

# The 2016 Ops StayTreat

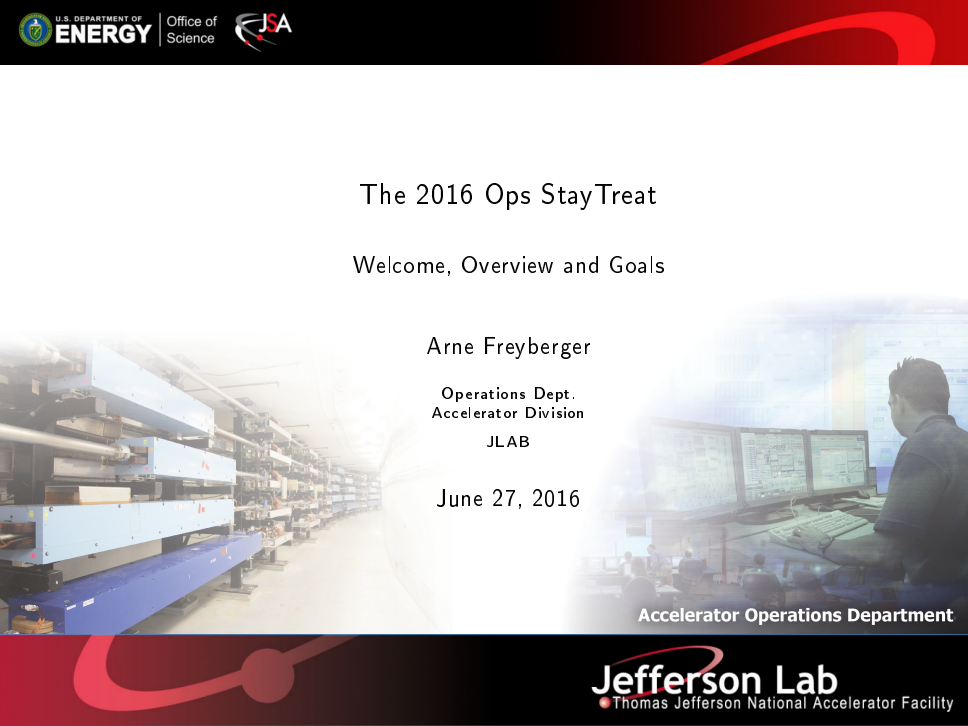
Welcome, Overview and Goals

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Accelerator Operations Department

- 1 Ops Annual StayTreat
- 2 Reliability?
- 3 12 GeV era CEBAF
- 4 Issues/Questions

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2014 One day; SRF/RF/Cryo focus:

**Energy Reach** Path to supporting 12 GeV operations (He processing or Plasma processing).

**System Issues**  $Q_0$ , heat load, calibrations

**Presentations** <https://www.jlab.org/indico/event/69/timetable/#20140403.detailed>

**Summary** <https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-95056/14-024.pdf>

2015 Three days; preparations for commissioning CEBAF at 12 GeV energy.

**Energy Reach** **Field Emission!!!** microphonics!!! RF vs Electrical heat!!!

**Reliability** Proactive vs. reactive.

**Presentations** <https://www.jlab.org/indico/event/109/>

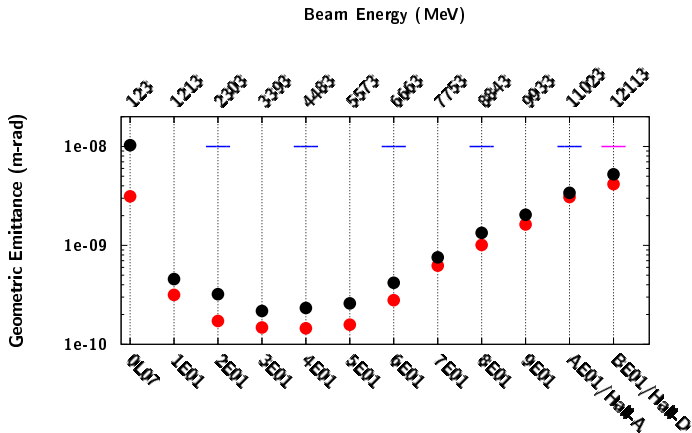
**Summary** <https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-107190/15-033.pdf>

2016 CEBAF Reliability and supporting the Physics program.

**Agenda** <https://www.jlab.org/indico/event/154/timetable/#20160628.detailed>

# OPS 2016 StayTreat: Reliability Focus

- CEBAF 12 GeV Commissioning is finished!
- Beam Operations are now solely in support of the experimental program.
- The user desire (expect) high reliability.
- Our sponsor (DOE) expects reliability in excess of 80%. This is their baseline for all facilities.



# Reliability?

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What time frame are we talking about when we discuss reliability?

- Short term? Today or this weeks performance?
- Slightly longer term? This run periods performance?
- Long term? Annual performance?
- Longer term?
- Future performance goals?

At what level should we be evaluating CEBAF reliability?

- At the individual component level? Valve? Switches? Resistors?
- At a higher level?
- At the organizational level?
  - ▶ Sustainable reliable operations must span staffing changes (aka as retirements).

**All of the above!**

From a recent Lab Operations review at another lab.

Comment:

The inventory of spares is insufficient to maintain reliable and sustainable operations. While this may be an acceptable short-term risk, this cannot be a sustainable long-term posture. **In the long term, operations should manage its resources based on need and not on affordability, much as the projects are being managed.**

Conversational snippets with fellow reviewers:

Colleague from a BES lab:

...my latest battle is finding funds to upgrade a critical system that uses a PDP-11 computer for controls....

Colleague from a NP lab:

The only original parts of the 40y old accelerator at my lab are the steel stands and magnet cores. Everything (coils, cables, interlocks, controls, ...) else has been refurbished to an "as new" state.

**Let's strive to be like the later statement!**



## System Reliability=XX%, now what?

- How is reliability improved?
- System lifetime calculations.
- Expected availability.
- Overall CEBAF Reliability, availability and lifetime.

A quantitative understanding of CEBAF system and sub-system reliability is needed to guide how the limited resources (stuff and staff) are to utilized to maximize CEBAF reliability, availability and lifetime.

**Hope to hear some good ideas over the next three days.**

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- This is the start of the 12 GeV CEBAF Experimental program.
- Experimental program is expected to last at least 15y, maybe 20y.
- CEBAF is expected to support up to 37 weeks of operation per year.

When planning for reliability, the lifespan of the program needs to be considered.

**Goal** CEBAF reliability improves during the 12 GeV era.

- Some exceptions due to increase in programmatic complexity (4-halls?).

**Goal** Near term and long term CEBAF Reliability, Availability and Lifetime estimates are quantitative and predictable.

- Functional and useful CEBAF reliability model exists and used to drive annual work plans.

**Goal** CEBAF at the end of the 12 GeV program is in a state to support the next JLab accelerator.

- Do not drive the car into the ground and donate to WHRO.

## Vision: End of 12 GeV Era (2036)

- CEBAF 12 GeV program complete, all the users are happy.
  - ▶ Average CEBAF reliability exceeded 80% for the entire 12 GeV era.
- Energy Reach stable. **Gradient Maintenance program terminated by 2023.**
- All digital RF controls: upgrade 2 analog zones/year for 20y.
- At least one new 2K cold-box in service. Using same modern cold compressor technology in use at FRIB and LCLS-II.
  - ▶ Accelerator Reliability often spans the DOE facilities, similar designs can lead to fewer required spares and more distributed expertise.
- No CAMAC crates.
- All Magnet coils evaluated and in a position to support the next JLab machine (ready for another 20 years).
  - ▶ May need to rotate out old end-of-life magnets for refurbishment. Rotate in spares.
- Computers, PLC, FPGAs, network systems and quantum computers upgraded, modern and maintainable for the next ten years.
- All software required for CEBAF operations, high level, low level, FPGA, reviewed. Non-portable, non-maintainable code written as portable and maintainable or eliminated.
- UIM Round-Two: Power Grid, Underground piping, Cooling Towers replaced and in position to support another 20 years of operation.

# Achieving the right Balance

**As Needed Maintenance/Repairs** Dealing only active fires can dominate the work tasks. Results in a reactive environment and a negative feedback loop.

- Reliability degrades, you're drowning.

**Near Term Maintenance** Supports the near term plan (run period), reactive dominated. Improvement in reliability difficult in this mode.

- You're treading water but at least you're not drowning.

**Sustained Maintenance** Annual maintenance plans (C20 refurbishments), computer/network upgrades, . . . .

- There is a life jacket nearby and when you reach it you'll be safe.

**Sustained Upgrades** Upgrade/replace obsolescent systems.

- You have two life jackets nearby, one old and obsolete and a new one. You swim toward the new one.

**Accelerator Improvements** Improve the Accelerator, nominally this means a capability improvement. Need to be careful, some capability improvements can have a negative impact on reliability, (4-hall operations).

- You swim to land, only to find yourself in a different country.

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- **We** will solve this problem by working together.
  - ▶ I need your help in developing the plan to achieve these goals and making the case to Lab management.
  - ▶ I need your help in achieving the right balance between repairs, maintenance, upgrades and improvements.
- Not even the questions are known at this time, much less the answers.
  - ▶ Is this a top-down problem?
  - ▶ Is a bottoms up approach appropriate?
  - ▶ Are we collecting the right data?
- There are constraints: funding, staffing, schedule. Having a reliability model will aid in determining what has priority within the constraints.

**This workshop is meant to start the conversation and set the seed for a plan towards sustained improvements in CEBAF reliability.**