



U.S. DEPARTMENT OF
ENERGY

Office of
Science



DOE Metrics

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OPS 2015 StayTreat

DOE Annual Budget Briefing

1 THOMAS JEFFERSON NATIONAL ACCELERATOR FACILITY											3.0%	
				FY16		COST-OF-LIVING						
				FY14	FY15	Guidance	Guidance	FY17	FY18	FY19	FY20	FY21
				Sept AFP	Approp		Reallocated					
141	Facility Performance/Statistics											
142	Operations Hours:											
143	Research					760	760	2,218	2,664	2,920	3,070	3,182
144	Beam Studies	315	752	444	444	437	329	356	374	388		
145	Tuning/Setup	656	752	422	422	375	255	275	289	299		
146	12 GeV pre-commissioning	341	251			302						
147	Total Operating Hours	1,312	1,754	1,626	1,626	3,332	3,248	3,551	3,733	3,869		
148	Unscheduled Shutdown	1,424	1,270	838	838	1,428	1,140	1,001	819	683		
149	Total Scheduled Hours	2,736	3,024	2,464	2,464	4,760	4,388	4,552	4,552	4,552		
150	Reliability	48%	58%	66%	66%	70%	74%	78%	82%	85%		
151												
152	Weeks of Base Operations	13	18	16	16	27	27	28	28	28		
153	Weeks of 12 GeV pre-ops & commissioning	6	3			3						
154	Total Weeks of Operations	19	21	16	16	30	27	28	28	28		
155	Hours per Week	144	144	154	154	159	163	163	163	163		
156	Operation Mode (Days per Week)	7	7	7	7	7	7	7	7	7		
157												
158	Optimal Hours	1,380	2,088	2,541	2,541	3,332	3,608	3,804	3,999	4,146		
159	Optimal Weeks	20	25	25	25	30	30	30	30	30		
160	Optimal Hours per Week	69	84	102	102	111	120	127	133	138		

- FY14 (the past) values are actuals. In this case, a best guess by me using DTM, elogs and other tools
- FY15 and beyond are expected hours based on Weeks of Operations, Reliability target.



DOE Hours

DOE NP Office requires quarterly updates and tracks:

- Delivered Research Hours
- Delivered Beam Study Hours
- Delivered Tuning/Restored Hours

The sum of these three hours is equal to the **Total Delivered Hours**.

Expected Delivered Hours: During the annual budgetary briefings expected targets are determined.

Reliability

Reliability = Total Delivered Hours/Total Scheduled Hours

Total Delivered Hours = Delivered Research Hours +
Delivered Beam Study Hours +
Delivered Tuning/Restored Hours

Total Scheduled Hours = Total Delivered Hours +
Unscheduled Failures

CEBAF DOE Hours 12GeV era

	Research Week	Restore Week
Scheduled Research Hours	144	0
Scheduled Beam Studies Hours	12	72
Scheduled Tuning/Setup Hours	8	72
Maintenance Hours	4	24
Scheduled Beam Hours per Week	164	144
Maintenance Hours per Week	4	24

- Scheduled hours per week less than 168 hours, and for the year the Scheduled hours per week is **163h**.
- My interpretation of **Unscheduled Hours per Week** is that the first 4 hours of Downtime during a **Research Week** *are free*.
- Unscheduled Failures = Downtime – $N_{\text{weeks}} * 4\text{h}$ (assuming research week)

CEBAF Reliability

- Reliability = Total Delivered Hours/Total Scheduled Hours
- Total Scheduled Hours = Total Delivered Hours + Unscheduled Failures
 - Unscheduled Failures = Downhard – 4h*N_{weeks}
- Total Delivered Hours = Delivered Research Hours + Delivered Beam Study Hours + Delivered Tuning/Restored Hours
 - While tracking of these hours is required, there might be an easier path to Reliability.
- Total Delivered Hours = Total Scheduled Hours – Unscheduled Failures
- Total Schedule Hours = Nweeks*163h
- **Reliability** = $(N_{\text{weeks}} * 163\text{h} - (\text{Downhard} - 4\text{h} * N_{\text{weeks}})) / N_{\text{weeks}} * 163\text{h}$
= 1 – (Downhard – 4h*Nweeks)/Nweeks*163h

CEBAF Reliability

	Scheduled Weeks	Operated Weeks	Reliability Target	Reliability Achieved	
FY14	13	10.3	50	48	
FY15	18	19.7	58	68	Received additional funds for more operating weeks
FY16	16		66		
FY17	27		70		
FY18	27		74		
FY19	28		78		
FY20	28		82		
FY21	28		85		

- Long term schedule is based on “Cost of Living” scenario.
- Additional funding will generally add more operating weeks and may also result in an increase to the reliability target.
- Reliability session this afternoon
- Metrics presentation on Friday

Availability

- Beam metric based on the users assessment of beam delivery.
- Physics to work out the details.

Summary

- Reliability can be derived from the Scheduled Hours, Downtime hours, and hours per week.
- Reliability improved significantly from FY14 to FY15.
 - Improved Cryo performance even with the CC4 failure.
 - No ZA event in FY15.
- Reliability for FY15 is above the target for FY15 and FY16.
- Tracking of DOE Hours is required and a pain.
 - Operations would rather not be involved.