Hydro Energy Model

ALABAMA POWER
A SOUTHERN COMPANY

Hydro Services

Manly Appleby

Abstract

The Hydro Energy Model is an analytical model for the determination of power production and its value by simulating actual reservoir operation.

Parameters include turbine discharge ratings and efficiencies, generator efficiencies, head loss, and operating guidelines.

History

ALABAMA POWER
A SOUTHERN COMPANY

- Original early 1980s
  - Replace 1960s Fortran Model
  - Hydro Value, Long Term Forecast
  - Additions, Changes to System
- Mid 1980s VMS
- 1990s Alpha OpenVMS
- Late 1990s MS Windows Interface
- 2000s Graphical Interface, other

Acceptance

- By using the Hydro Energy model rather than actual generation records, Alabama Power has developed an accurate estimate of annual generation under existing conditions (baseline) to which alternatives can be compared.

- FERC has recognized the validity of this Hydro Energy Model approach to estimating annual generation by accepting this method in the context of Alabama Power's relicensing of the Yates and Thurlow Project (P-2407) in the early 1990's.

- Alabama Power has submitted the same method for the Coosa Relicensing

- In addition, FERC has accepted this methodology for calculating annual generation in the context of headwater benefits analysis.

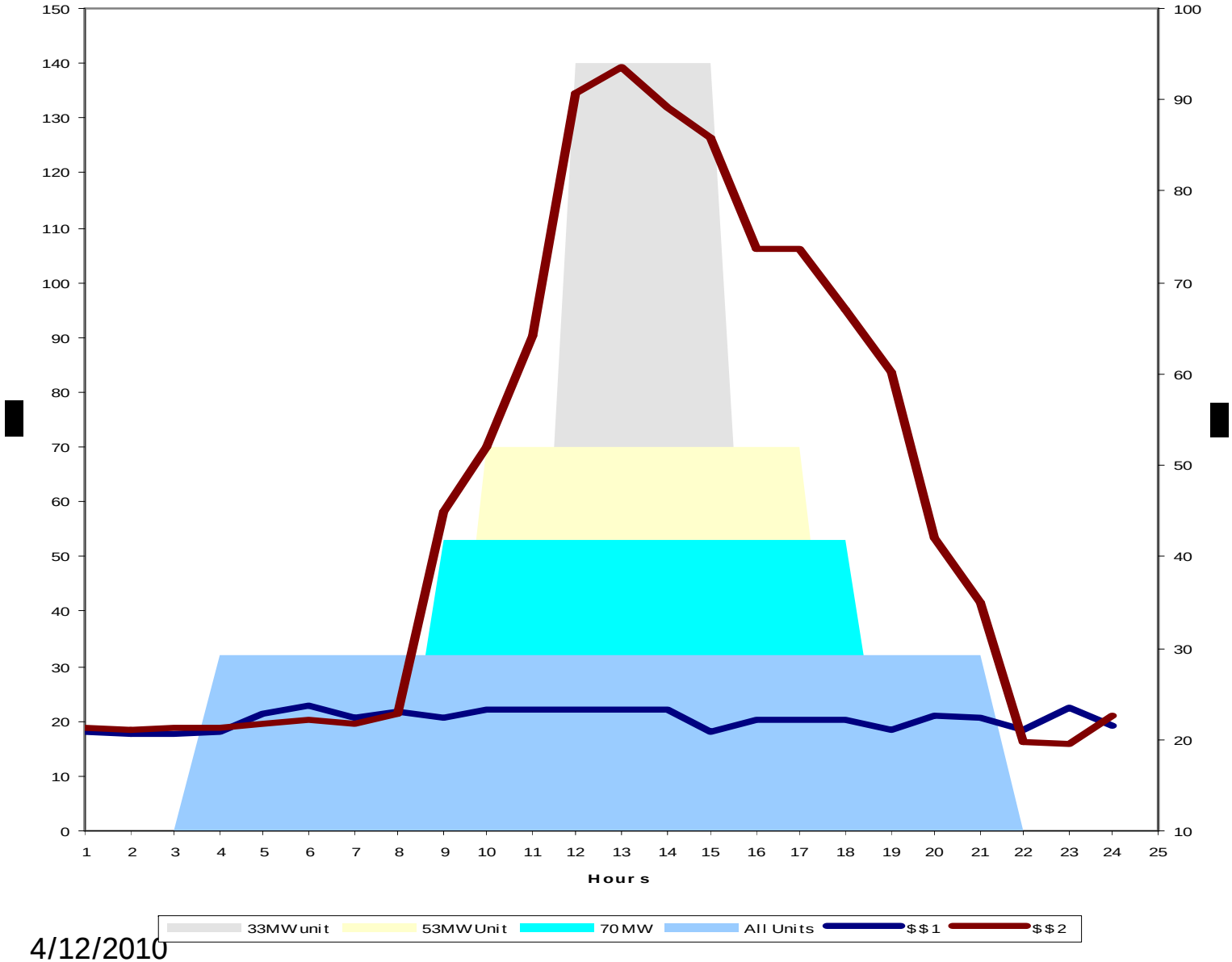
Proprietary

- Model developed completely internal to the Southern Company
- Model contains confidential financial information

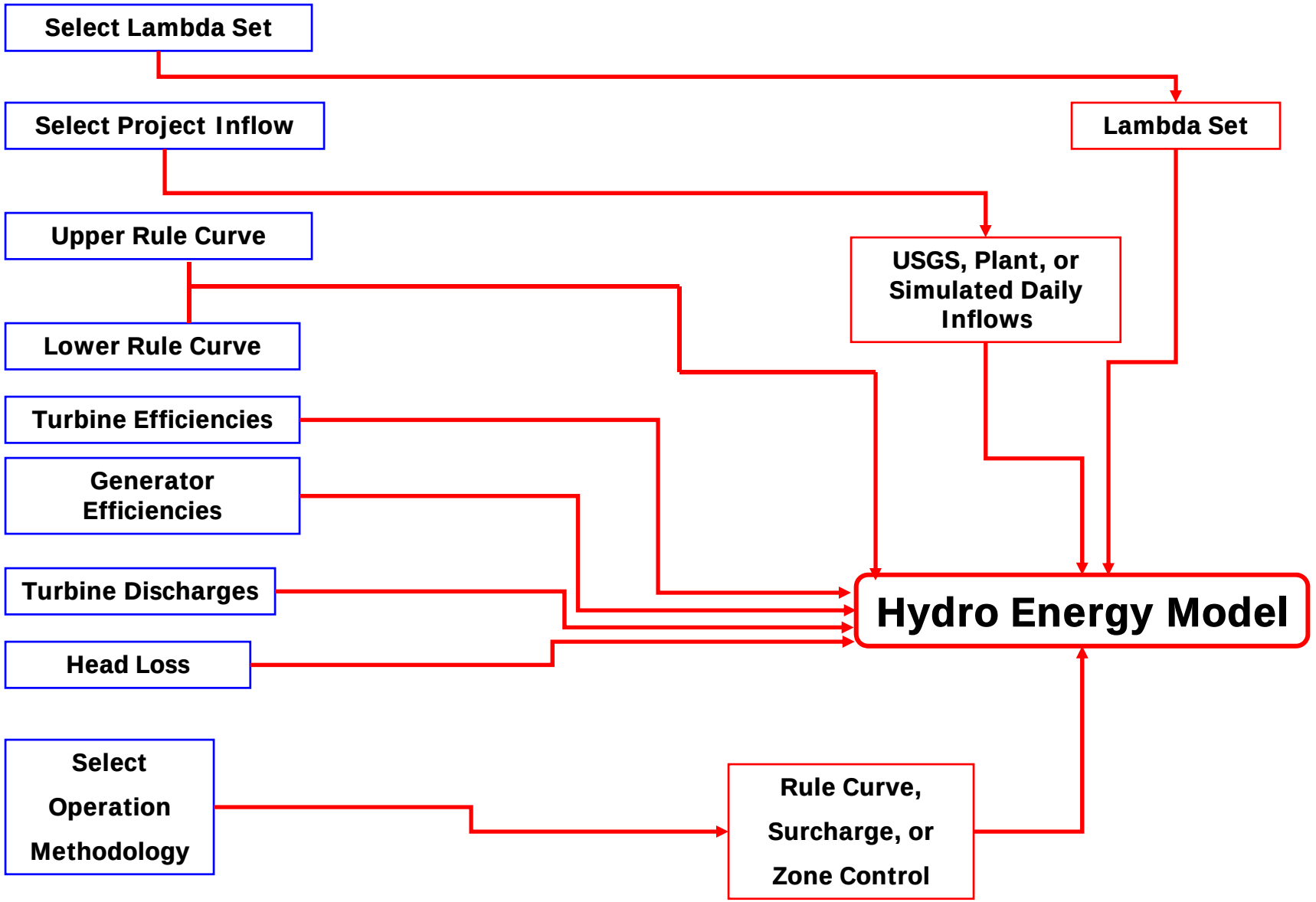
Model Features

1. System Lambdas use to calculate most valuable use of inflows
2. Rule Curve, Surcharge, or Zone Control Methodologies
3. Flood Control Operations
4. Minimum Releases
5. Optimize to minimize weekend releases
6. Peak and Off Peak Accounting
7. Model based on downstream constraints
8. Model based on Minimum Generation
9. Model based on flow needed at downstream point
10. Daily outputs as well as monthly totals
11. Hourly information if desired.
12. Head is based on mean pool elevation for given day
13. Water deficiencies are withdrawn from the reservoir causing a decrease in elevation and storage of pool
14. Water excesses are either surcharged and/or spilled depending on operating rules of reservoir.
15. Discharge and turbine efficiencies are based on head
16. Program is modular which allows for easier revision and incorporating of additional features.
17. Graphical output of information available
18. The impact of water withdrawals either permanently or returned below the project can be evaluated.

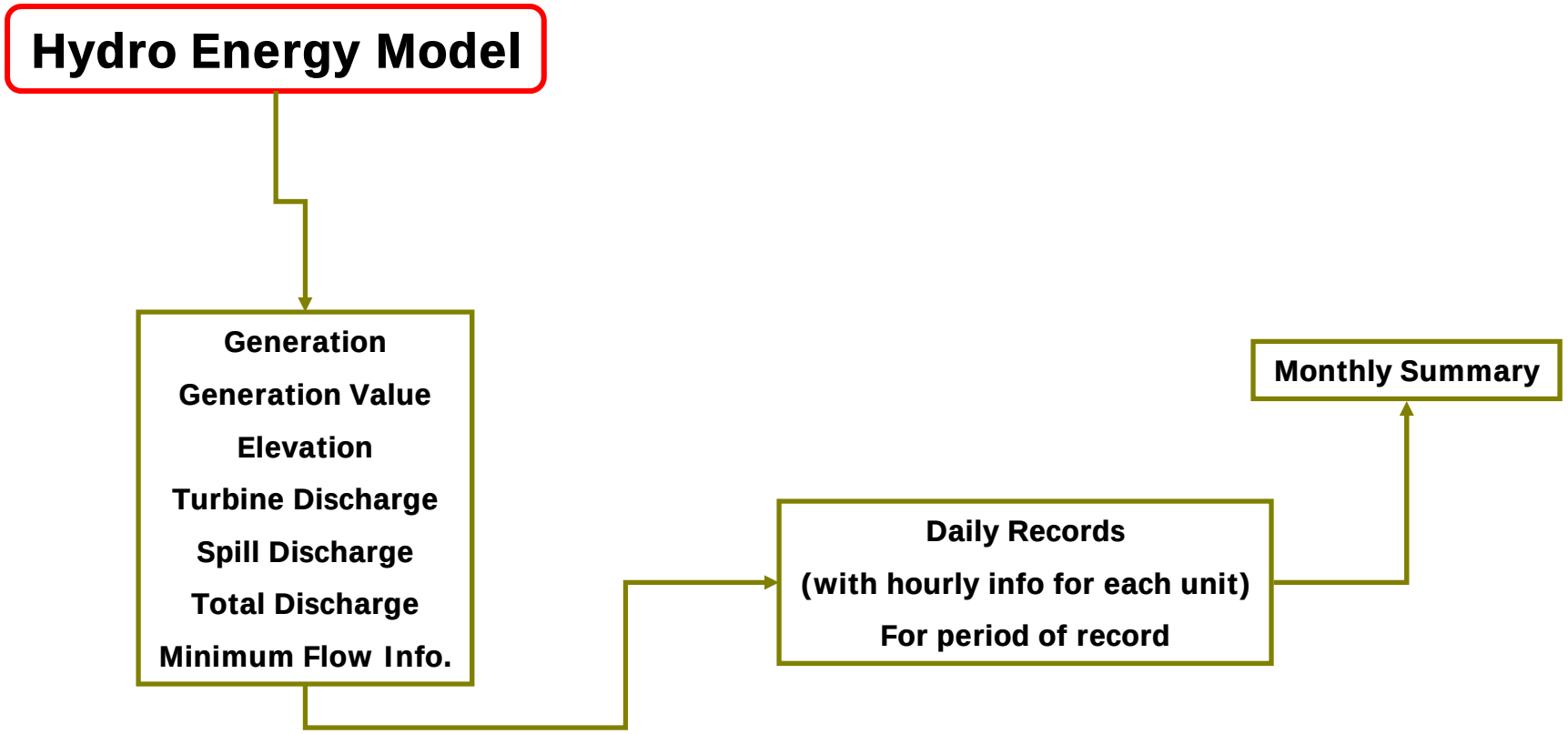
MW compared to Lambdas



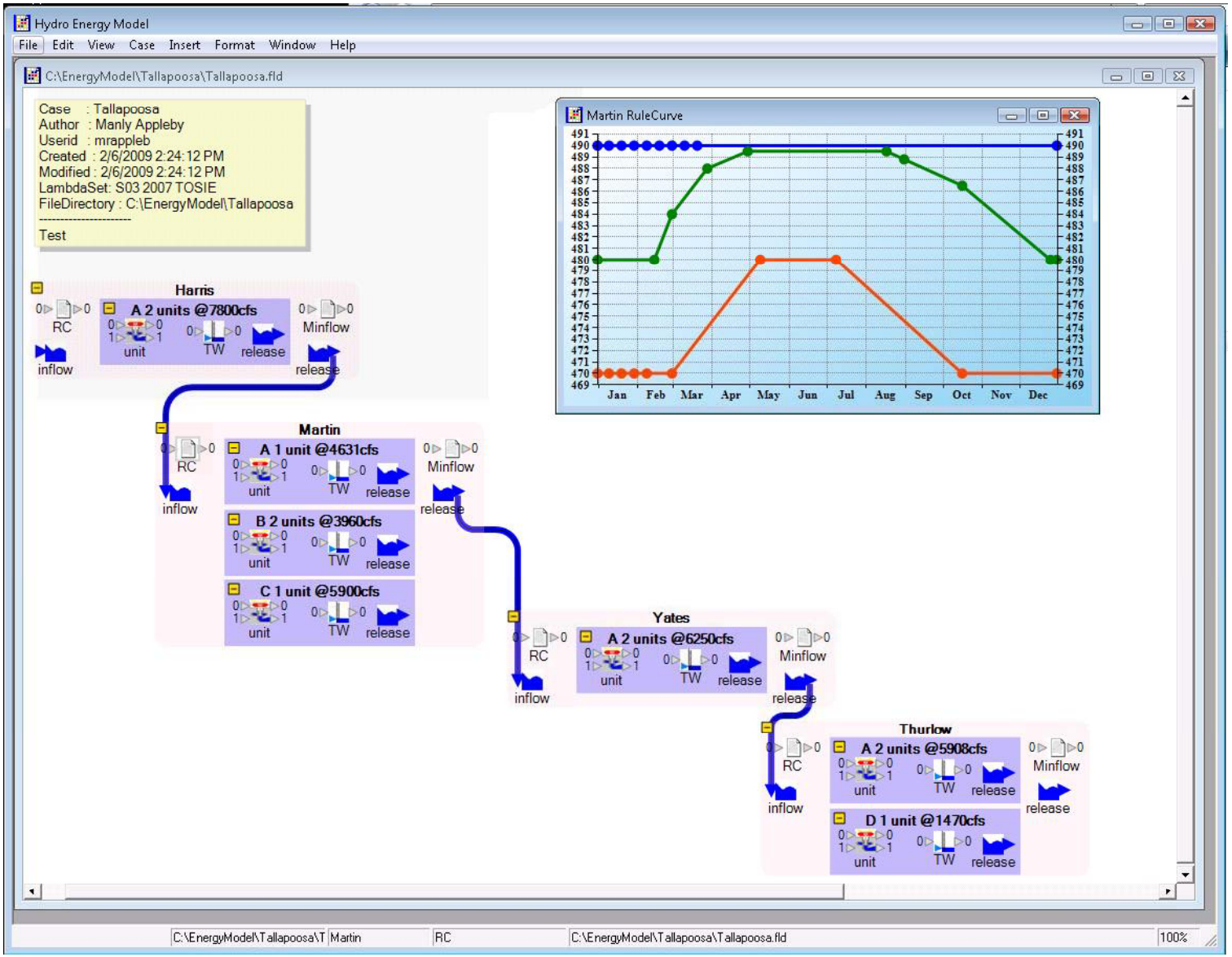
Model Inputs



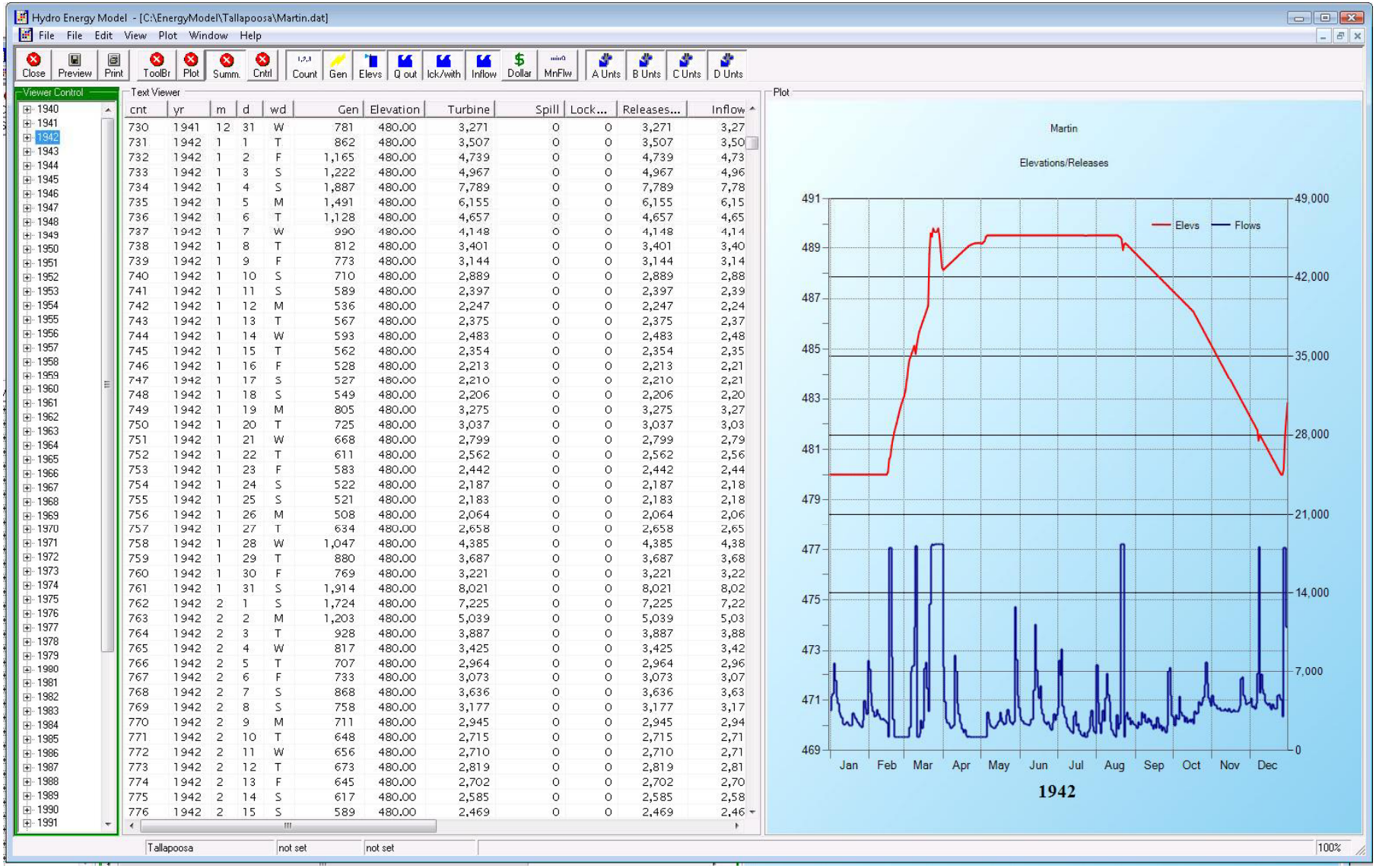
Model Generated Outputs



Model Interface



Daily Output



Southern Company

Martin

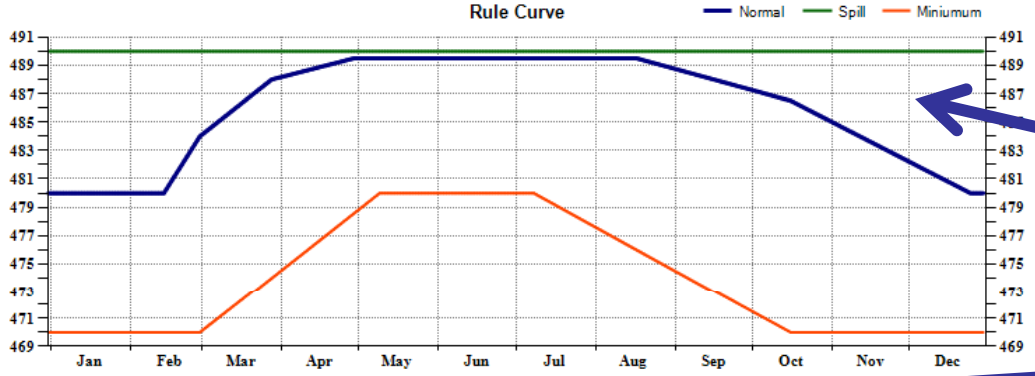
C:\EnergyModel\2006 HEB\Martin.dat

Summary

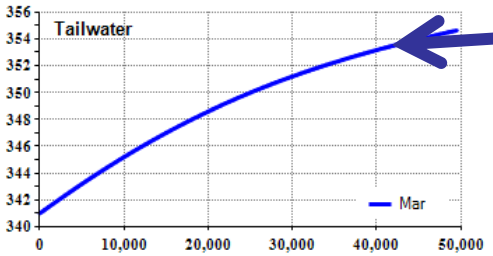
ALABAMA POWER
A SOUTHERN COMPANY

Plant info	Main	Secondary	Teritary	Auxiliary	
Number Units	1	2	1	0	
MWs Best	44.3	41.6	53.6	0.0	181.0
MWs Full	50.7	42.4	56.5	0.0	192.1
Turb cfs Best	4,042	3,750	4,900	0	16,442
Turb cfs Full	4,631	3,960	5,900	0	18,451
MWs B Plt	42.5	39.9	51.6	0.0	173.8
MWs F Plt	48.5	40.5	54.3	0.0	183.8
Best Q Plt	4,008	3,718	4,862	0	16,305
Full Q Plt	4,590	3,923	5,853	0	18,[illegible]
Headloss	1.50	1.50	1.50	0.00	1.50
Best G. Eff	91.00%	92.00%	91.00%	0.00%	91.50%
Full G. Eff	91.00%	89.00%	80.00%	0.00%	87.25%
Best G. Eff	98.00%	98.00%	98.00%	0.00%	98.00%

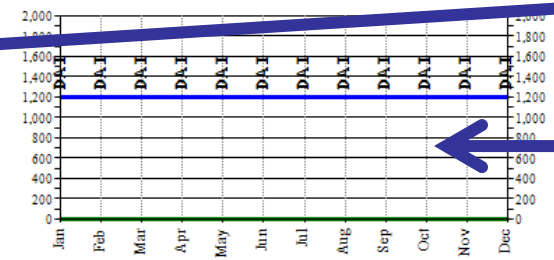
Plant Information



Operating Guidelines



Tailwater Curve



Minimum Flow

Zone Control Methodolgy
Lambda File was
Weekend Control - OFF.

DAI - Daily release thru main units at BG during peak h

Miscellaneous Options

		Area	Years
10000003	SMFLW	2,963	1940 to 1993
003	HSPLT	2,963	1994 to 2005

Drainage area of Project is 2,963 sq. miles

Inflow Data

This project has the following project's model runs immediately upstream :
C:\EnergyModel\2006 HEB\Harris.dat

Item	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Yearly
Energy													
$													
Inflow	1												
Turb	1												
Spill													
TotalQ	1												
Elev15													

Output Summary

HEM Ver. 08.17b.2006
GoHydroEnergy Ver. 4.5 Build:2421.13048

Friday, August 18, 2006 10:41 AM

Historical Comparison