POST-BES REVIEW ACTIVITIES: BUDGET SPREADSHEETS

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BES QUESTIONS

- Questions to NSLS-II to which the answer is generally that their cost structure results from status of commissioning and early operations
- ALS low on beamline staff
- APS ESHQ costs appear low (indirect supports another ~3FTEs, $737K)
- ALS got a better deal on electricity
- BNL moving to a “better” overhead structure
- Size of business groups – APS a little large, SSRL lean and mean
- Routine M&S budget for each beamline; R&D partitioning
- Support for “non-BES” beamlines: ~0.2
- Research time for beamline scientist, accelerator scientists:
  - Beamline Sci. ~20%: SSRL, APS in the R&D bucket, NSLS-II (?) and ALS in Ops bucket
  - Accelerator: No facility claims 20% R&D time. Get the sense that BES thinks accelerator R&D is low…. (APS pointed to APS-U!)
- Questions on indirect vs. direct support for HR staff at APS
- BES revised labor multiplication factor to include all space charges to standardize
- What percentage of our budget is discretionary – “free energy”

STORAGE RING SOURCE FINANCIAL COMPARISONS

BES Funding & Users	APS	ALS	NSLS-II	SSRL
Fiscal Year	FY2016	FY2016	FY2016	FY2016
BES Operations (Ops) Funds [K$]	129,832	62,750	110,000	40,755
Number of Unique Users	5,521	2,317	477	1,641
Ops Cost/User [K$]	23.5	27.1	230.6	24.8
Number of Referee Journal Publication	1,864	936	26	573
Number of High Impact Journal Publication	321	192	5	134
Percentage of High Impact Journal Publication [%]	17.2%	20.5%	19.2%	23.4%
Ops Cost/Publication [K$]	69.7	67.0	4,230.8	71.1
Total FTEs	355.5	157.4	270.9	118.2

BEAMLINES	APS	ALS	NSLS-II	SSRL
Beamlines Ops Cost Percentage [%]	35.3%	47.4%	18.6%	42.1%
Total No. of Independent Beamlines	67.0	36.0	11.0	24.0
No. of Independent Beamlines Supported by Ops Funds	37	22.5	8	14.5
No. of Independent Beamlines Supported by Non BES Funds	30	13.5	3	9.5
No. of Beamline Equivalents Support by Ops Funds	43	25.2	8.6	16.4
Beamline Equivalent Fraction (for each non BES supported beamline)	0.2	0.2	0.2	0.2
Beamlines Ops Cost Percentage [%] (Including Space Charge Adjustment)	40.1%	47.4%	20.7%	42.1%
Ave Ops Cost per Beamline (Based on Beamline Equivalent)	1,065	1,179	2,381	1,046
Ave Ops Cost per Beamline (Based on Ops Supported Beamlines)	1,238	1,321	2,560	1,183
Ave Ops Cost per Beamline (Based on Beamline Equivalent and Including Space Charge Adjustment)	1,212	1,179	2,643	1,046
Ave Ops Cost per Beamline (Based on Ops Supported Beamlines and Including Space Charge Adjustment)	1,408	1,321	2,841	1,183
FTEs for Beamline Ops	163.6	83.6	76.21	56.85
Ave FTE per Beamline Ops (Based on Beamline Equivalent)	3.8	3.3	8.9	3.5
Ave FTE per Beamline Ops (Based on Ops Supported Beamlines)	4.4	3.7	9.5	3.9
Ave Routine Ops M&S Cost per Beamline [K$] (Based on Beamline Equivalent)	135.4	149.6	169.6	93.8
Ave Routine Ops M&S Cost per Beamline [K$] (Based on Ops Supported Beamlines)	157.4	167.5	182.3	106.1
Loaded M&S Multiplier for Ops	1.22	1.24	1.54	1.14
Estimate Unloaded Routine Ops M&S Cost per Beamline [K$]	128.7	135.4	118.6	93.2
Loaded FTE Multiplication Factor	2.47	2.61	2.19	2.23
Beamline Improvement and R&D Cost Percentage [%]	9.8%	9.8%	23.5%	11.8%
Beamline Improvement and R&D Cost Percentage [%] (Including Space Charge Adjustment)	10.8%	9.8%	25.3%	11.8%
FTEs for Beamline Improvement and R&D	34.8	7.7	68.2	10.4
Unloaded M&S [K$] (direct from table)	2,120	212	8,666	2,148
Total FTEs for Beamlines	198.4	91.3	144.4	67.3

ACCELERATOR	APS	ALS	NSLS-II	SSRL
Accelerator Ops Cost Percentage [%]	23.5%	19.0%	27.9%	23.0%
Accelerator Ops Cost Percentage [%] (Including Space Charge Adjustment)	26.8%	19.0%	30.7%	23.0%
Storage Ring Circumference [m]	1104	197	792	234
FTEs for Accelerator Ops [K$]	110.1	37.6	107.0	30.4
Accelerator Improvement and R&D Cost [K$]	5,092	2,346	700	3,347
Accelerator Improvement and R&D Cost Percentage [%]	3.9%	3.7%	0.6%	8.2%
Accelerator Improvement and R&D Cost [K$] (Including Space Charge Adjustment)	5,696	2,346	700	3,347
Accelerator Improvement and R&D Cost Percentage [%] (Including Space Charge Adjustment)	4.4%	3.7%	0.6%	8.2%
FTEs for Accelerator Improvement and R&D	15.7	6.0	0.0	8.8
Accelerator Improvement and R&D FTE Cost [K$]	4,304	1,363	0	2,553
Accelerator Improvement and R&D FTE Cost [K$] (Including Space Charge Adjustment)	4,908	1,363	0	2,553
Total FTEs for Accelerators	125.8	43.6	107.0	39.2

ESHQ	APS	ALS	NSLS-II	SSRL
ESHQ Cost [K$]	2,143	3,143	4,985.8*	1,702
ESHQ Cost Percentage [%]	1.7%	5.0%	4.5%	4.2%
ESHQ Cost [K$] (Including Space Charge Adjustment)	2,597	3,143	5,360	1,702
ESHQ Cost Percentage [%] (Including Space Charge Adjustment)	2.0%	5.0%	4.9%	4.2%
FTEs for ESHQ	11.8	9.4	12.67	6.59
BUSINESS				
Business Cost Percentage [%]	23.0%	9.4%	14.0%	8.9%
Business Cost Percentage [%] (Including Space Charge Adjustment)	13.0%	9.4%	6.9%	8.9%
Business FTEs	19.5	13.1	6.89	5.12
Space Charge Cost [K$]	13,684	0	8,002	0
Electric Cost [K$]	6,989	1,691	1,656	1,743
Business Cost Excluding Space & Electric [K$]	9,169	4,197	5,727	1,884
Business Cost Percentage Excluding Space & Electric [%]	7.1%	6.7%	5.2%	4.6%
FREE ENERGY				
Free Energy Percentage [%]	16.6%	19.2%	35.0%	21.8%
Free Energy Percentage [%] (Including Space Charge Adjustment)	18.1%	19.2%	36.8%	21.8%

*NSLS-II had significant non-FTE ESH costs

OVERHEAD SUPPORTED FTEs	APS	ALS	NSLS-II	SSRL
Beamline Ops	5.3		1.1	0.6
Accelerator Ops	4.9		0.5	1.2
ESHQ Ops	0		2.23	0.04
Business Ops	8.2	10.7	17.25	6.71
Total	18.4	10.7	21.1	8.5

USER OFFICE (Included in BEAMLINES)				
FTEs for User Office	7.4	5.2	4	3.6
M&S for User Office [K$]				

*NSLS-II had significant non-FTE ESH costs

CHECKSUMS	APS	ALS	NSLS-II	SSRL
Total Cost for Ops Only [K$]	108,334	50,697	71,489	31,863
Total Improvement and R&D Cost [K$]	17,767	8,500	26,522	8,146
Total Cost for Ops Only [K$] (Including Space Charge Adjustment)	106,390	50,697	69,475	31,863
Total Improvement and R&D Cost [K$] (Including Space Charge Adjustment)	19,711	8,500	28,536	8,146
Total Cost [K$]	126,101	59,197	98,011	40,009

OVERHEAD	APS	ALS	NSLS-II	SSRL
Total Cost [K$]	126,101	59,197	98,011	40,009
Total Direct Space Charge [K$]	9,059	0	5,563	0
Total Direct Cost (Exclude Space Charge) [K$]	79,115	36,355	64,295	26,119
Overall Facility Overhead (Include Space Charge) [K$]	46,986	22,842	33,716	13,891
Overall Facility Overhead Rate (overhead/total direct cost)	59.4%	62.8%	52.4%	53.2%

LABOR	APS	ALS	NSLS-II	SSRL
Total FTEs	355.5	157.4	270.93	118.17
% of Labor Cost for Facility	70.0%	80.5%	64.1%	80.9%
Total FTEs for Operation Only	305	143.7	202.73	98.94
% of Labor Cost for Operation Only	68.3%	86.1%	70.1%	86.1%
Labor Multiplier for Operation Fund	2.47	2.61	2.19	2.23
Space Charge [K$]	13,684	0	8,002	0
% of Effective Labor Cost for Facility	80.8%	80.5%	72.2%	80.9%
Space Cost per FTE [K$]	38.5	0.0	29.5	0.0
% of Effective Labor Cost for Operation Only	79.1%	86.1%	78.4%	86.1%
Effective Labor Multiplier for Operation Fund	2.86	2.61	2.45	2.23

APS SPACE CHARGES AND LAB INDIRECT

- Breaking costs down in the manner described previously yields a different message for APS over the FY14-FY16 period – that the cost of doing business has been stable – in contrast to the labor multiplier trend or the Line 131 overhead rate trend:
  - APS shifted resources from staffing to M&S, to gain free energy
  - Other non-effort costs remained stable in aggregate
    - APS' space footprint increased when 400A (built for APS-U.01) was turned over
    - Increases in space charges have been offset by working with the Lab to reallocate certain electricity costs
  - By working closely with the Lab, APS has managed to maintain a reasonably stable contribution to Lab indirect

	FY2014	FY2015	FY2016
Fully Burdened Effort Cost (including program and division support) ($K)	$83,096.8	$80,928.0	$78,136.9
Fully Burdened M&S Cost (including program and division support) ($K)	$14,138.4	$17,541.7	$19,945.7
Other Fully Burdened Non-effort Cost (including program and division support) ($K)	$27,663.8	$27,417.7	$28,017.4
Total Cost ($K)	$124,899.0	$125,887.4	$126,100.0
Lab Indirect ($K)	$32,954.7	$33,951.3	$34,008.2
Effective Lab Indirect Rate	35.8%	36.9%	36.9%
Fully Burdened Space Charges (including program and division support) ($K)	$18,094.0	$18,661.0	$19,245.2
Fully Burdened Electricity Charges (including program and division support) ($K)	$9,020.0	$7,500.2	$7,646.3
Sq Ft Occupied (sq. ft.)	625,561	623,260	637,012
Cost / Sq. Ft. ($)	$28.92	$29.94	$30.21

R&D STAFFING

R&D FTEs by Topic	APS (FY16)	ALS	NSLS-II (FY17)	SSRL
Accelerator R&D				
Insertion Devices, Magnetic Systems	7.8	2	0	0.6
New Sources, RF, Accel. Controls & Instrumentation	7.9	4	0	1.5
Beamline R&D				
Detector	3.8	1	4.82	0.5
Optics & Metrology	3.4	2	4.99	1.2
Instrumentation, Beamline Tech. and Development	3.1	3	2.99	3.3
Software	6.8	2		1.2
Methods & Techniques	(~18%)	(~20%)	(~15%)	(~25%)

DISCUSSION:
WHAT METRICS DO / DON’T LIKE?
WHAT METRICS ARE MISSING?

- APS does not particularly care for the revised labor multiplier including all space charges

- ….