

RHIC OPERATIONS

PRESENTED TO THE RHIC/ AGS USERS EXECUTIVE COMMITTEE

June 15,2001

D.I.LOWENSTEIN

FY02 PLANNING = STEERING BETWEEN SCYLLA & CHARYBDIS

RHIC PLANNING PRIORITIES

RUNNING TIME

MACHINE COMPLETION & PERFORMANCE

EXPERIMENTAL SUPPORT

MACHINE ENHANCEMENT

RHIC PLANNING VARIABLES

FUNDING

MANPOWER

ENERGY COSTS

PURCHASES

OVERHEADS

	FY00	FY01	FLAT FY02	ESC (2%) FY02	REQUESTED FY02
MANPOWER	36	33.9	34.8	35.6	36.6
FTE	395	364	353	362	374
ENERGY	8.7	9.1	7.6	9.1	14.5
		28 C, 17 B	14.5 C, 12.5 B	19 C, 17 B	37C, 33 B
PURCHASES & SERV	15	10.9	10.9	10.9	13.2
OVERHEADS	30	27.5	28	28.2	30.1
EQUIPMENT	0	1.4	0.7	0.7	1.4
AIP	1.3	2	2	2	4
TANDEM INCOME	-0.8	-0.8	-0.8	-0.8	-0.8
TOTAL	91	84	84	85.7	99

	(FLAT FY02) FY03	(ESC FY02) FY03
MANPOWER	36.5	36.5
FTE	353	353
ENERGY	7.7	8.1
	15 C, 9 B	16.5 C, 10.5 B
PURCHASES & SERVICES	10.9	10.9
OVERHEADS	28.7	29.1
EQUIPMENT	0	0.4
AIP	1	1.5
TANDEM INCOME	-0.8	-0.8
TOTAL	84	85.7

C=CRYO WKS
B=BEAM WKS

COPING IN FY02 WITH A FLAT-FLAT FY02 BUDGET

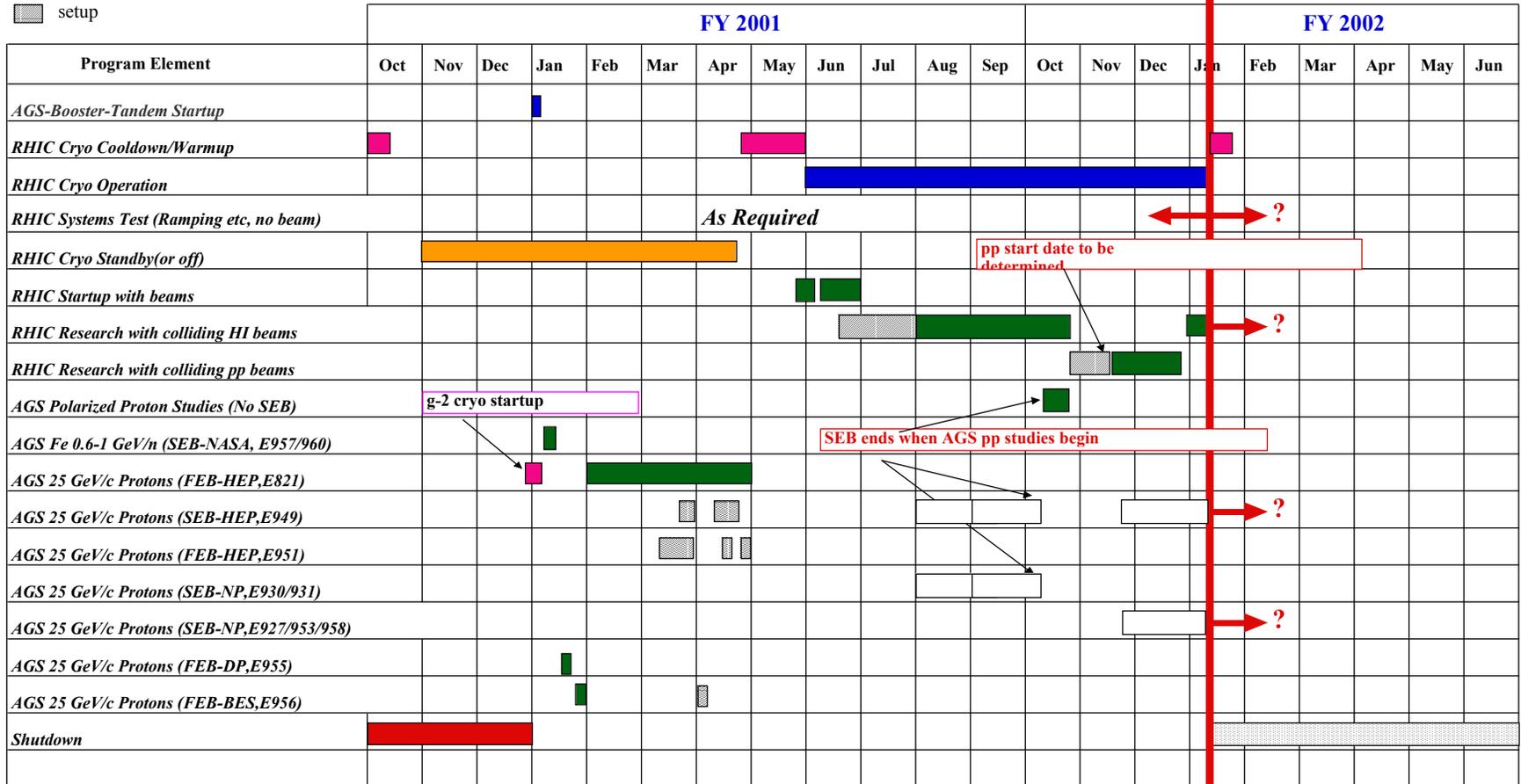
- **REAL ESCALATION IS >4% FROM FY01**
 - YEAR 3 OF OPERATIONS OF A \$1.5B FACILITY
 - WASTE MANAGEMENT IS NOW A DIRECT CHARGE (\$150K)
 - **\$15M BELOW OPTIMUM LEVEL**
- **REDUCED COLLISION WEEKS**
 - **36% UTILIZATION (INCLUDING 01-02 COMBINED RUN)**; SEVERELY LIMIT ENERGY SCANS, VARY ION SPECIES, SPIN PHYSICS
 - SEVERELY REDUCED ACCELERATOR STUDIES==>LOST FUTURE PHYSICS OPPORTUNITIES
- **REDUCE PERFORMANCE**
 - DELAY CONSTRUCTION OF “MISSING” MACHINE SPARES AND EXPERIMENTAL AREA INFRASTRUCTURE ==> EXTENDED FAILURE RECOVERY TIME
 - SUPERCONDUCTING RING MAGNETS
 - SINGLE POINT FAILURE INJECTOR SYSTEM COMPONENTS
 - VULNERABLE TO LARGE TICKET REPAIRS
 - UNPLANNED FY01 MG SET REPAIR OF \$1.8M
 - COLD VALVE BOXES? BPM CABLES?
 - SEVERELY REDUCE COST REDUCTION EFFORTS
 - CRYOGENIC SYSTEM, TANDEM REPLACEMENT
- **REDUCE STAFF LEVEL**
 - FY 01 STAFFING LEVEL IS ALREADY AT SUB-OPTIMUM BY 3%
 - REDUCE STAFF LEVELS (3%) IN ACCELERATOR, MAGNET AND DETECTOR SUPPORT
- **SEVERELY REDUCE MACHINE ENHANCEMENTS**
 - LUMINOSITY,ELECTRON COOLING R&D

C-A Operations-FY01-02

-  to be determined
-  concurrent with RHIC operations
-  AGS cycle on demand
-  setup

Preliminary schedule, subject to funding and other issues

~Current RHIC Budget Limit



**RHIC OPERATIONS (FACILITY OPS & EXPERIMENTAL SUPPORT)
 FISCAL YEAR COMPARISON FY 2001 - FY 2002 PRESIDENTIAL
 Dollars in Millions**

	FY 2001	FY 2002
Run Weeks Cryo	28	14.5
Run Weeks Beam	17	12.5
Effort - FTE'S	364	352
BUDGET		
Direct labor	33.9	34.7
Purchases	10.9	9.8
TVDG & BLIP Income	-0.8	-0.8
POWER	9.1	8.5
Overhead	27.5	27.8
Total Operations	80.6	80
Capital EQU	1.4	1.5
A I P	2	2.5
Total RHIC Funds	84	84
FUNDING SPLIT		
Carryforward	1.4	0
B/A KB 02 02 02-1	72.026	72.745
B/A KB 02 02 01-2	7.164	7.236
Operations Total	80.59	79.981
Capital ops + Exp. Sup.	1.397	1.52
A I P	1.951	2.5
TOTAL FUNDING	83.938	84.001

RHIC OPERATIONS FY 2001 BUDGETS BY GROUP
Dollars in Thousands

	Budget
ACCELERATOR DIVISION	
Accelerator Div.	3472
Accelerator Physics	2893
Electrical Systems	7989
Vacuum Systems	1684
Machine Operations	1843
Beam Comp. & Instr.	1688
RF	2235
High Frequency Instr.	549
Mechanical Systems	2063
Cryogenic Systems	4788
Pre - Injectors	4785
<i>Total Accelerator Division</i>	33989
EXPERIMENTAL SUPPORT & FACILITIES	
E S & F Div	3040
Physics Support	908
Communications & Electronic	1425
Facilities & Experimental Sup.	8611
<i>Total E S & F Division</i>	13984
CONTROLS DIVISION	4174
MAGNET DIVISION	4786
MGMT & ADMINISTRATION	
Mgmt & Admin.	3988
ESH & QA	899
Power	8850
ITD Allocation	1820
Space	7405
User/ALD	700
Total Mgmt & Administration	23662
TOTAL RHIC OPERATIONS	
New B/A	79190
PY Cfd.	1405

COPING IN FY02 WITH A 2% “ESCALATED” FY02 BUDGET

- **REAL ESCALATION (>4%) >> DOE ESCALATION (2%)**
 - LESS THAN CONSTANT EFFORT
 - WASTE MANAGEMENT IS NOW A GROWING DIRECT CHARGE (\$150K)
 - **\$14M BELOW OPTIMUM LEVEL**
- **MAINTAIN COLLISION WEEKS AT FY01 LEVEL**
 - **48% UTILIZATION (COMBINED 01-02 RUN)**; LIMIT ENERGY SCANS, VARY ION SPECIES, SPIN
 - REDUCED ACCELERATOR STUDIES==>LOST FUTURE PHYSICS OPPORTUNITIES
- **REDUCE PURCHASES**
 - DELAY CONSTRUCTION OF “MISSING” MACHINE SPARES AND EXPERIMENTAL AREA INFRASTRUCTURE ==> EXTENDED FAILURE RECOVERY TIME
 - SUPERCONDUCTING RING MAGNETS
 - SINGLE POINT FAILURE INJECTOR SYSTEM COMPONENTS
 - VULNERABLE TO LARGE TICKET REPAIRS
 - UNPLANNED FY01 MG SET REPAIR OF \$1.8M
 - COLD VALVE BOXES? BPM CABLES?
 - SLOWDOWN COST REDUCTION EFFORTS
 - CRYOGENIC SYSTEM, TANDEM REPLACEMENT
- **REDUCE STAFF LEVEL**
 - FY01 STAFFING LEVEL IS ALREADY AT SUB-OPTIMUM BY 3%
 - REDUCE STAFF LEVELS (1%) IN ACCELERATOR, MAGNET AND DETECTOR SUPPORT
- **REDUCE MACHINE ENHANCEMENTS**
 - LUMINOSITY, ELECTRON COOLING R&D

COPING IN FY03 WITH A FLAT-FLAT FY03 BUDGET

- FROM FY01 REAL ESCALATION (8%)>> DOE ESCALATION (0-2%)
 - YEAR 4 OF OPERATIONS OF A \$1.5B FACILITY THAT HAS NEVER APPROACHED MORE THAN 50% UTILIZATION
 - WASTE MANAGEMENT IS NOW A GROWING DIRECT CHARGE (\$250K)
 - \$17-19 BELOW OPTIMUM LEVEL
- SEVERELY REDUCED COLLISION WEEKS
 - 25-28% UTILIZATION (INCLUDES THERMAL CYCLE); LIMITS ENERGY SCANS, VARY ION SPECIES, SPIN PHYSICS
 - NO ACCELERATOR STUDIES==>LOST FUTURE PHYSICS OPPORTUNITIES
- REDUCE PERFORMANCE
 - CONSTRUCTION OF “MISSING” MACHINE SPARES AND EXPERIMENTAL AREA INFRASTRUCTURE ==> EXTENDED FAILURE RECOVERY TIME
 - STILL UNDONE AFTER 4 YEARS SINCE PROJECT COMPLETION
 - OPERATIONS RELIABILITY IS AT HIGH RISK AS MACHINE AGES
 - SUPERCONDUCTING RING MAGNETS
 - SINGLE POINT FAILURE INJECTOR SYSTEM COMPONENTS
 - VULNERABLE TO LARGE TICKET REPAIRS
 - UNPLANNED FY01 MG SET REPAIR OF \$1.8M
 - COLD VALVE BOXES? BPM CABLES?
 - NONE TO SEVERELY REDUCED COST REDUCTION EFFORTS
 - CRYOGENIC SYSTEM, TANDEM REPLACEMENT
- REDUCE STAFF LEVEL
 - FY01 STAFFING LEVEL IS ALREADY AT SUB-OPTIMUM BY 3%
 - AGAIN REDUCE STAFF LEVELS (0-2%) IN ACCELERATOR, MAGNET AND DETECTOR SUPPORT
- NONE TO SEVERELY REDUCED MACHINE ENHANCEMENTS
 - LUMINOSITY, ELECTRON COOLING R&D
 - FUTURE PHYSICS PHYSICS PROGRAM IS SEVERELY IMPACTED

THE \$15M COLLIDER-ACCELERATOR REQUEST

The FY02 incremental budget step needed to meet the expectations of the RHIC user community and the DOE as reflected in the NSAC Long Range Plan for RHIC Ops:

- +\$5M to increase the operating weeks to 37 weeks / year
- +\$4M Increment for materials and services and staff as determined by actual consumption costs and rates in FY00 and FY01
- +\$4M Increment for BNL actually experienced inflation rate
- +\$2M AIP funding to provide for future reliable, efficient and cost effective machine performance

RHIC OPERATIONS EFFORT AND FUNDING - FY 2001

Dollars in thousands, Effort in FTE

	<i>Acceler. Oper.</i>	<i>Exper. Support</i>	<i>Total</i>
Mgmt, Admin., ESH&Q	22	0	22
Acceler. Div.	214	0	214
Controls Div.	29	0	29
Magnet Div.	28	0	28
Exper. Support & Facil.			
Physics, Elect, Mech, Engr.	0	30	30
Survey	3	1	4
Comm & Electronics	10	0	10
Water Systems	10	2	12
Power Distrib.	4	0	4
Tech. Support	8	2	10
<i>Sub Total ES&F</i>	<i>35</i>	<i>35</i>	<i>70</i>
TOTAL EFFORT	328	35	363
<i>NSAC MODEL EFFORT</i>	<i>323</i>	<i>34</i>	<i>357</i>
FUNDS - ACCELERATOR	72026		72026
- EXPER. SUPPORT		7164	7164
TOTAL FUNDS	72026	7164	79190

OPERATIONS (NON-RESEARCH) FUNDING COMPARISON*

* COMMUNICATIONS WITH S. HOLMES (FNAL)

	RHIC	TEVATRON
<u>ACCELERATOR</u>		
STAFFING (FTE)	327	520
	\$M	\$M
OPERATING	75	86
AIP	2	4
EQUIPMENT	1	0.3
R&D	0	6
<u>EXPERIMENTAL SUPPORT + INFRASTRUCTURE</u>	STAR,PHENIX BRAHMS,PHOBOS	CDF + D0
STAFFING (FTE)	90	100
COMPUTING STAFFING (FTE)	20	70
	\$M	\$M
OPERATING	21	33
EQUIPMENT	4.4	?
COMPUTING EQPT.	2	6
<u>TOTAL COST (\$M)</u>	106	147+
<u>TOTAL STAFFING (FTE)</u>	437	690

COLLIDER = 2X4=8KM

COLLIDER = 6KM

CAD Accelerator Division FY 2001-2003 capital AIP's, and "big ticket" operations items (in k\$)

3/9/01 Thomas Roser		FY2001						FY2002			FY2003			Comments
		AIP		CAP		OPS		AIP	CAP	OPS	AIP	CAP	OPS	
		spent	to go	spent	to go	spent	to go							
1	Cryogenics													
	Collider Helium Storage Addition (AIP)	1,300	655					600						Helium loss prevention
	Liquid Nitrogen based shut-down cooling system (AIP)							1,960						Eliminates the need for warm-ups
	PLC controls for turbines (AIP)										520			Replace pneumatic controls
	Complete LSA reliquifier installation				250									
	Rep.turbine oil skids/eliminate seal gas compressor (AIP)							640						
	Repl. Refrigerator and compressor I/O (AIP)										720			
	RHIC Helium Compressor Annunciator Upgrade (AIP)										660			
	Misc. cryogenic equipment (CAP)								200			350		
	Replace process controls (CRISP) with PLC's								???			???		
	Repair of cold valve boxes									???			???	Solder flux residue is corroding tubing
	Painting of cold boxes and piping									560				Corrosion prevention
	He delivery						110			100				Corrosion prevention
	Subtotal:	1,300	655	0	250	0	110	3,200	200	660	1,900	350	0	
2	RF and Instrumentation													
	Complete longitudinal damper			100										Long. Emittance reduction
	120 bunch upgrade									100				Low level rf upgrade
	Accelerating cavity upgrade								200					
	Repair cold end of RHIC BPM coax cables									???			???	Thermal cycling is breaking solder joints
	Misc. test and measuring equipment							0	100		0	250		
	Subtotal:	0	0	100	0	0	0	0	300	100	0	250	0	
3	Vacuum													
	New blower pump station						50							Improvement of RHIC pump down time
	Subtotal:	0	0	0	0	0	50	0	0	0	0	0	0	
4	Facility													
	4:00 O'Clock Blockhouse upgrade									90				
	Service Building Upgrades and PA installation				150				150					
	Upgrade sextant 11						25							
	Compressor Cooling Towers Upgrade								150					
	Berm repairs						25			25			25	
	Variuos jobs at 1005									115				
	RHIC shielding upgrade											150		
	Replace ATR water mains											100		
	Subtotal:	0	0	0	150	0	50	0	300	230	0	250	25	
5	RHIC devices													
	RHIC Collimators (AIP)										425			
	RHIC Injection Kicker Upgrade (AIP)										350			
	RHIC AC dipole						70							
	Spin rotators warm-to-cold transition									400				
	Injection kicker repair						50							Replace dielectric with ferrite kickers
	Transition energy jump supplies			150	150									24 pulsed supplies plus controls
	Abort kicker thyatron replacement						100			150				Spares needed for 100 GeV/u ops.
	Subtotal:	0	0	150	150	0	220	0	0	550	775	0	0	
6	AGS/Booster/Linac/Tandem devices and MMPS													
	Ring equipment upgrade						100			100			100	
	Linac equipment overhaul									100			100	
	Westinghouse Generator Cooling Syst. Upgr. (AIP)										300			
	Westinghouse Motor Stator Insulation Upgr. (AIP)										350			
	FEB Power Supply Upgrade					150								Reduction of extraction jitter
	AGS MMPS Ripple Red. And Transformer Repl. (Phase I) (AIP)							1,260						
	AGS MMPS Ripple Red. And Transformer Repl. (Phase II) (AIP)										1,735			
	AGS MMPS Generator Field Supply Upgrade (AIP)							600						
	Add. AGS Quadrupoles for Polarized Proton Ops. (AIP)										300			
	Subtotal:	0	0	0	0	150	100	1,860	0	200	2,685	0	200	
8	Spares and Maintenance													
	AGS magnet bus replacement									200				
	Siemens Rotor Maintenance					400	1,400							
	Linac tube spares					500				360			360	
	Booster MMPS Transformer									200				
	RHIC cavities spare parts					200				200			200	
	RHIC Turbine and compressor spare parts					400	100			500			500	
	Controls equipment to replace obsolete systems								200			250		
	Subtotal:	0	0	0	0	1,500	1,500	0	200	1,460	0	250	1,060	
	Total:	1,300	655	250	550	1,650	2,030	5,060	1,000	3,200	5,360	1,100	1,285	

C-A Dept Experimental Facilities and Support Division FY 2001-3 Experiment Projects

Updated 02/26/01		FY 2001		FY 2002	FY 2003	FY2002-3 GPP
		Capital + Operating	Status	Capital Request	Capital Request	
		Plan***				
PHENIX						
	Counting House Air Conditioning Upgrade	\$ 22,000	Planning			
	Paving to gas mixing house and pad	\$ -		\$ -	\$ -	\$ 30,000
	IR Humidity Control	\$ 75,000	Planning			
	Heat for assembly building	\$ -		\$ 25,000	\$ -	
	Chiller for spectrometer magnets	\$ 285,000	In Progress			
	Add second chiller				\$ 75,000	
	Convert cooling tower to ozone based system	\$ -			\$ 75,000	
	Convert safety system to PLC base	\$ -		\$ -	\$ 75,000	
	Tech Support for PHENIX Detector Upgrades (labor)	\$ -	In Progress	\$ -	\$ -	
	1008 LCVS Stack Hood	\$ 10,000	Complete			
	Cover over the gas pad area	\$ 15,000	In Progress			
	Seismic restraints for shield wall			\$ 750,000	\$ -	
	PHENIX Total	\$ 407,000		\$ 775,000	\$ 225,000	\$ 30,000
STAR						
	EMC and SVT Installation (labor)	\$ -	In Progress	\$ -	\$ -	
	DAQ Room HVAC Upgrade	\$ 30,000	Planning			
	Control Room HVAC Upgrade	\$ 15,000	Planning			
	Paving entrance road	\$ -		\$ -		\$ 60,000
	IR Dehumidification	\$ 42,000	Planning			
	Backup transformers for power supplies			\$ 167,000		
	Chiller for main magnet water	\$ 390,000	In Progress			
	Convert cooling tower to ozone based system			\$ -	\$ 75,000	
	Extend gas pad and shelter	\$ 40,000	Planning			
	Video monitoring for IR	\$ 10,000	Planning			
	Assembly Building heating system upgrade			\$ 55,000		
	Enclosure between control room and 1006C- building addition			\$ 90,000		
	Electronics development trailer			\$ 75,000		
	STAR Total	\$ 527,000		\$ 387,000	\$ 75,000	\$ 60,000
PHOBOS						
	Service building ventilation	\$ 35,000	Planning			
	Safety systems upgrades			\$ 35,000		
	PHOBOS Total	\$ 35,000		\$ 35,000	\$ -	\$ -
BRAHMS						
	Paving Roadway	\$ -		\$ -		\$ 42,000
	Substation Installation	\$ 50,000	Complete			
	1002A Sprinkler Addition	\$ 20,000	Complete			
	1002 Dehumidification					
	Seismic restraints for shield wall				\$ 300,000	
	BRAHMS Total	\$ 70,000		\$ -	\$ 300,000	\$ 42,000
PP2PP	(Medium Energy Budget request for FY 2001-3, Physics Dept)					
	Roman Pot Design (C-AD labor)	\$ -				
	Stands for Roman Pots (C-AD labor)	\$ -				
	Experiment Power (C-AD labor)	\$ -				
	Jet target procurement/installation (RHIC Spin)	\$ -				
	PP2PP Total	\$ -		\$ -		
General Experiment Support						
	General Capital	\$ -		\$ 200,000	\$ 200,000	
	Power Transmission Line Upgrade			\$ -	\$ 500,000	
	Communications and Electronic Support	\$ 30,000	In Progress	\$ 125,000	\$ 125,000	
	General Total	\$ 30,000		\$ 325,000	\$ 825,000	\$ -
Total		\$ 1,069,000		\$ 1,522,000	\$ 1,425,000	\$ 132,000
	Total Committed (complete or in progress)	\$ 800,000				
	Total To Go	\$ 269,000				

THE MESSAGE

BNL RECENTLY COMPLETED THE \$600M RHIC.

A UNIQUE WORLD-CLASS \$1.5B FACILITY IS NOW OPERATING TO PROBE THE FRONTIERS OF PHYSICS.

THE FIRST PHYSICS RESULTS ARE EXCITING AND PUSHING OUR UNDERSTANDING OF NATURE.

DUE TO LACK OF OPERATING FUNDS, THE PRESENT UTILIZATION IS LESS THAN 50% AND FUTURE ENHANCEMENTS ARE AT RISK.

AN INCREMENT OF \$15M WILL ALLOW FOR FULL UTILIZATION OF 37 WEEKS OPERATION.