Minimizing the impact of Maintenance/Repair Day's on performance

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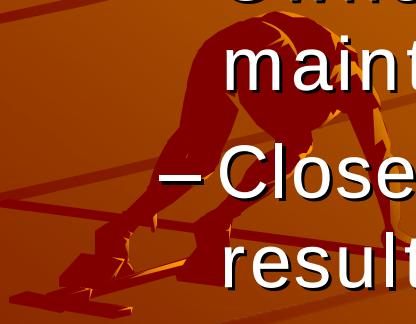
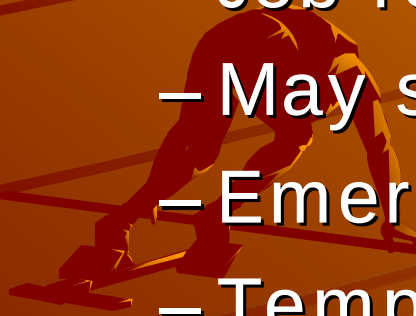
What did we do differently:

- Utilized new methods outlined at RHIC Retreat 06.
  - Approval.
  - Ownership, outside agreement that maintained systems are operational.
  - Closeout, including operational test results and owner accord.
  - Documenting.
  - Post mortem.



Job Request System

- Extensively used this year for the first time.
- Added features:
  - Job recollection for re-use.
  - May submit continuing/recurring jobs.
  - Emergent and failure modes added.
  - Template forum may be utilized for any job ever submitted.



Scheduling effectiveness:

- Was successful for the injectors:
  - Accelerators were operational on or before schedule.
  - Impact of sweeps was minimal.
  - The test period for injectors following maintenance and accesses proved quite useful.
  - Structured evolution into and out of Maintenance successful.
    - Injector availability was markedly improved.

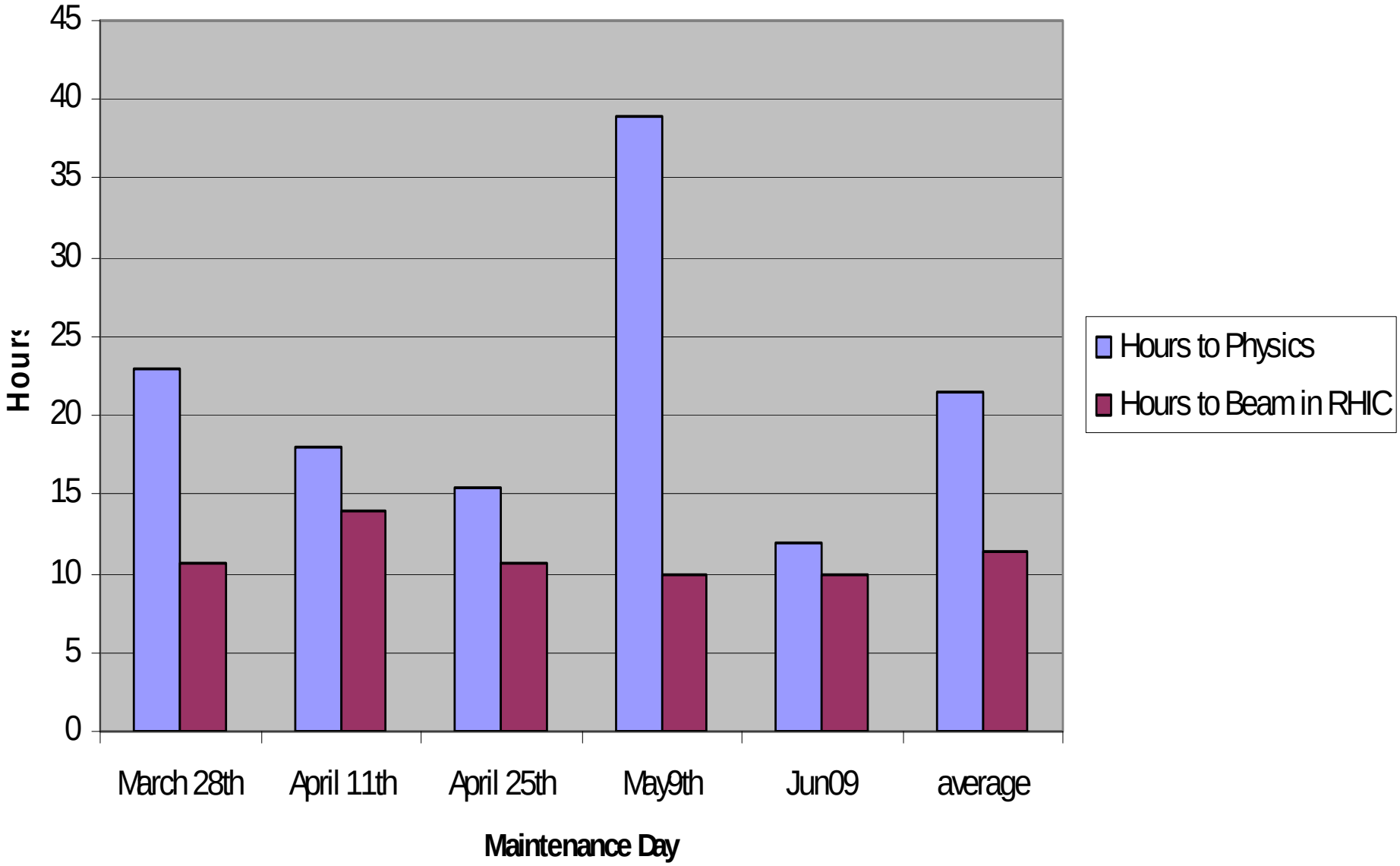
Effectiveness of outside ownership and job closeout:

- Ownership had limited success:
  - Many jobs had ‘Operations’ as owner.
    - No different than before.
  - Limited manpower and availability for ownership.
    - Most owners also performing their maintenance own jobs.
- Job closeouts often hurried, delayed due to work volume and length.

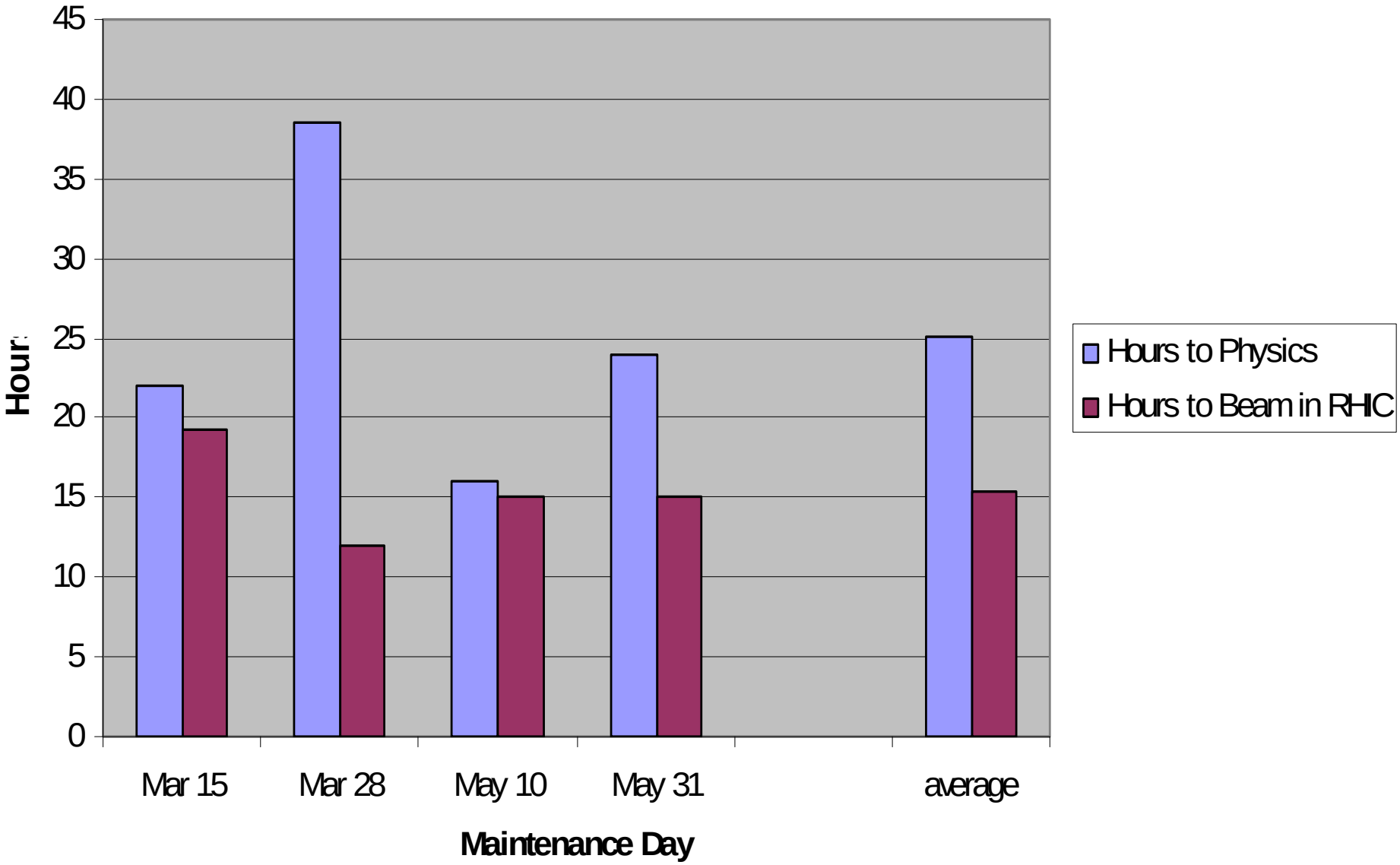
Did it help?

- RHIC: some improvement:
  - Average 3+ hour less this year than last between start of maintenance and Physics running.
- Omitted from graphs: access on May 23, 2007 and the week following April 14, 2006.
  - May 23rd , 2007 was a repair period after which Physics was restored immediately for one store, but ensuing failures caused 18 additional hours of downtime.
  - April 14th , 2006 RHIC was off for STAR disconnect failure investigation (~one week).

Botton Line 2007



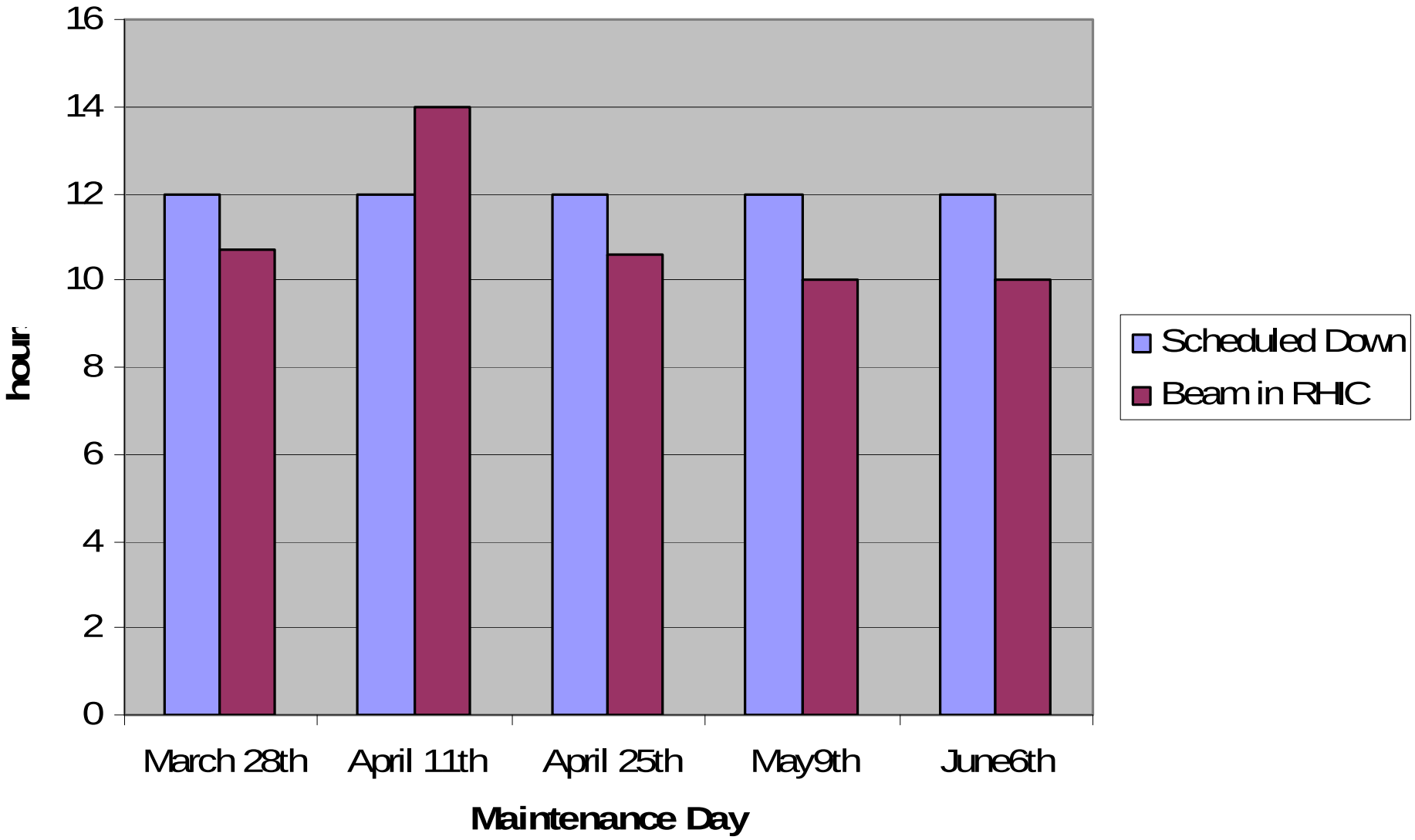
Bottom Line 2006



Injectors:

- Were nearly always on or before schedule.
  - Except following the BTA QV3 breaker failure.
- Often ran programs during the maintenance day.
  - NSRL ran many days from 1100 hrs (only 4 hours total down for the Booster).

Scheduled Maintenance to Beam in RHIC



What Happened?

Failures following Maintenance:

- March 28:
  - ACS program problem in AtR and failed
  - ACS failed relay.
  - ACS 1Z1 discrepancy.
  - RHIC Power supply failure.
  - Quench detection.
- April 11:
  - Failed bottle contactors found at AtR substation.
  - ACS Panelview problem delayed sweeps.
- April 25:
  - W arc 20 water problems.
  - RHIC power supply.

Failures continued

- May 9:
  - BTA QV3 disconnect failure*.
  - Blue RF screen supply*.
  - BTA vacuum*.
  - RHIC Power Supply.
  - Fire alarm at PHENIX*.
  - ODH alarm*.
- May 23 (repair period- no Maintenance or development done):
  - RHIC Power supplies.
  - Failed breaker for RF system.
  - RF low level power supply failure.
- June 6:
  - RHIC Power Supplies.

*not touched during Maintenance

QA issues:

- March 2 Wrong BMMPS function loaded during test.
- March 28:
  - Loose connector for RF drive.
  - PLC power for Booster correctors
- April 11:
  - Permit for Stochastic coolers left on without authorization.
- April 25:
  - LEMO connectors for RHIC power supplies left off.
- May 09:
  - Bad MMPS supply installed at RHIC.
  - RF DSP card not booted properly.
  - BTA vacuum not noticed.

Other delays

- PHENIX access April 11 (3hrs)

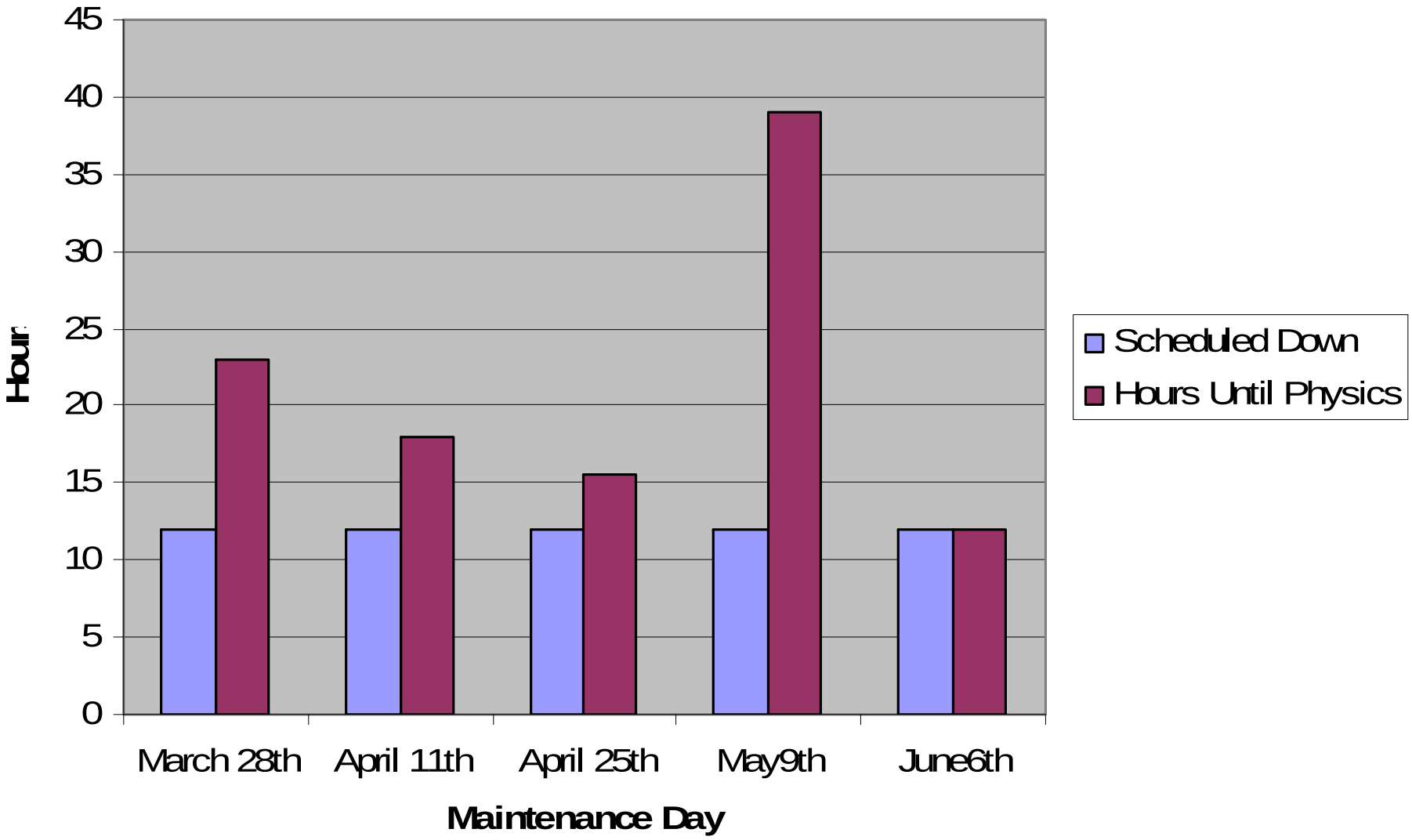
What's the Problem?

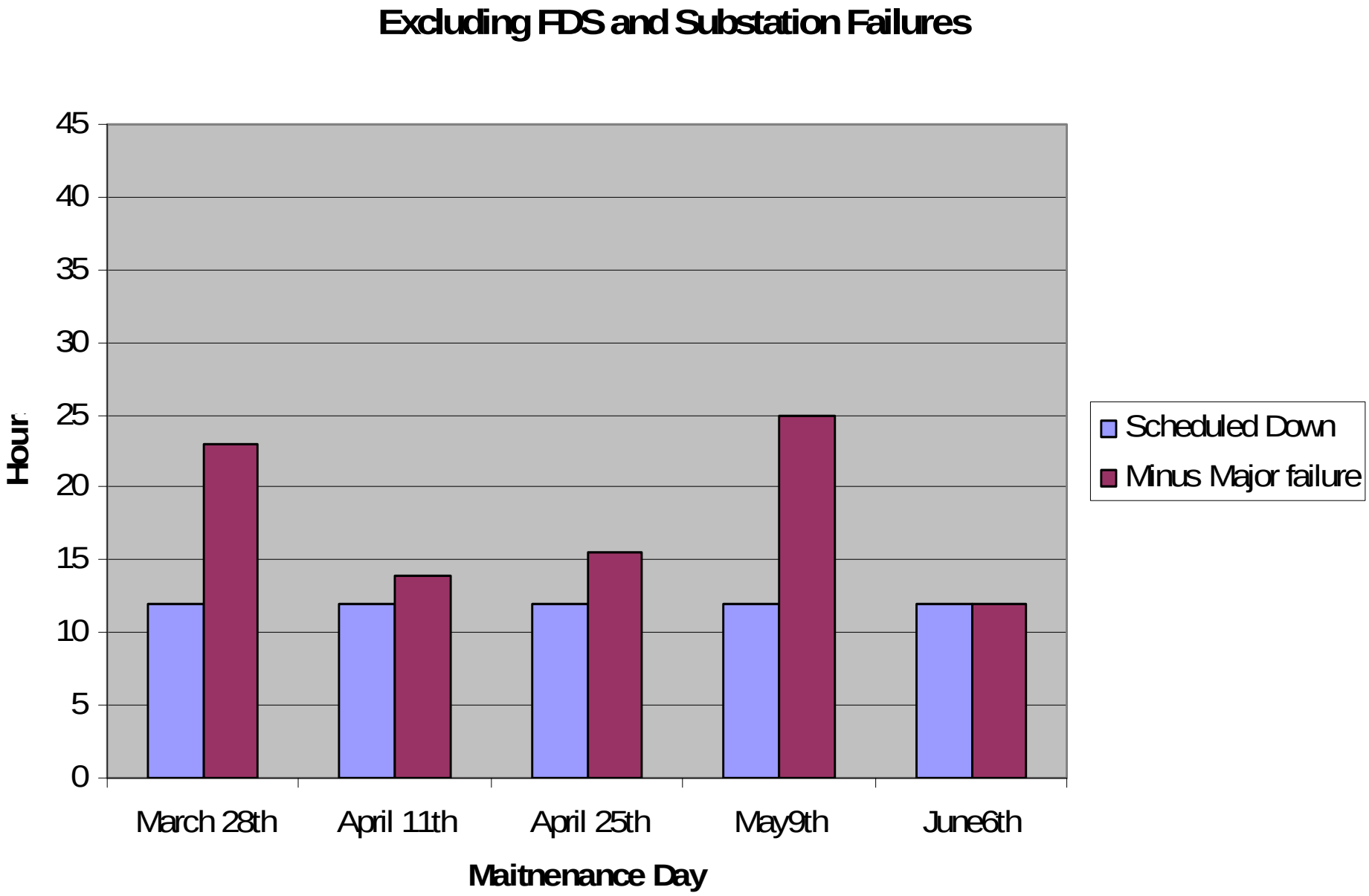
- Overworked, undermanned.
  - Workforce is spread very thin.
  - Works very long hours.
  - Often get called back in early on day 2.
- Too much to do:
  - Left over items from setup and shutdown often put off 'till a Maintenance Day'.
  - New systems installation, testing and troubleshooting.
- Development and other programs running during Maintenance Days.
  - NSRL and or polarized proton setup ran most MDs. Causes distractions, uses up resources.

How can we improve?

- Preventative Maintenance:
  - Disconnects, substations: ongoing and during the shutdown.
  - Power supply fixes.
- Continue QA
  - Plan work better.
    - Job completion procedures/checklists?
  - Stricter enforcement of ownership.
  - Less setup and development work on Maintenance Days.

Bottom Line: APEX off to RHIC Physics




Excluding FDS and Substation Failures
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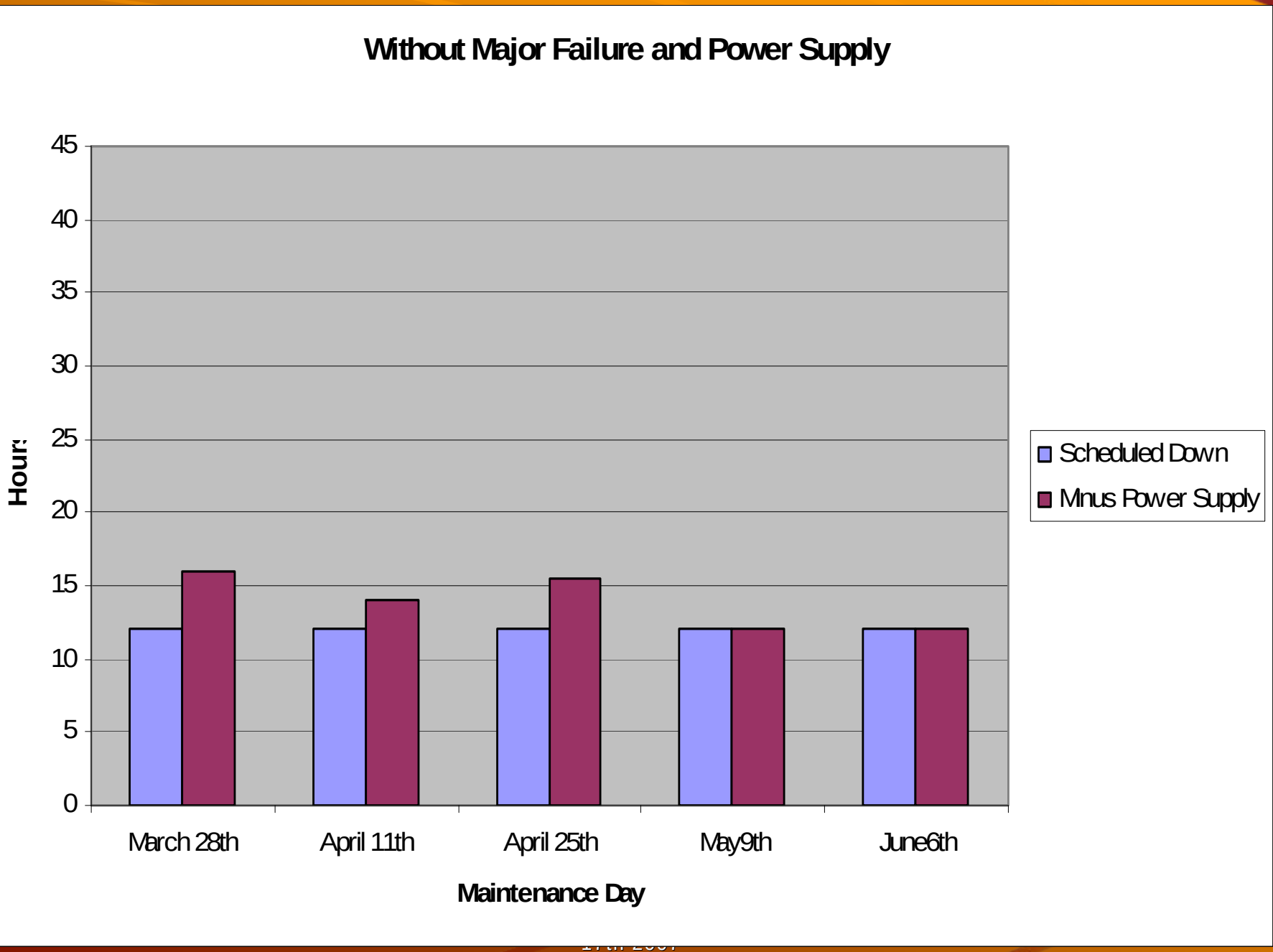
Scheduled Down
Minus Major failure


Without Major Failure and Power Supply
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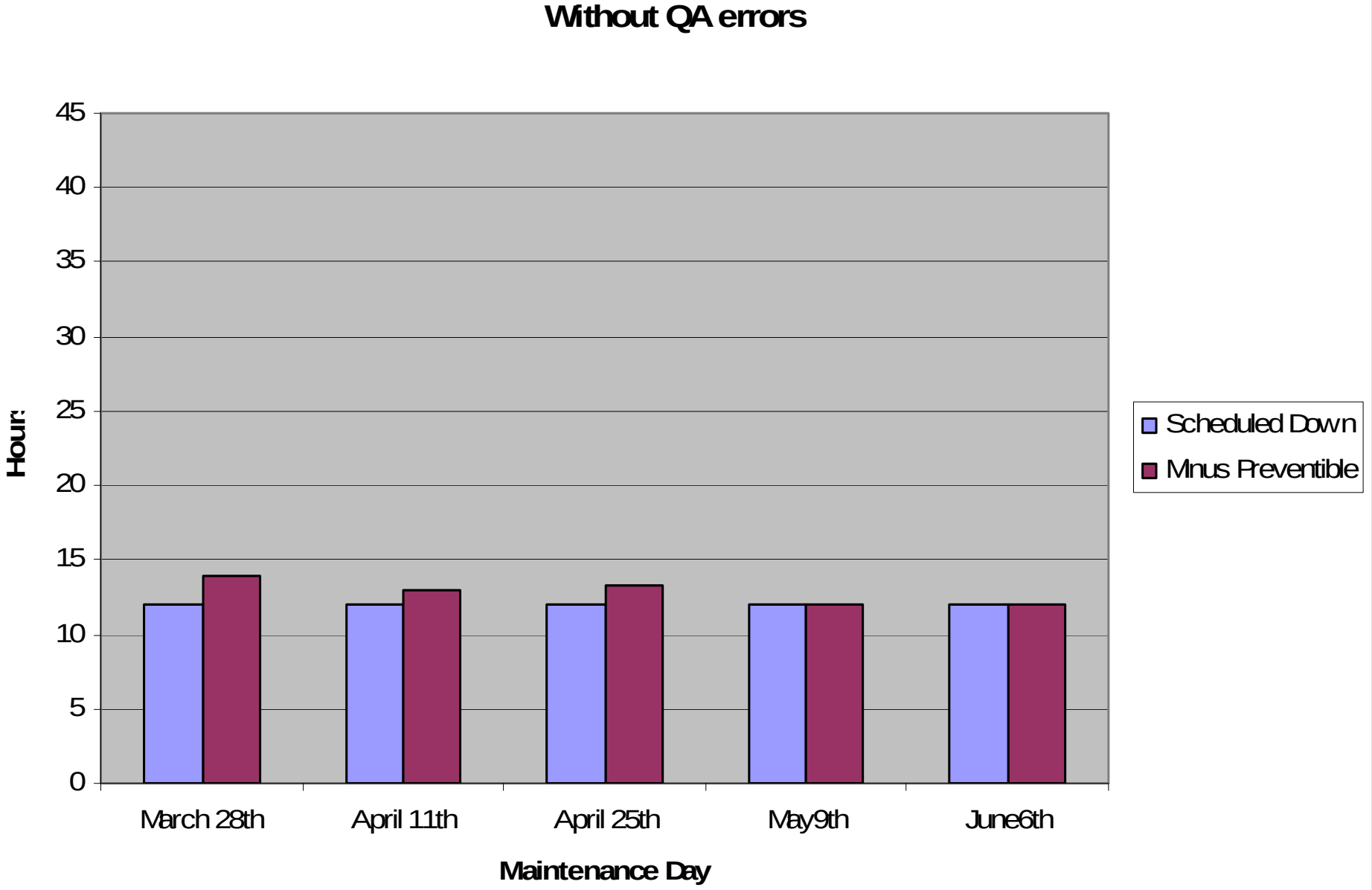
Without QA errors
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April 11th
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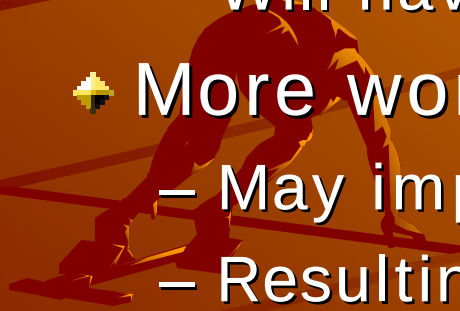
June6th
Maintenance Day
Scheduled Down
Mnus Preventible

Unscheduled Maintenance?

- A schedule with jobs and urgencies is maintained.
  - Can be implemented following extended failures.
  - Will have personnel and beginning affects.
- More work ‘Behind Stores’
  - May impact beam development.
  - Resulting failures may impact availability.



What about a Hybrid maintenance schedule?

- Floating access periods dedicated to repairs.
  - Shorter in duration.
  - Fewer Jobs.
  - No new installation or test setups.
  - 24-48 hour notice to workers and experimenters.
- Development days:
  - Less frequent.
  - Longer in duration and setup.
  - Higher potential for failures/problems.