Title	***LINAC Spares and Maintenance***		
Project Requestor	Dave Bromberek		
Date	2/25/09		
Group Leader(s)	Ali Nassiri		
Machine or Sector Manager	Nick Sereno		
Category	Obsolescence/Spares		
Content ID*	APS_1283030	Rev. 2	2/26/09 4:12 PM

*This row is filled in automatically on check in to ICMS. See Note [1]

Description:

Start Year (FY)	**2009**	**Duration (Yr)**	**3**

Objectives:

Address component lifetime, obsolescence, spares, redundant systems capability and performance issues in the linac rf, mechanical, and vacuum support systems.

Benefit:

Reduced risk of catastrophic failure and injector downtime which could lead to extended downtime. Maintain adequate spares inventory. Increase redundancy capability and increase performance.

Risks of Project: See Note [2]

LOW. A minimum of 20% of windows received will be high power tested utilizing the L6 Test stand.

Consequences of Not Doing Project: See Note [3]

Extended downtime on the order of weeks or longer, from a catastrophic event due to component end-of-life failures, such as was seen with an rf window failure at the end of January 2009. It is believed that the lifetime of an rf window is between 10-15 years. The current linac waveguide system contains a total of 35 windows aged 9 years or greater. Ten Gamma windows installed in the system were manufactured in 1991 with the majority of those in continuous service since 1993. It should be considered a high risk to machine operations to delay purchases of new windows and spares. Some items such as certain waveguide components and vacuum valves are dangerously low or nonexistent as spares inventory. Many rf, water & vacuum system components are obsolete and are not repairable.

Cost/Benefit Analysis: See Note [4]

Undertaking this project will ensure a healthy linac with consistent performance and minimize injector downtime, improve performance, mitigate the likelihood of a catastrophic failure, and bring spares inventory of rf, mechanical and vacuum systems up to acceptable levels.

Description:

Procure & manufacture linac rf system and waveguide components to maintain system integrity and performance, and maintain spares at acceptable levels. Replace existing Gamma rf windows at accelerating structures inputs and rf guns, with new CML rf windows. Replace Titan-Beta windows with new CML windows. Install Chinese SLEDS in L4 & L5 to improve linac performance. The Chinese SLEDS would enable the klystrons at these stations to operate at lowered power levels which theoretically would increase klystron lifetime while also being capable of producing higher beam energies. Replace obsolete Class C 400W amplifiers with 500W linear amplifiers. Replace obsolete Los Alamos vector detector modules with new digital phase detectors.

Replace obsolete ion pumps and controllers, some of which have over 130,000 hours of operation. Existing controllers drive two pumps with single-ended outputs which make them difficult to troubleshoot and provide only a single remote readback. Standardize vacuum valves (currently no spares on-hand), and upgrade existing 1st generation valve controllers to the latest version used in the Storage Ring, enabling remote lock-out of valves. Upgrade the waveguide SF6 gas system. Currently, an SF6 refresh requires a technician call-in and takes ~90 minutes + technician travel time. The new system will have separate pumps/valves/etc., and a new control system with EPICS interface that would allow the MCR operators to refresh the SF6 remotely in less than30 minutes.

Replace the linac rf water stations which have been in service since the birth of the APS. The stations now in use have been greatly modified over the years to achieve the temperature control required to operate the linac but are nearing the end of their life cycle. Due to the fact that there are no back-up systems, almost any type of failure results in injector downtime. Component obsolescence and end-of-life failures are major issues with the existing systems. The new systems would improve long-term reliability and serviceability, replace outdated relay logic with PLC based control systems with EPICS interface, provide the possibility of separate temperature control for the SLEDS, and also reduce sound levels from the equipment (estimated reduction of 10dB).

<u>Risk Matrix Evaluation:</u>
Impact 3 Likelihood 3 Risk 6

Funding Details

Cost: ($K)
Use FY08 dollars.

Year	AIP	Contingency
1	173.6	
2	664.2	40
3	664.1	40
4		
5		
6		
7		
8		
9		
Total	1501.9	80

Contingency may be in dollars or percent. Enter figure for total project contingency.

Effort: (FTE)
The effort portion need not be filled out in detail by March 28

Year	Mechanical Engineer	Electrical Engineer	Physicist	Software Engineer	Tech	Designer	Post Doc	Total
1		0.15			0.05	0.1		0.3
2	0.6	0.15		0.1	1.35	0.1		2.3
3	0.6	0.05		0.05	1.55			2.25
4								0
5								0
6								0
7								0
8								0
9								0

Notes:

[1] **ICMS**. Check in first revision to ICMS as a *New Check In*. Subsequent revisions should be checked in as revisions to that document i.e. C*heck Out* the previous version and C*heck In* the new version. Be sure to complete the *Document Date* field on the check in screen.

[2] **Risk Assessment.** Advise of the potential impact to the facility or operations that may result as a consequence of performing the proposed activity. Example: If the proposed project is undertaken then other systems impacted by the work
include ... (If no assessment is appropriate then enter NA.)

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[3] **Consequence Assessment.** Advise of the potential consequences to the facility or to operations if the proposal is not executed. Example: If the proposed project is not undertaken then ____ may happen to the facility. (If no assessment is appropriate then enter NA.)

[4] **Cost Benefit Analysis.** Describe cost efficiencies or value of the risk mitigated by the expenditure. Example: Failure to complete this maintenance project will result in increased total costs to the APS for emergency repairs and this investment of ___ will also result in improved reliability of ____. (If no assessment is appropriate then enter NA.)