Q. Indicate the average energy capability of each of Hydro's hydro-electric generating stations for the years 1994 to 2004 and identify the changes to such capability associated, in each year, with the addition of the previous year's hydrological data to the long term average (and with any other changes). Explain the assumptions and derivation for Schedule IV of Mr. Haynes' evidence on total system energy storage by month (minimum energy storage target and maximum energy operating level), and provide equivalent schedules for each year from 1994 to 2004.

A. The attached table on page 3 of 14 provides the average energy capability by year for each of Hydro's hydro-electric generating stations, along with the year-to-year changes in the same. A review of the annual average energy capability is made in most years but the averages are only updated when significant differences are observed. They were updated in 1996, 1998, 2000, 2001 and 2002. The 2000, 2001 and 2002 estimates are based upon 30 year averages, while the 1996 and 1998 estimates were developed using the full historic record. The tables on pages 4 and 5 of 14 provide the changes in average energy capability associated with the factors which impact its calculation as described in NP-64 NLH.

Schedule IV of J. Haynes' evidence shows the combined energy in storage for all of Hydro's major reservoirs as compared to the minimum that should be maintained in each month, and the maximum level below which total storage must remain or water spillage must occur. The minimum levels are established by using simulations to determine the amount of energy that must be retained in storage in order to ensure that all firm loads can be met should the historical dry sequence recur. The maximum operating level represents the physical limitation of the system with respect to storage and dam safety. The physical volume of water in storage related to the maximum operating level, actual storage and minimum levels are converted to energy by applying an appropriate water to energy conversion factor.

The attached graphs show the daily energy in storage for the period 1994 to 2002. Note that until 2001, storage targets were based upon guide curve simulations. Guide curve simulations provide the levels below which maximum thermal production is required in order to meet firm loads in the event of the recurrence of the critical dry sequence. The guide curve simulations did not integrate operation of the Cat Arm and Hinds Lake reservoirs with the Bay D'Espoir system. During 2000, Hydro implemented a decision support system, which integrated all reservoir operations in the development of the minimum storage levels. Minimum storage levels developed using the decision support system represents the level above which total energy storage should remain even using maximum thermal production, in order to protect against a repeat of the critical dry sequence. Accordingly, minimum monthly storage targets for 2001 and 2002 are provided rather than guide curve targets.

Annual Average Energy Capability by Plant
1994-2002
(GWh)

	Year	Bay D'Espoir	Upper Salmon	Hinds Lake	Cat Arm	Paradise River
1994	Capability	2535	541	340	735	38
1995	Capability	2535	541	340	735	38
	Change	*0*	*0*	*0*	*0*	*0*
1996	Capability	2570	543	341	742	39
	Change	*35*	*2*	*1*	*7*	*1*
1997	Capability	2570	543	341	742	39
	Change	*0*	*0*	*0*	*0*	*0*
1998	Capability	2587	549	339	736	39
	Change	*17*	*6*	*-2*	*-6*	*0*
1999	Capability	2587	549	339	736	39
	Change	*0*	*0*	*0*	*0*	*0*
2000	Capability	2710	586	357	734	38
	Change	*123*	*37*	*18*	*-2*	*-1*
2001	Capability	2681	578	354	731	37
	Change	*-29*	*-8*	*-3*	*-3*	*-1*
2002	Capability	2657	572	352	733	37
	Change	*-24*	*-6*	*-2*	*2*	*0*

Bay d'Espoir Annual Average Energy Changes

Year	Average Annual Energy (GWh)	Change (GWh)	Factor Causing the Change (GWh)			
			Hydrological Data	Spill History	Fisheries Compensation History	Conversion Factor
1993	2535					
1996	2570	35	28	-1	-3	11
1998	2587	17	9	2	-1	7
2000	2710	123	130	-5	0	-2
2001	2681	-29	-31	1	0	1
2002	2657	-24	-26	1	0	1

Upper Salmon Annual Average Energy Changes

Year	Average Annual Energy (GWh)	Change (GWh)	Factor Causing the Change (GWh)			
			Hydrological Data	Spill History	Fisheries Compensation History	Conversion Factor
1993	541					
1996	543	2	4	-3	-1	2
1998	549	6	3	1	0	2
2000	586	37	38	0	0	-1
2001	578	-8	-7	1	0	-2
2002	572	-6	-7	0	0	1

Hinds Lake Annual Average Energy Changes

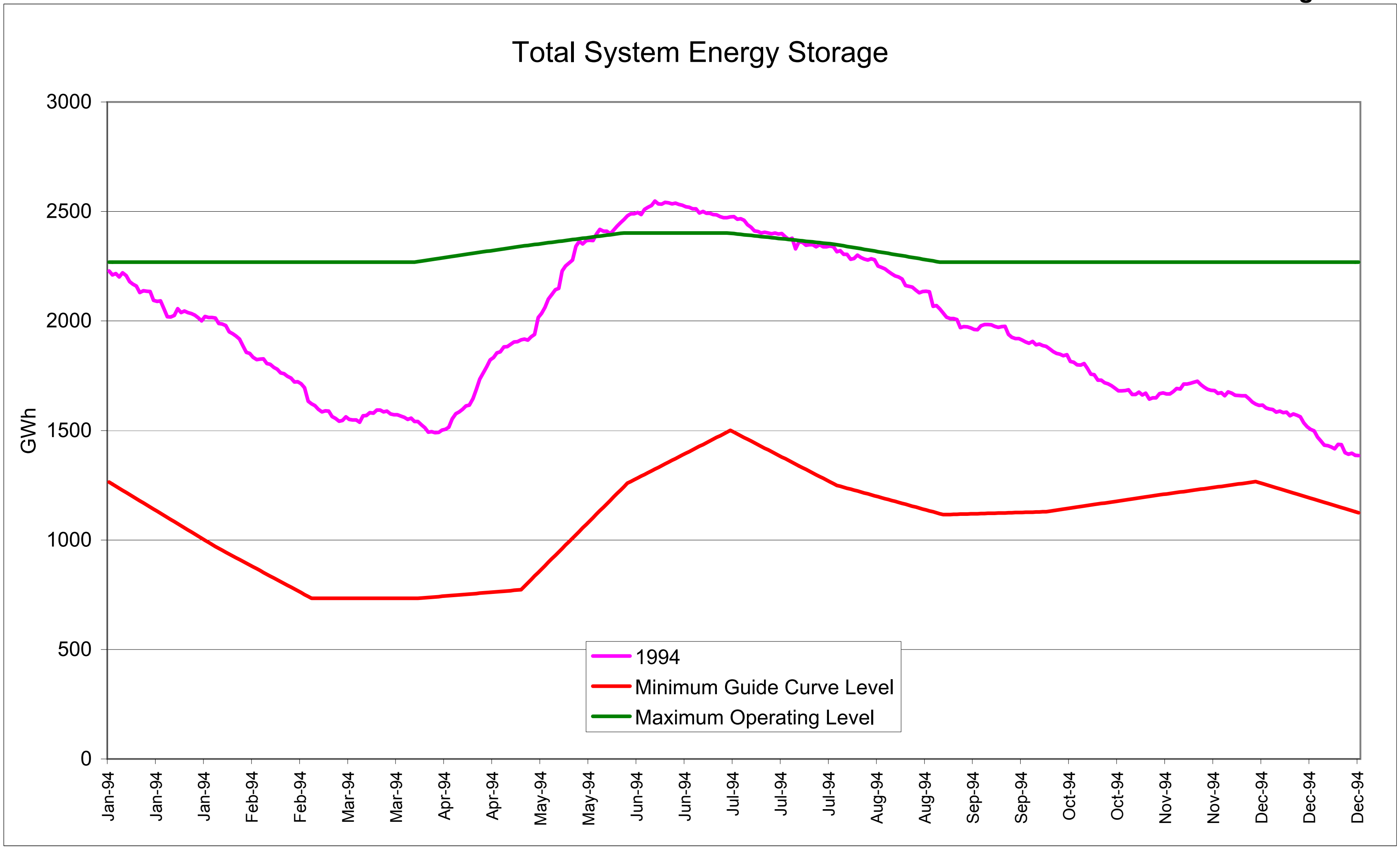
Year	Average Annual Energy (GWh)	Change (GWh)	Factor Causing the Change (GWh)			
			Hydrological Data	Spill History	Fisheries Compensation History	Conversion Factor
1993	340					
1996	341	1	2	0	0	-1
1998	339	-2	2	0	-1	-3
2000	357	18	18	-1	0	1
2001	354	-3	-3	0	0	0
2002	352	-2	-2	0	0	0

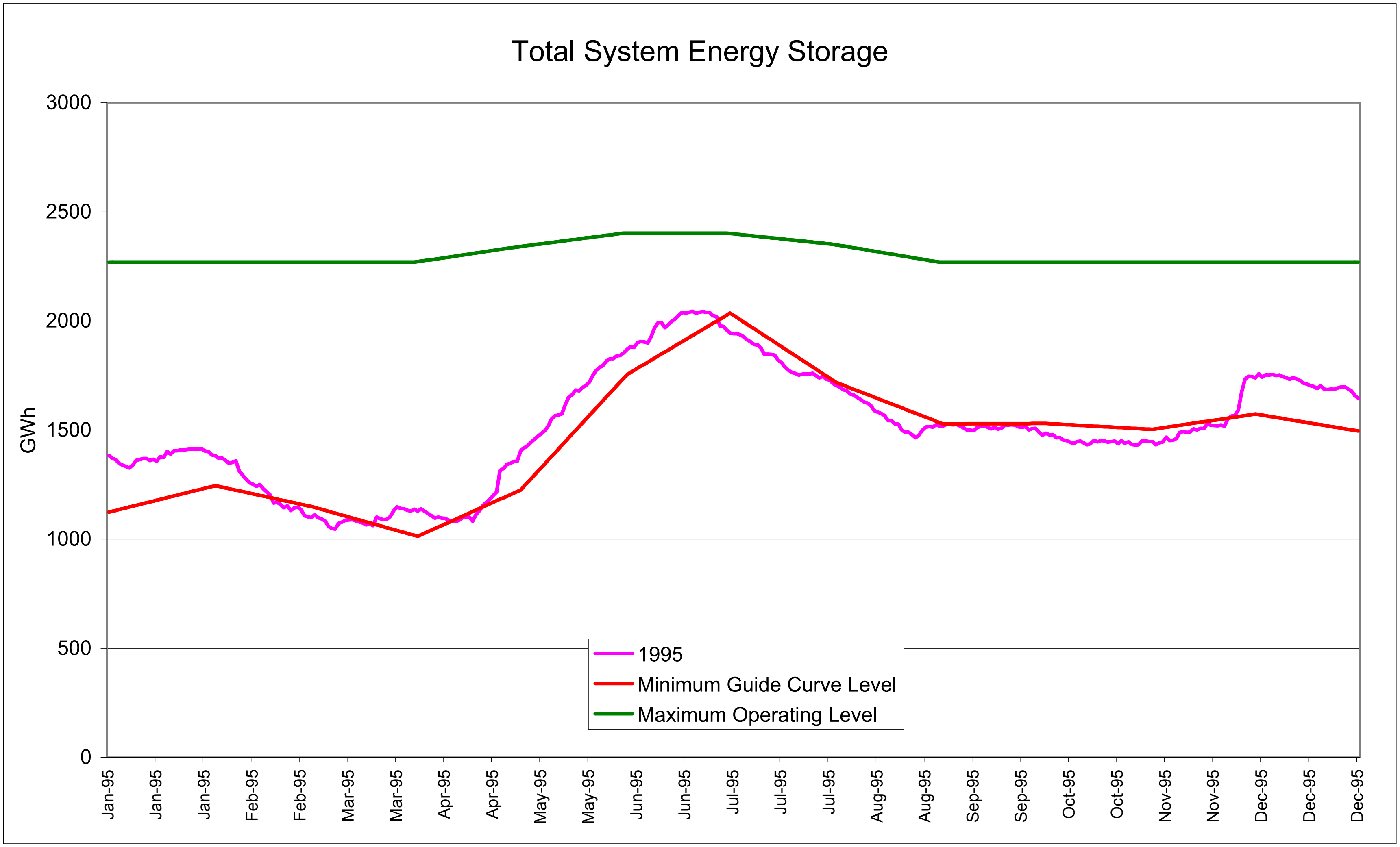
Cat Arm Annual Average Energy Changes

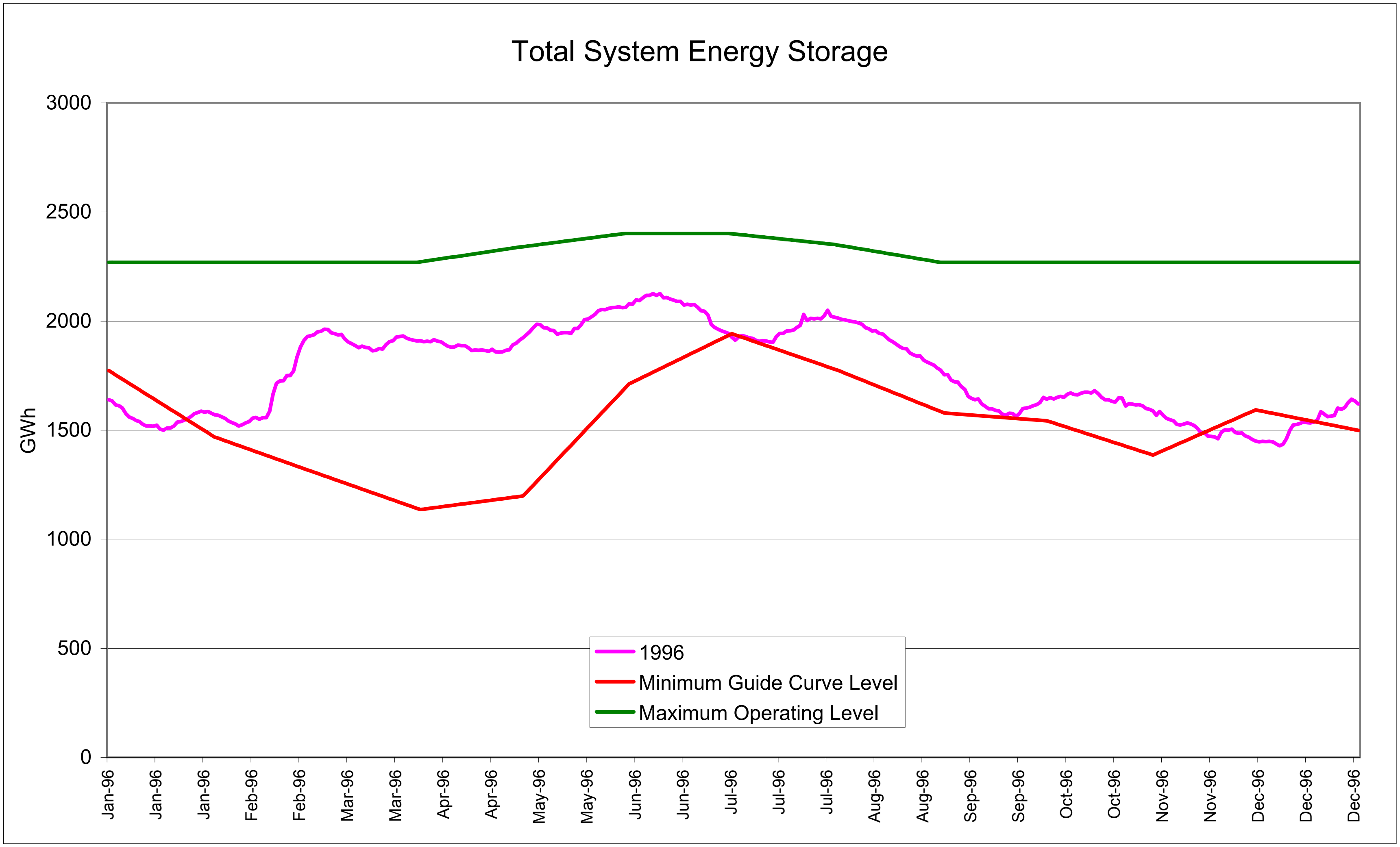
Year	Average Annual Energy (GWh)	Change (GWh)	Factor Causing the Change (GWh)			
			Hydrological Data	Spill History	Fisheries Compensation History	Conversion Factor
1993	735					
1996	742	7	2	11	0	-6
1998	736	-6	-1	3	0	-8
2000	734	-2	2	-1	0	-3
2001	731	-3	-6	1	0	2
2002	733	2	0	1	0	1

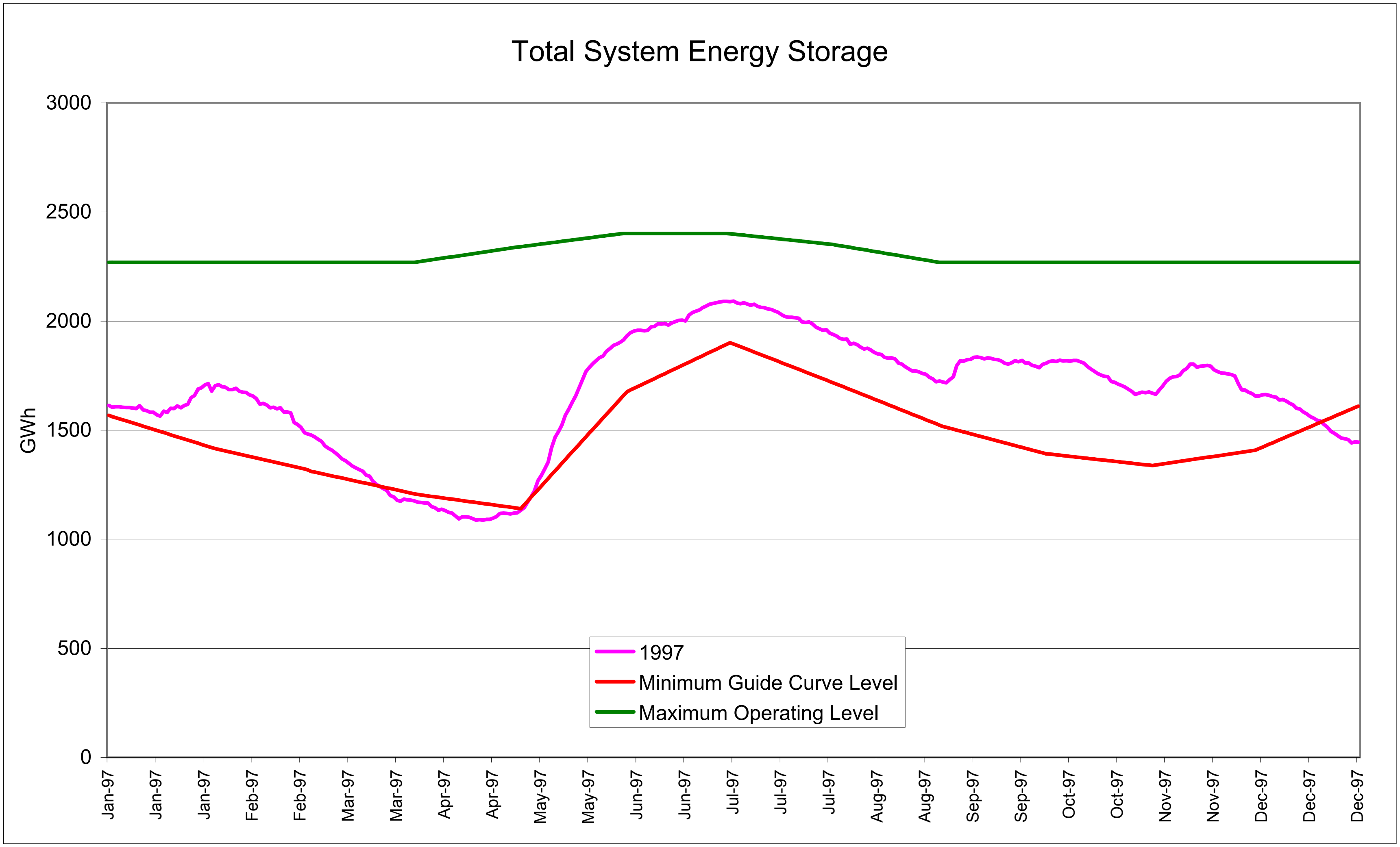
Paradise River Annual Average Energy Changes

Year	Average Annual Energy (GWh)	Change (GWh)	Factor Causing the Change (GWh)			
			Hydrological Data	Spill History	Fisheries Compensation History	Conversion Factor
1993	38					
1996	39	1	-1	0	0	2
1998	39	0	0	0	0	0
2000	38	-1	0	-1	0	0
2001	37	-1	0	0	0	-1
2002	37	0	0	0	0	0


Total System Energy Storage
GWh
3000
2500
2000
1500
1000
500
0
Jan-94
Jan-94
Jan-94
Feb-94
Feb-94
Mar-94
Mar-94
Apr-94
Apr-94
May-94
May-94
Jun-94
Jun-94
Jul-94
Jul-94
Jul-94
Aug-94
Aug-94
Sep-94
Sep-94
Oct-94
Oct-94
Nov-94
Nov-94
Dec-94
Dec-94
Dec-94
1994
Minimum Guide Curve Level
Maximum Operating Level


Total System Energy Storage
GWh
3000
2500
2000
1500
1000
500
0
Jan-95
Jan-95
Jan-95
Feb-95
Feb-95
Mar-95
Mar-95
Apr-95
Apr-95
May-95
May-95
Jun-95
Jun-95
Jul-95
Jul-95
Jul-95
Aug-95
Aug-95
Sep-95
Sep-95
Oct-95
Oct-95
Nov-95
Nov-95
Dec-95
Dec-95
Dec-95
1995
Minimum Guide Curve Level
Maximum Operating Level


Total System Energy Storage
GWh
3000
2500
2000
1500
1000
500
0
Jan-96
Jan-96
Jan-96
Feb-96
Feb-96
Mar-96
Mar-96
Apr-96
Apr-96
May-96
May-96
Jun-96
Jun-96
Jul-96
Jul-96
Jul-96
Aug-96
Aug-96
Sep-96
Sep-96
Oct-96
Oct-96
Nov-96
Nov-96
Dec-96
Dec-96
Dec-96
1996
Minimum Guide Curve Level
Maximum Operating Level


Total System Energy Storage
GWh
3000
2500
2000
1500
1000
500
0
1997
Minimum Guide Curve Level
Maximum Operating Level
Jan-97
Jan-97
Jan-97
Feb-97
Feb-97
Mar-97
Mar-97
Apr-97
Apr-97
May-97
May-97
Jun-97
Jun-97
Jul-97
Jul-97
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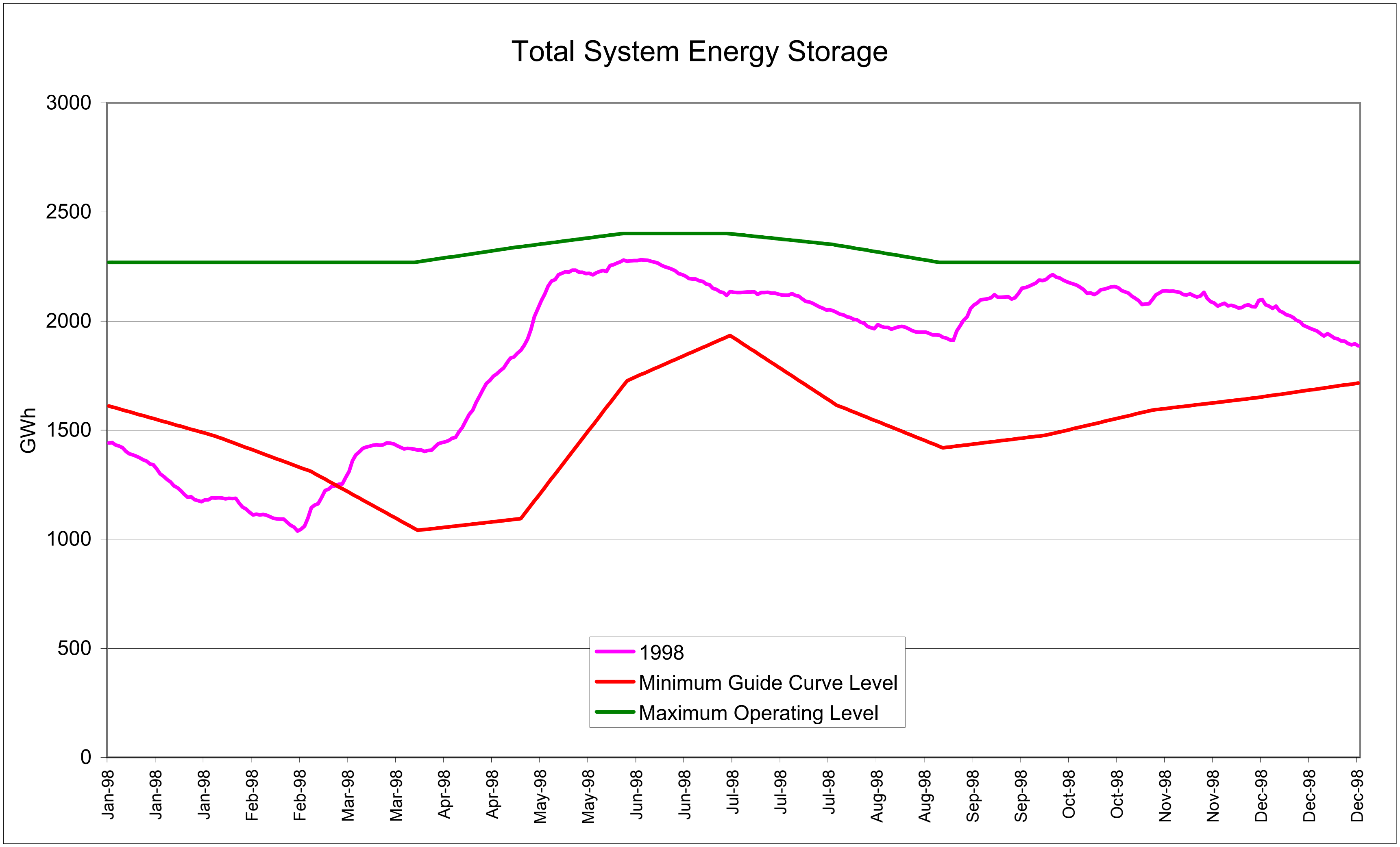
Dec-97
Dec-97
Dec-97


Total System Energy Storage
GWh
3000
2500
2000
1500
1000
500
0
1998
Minimum Guide Curve Level
Maximum Operating Level
Jan-98
Jan-98
Jan-98
Feb-98
Feb-98
Mar-98
Mar-98
Apr-98
Apr-98
May-98
May-98
Jun-98
Jun-98
Jul-98
Jul-98
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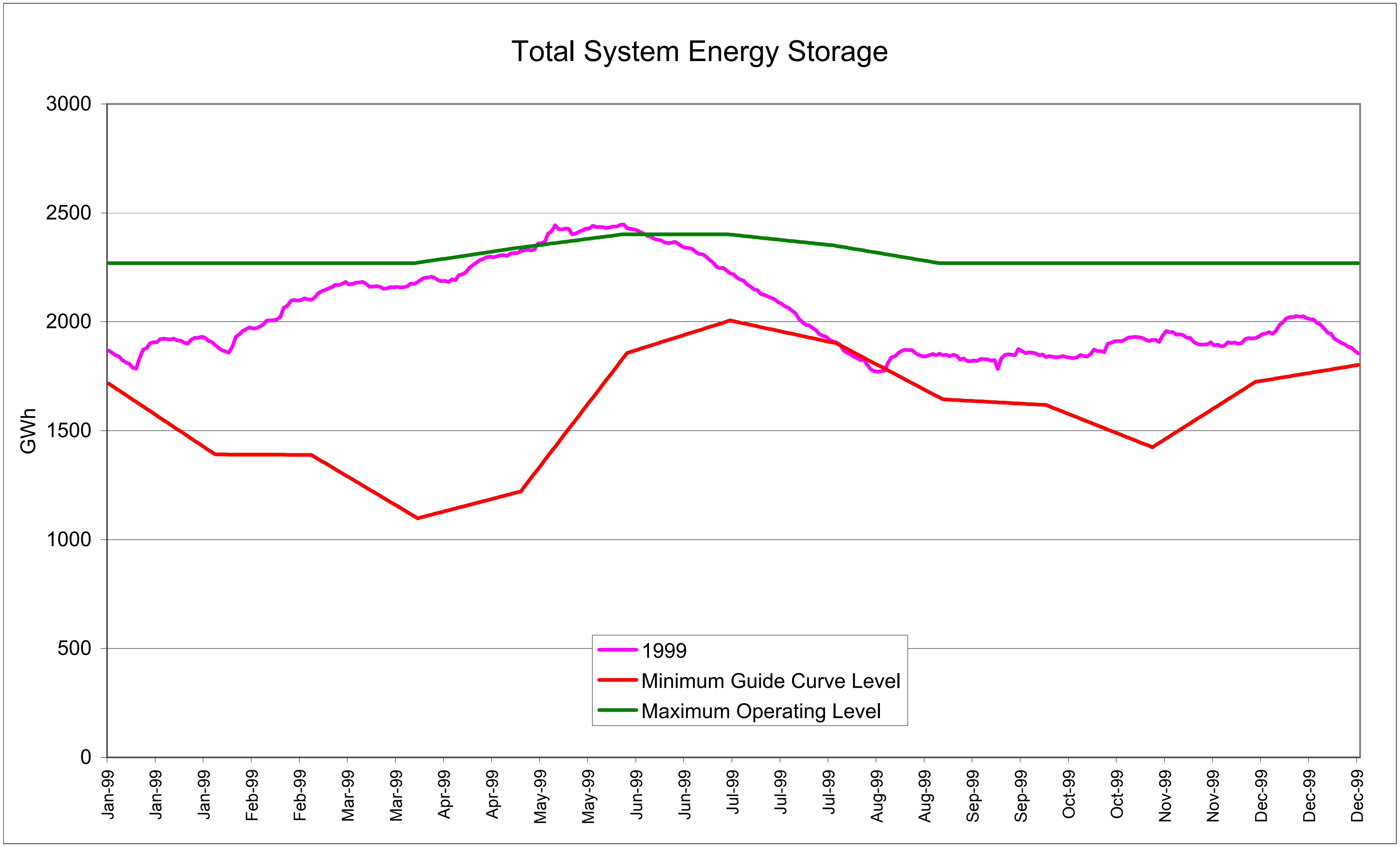
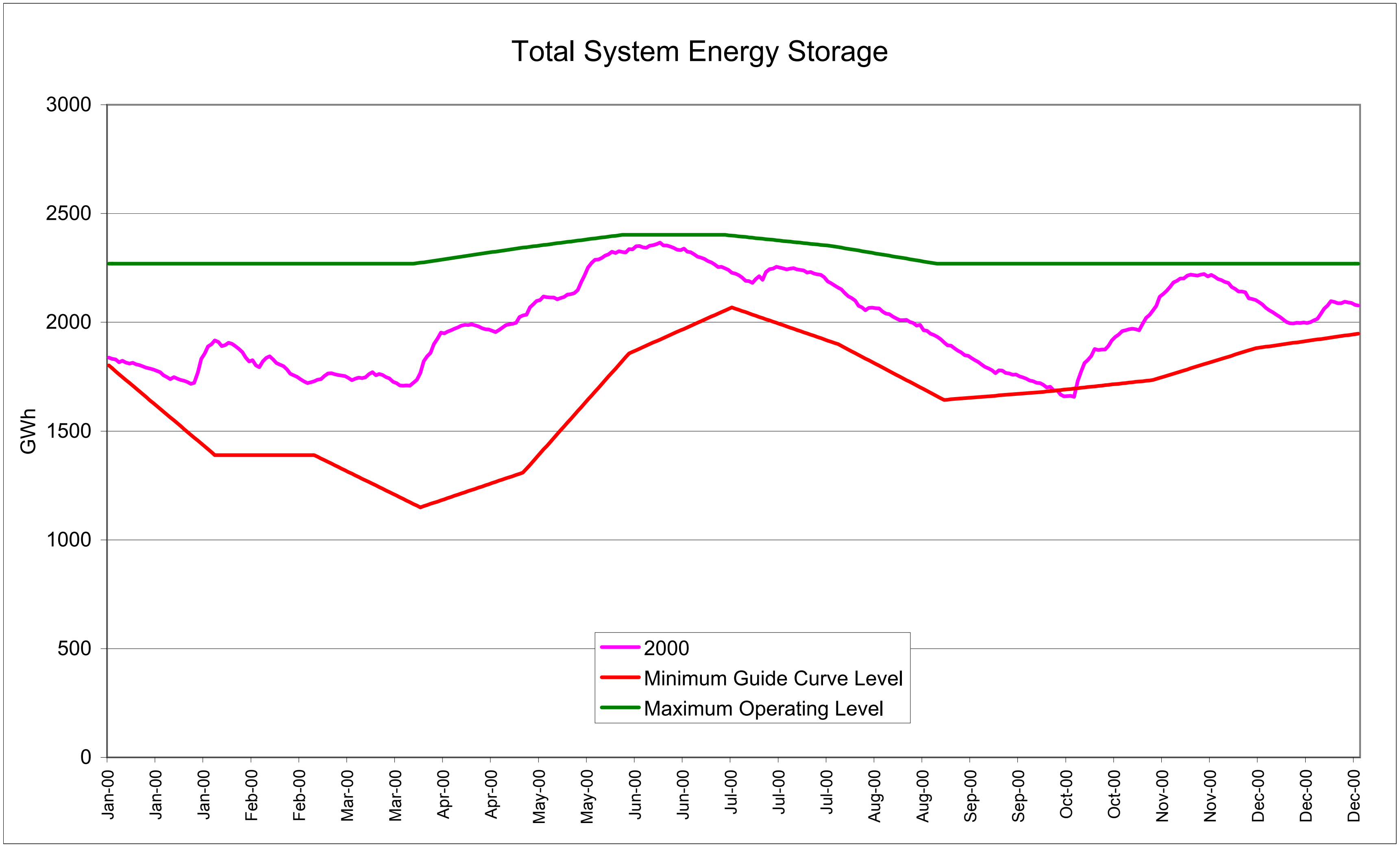
Dec-98
Dec-98
Dec-98


Total System Energy Storage
3000
2500
2000
1500
1000
500
0
GWh
Jan-99
Jan-99
Jan-99
Feb-99
Feb-99
Mar-99
Mar-99
Apr-99
Apr-99
May-99
May-99
Jun-99
Jun-99
Jul-99
Jul-99
Jul-99
Aug-99
Aug-99
Sep-99
Sep-99
Oct-99
Oct-99
Nov-99
Nov-99
Dec-99
Dec-99
Dec-99
1999
Minimum Guide Curve Level
Maximum Operating Level


Total System Energy Storage
GWh
3000
2500
2000
1500
1000
500
0
Jan-00
Jan-00
Jan-00
Feb-00
Feb-00
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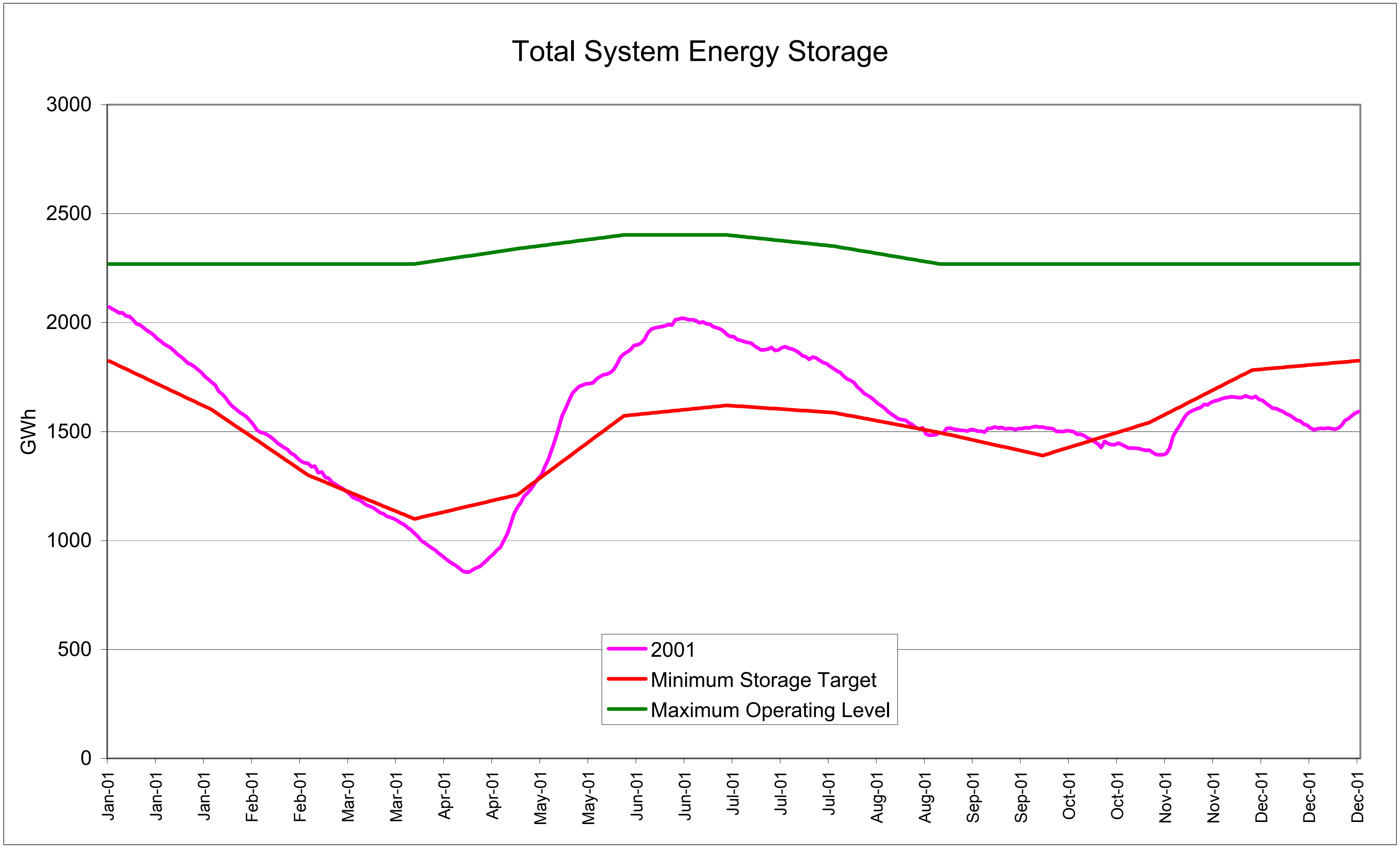
Mar-00
Apr-00
Apr-00
May-00
May-00
Jun-00
Jun-00
Jul-00
Jul-00
Jul-00
Aug-00
Aug-00
Sep-00
Sep-00
Oct-00
Oct-00
Nov-00
Nov-00
Dec-00
Dec-00
Dec-00
2000
Minimum Guide Curve Level
Maximum Operating Level


Total System Energy Storage
GWh
3000
2500
2000
1500
1000
500
0
Jan-01
Jan-01
Jan-01
Feb-01
Feb-01
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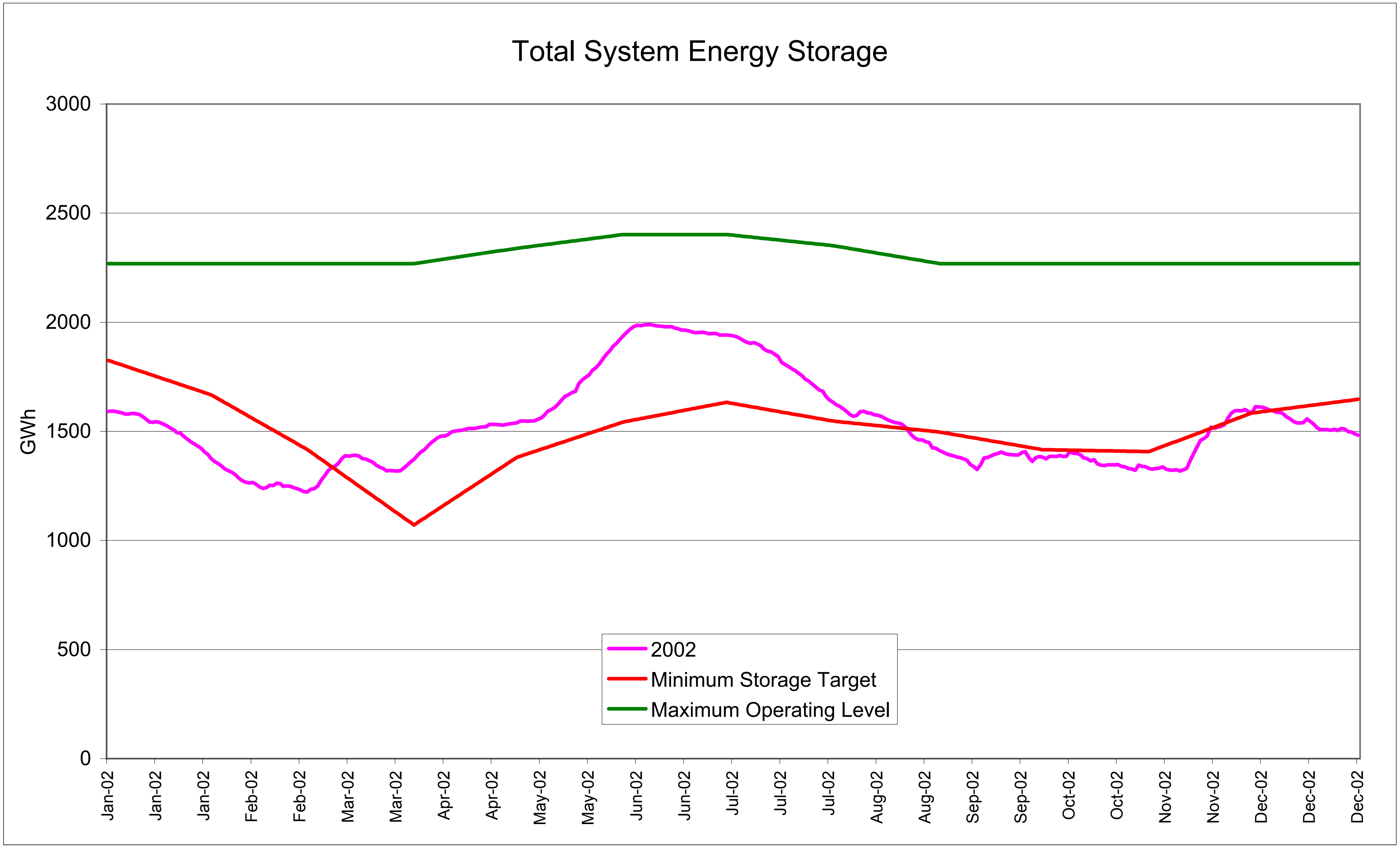
Mar-01
Apr-01
Apr-01
May-01
May-01
Jun-01
Jun-01
Jul-01
Jul-01
Jul-01
Aug-01
Aug-01
Sep-01
Sep-01
Oct-01
Oct-01
Nov-01
Nov-01
Dec-01
Dec-01
Dec-01
2001
Minimum Storage Target
Maximum Operating Level


Total System Energy Storage
GWh
3000
2500
2000
1500
1000
500
0
Jan-02
Jan-02
Jan-02
Feb-02
Feb-02
Mar-02
Mar-02
Apr-02
Apr-02
May-02
May-02
Jun-02
Jun-02
Jul-02
Jul-02
Jul-02
Aug-02
Aug-02
Sep-02
Sep-02
Oct-02
Oct-02
Nov-02
Nov-02
Dec-02
Dec-02
Dec-02
2002
Minimum Storage Target
Maximum Operating Level