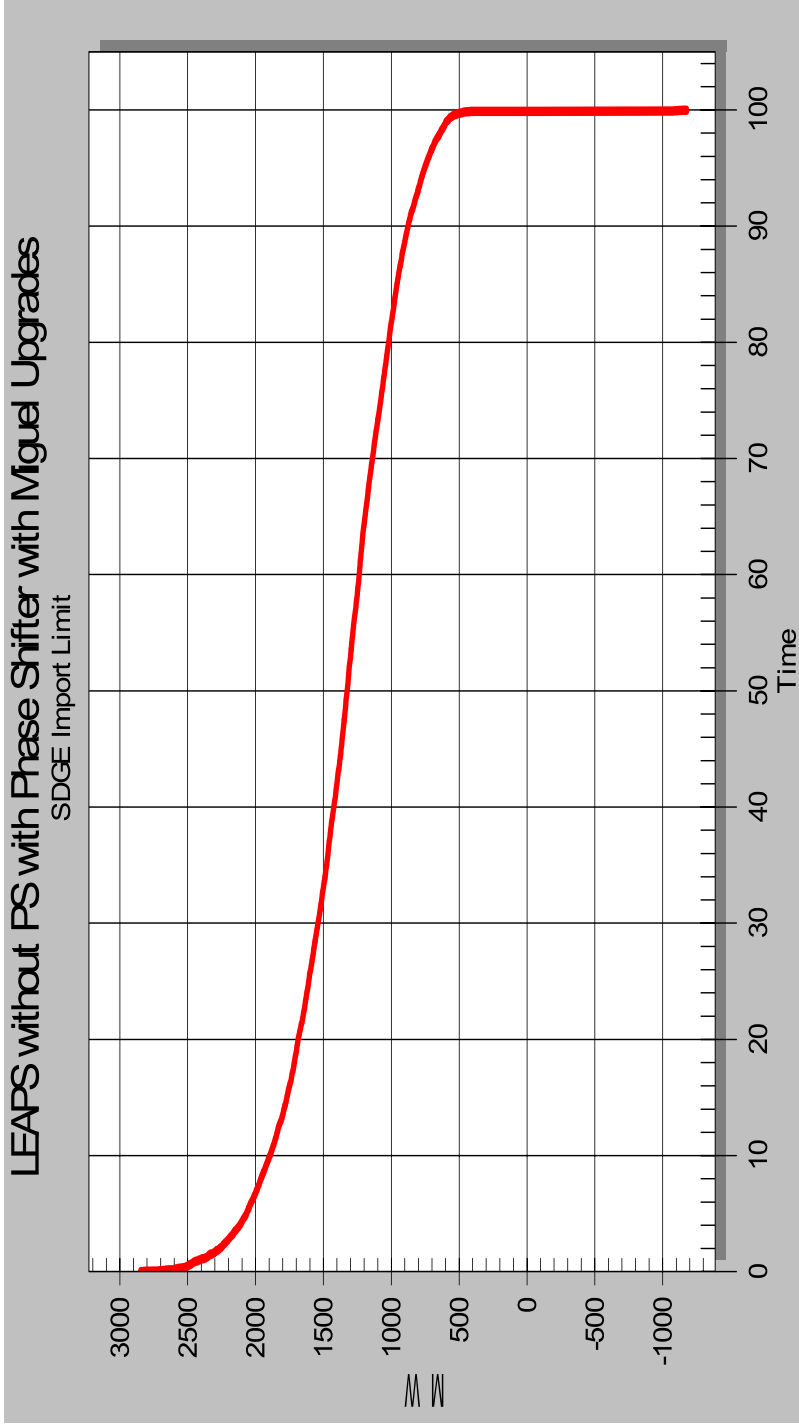


LEAPS without PS with Phase Shifter with Miguel Upgrades

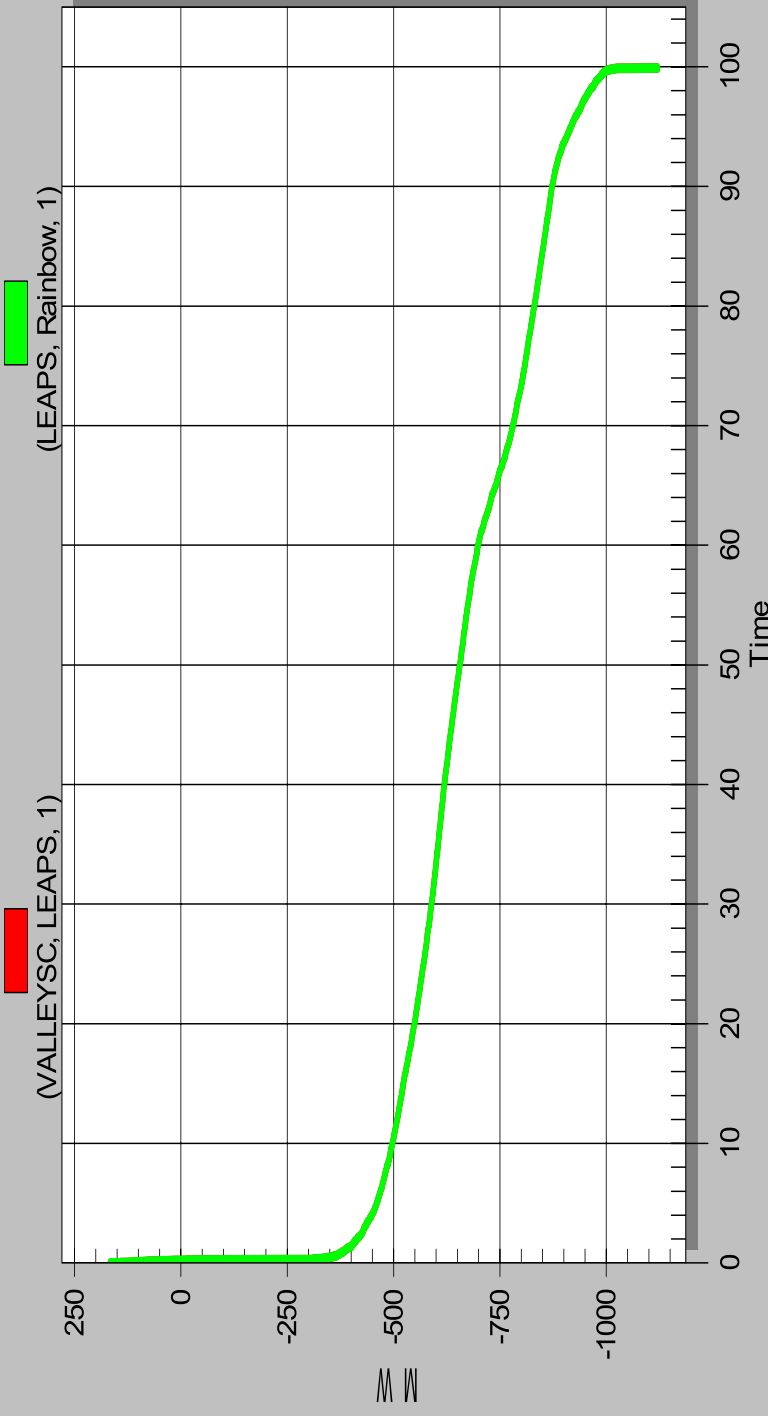
AZ/NV Lines



LEAPS without PS with Phase Shifter and With Miguel Improvements



LEAPS without PS with Phase Shifter with Miguel Upgrades



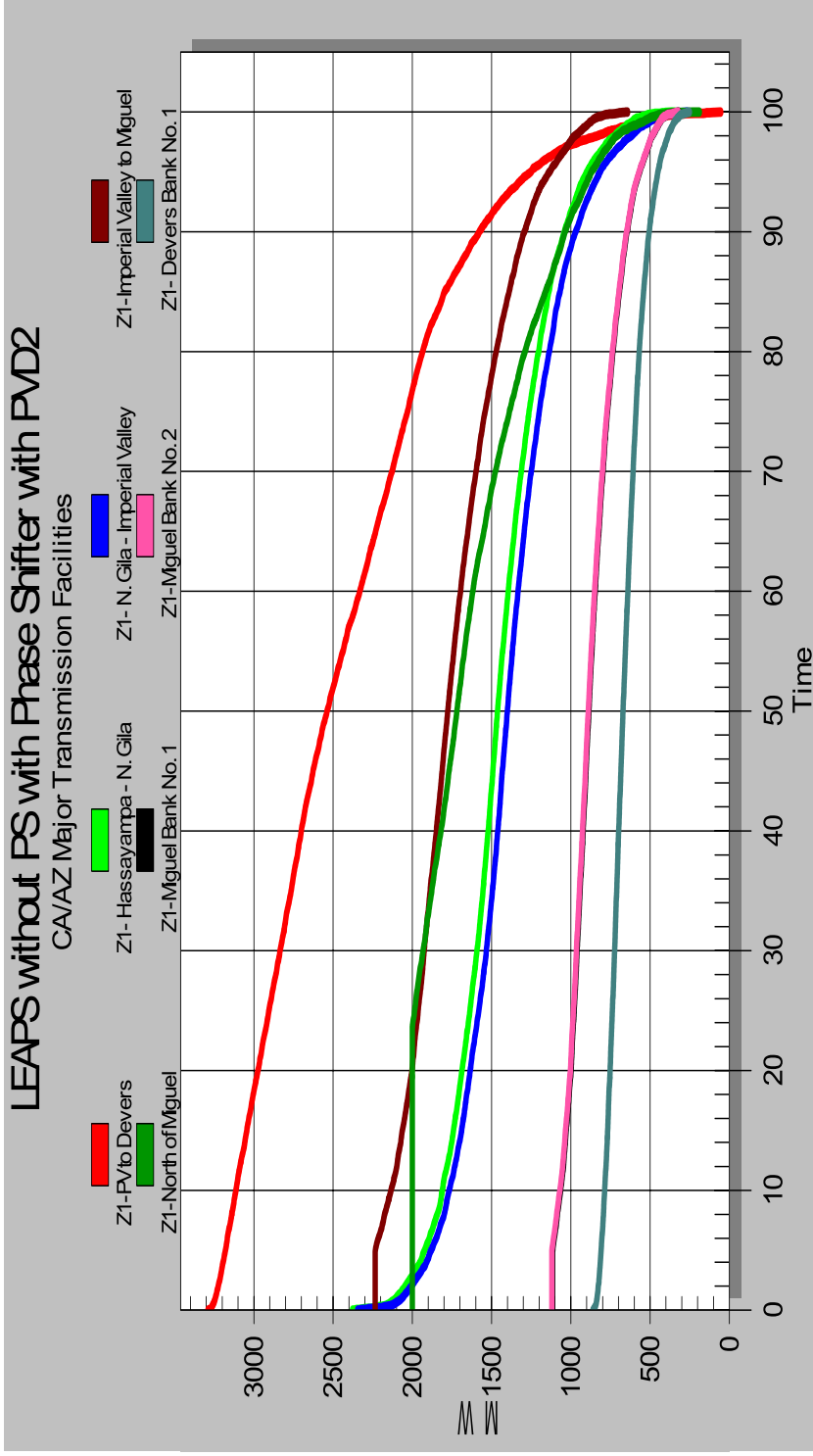
LEAPS (without PS) Project with Phase Shifter and with PVD2

\$4 Fuel Price

AreaID	Name	DemandGWH	DemandK\$	DemandAvgPrice	GenGWH	Gen\$	GenAvgPrice
1	NEW MEXI	21,145.00	\$ 1,028,576.00	\$ 48.64	17,640.00	\$ 844,650.00	\$ 47.88
2	ARIZONA	86,822.00	\$ 4,298,023.00	\$ 49.50	149,260.00	\$ 7,040,361.00	\$ 47.17
3	NEVADA	26,679.00	\$ 1,290,316.00	\$ 48.36	25,823.00	\$ 1,246,069.00	\$ 48.25
4	WAPA L.C	2,225.00	\$ 107,939.00	\$ 48.51	19,435.00	\$ 924,861.00	\$ 47.59
5	MEXICO-C	15,465.00	\$ 754,833.00	\$ 48.81	13,185.00	\$ 647,380.00	\$ 49.10
6	IMPERIAL	3,868.00	\$ 186,636.00	\$ 48.25	3,489.00	\$ 165,069.00	\$ 47.31
7	SANDIEGO	20,406.00	\$ 1,004,844.00	\$ 49.24	7,210.00	\$ 367,006.00	\$ 50.90
8	SOCALIF	98,334.00	\$ 4,784,789.00	\$ 48.66	48,944.00	\$ 2,465,436.00	\$ 50.37
9	LADWP	29,397.00	\$ 1,439,763.00	\$ 48.98	21,643.00	\$ 1,064,306.00	\$ 49.18
10	PG AND E	127,991.00	\$ 6,409,075.00	\$ 50.07	97,371.00	\$ 4,984,717.00	\$ 51.19
11	NORTHWES	168,445.00	\$ 8,278,440.00	\$ 49.15	187,364.00	\$ 8,984,611.00	\$ 47.95
12	B.C.HYDR	62,319.00	\$ 3,250,892.00	\$ 52.17	47,128.00	\$ 2,455,325.00	\$ 52.10
13	AQUILA	3,974.00	\$ 207,188.00	\$ 52.14	4,676.00	\$ 238,463.00	\$ 51.00
14	ALBERTA	60,618.00	\$ 2,573,791.00	\$ 42.46	68,307.00	\$ 2,885,279.00	\$ 42.24
15	IDAHO	17,296.00	\$ 827,002.00	\$ 47.81	25,626.00	\$ 1,148,504.00	\$ 44.82
16	MONTANA	11,949.00	\$ 562,457.00	\$ 47.07	21,732.00	\$ 1,026,875.00	\$ 47.25
17	WAPA U.M	932.00	\$ 43,639.00	\$ 46.82	0.00	\$ -	\$ -
18	SIERRA	11,769.00	\$ 570,270.00	\$ 48.46	6,618.00	\$ 326,724.00	\$ 49.37
19	PACE	36,336.00	\$ 1,714,329.00	\$ 47.18	40,229.00	\$ 1,870,887.00	\$ 46.51
20	PSCOLORA	40,312.00	\$ 1,930,263.00	\$ 47.88	28,448.00	\$ 1,361,019.00	\$ 47.84
21	WAPA R.M	22,461.00	\$ 1,045,714.00	\$ 46.56	34,615.00	\$ 1,611,662.00	\$ 46.56
	Total WECC	868,743.00	\$42,308,779.00	\$ 48.70	868,743.00	\$41,659,204.00	\$ 47.95
	ISO	246,731.00	\$12,198,708.00	\$ 49.44	153,525.00	\$7,817,159.00	\$ 50.92

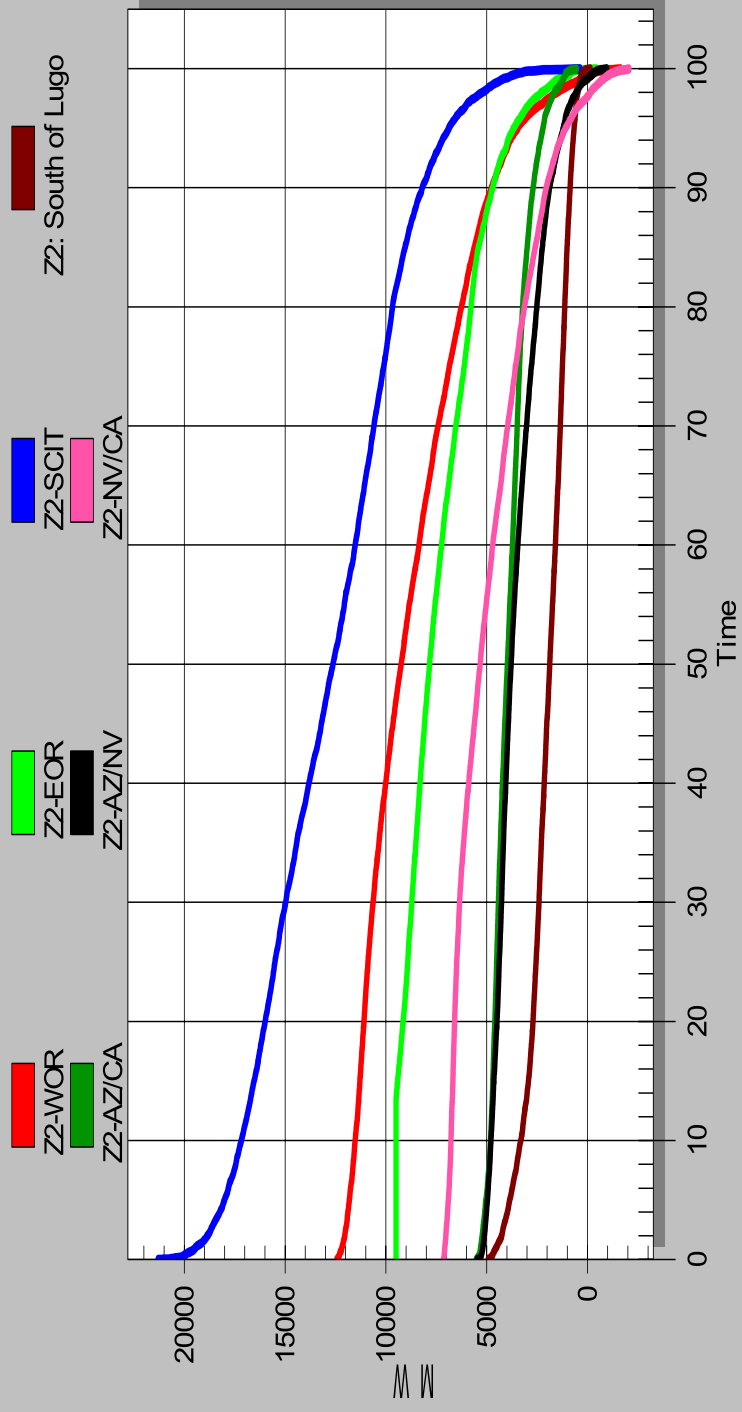
Area	ProductionCostKUSD	EnergyMWH
NEW MEXI	\$ 454,233.00	16,896,033.13
ARIZONA	\$ 3,600,119.36	147,327,547.82
NEVADA	\$ 927,861.90	25,823,473.04
WAPA L.C	\$ 518,298.61	13,239,597.00
MEXICO-C	\$ 341,476.01	13,185,069.52
IMPERIAL	\$ 33,221.90	3,291,865.02
SANDIEGO	\$ 322,395.30	7,209,616.75
SOCALIF	\$ 1,164,672.11	40,431,864.20
LADWP	\$ 661,221.60	21,667,446.42
PG AND E	\$ 2,176,807.91	74,651,681.49
NORTHWES	\$ 1,705,699.59	60,672,830.70
B.C.HYDR	\$ 306,859.50	7,109,293.09
AQUILA	\$ 359.90	2,399.00
ALBERTA	\$ 1,187,996.50	66,539,496.87
IDAHO	\$ 281,412.69	17,065,574.00
MONTANA	\$ 183,978.50	18,563,918.00
WAPA U.M	\$ -	0.00
SIERRA	\$ 160,416.90	6,561,301.13
PACE	\$ 510,184.20	38,061,269.97
PSCOLORA	\$ 569,964.70	27,788,350.46
WAPA R.M	\$ 542,965.50	32,477,553.88
Total WECC	\$15,650,145.68	638,566,181.50
ISO	\$3,663,875.31	122,293,162.44

LEAPS (without PS) Project with Phase Shifter and with PVD2

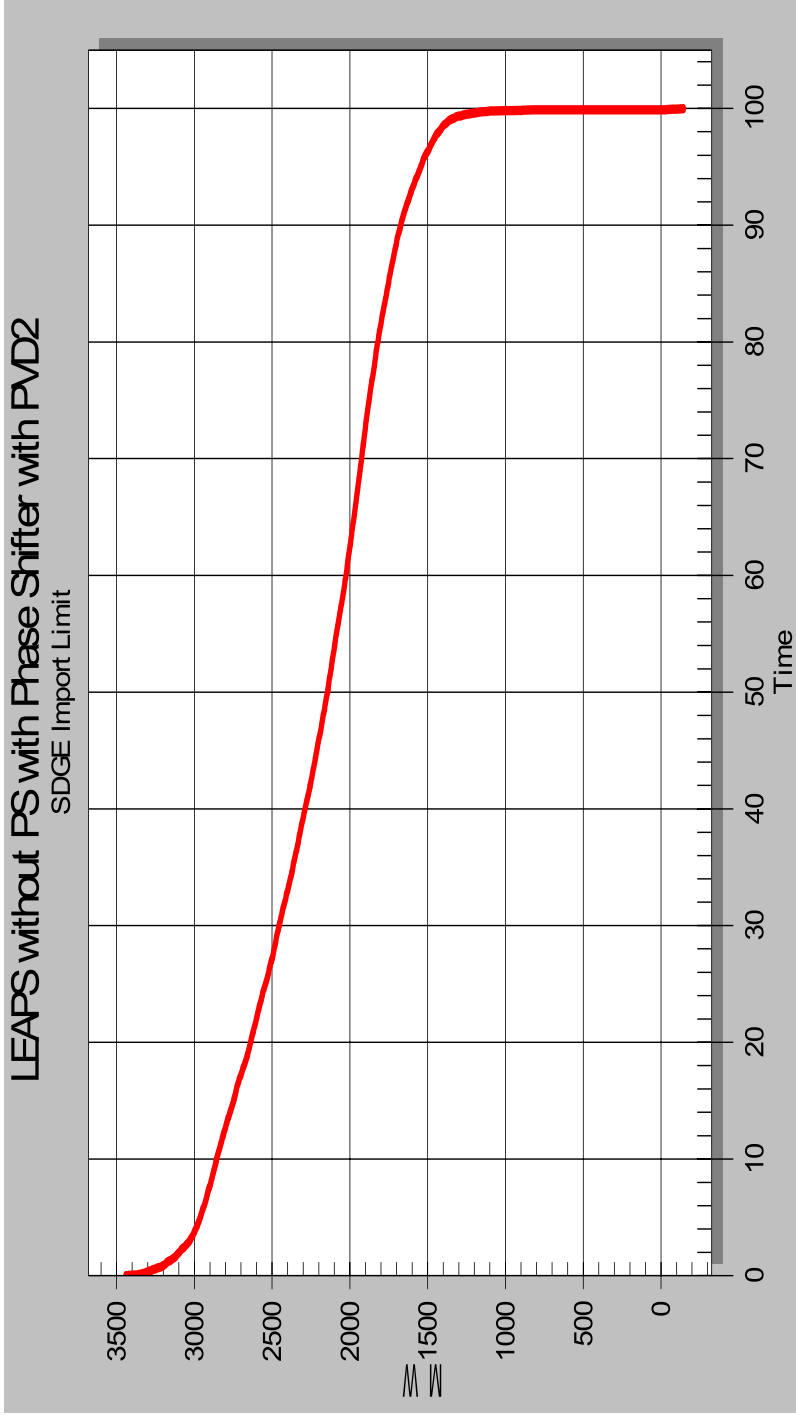


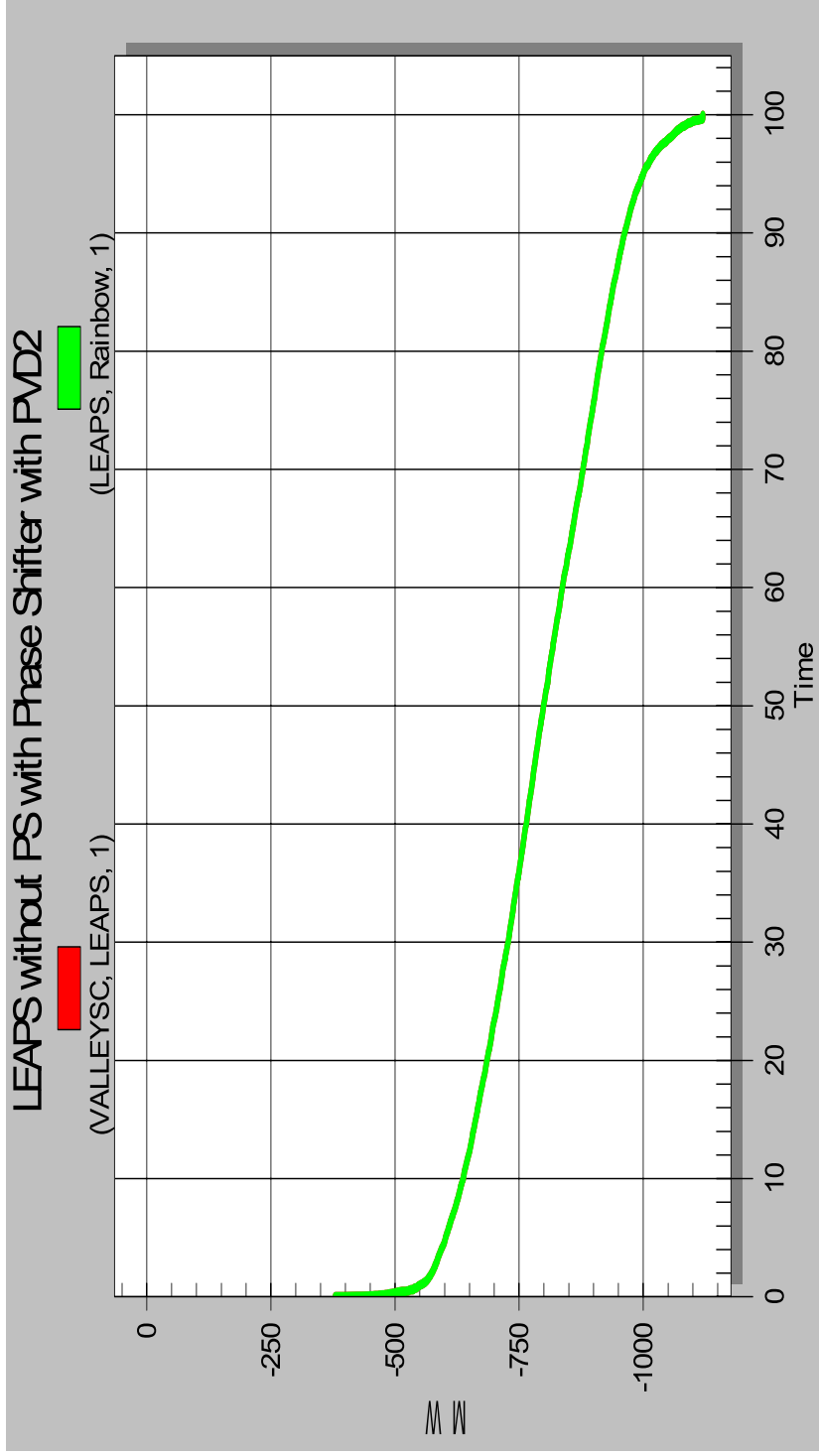
LEAPS without PS with Phase Shifter with PVD2

Major South West Paths and Interfaces

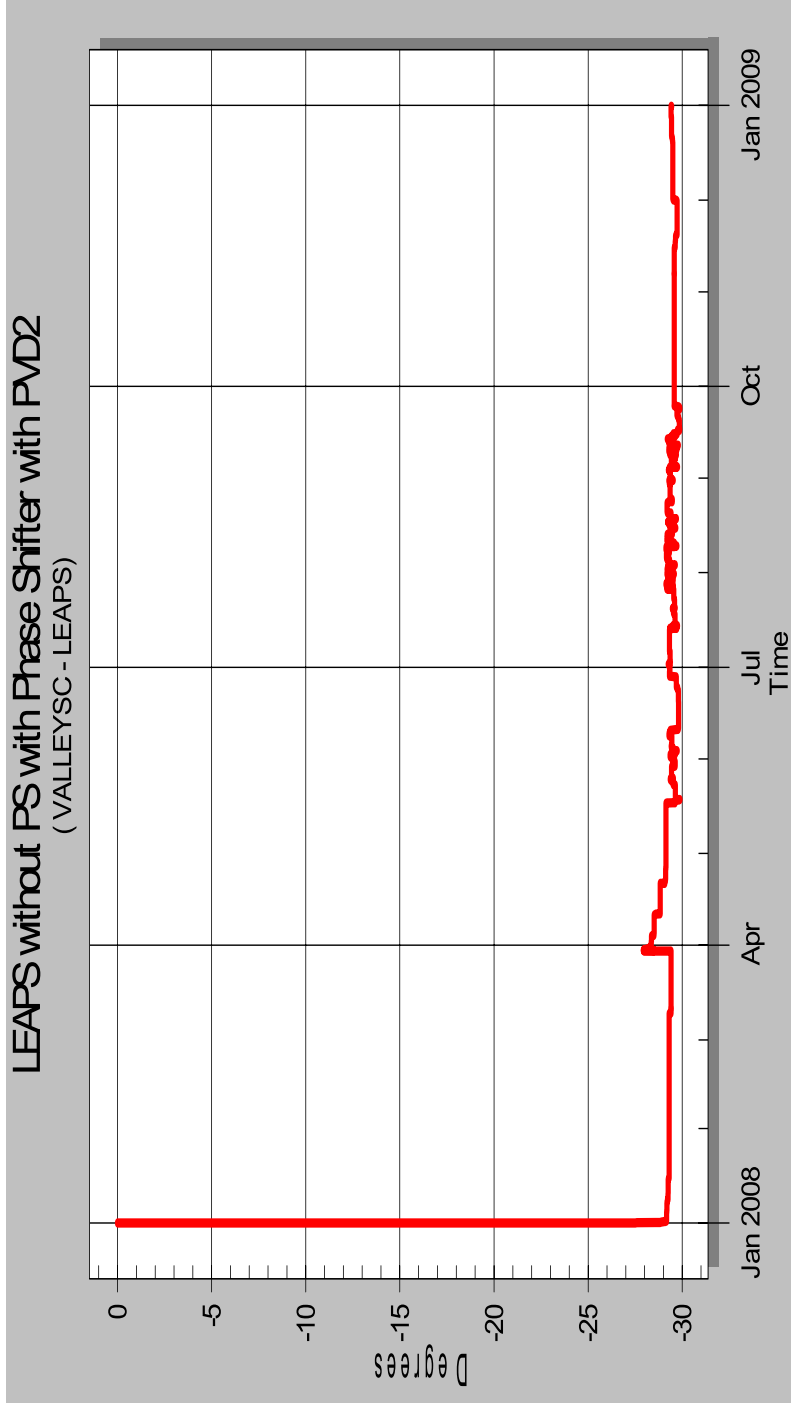


LEAPS (without PS) Project with Phase Shifter and with PVD2





LEAPS (without PS) Project with Phase Shifter and with PVD2

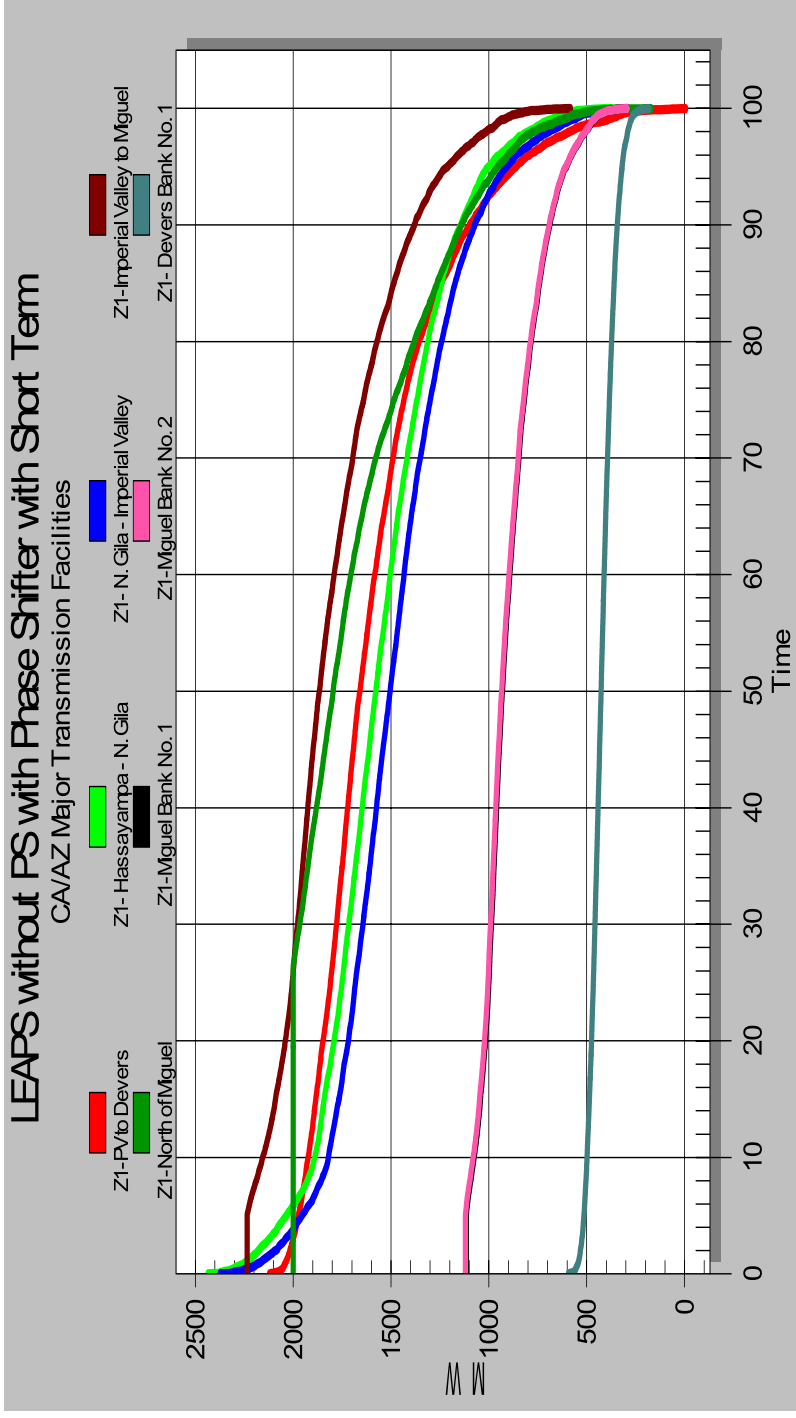


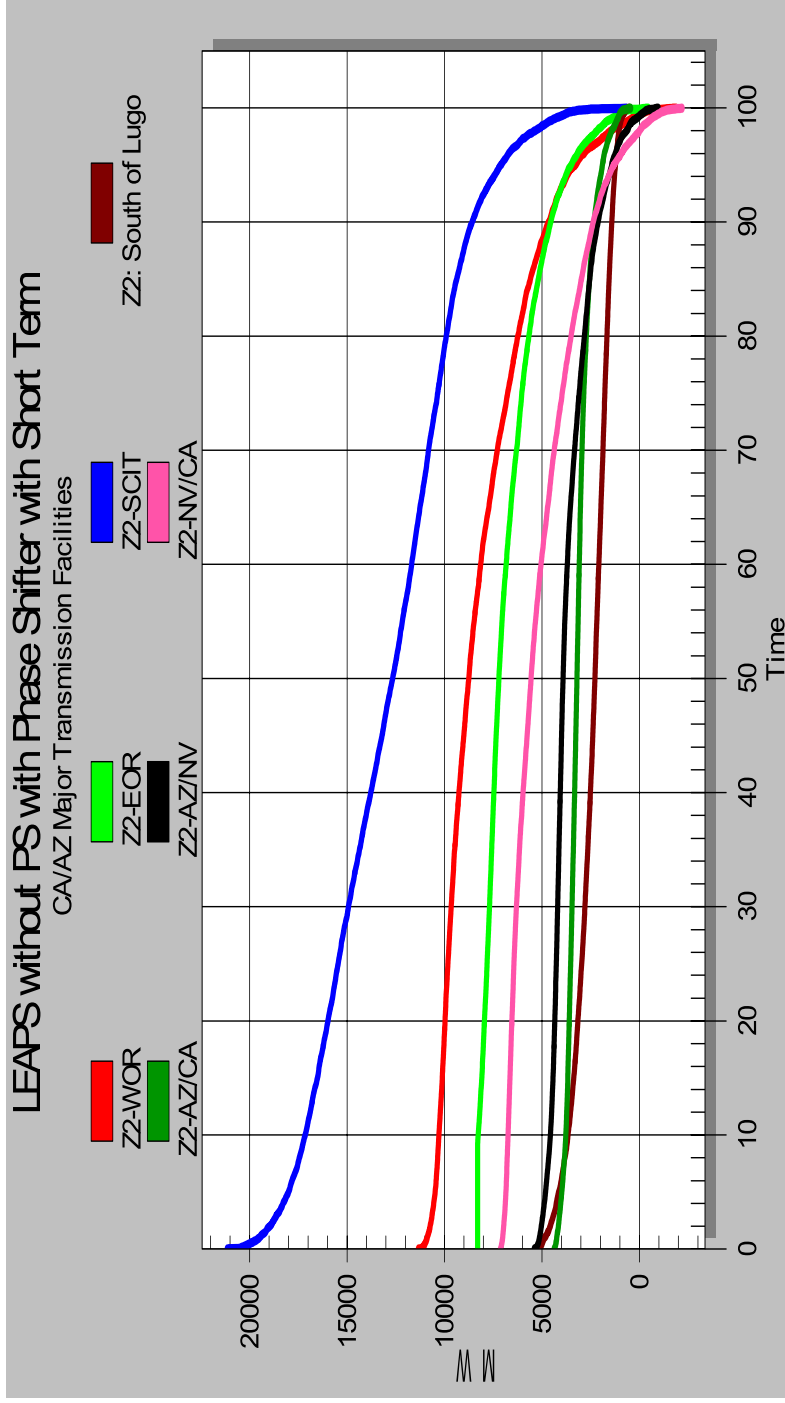
LEAPS without PS with Phase Shifter and with Short Term Upgrade (without enforcing SDG&E SIL)
\$4 Fuel Price

AreaID	Name	DemandGWH	DemandK\$	DemandAvgPrice	GenGWH	Gen\$	GenAvgPrice
1	NEW MEXI	21,145.00	\$ 1,022,862.00	\$ 48.37	17,542.00	\$ 834,987.00	\$ 47.60
2	ARIZONA	86,822.00	\$ 4,263,624.00	\$ 49.11	144,594.00	\$ 6,761,692.00	\$ 46.76
3	NEVADA	26,679.00	\$ 1,292,513.00	\$ 48.45	27,072.00	\$ 1,299,004.00	\$ 47.98
4	WAPA L.C	2,225.00	\$ 107,151.00	\$ 48.16	19,062.00	\$ 900,718.00	\$ 47.25
5	MEXICO-C	15,465.00	\$ 748,640.00	\$ 48.41	13,094.00	\$ 636,068.00	\$ 48.58
6	IMPERIAL	3,868.00	\$ 179,500.00	\$ 46.41	3,261.00	\$ 145,297.00	\$ 44.56
7	SANDIEGO	20,406.00	\$ 1,011,523.00	\$ 49.57	7,254.00	\$ 365,920.00	\$ 50.44
8	SOCALIF	98,334.00	\$ 4,835,618.00	\$ 49.18	51,527.00	\$ 2,608,216.00	\$ 50.62
9	LADWP	29,397.00	\$ 1,449,690.00	\$ 49.31	21,392.00	\$ 1,053,037.00	\$ 49.23
10	PG AND E	127,991.00	\$ 6,452,356.00	\$ 50.41	99,207.00	\$ 5,106,724.00	\$ 51.48
11	NORTHWES	168,445.00	\$ 8,306,131.00	\$ 49.31	187,395.00	\$ 9,021,715.00	\$ 48.14
12	B.C.HYDR	62,319.00	\$ 3,259,511.00	\$ 52.30	47,238.00	\$ 2,467,088.00	\$ 52.23
13	AQUILA	3,974.00	\$ 207,746.00	\$ 52.28	4,676.00	\$ 238,902.00	\$ 51.09
14	ALBERTA	60,618.00	\$ 2,575,351.00	\$ 42.48	68,319.00	\$ 2,887,532.00	\$ 42.27
15	IDAHO	17,296.00	\$ 829,819.00	\$ 47.98	25,628.00	\$ 1,151,458.00	\$ 44.93
16	MONTANA	11,949.00	\$ 564,561.00	\$ 47.25	21,732.00	\$ 1,030,652.00	\$ 47.43
17	WAPA U.M	932.00	\$ 43,756.00	\$ 46.95	0.00	\$ -	\$ -
18	SIERRA	11,769.00	\$ 572,392.00	\$ 48.64	6,574.00	\$ 325,261.00	\$ 49.48
19	PACE	36,336.00	\$ 1,717,359.00	\$ 47.26	40,177.00	\$ 1,869,889.00	\$ 46.54
20	PSCOLORA	40,312.00	\$ 1,925,202.00	\$ 47.76	28,432.00	\$ 1,355,520.00	\$ 47.68
21	WAPA R.M	22,461.00	\$ 1,043,823.00	\$ 46.47	34,569.00	\$ 1,605,836.00	\$ 46.45
	Total WECC	868,743.00	\$42,409,128.00	\$ 48.82	868,745.00	\$41,665,516.00	\$ 47.96
	ISO	246,731.00	\$12,299,497.00	\$ 49.85	157,988.00	\$8,080,860.00	\$ 51.15

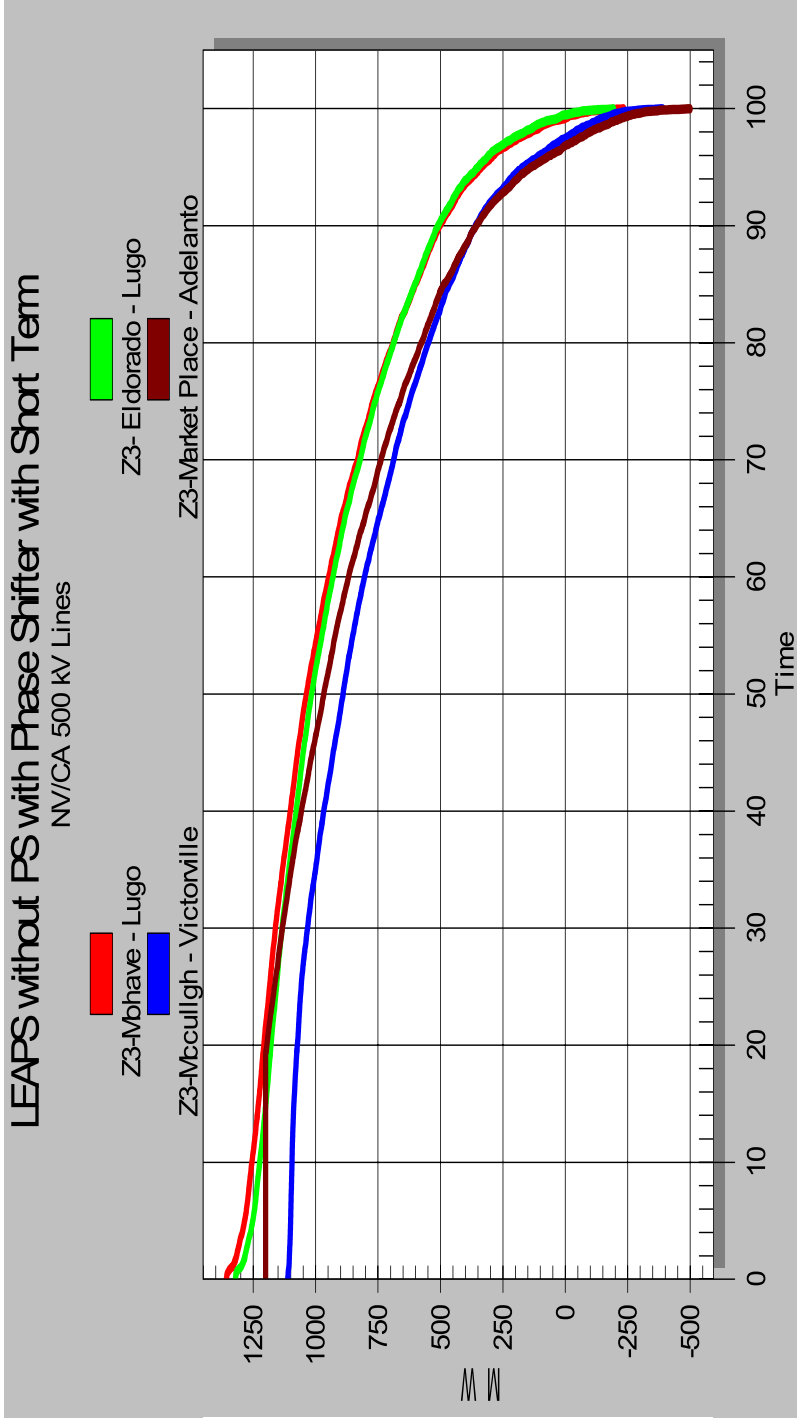
Area	ProductionCostKUSD	EnergyMWH
NEW MEXI	\$ 449,463.91	16,798,152.95
ARIZONA	\$ 3,411,400.10	142,660,958.45
NEVADA	\$ 976,665.61	27,072,039.55
WAPA L.C	\$ 503,906.70	12,866,705.00
MEXICO-C	\$ 336,815.30	13,094,252.17
IMPERIAL	\$ 23,948.10	3,063,599.10
SANDIEGO	\$ 325,274.50	7,254,284.55
SOCALIF	\$ 1,288,007.92	43,015,108.70
LADWP	\$ 647,252.19	21,415,934.97
PG AND E	\$ 2,258,512.01	76,487,794.65
NORTHWES	\$ 1,706,907.41	60,703,178.88
B.C.HYDR	\$ 312,230.01	7,219,561.91
AQUILA	\$ 246.00	1,639.70
ALBERTA	\$ 1,188,534.19	66,551,334.08
IDAHO	\$ 281,439.91	17,067,222.00
MONTANA	\$ 183,978.50	18,563,918.00
WAPA U.M	\$ -	0.00
SIERRA	\$ 158,023.10	6,517,244.18
PACE	\$ 507,565.20	38,009,726.21
PSCOLORA	\$ 568,063.10	27,772,725.44
WAPA R.M	\$ 540,330.80	32,430,802.28
Total WECC	\$15,668,564.56	638,566,182.78
ISO	\$3,871,794.43	126,757,187.90

LEAPS without PS with Phase Shifter and with Short Term Upgrade (without enforcing SDG&E SIL)



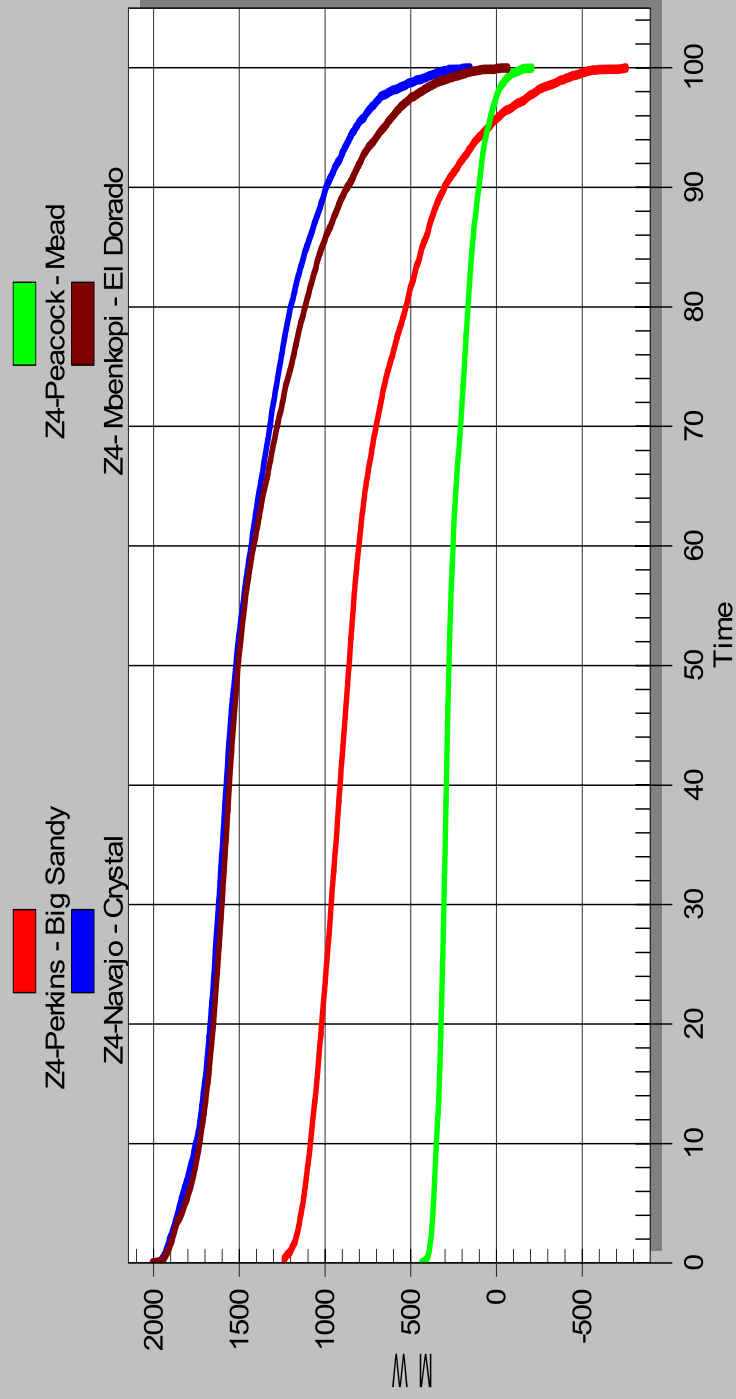


LEAPS without PS with Phase Shifter and with Short Term Upgrade (without enforcing SDG&E SIL)

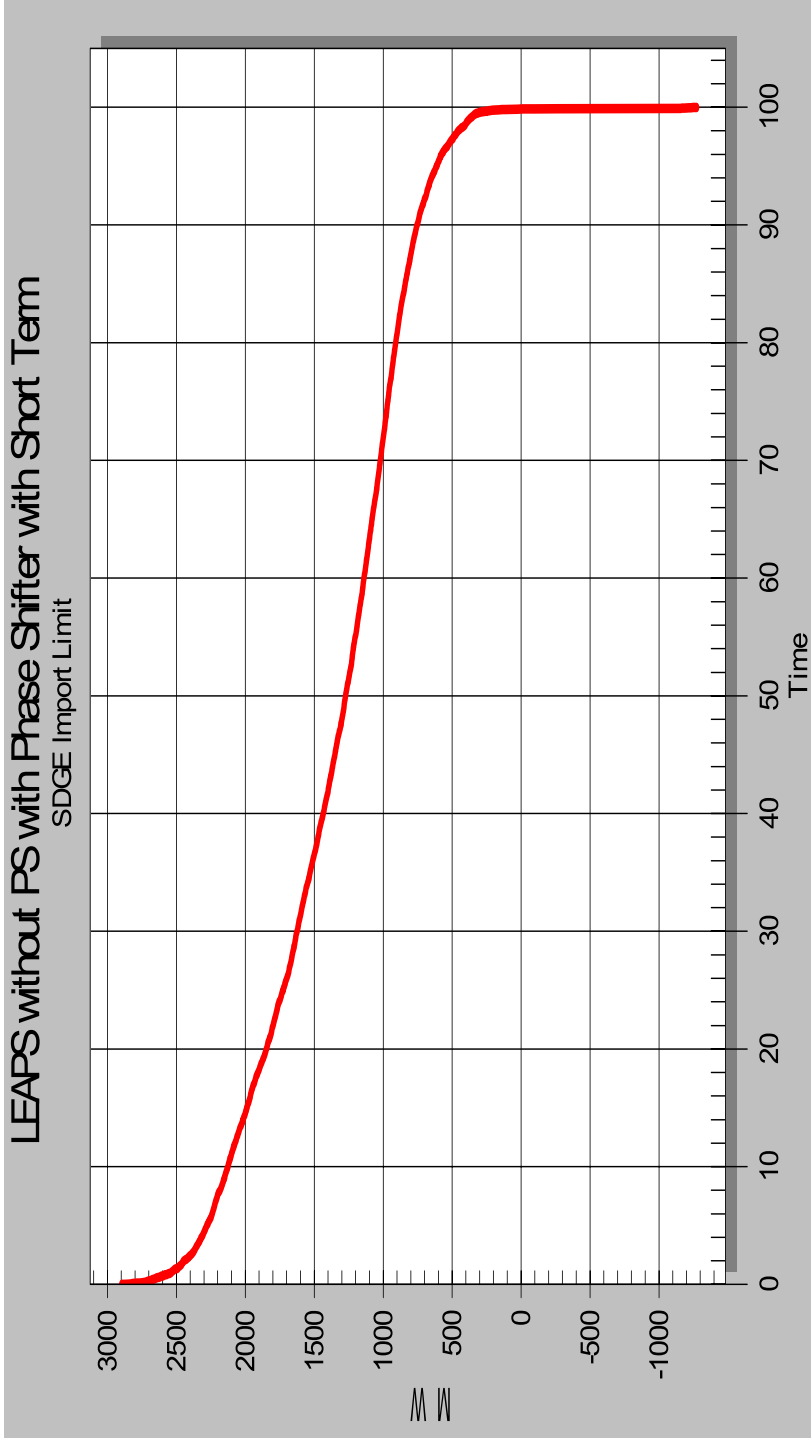


LEAPS without PS with Phase Shifter with Short Term

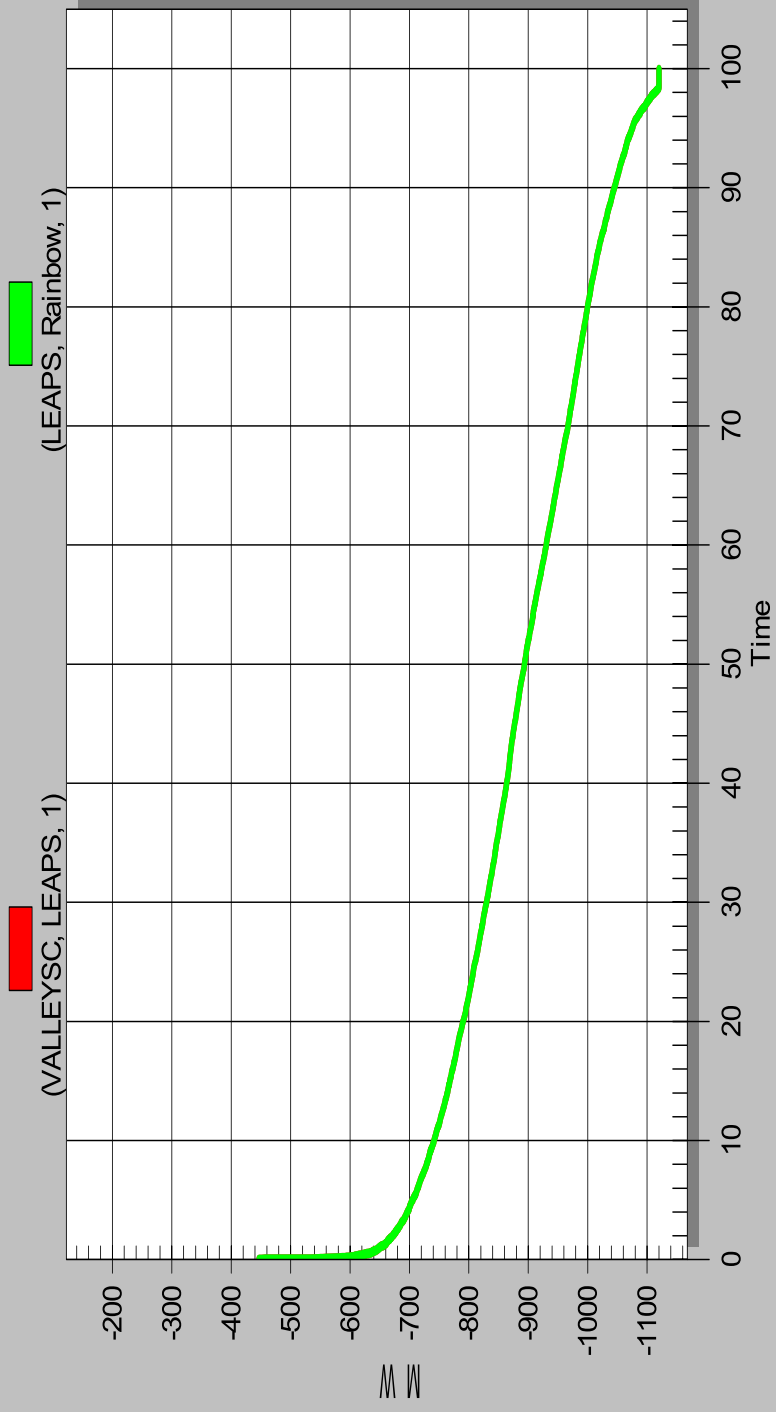
AZ/NV Lines



LEAPS without PS with Phase Shifter and with Short Term Upgrade (without enforcing SDG&E SIL)



LEAPS without PS with Phase Shifter with Short Term



LEAPS without PS with Phase Shifter and with Short Term Upgrade (without enforcing SDG&E SIL)

