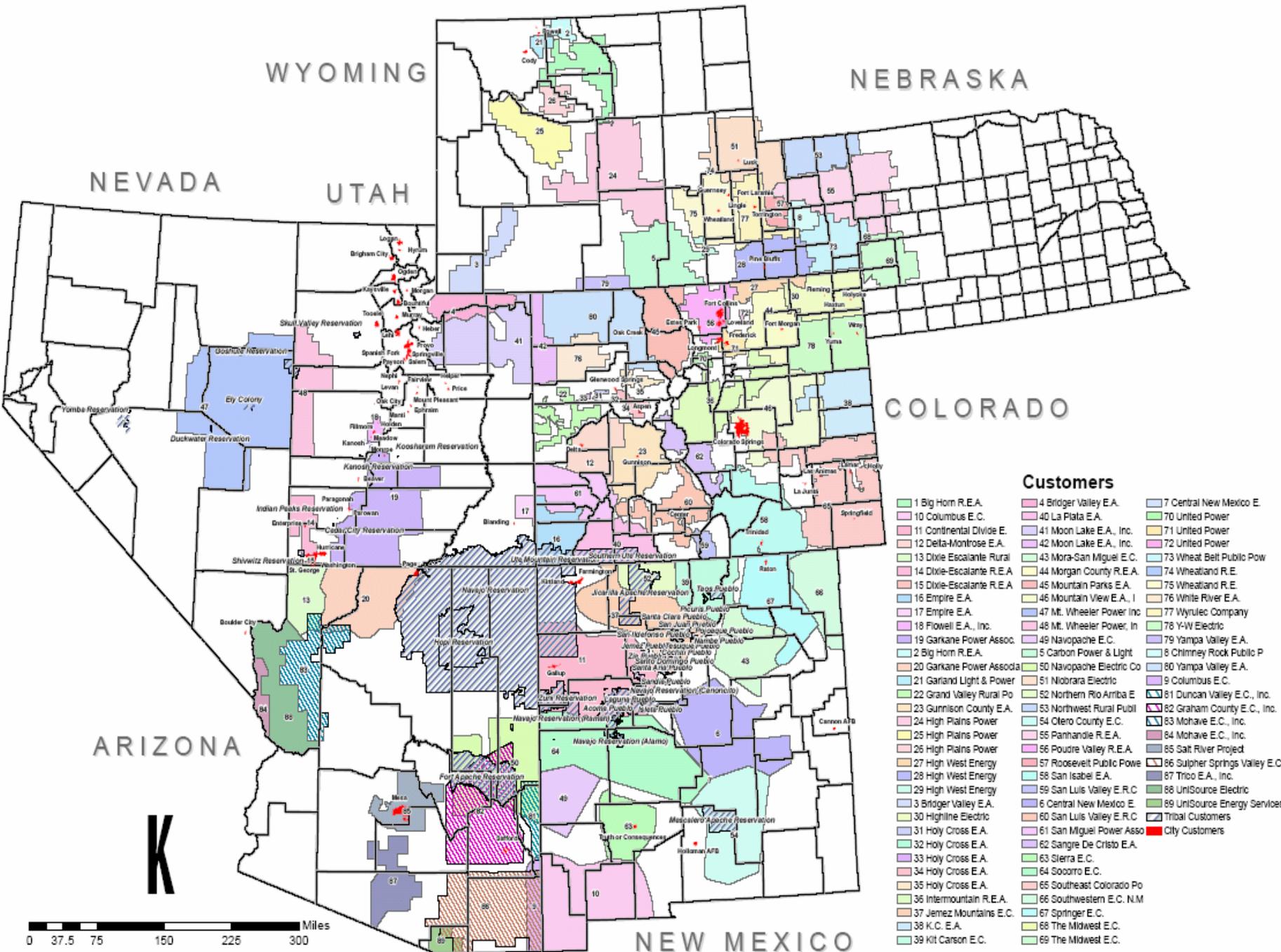


SLCA/IP (aka CRSP) Customer Service Area Mapping Project

- GIS mapping of customer service areas
- Service areas can be overlaid with census data, other demographic data and political boundaries





WYOMING

NEBRASKA

NEVADA

UTAH

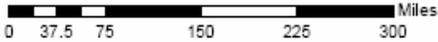
COLORADO

ARIZONA

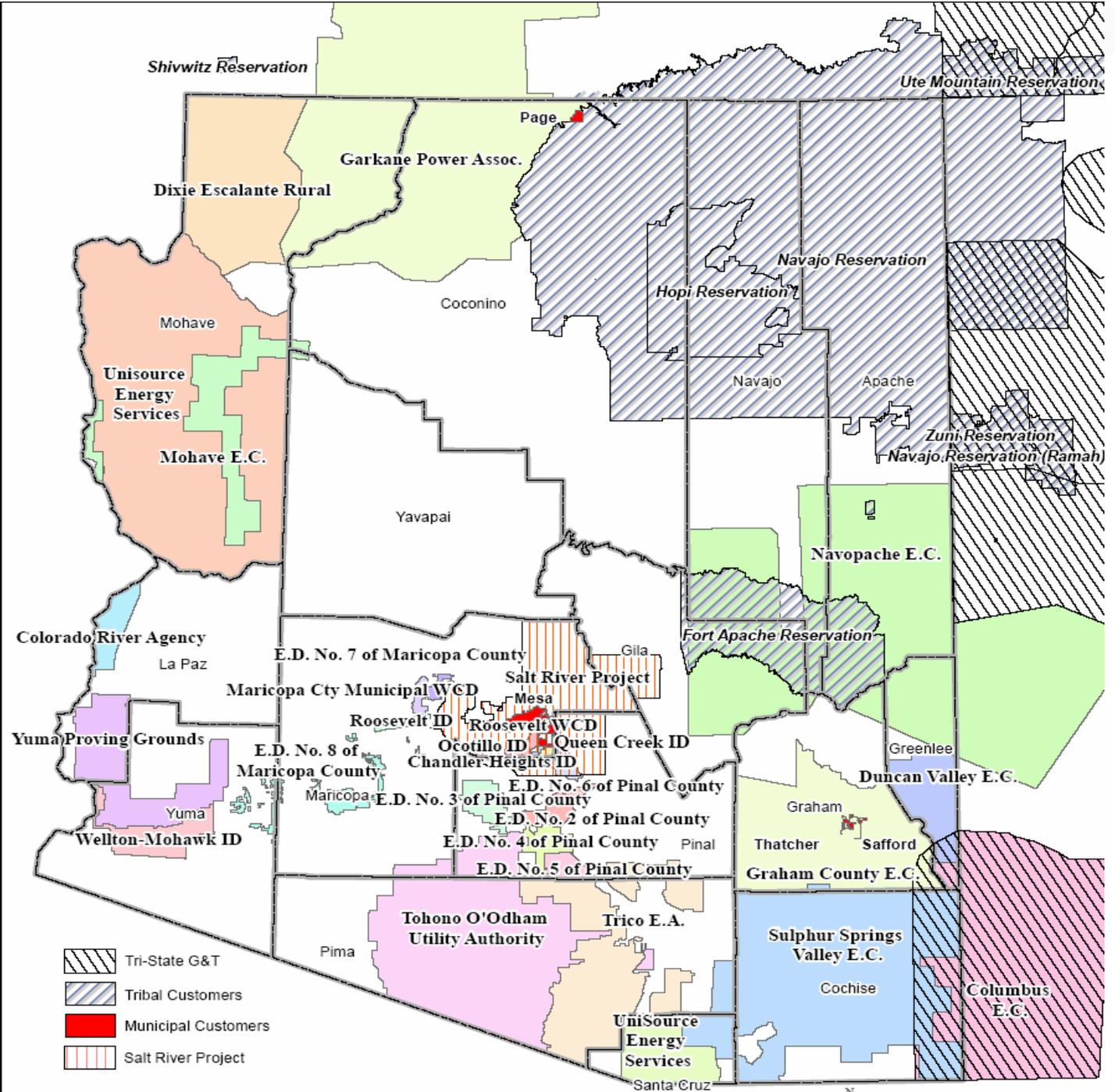
NEW MEXICO

Customers

- 1 Big Horn R.E.A.
- 2 Big Horn R.E.A.
- 3 Bridger Valley E.A.
- 4 Carbon Power & Light
- 5 Carbon Power & Light
- 6 Central New Mexico E
- 7 Central New Mexico E
- 8 Chimney Rock Public P
- 9 Columbus E.C.
- 10 Columbus E.C.
- 11 Continental Divide E
- 12 Delta-Monrose E.A.
- 13 Dixie Escalante Rural
- 14 Dixie-Escalante R.E.A.
- 15 Dixie-Escalante R.E.A.
- 16 Empire E.A.
- 17 Empire E.A.
- 18 Flowell E.A., Inc.
- 19 Garkane Power Assoc.
- 20 Garkane Power Assoc
- 21 Garland Light & Power
- 22 Grand Valley Rural Po
- 23 Gurnison County E.A.
- 24 High Plains Power
- 25 High Plains Power
- 26 High Plains Power
- 27 High West Energy
- 28 High West Energy
- 29 High West Energy
- 30 Highline Electric
- 31 Holy Cross E.A.
- 32 Holy Cross E.A.
- 33 Holy Cross E.A.
- 34 Holy Cross E.A.
- 35 Holy Cross E.A.
- 36 Intermountain R.E.A.
- 37 Jemez Mountains E.C.
- 38 K.C. E.A.
- 39 Kit Carson E.C.
- 40 La Plata E.A.
- 41 Moon Lake E.A., Inc.
- 42 Moon Lake E.A., Inc.
- 43 Mora-San Miguel E.C.
- 44 Morgan County R.E.A.
- 45 Mountain Parks E.A.
- 46 Mountain View E.A., I
- 47 Mt. Wheeler Power Inc
- 48 Mt. Wheeler Power, In
- 49 Navapoe E.C.
- 50 Navapoe Electric Co
- 51 Niobrara Electric
- 52 Northern Rio Arriba E
- 53 Northwest Rural Publ
- 54 Otero County E.C.
- 55 Panhandle E.A.
- 56 Poudre Valley R.E.A.
- 57 Roosevelt Public Powe
- 58 San Isabel E.A.
- 59 San Luis Valley E.R.C
- 60 San Luis Valley E.R.C
- 61 San Miguel Power Asso
- 62 Sangre De Cristo E.A.
- 63 Sierra E.C.
- 64 Soorro E.C.
- 65 Southeast Colorado Po
- 66 Southwestern R.E.C. N.M
- 67 Springer E.C.
- 68 The Midwest E.C.
- 69 The Midwest E.C.
- 70 United Power
- 71 United Power
- 72 United Power
- 73 Wheat Belt Public Pow
- 74 Wheatland R.E.
- 75 Wheatland R.E.
- 76 White River E.A.
- 77 Wyrulec Company
- 78 Y-W Electric
- 79 Yampa Valley E.A.
- 80 Yampa Valley E.A.
- 81 Columbus E.C.
- 82 Duncan Valley E.C., Inc.
- 83 Graham County E.C., Inc.
- 84 Mohave E.C., Inc.
- 85 Poudre River Project
- 86 Sulpher Springs Valley E.C.
- 87 Tinco E.A., Inc.
- 88 UniSource Electric
- 89 UniSource Energy Services
- 90 Tribal Customers
- City Customers



K



-  Tri-State G&T
-  Tribal Customers
-  Municipal Customers
-  Salt River Project

Three Years of Experimentation at Glen Canyon Dam: the Electrical Power Economic Costs



S. Clayton Palmer

*Manager, Environmental Planning & Resource Analysis
Colorado River Storage Project - Management Center
Western Area Power Administration*

- **The Financial Costs to Western and its Customers of Experimentation at Glen Canyon Dam: FY 03 (peer-review draft report)**
S. Clayton Palmer and Heather Patno
- **The Financial Cost to Western and its Customers of Experimentation at Glen Canyon Dam: FY 04, (draft report)**
S. Clayton Palmer and Heather Patno
- **The Financial Cost to Western and its Customers of Experimentation at Glen Canyon Dam: FY 05 (in preparation)**
S. Clayton Palmer and Heather Patno



Sources of Financial Impact

- Restrictions that put limits on the daily hydrograph
 - e.g. limiting down ramps to 1,500 cfs
- Reallocation water volumes from some months to other months
 - While most of the controversy is centered around the restrictions on the daily hydrograph, reallocation of monthly volumes can have a greater financial impact



Even though Western's financial studies are focused on impacts in a fiscal year, it will be more instructive to review the financial impact of each GCD experiment in isolation before combining the impact of several experiments



Non Native Fish Suppression Flows January – March, 2003

- Impact of modified daily hydrograph – all three winter months: \$1.39 Million – a financial gain
- Impact when the reallocation of monthly water volumes is included: - \$.99 Million

(assumes that most of the water volume added to March, 03 came from December, 02)

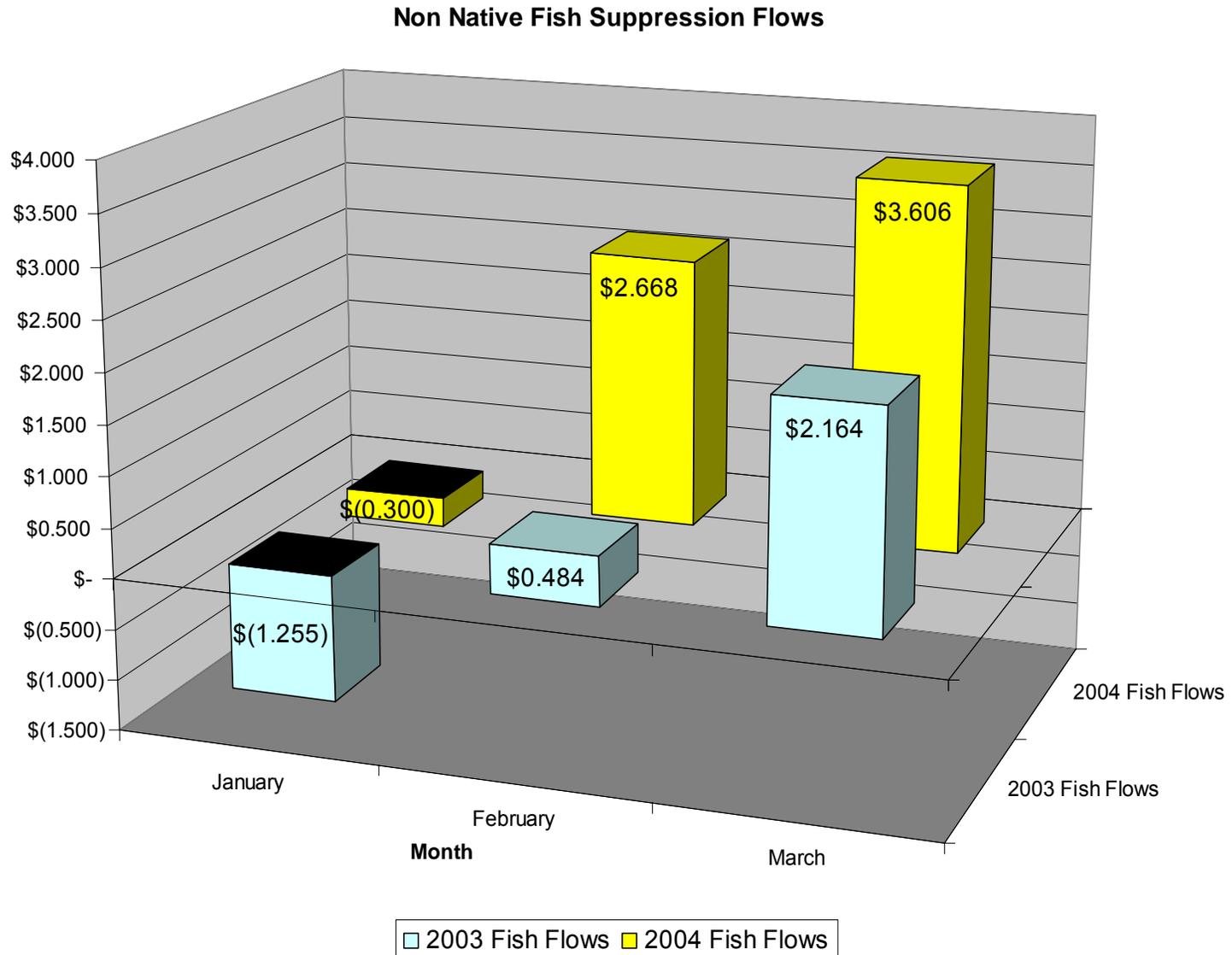


Non Native Fish Suppression Flows January – March, 2004

- Impact of modified daily hydrograph – all three winter months: \$5.97 Million a financial gain
- Impact when the reallocation of monthly water volumes is included: \$2.67

Non-native Fish Suppression Flows

(aka: Trout Suppression Flows)



Comparison: 2003 vs 2004

- Changes were made to the daily hydrograph in 2004 adding two hours to the daily peak flows and eliminated the peak flows on Sunday
- The weekday change provided a better match between CRSP generation and the combined customers schedule

(note: results are subject to peer review and are sensitive to prices used)



The Financial Impact of Autumnal Reallocations of Monthly Water Volumes

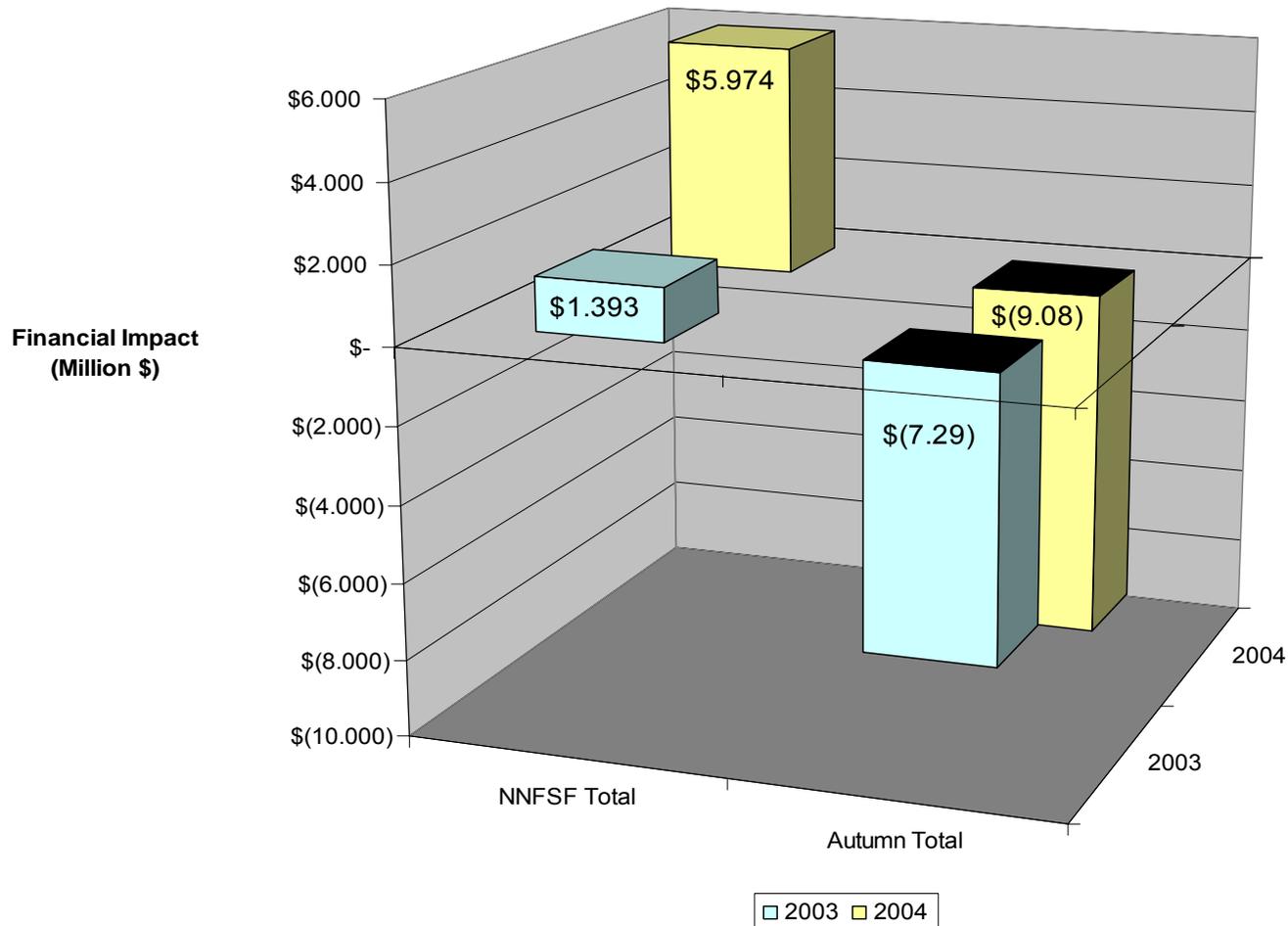
- In WY 03, & 04, GCD monthly water release targets were reduced in preparation for the possibility of a January BHBF
- Autumnal monthly targets remained low against the possibility of the trigger and a subsequent need for low velocity releases until January
- In each year, no sediment trigger occurred

- 2003 Autumnal Cost \$(7.29) Million
- 2004 Autumnal Cost \$(9.08) Million



Financial Impact of Combined GCD Experiments, FY 03 & 04

Total Financial Impact From NNFSF and Autumnal Movement of Water



Financial Impact of Combinations of GCD Experiments

- WY 03 Combined Financial Impact of Autumnal water reallocation and NNFS flows: - \$5.90 Million
- WY 04 Combined Financial Impacts of Autumnal water reallocation and NNFS flows: - \$ 3.11 Million



Beach Habitat Building Flows

November, 2004

- Total Estimated Cost of modification of the daily hydrograph in November: \$.766 Million
(includes pre BHBF and post BHBF “photo flows”)
- Estimated Cost of Reallocation of monthly water volumes from other months into November: \$3.6 Million

(Note: these results are subject to modification in future drafts and are sensitive to the prices used and the assumptions made regarding the reallocation of monthly water volumes in the test case)



The Electrical Power Economic Impacts of Liberalizing Glen Canyon Dam Operational Constraints

S. Clayton Palmer, Clark Burbidge, and
Wayne Cook
(in preparation)



Purposes of this research

- To develop information regarding the magnitude of impacts on hydroelectric generation from experiments or management actions – (e.g. for completion of the hydropower “matrix” of the MATA process)
- To assist in developing experiments regarding the impact of the operational parameters of the MLFF
- To assist participants in the GC AMP in an understanding of the GCD hydropower resource and the effect of MLFF operating constraints



Understanding Financial Impacts

- CRSP Long-term, firm power customers have are given monthly energy allocations, minimum “take” requirements and seasonal capacity limits
- CRSP customers have the flexibility to schedule their monthly energy as they wish within these limits



Understanding Financial Impacts (cont)

- Western schedules daily and hourly generation from the CRSP powerplants to meet a combined customer “load” or “schedule
- What is cannot be generated by CRSP powerplants must be purchased on the wholesale electrical market
- CRSP generation that exceeds customer load is sold to the wholesale electrical market



Understanding Financial Impacts (cont)

- Electrical purchases are usually made in “blocks” (e.g. 24 hour block or 16 hour block)
- When purchases are necessary, Western purchases a block. This block is placed at the bottom of a “resource stack” and CRSP generation is used to follow changes in “load”
- Purchases for fewer hours than a traditional block are much more expensive

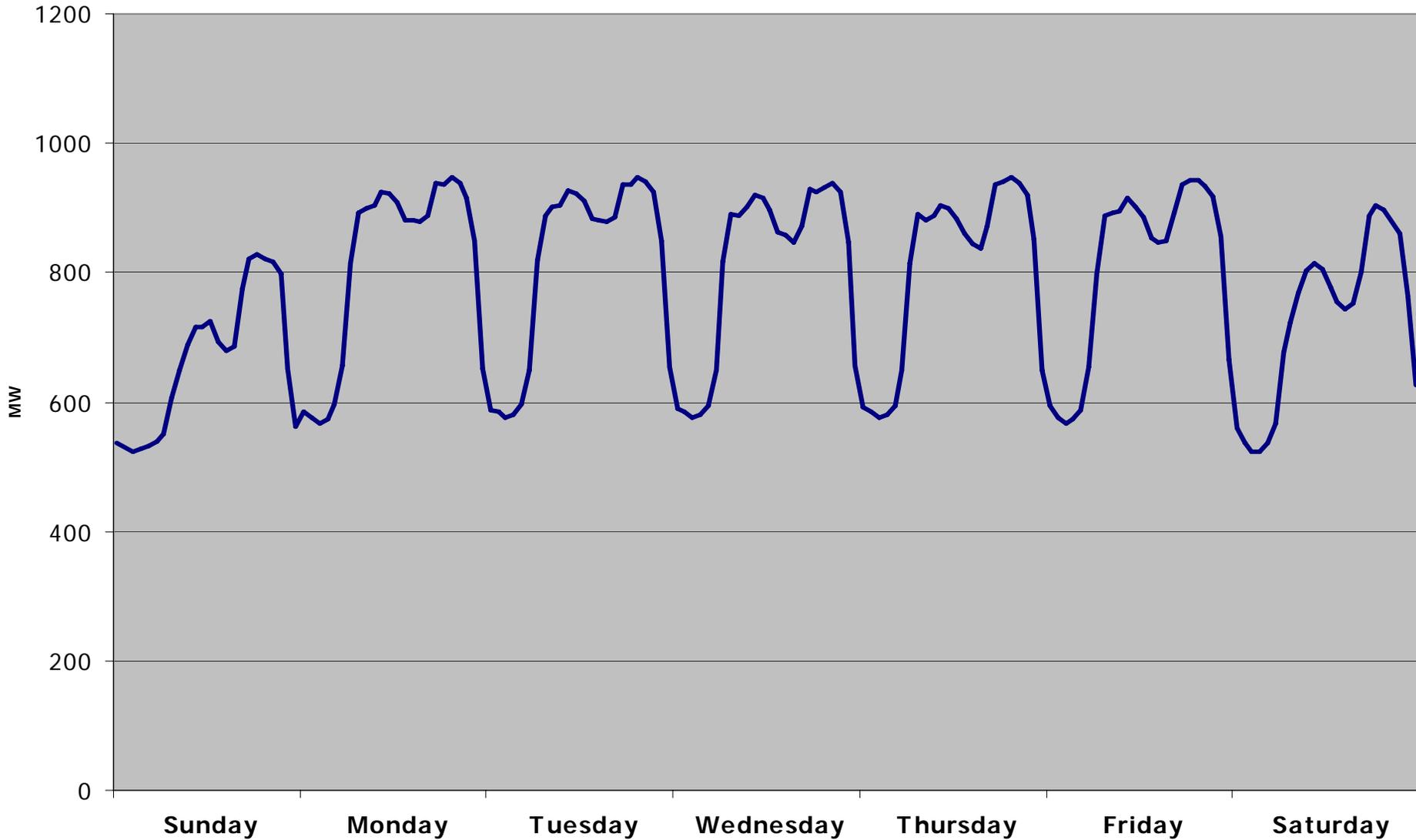


Understanding Financial Impacts (cont)

- The financial effects of GCD operating constraints, by and large, occur in direct in direct proportion to how the CRSP powerplants can be scheduled to meet the combined CRSP customer “load”



Illustration of CRSP Customers' Schedule for a Typical Winter Week

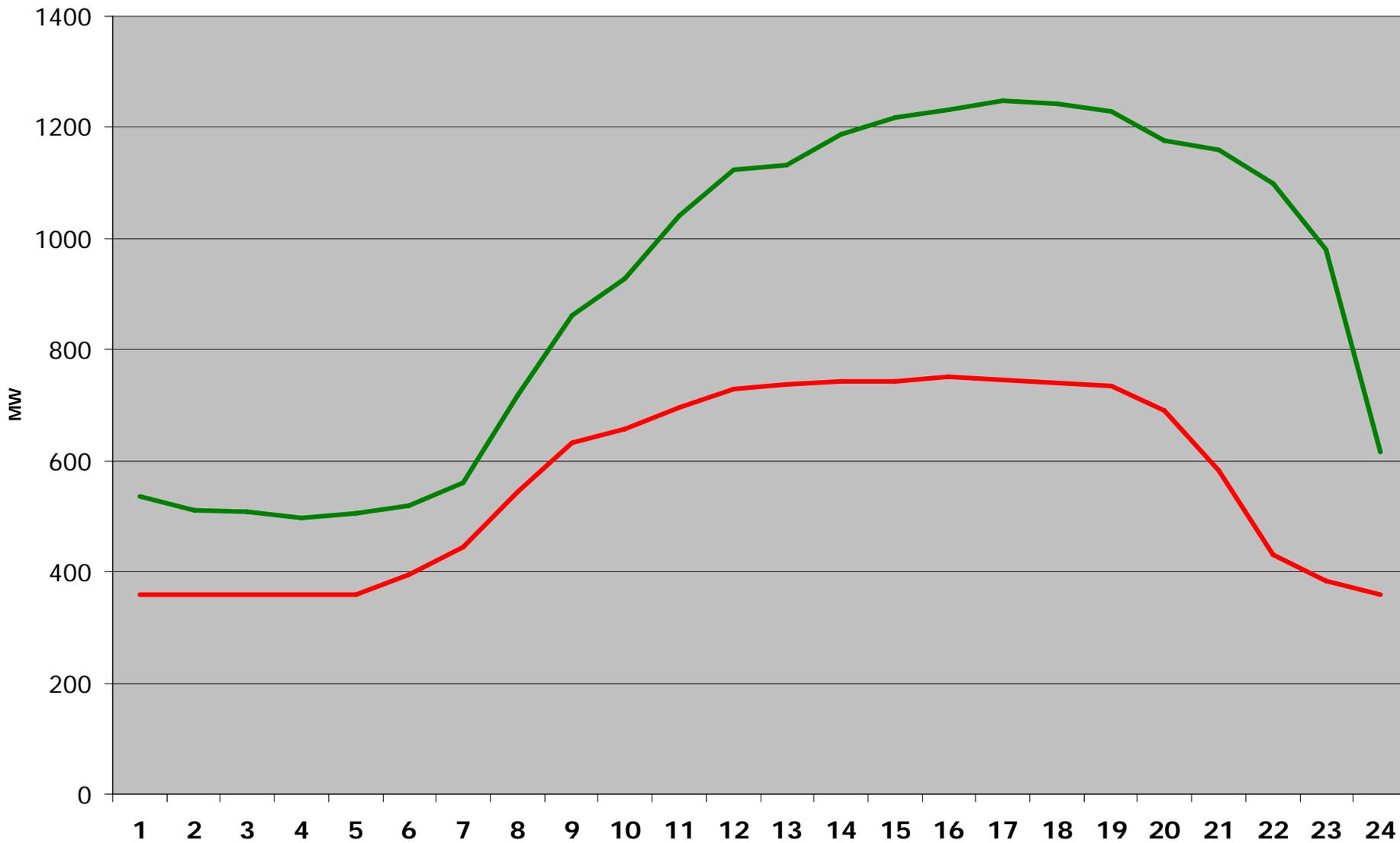


Contract Amendment #4

- Negotiated, written and signed in anticipation of the GCD ROD
- Establishes a “floor” commitment level and allows Western to reduce its firm obligation on a seasonal basis down to this floor, as a result of hydrological conditions or operational restrictions



CRSP Combined Customer Schedule 1994 vs 2004



Post ROD Reduction in Commitment Levels to CRSP Customers

- Financial Impacts of replacing peak-hour electrical generation are not included in Western's reports on the financial impact or GCD experimentation
- Western's efforts are now directed at meeting new, usually lower, contractual obligations
- There has been no ex-post analysis on the power resource impacts predicted by the EIS



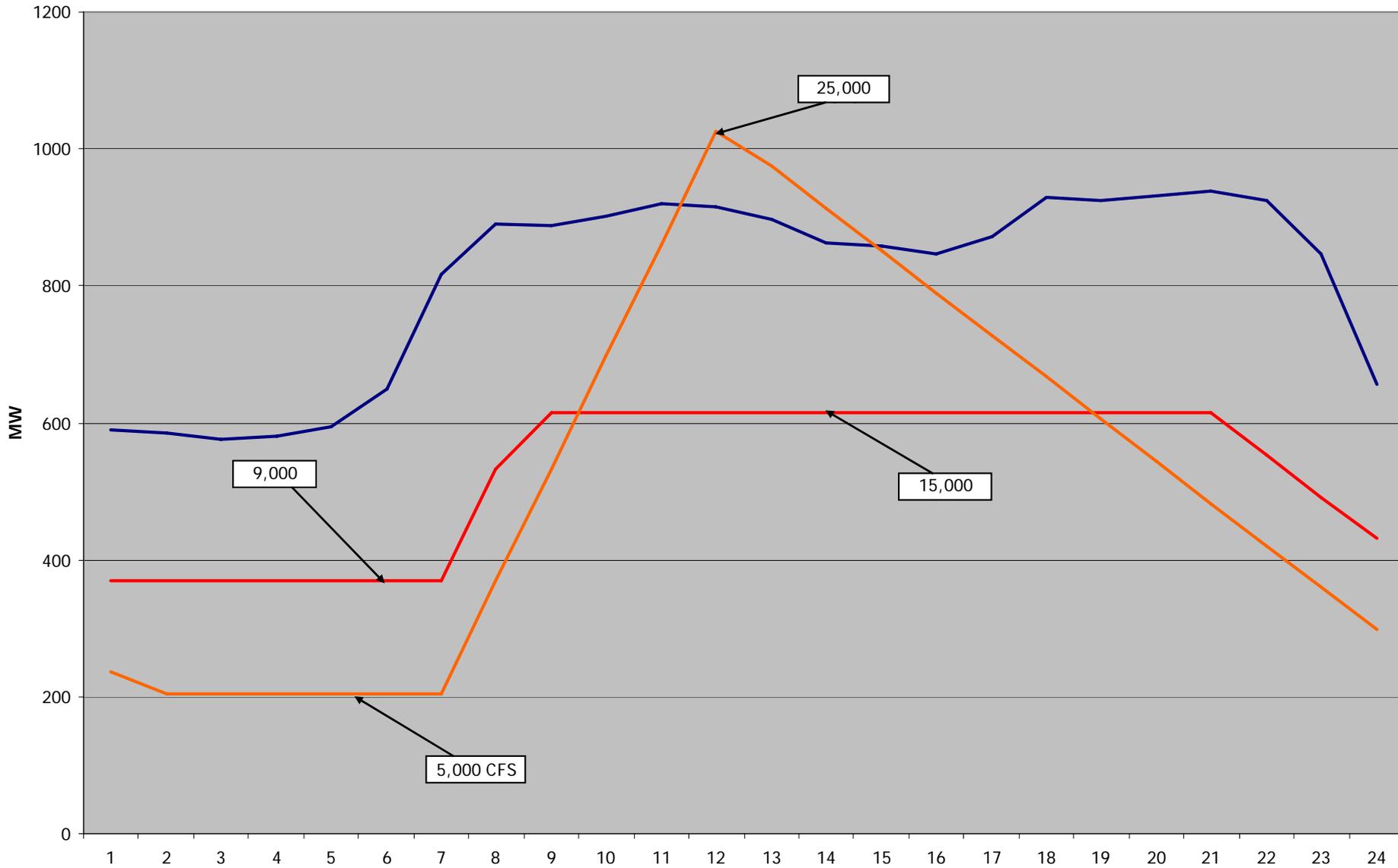
MLFF Operating Parameters

- Down ramp: limited to 1,500 cfs
- Up ramp: limited to 4,000 cfs
- Maximum daily change: 5,000 cfs, 6,000 cfs or 8,000 cfs (volume dependent)
- Minimum release: 5,000 cfs, 7pm – 7 am
8,000 cfs 7 am – 7 pm

Maximum release: 25,000 cfs (hydrological conditions permitting)

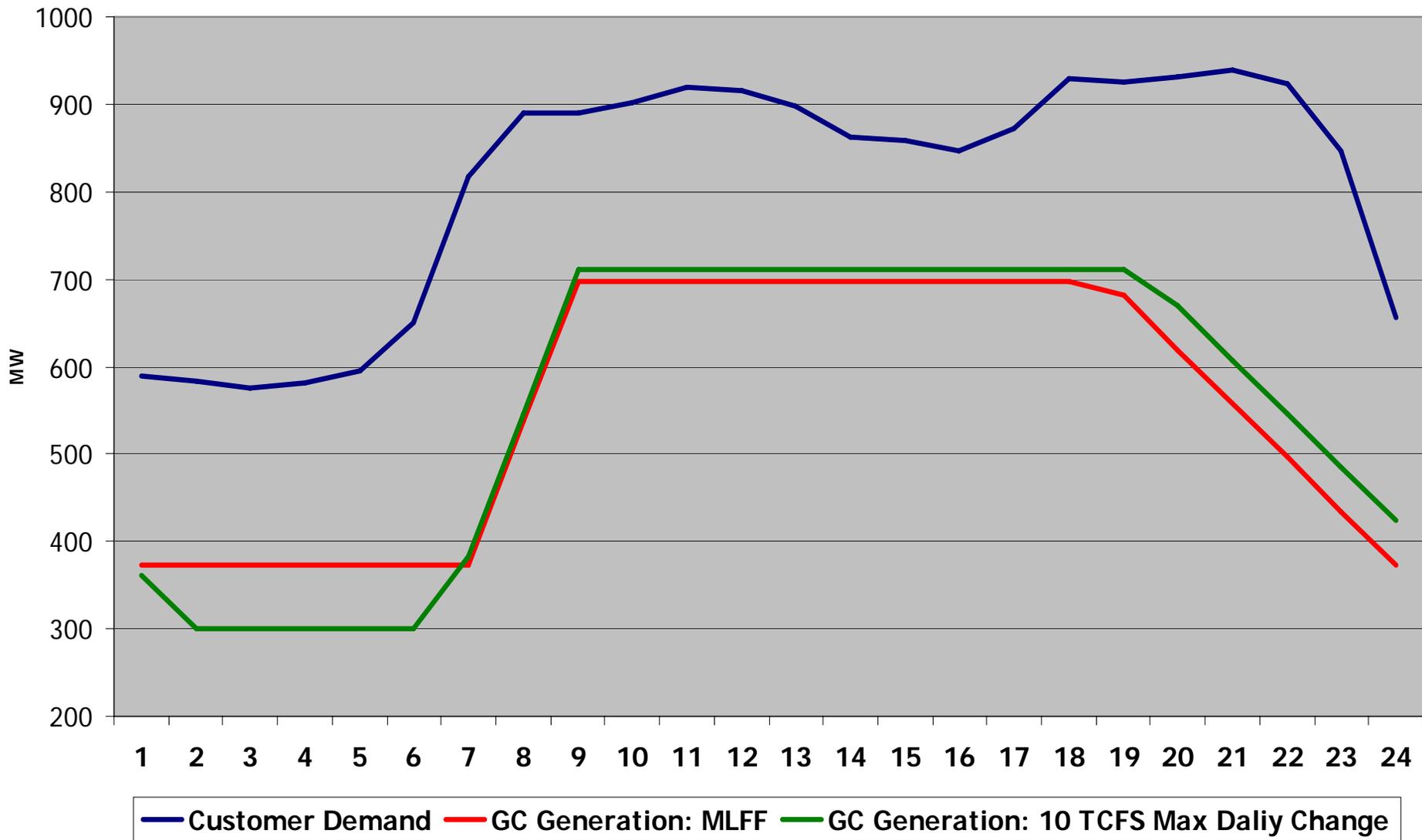


Significant Relaxation of Maximum Daily Change [in Isolation]



Moderate Relaxation in Maximum Daily Change

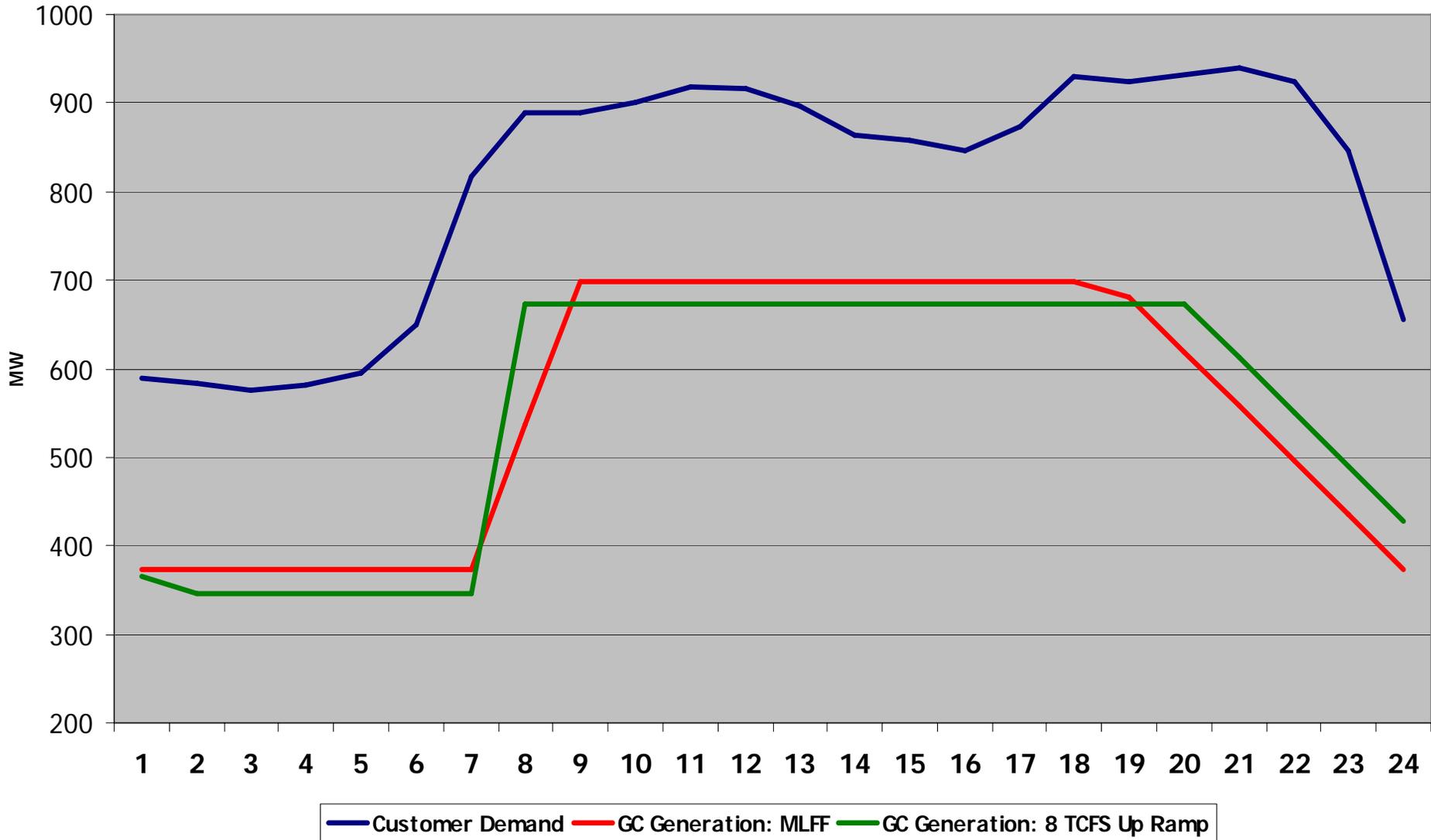
Modeled December Weekday Generation and Load
Max Daily Change: 10 TCFS, Up Ramp: 4 TCFS/hr, Down Ramp 1.5 TCFS/hr



Relaxation of Up-ramp Restriction – in isolation

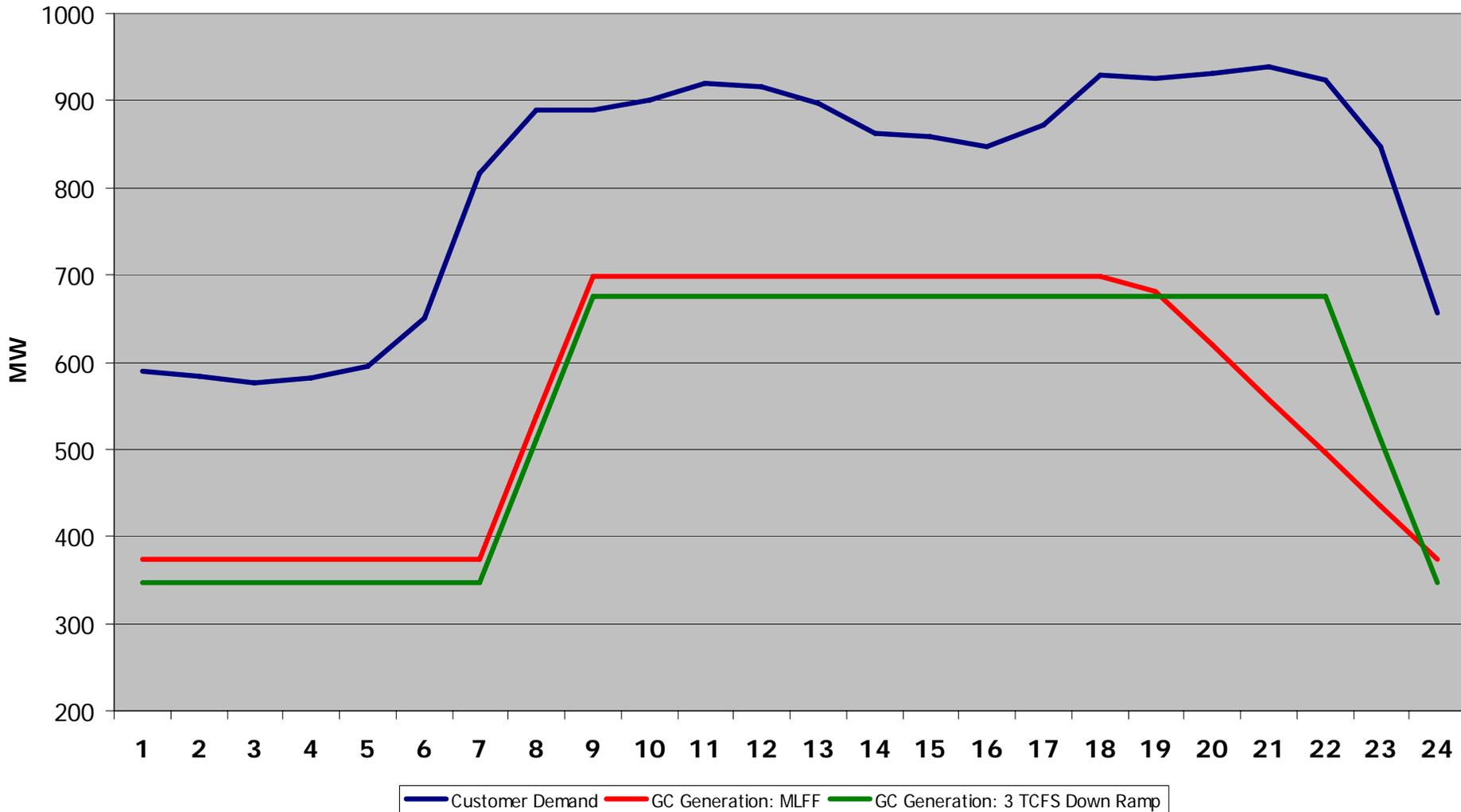
Modeled December Weekday Generation and Load

Maximum Daily Change: 8 TCFS, Up Ramp: 8 TCFS/hr, Down Ramp 1.5 TCFS/hr



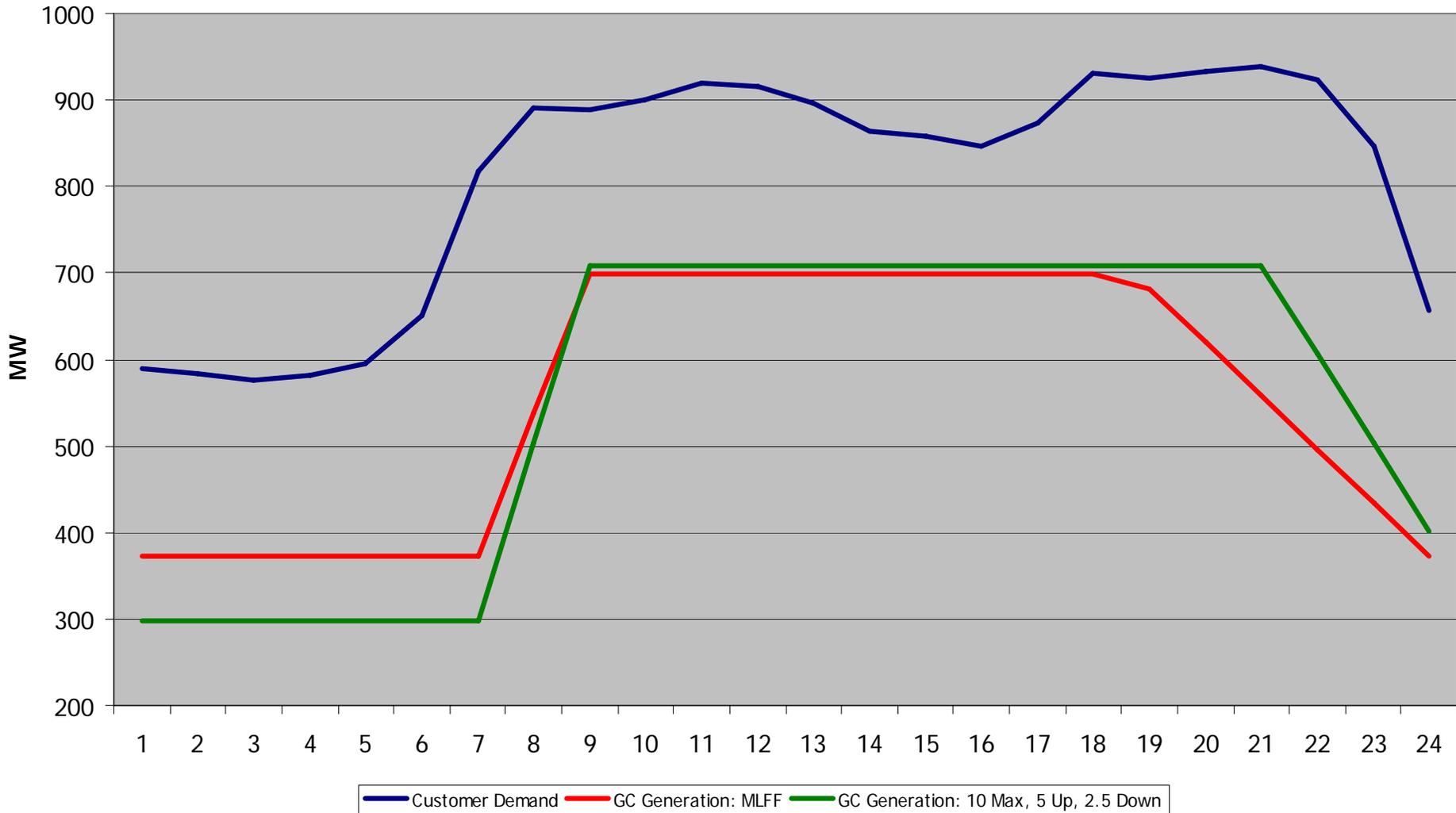
Relaxation of the down-ramp Restriction – In Isolation

Modeled December Weekday Generation and Load
Max Daily Change: 8 TCFS, Up Ramp: 4 TCFS/hr, Down Ramp 3 TCFS/hr



Relaxation of Several Operating Parameters at Once

Modeled December Weekday Generation and Load
Max Daily Change: 10 TCFS, Up Ramp: 5 TCFS/hr, Down Ramp 2.5 TCFS/hr



Conclusions

- **An unlimited “maximum daily change” has little to no financial benefit**
- **Relaxation of the MLFF up ramp has little to no financial benefit**
- **Relaxation of the MLFF down ramp could have a financial benefit**
- **Relaxation of several operating parameters in combination shows the greatest potential for financial benefit**
- **Potential for financial benefit appears to be most significant for a modest amount of relaxation of limits, provided the “right” limits are targeted**