

LQCD-ext II Project: Risk Register Summary

Sum of Risk Rating	Column Labels					
Row Labels	Cost	Schedule	Security	Service	Technolog	Grand Total
Exists	1.375	0.375	0.075	0.55	0.825	3.2
2 - Medium	0.7	0.375		0.225	0.5	1.8
01: Technology/systems may take longer than expected to become available		0.375				0.375
02: Cost projections for future years uncertain	0.25					0.25
08: Failure of a facility due to natural disaster				0.225		0.225
41: Software infrastructure may not be mature enough for newer computing architectures					0.25	0.25
42: LQCD sustained performance-per-dollar on commodity hardware may not improve as rapidly as anticipated					0.25	0.25
44: DOE funding unavailable beyond FY19	0.45					0.45
3 - Low	0.675		0.075	0.325	0.325	1.4
03: Unexpected increases in life costs arise after systems are acquired	0.125					0.125
04: Hardware acquired becomes obsolete before expected					0.05	0.05
07: Host institutions do not provide necessary infrastructure	0.125					0.125
10: Agency personnel changes reduce support for project	0.125					0.125
11: Major computer system failure					0.125	0.125
13: Changes in funding due to policy changes or new directives	0.125					0.125
16: Change in agency mission					0.025	0.025
17: Inappropriate use of computer resources			0.05			0.05
18: Unauthorized access to computing may disclose private information			0.025			0.025
19: Slow networking between sites inhibits productivity					0.025	0.025
20: Authentication differences affect inter-site transfers, productivity					0.05	0.05
21: Power costs could become substantial	0.05					0.05
26: Utility system failure at one of the facilities				0.125		0.125
27: Loss of nearline stored data				0.125		0.125
28: Stored data may get corrupted or lost				0.025		0.025
37: Staff changes have adverse effect					0.05	0.05
38: Inaccurate Storage Forecasting	0.075					0.075
39: Inadequate Lustre Support	0.05					0.05
40: TJNAF Computing Facilities Re-org				0.05		0.05
Retired	0.225	2.475		0.15	1.5	4.35
(blank)						
Grand Total	1.6	2.85	0.075	0.7	2.325	7.55

Risk ID	Risk Title	Risk Area	Description	Probability of Occurrence	Impact of Occurrence	Risk Rating
1	01: Technology/systems may take longer than expected to become available	Schedule	The schedule for achieving LQCD investment milestones might slip for the following reasons: a) Vendors may take longer than anticipated to bring new processors, memory systems, and/or interconnect systems to market; b) It may take longer than expected to bring new systems on-line for production use.	High	Moderate	0.375
2	02: Cost projections for future years uncertain	Cost	Although cost projections for the current budget year are reasonably precise, projections for subsequent years become progressively uncertain.	Medium	Moderate	0.250
3	03: Unexpected increases in life costs arise after systems are acquired.	Cost	Unexpected increases in life costs arise after systems are acquired.	Low	Moderate	0.125
4	04: Hardware acquired becomes obsolete before expected	Technology	Obsolescence: The hardware acquired by this investment becomes obsolete before the end of the planned operations and so does not deliver scientific computing for LQCD calculations in a cost-effective manner.	Medium	Low	0.050
7	07: Host institutions do not provide necessary infrastructure	Cost	Dependency: Host institutions will not provide space, network connectivity, and mass storage.	Low	Moderate	0.125

8	08: Failure of a facility due to natural disaster	Service	Surity: A major failure of a facility due to natural disaster (destruction of buildings, utility systems)	Low	Severe	0.225
10	10: Agency personnel changes reduce support for project	Cost	Agency personnel changes, limiting continuity and support for this investment.	Low	Moderate	0.125
11	11: Major computer system failure	Technology	A major system, such as a cluster or a high performance network, fails to meet performance specifications such that our ability to achieve scientific goals is compromised and the investment does not meet technical goals.	Low	Moderate	0.125
13	13: Changes in funding due to policy changes or new directives	Cost	Changes in funding, due to alteration in administration policy, or legislative directives.	Low	Moderate	0.125
16	16: Change in agency mission	Technology	Changes in the mission and plans of the Office of Science.	Low	Low	0.025
17	17: Inappropriate use of computer resources	Security	Inappropriate use of computer resources by authorized or unauthorized personnel	Medium	Low	0.050

18	18: Unauthorized access to computing may disclose private information	Security	Unauthorized access to computing hardware can disclose private information.	Low	Low	0.025
19	19: Slow networking between sites inhibits productivity	Technology	Slow Internet data transfer rates among the three labs and external sites may inhibit productivity	Low	Low	0.025
20	20: Authentication differences affect inter-site transfers, productivity	Technology	Differing authentication schemes among the three labs makes data transfers difficult which limits productivity	Medium	Low	0.050
21	21: Power costs could become substantial	Cost	The direct (electricity for computers) and indirect (electricity for cooling the computers) costs to the DOE could be substantial in the later years of the project.	Medium	Low	0.050
26	26: Utility system failure at one of the facilities	Service	Utility system failure at one of the facilities	Low	Moderate	0.125

27	27: Loss of nearline stored data	Service	Reliability: Loss of nearline stored data.	Low	Moderate	0.125
28	28: Stored data may get corrupted or lost	Service	Data Integrity: Some stored data may get corrupted or lost. Some LQCD data products, such as gauge configurations and very large quark propagators, are very valuable in terms of the computing required to reproduce them in case of loss or corruption.	Low	Low	0.025
37	37: Staff changes have adverse effect	Technology	Performance: Changes in staff can have adverse effects on the project.	Medium	Low	0.050
38	38: Inaccurate Storage Forecasting	Cost	Changes in science algorithms or storage use patterns could lead to underestimation of future storage needs which drive up costs or limit the science that can be done with the deployed CPU's.	High	Low	0.075
39	39: Inadequate Lustre Support	Cost	Lustre may require more site effort than currently expected (for a fixed amount of storage) if vendor support or storage operating characteristics change.	Medium	Low	0.050

40	40: TJNAF Computing Facilities Re-org	Service	TJNAF is re-organizing its computing facilities to meet a PUE goal of 1.4 by about March 2017. This will mean one more full power outage in late 2016 (power transitions, Lustre relocation) plus rolling downtime for compute cluster as racks are moved and/or reconfigured.	Medium	Low	0.050
41	41: Software infrastructure may not be mature enough for newer computing architectures	Technology	41: Software infrastructure may not be mature enough for the latest highest-performing architectures to allow the project to exploit the otherwise most cost-effective hardware	Medium	Moderate	0.250
42	42: LQCD sustained performance-per-dollar on commodity hardware may not improve as rapidly as anticipated	Technology	The performance of commodity hardware components may not improve or their prices may not drop as rapidly as anticipated. New or advancing technologies in commodity hardware, particularly in processors and accelerators, may not perform adequately because of unforeseen bottlenecks that are not adequately addressed in current LQCD software. Realization of these risks may result in the investment failing to meet performance goals in the later years of the project.	Medium	Moderate	0.250
44	44: DOE funding unavailable beyond FY19	Cost	Risk of unavailability of DOE funding beyond the end of the project (end of FY19)	Medium	Severe	0.450

Risk Priority	Risk Status	Creation Date	Last Review Date	Next Review Date	Last Change
2 - Medium	Exists	7/1/04	5/10/17	9/15/17	No change
2 - Medium	Exists	7/1/04	5/10/17	9/15/17	No change
3 - Low	Exists	7/1/04	5/10/17	5/15/18	5/10/2017: Added note from Chip Watson.
3 - Low	Exists	7/1/04	5/10/17	4/15/18	4/8/2015: Mitigation strategy text: typically for 4.5 years (was 3 years)
3 - Low	Exists	7/1/04	5/10/17	6/15/18	No change

2 - Medium	Exists	7/1/04	5/10/17	9/15/17	No change
3 - Low	Exists	7/1/04	5/10/17	4/15/18	No change
3 - Low	Exists	7/1/04	5/10/17	3/15/18	4/8/2015: Clarify that this risk applies to all systems, even though the mitigation only treats the most likely case.
3 - Low	Exists	7/1/04	5/10/17	3/15/18	No change
3 - Low	Exists	7/1/04	5/10/17	5/15/18	No change
3 - Low	Exists	7/104	5/10/17	4/15/18	No change

3 - Low	Exists	6/1/05	5/10/17	5/15/18	No change
3 - Low	Exists	6/1/05	5/10/17	3/15/18	4/22/2015: Rewrote mitigation strategy to address improvements in networking in past few years.
3 - Low	Exists	6/1/05	5/10/17	4/15/18	4/8/2015: Modest text change in mitigation strategy
3 - Low	Exists	8/8/05	5/10/17	5/15/18	No change
3 - Low	Exists	7/21/09	5/10/17	3/15/18	4/8/2015: Adjusted mitigation strategy text.

3 - Low	Exists	7/1/04	5/10/17	4/15/18	4/8/2015: Adjusted mitigation strategy text.
3 - Low	Exists	8/18/09	5/10/17	5/15/18	5/10/2017: Expanded node per Chip Watson.
3 - Low	Exists	7/1/04	5/10/17	7/15/17	4/22/2015: Set to impact to Low, add Notes about variants.
3 - Low	Exists	8/20/14	10/15/16	10/15/17	Update treatment of storage in mitigation strategy
3 - Low	Exists	8/20/14	5/10/17	5/15/18	No change

3 - Low	Exists	8/20/14	5/10/17	4/15/18	5/10/2017: Replaced note per Chip Watson.
2 - Medium	Exists	4/22/15	5/10/17	7/15/17	5/10/2017: Replaced note per Chip Watson.
2 - Medium	Exists	8/19/15	5/10/17	8/15/17	No change
2 - Medium	Exists	10/24/16	5/10/17	8/15/17	No change

Mitigation Strategy	Notes
<p>For more than a decade now, the LQCD Integrated Project Team has worked on multiple large cluster hardware procurements with significant success. Experienced professional staff follow the commodity market carefully and gain insight by evaluating prototype hardware. They meet with vendors frequently under non-disclosure agreements and are briefed on roadmaps for components such as processors, chipsets, motherboards, network interface cards and switches. In addition to working closely with manufacturers and system integrators, the team has the capability of testing pre-release components. Working with the manufacturers, the team is aware of the strengths and weaknesses in vendor products. The team is able to determine whether new capabilities will actually provide any advantage in future system procurements. The team plans to use past procurement methodologies, fine tuning them as appropriate.</p>	
<p>Market information is gathered and prototypes are built throughout the lifetime of the project. Open procurements of commodity components allow for competitive prices. Since hardware is modular in nature, if prices exceed expectations in any given year, it is possible to deploy smaller machines. A level of performance contingencies are maintained for all procurements.</p>	<p>If conventional clusters remain competitive for next two years, the risks will remain same.</p>
<p>Hardware maintenance costs are included in procurement of components for each new system procured (each year). Operations costs are well understood based on years of similar operational experience. Each of the three host institutions (FNAL, TJNAF, and BNL) has operated computing equipment for LQCD computing for more than 10 years. Since the LQCD project is staffed by few key professionals, the loss of any of them is likely to affect the performance of the project; this risk is accepted “as-is” although the project does strive through cross-training and other efforts to maintain expertise across and among the staffs at the three sites.</p>	<p>New technology sometimes comes with increased first year operational costs, e.g. the first generation of production Xeon Phi for the project, the 16p KNL cluster at JLab, saw increased operational costs due to multiple changes in BIOS, including running a couple of screen tests on all nodes to weed out weak chips. This higher first year cost is addressed by keeping labor contingency at the deployment sites (and some of that was used at JLab in FY17).</p>
<p>Clusters purchased by this investment are operated typically for 4.5 years, and subsequently retired. These assumed lifetimes are consistent with historical life cycles observed on similar hardware over the last decade.</p>	
<p>The required computer room space is available at each of the host institutions. Only a small fraction of the Internet bandwidth and mass storage of the laboratories is required to support the LQCD computing project. The experiments that are the main users of computer facilities are a high priority for each of the laboratories, and the computer space, and network and mass storage resources will continue to evolve to support these experiments in a way that will also meet the needs of this investment. Further, the project maintains Memoranda of Understanding (MOU) with each institution which detail the resources which are to be committed. In any given year, should one of the three host institutions predict that it would not be able to provide the required resources in a later year; the project will plan to shift deployment of hardware to one of the other host institutions.</p>	

<p>LQCD computer facilities are located within large buildings suitable for large computing installations. These building are not necessarily hardened for natural disasters. To make them disaster-proof would be extremely expensive. The impact of a disaster is severe because this will impact the scientific delivery schedule significantly. However, the probability of occurrence is low. The project accepts this risk.</p>	
<p>DOE staff has knowledge of the investment, and have been providing support for over six years. As the investment spans multiple programs, this expertise is not limited to a single individual, and so the impact of a single change is minimal. The existence of an Integrated Project Team, whose composition includes Federal personnel, also mitigate risks due to agency personnel changes. A rigorous review process has been established to mitigate risks, including monthly and quarterly reports and annual reviews.</p>	
<p>While this risk applies to all systems in principle, we focus our mitigation strategy on new systems since, in our experience, that is where this is much more likely to occur. The project evaluates prototype machines before procuring and installing production hardware. The project also builds appropriate acceptance criteria into major purchases. During the acceptance testing phase lasting 30 days, the system is tested thoroughly. If the system is deemed to be unacceptable, it can be returned to the supplier under the warranty condition. The project procures systems with a minimum 3 year warranty service. Also, each project purchase represents an addition of $\leq 50\%$ to the deployed CPU power, which limits the impact of this risk. Even if a new system completely failed to perform despite the aforementioned safeguards, at worst only 1/3 of the post-purchase CPU power is affected. The loss of any one resource for 2-3 months would not result in a major impact on project deliverables.</p>	
<p>The investment allocates resources and builds new computing capabilities on a yearly basis, so it is possible to adjust to changing funding levels. This is particularly so because the systems are modular, so reductions in funding can be adjusted for by reducing the size of the systems. Such reductions may delay reaching computational and scientific milestones. A strategy is not available which mitigates the loss of technical computing capability due to substantial decreases in funding.</p>	
<p>The computing systems acquired by this investment for LQCD computing have a broad range of applicability in other areas of computational science and could be put into other scientific uses. This is an accepted “as-is” risk.</p>	
<p>The computing hardware acquired and operated by this investment is included in enclaves at each of the three sites (FNAL, TJNAF, and BNL). These enclaves have approved C&As according to Federal guidelines (NIST, DOE). Strong authentication is required for access to the systems. The computer resources are on private networks behind these secure systems. The project will coordinate security with the host laboratories. Usage is carefully monitored and controlled by batch systems. Performance is also carefully monitored, so any unauthorized usage would be quickly noticed and terminated. On clusters, batch systems automatically terminate user processes at the end of each job and before each new job starts up. Thus, any unauthorized process would be terminated.</p>	

<p>No classified information, sensitive data, or personally identifiable information is stored on the systems. No privacy risks are present because the lattice QCD systems acquired and operated by the investment contain no personally identifiable information. To enforce this, LQCD users are required to comply with security policies established by respective laboratories.</p>	
<p>At FNAL, a dedicated node to be used for intersite transfers (via GlobusOnline) was deployed in 2013 with 10 gigE connectivity to the internet and QDR Infiniband connectivity to the FNAL LQCD Lustre filesystem. When users report slow transfers, Fermilab networking staff have worked with external sites (for example, Globus Online, ANL, NCSA) to determine and repair the causes of any bottlenecks. Similarly, JLab has a dedicated 10 gigE / 40g IB data gateway hosting GlobusOnline, with (shared) 10 gigE to ESnet; network experts work with ESnet to diagnose any slow connections.</p>	<p>Transfer needs between FNAL and TJNAF are minimal. Transfer needs between FNAL and BNL are rare and the connectivity is excellent. Transfer needs between TJNAF and BNL are minimal. Transfer needs are more frequent from Leadership class computing to LQCD computing sites. Although transfer rates between ANL and FNAL are not an issue, there are sporadic issues with transfers from Oak Ridge to FNAL. Oak Ridge to TJNAF: any transfer problem occurs in bursts, mostly with propagators. Transfer problems are often solved by providing better tools to users (e.g. BBFTP, Globus Online) or suggesting procedural changes such as pre-staging from tape to disk.</p>
<p>FNAL, BNL, and TJNAF network staff tunes parameters to optimize transfers. Scientific allocations of time on the LQCD computing clusters takes into account the quantity of data which must be transferred between sites; if network performance would limit productivity, allocations are made such that analysis jobs would run at the same site as data are stored (i.e., to minimize transfers). This is an accepted risk for the project since controls for computer security protections are expected to become stricter in near future. Site Managers try to mitigate this risk by addressing helpdesk requests and better documentation.</p>	
<p>Project staff uses historical power trends to predict electrical costs. The project also tracks actual power consumption of new systems. The project also specifies power consumption criteria for new procurements to prefer lower power components. The project is always investigating new cost saving and effective computer cooling technologies.</p>	
<p>There is a moderate possibility of a single-site utility failure. However, the deployment of SciDAC LQCD software libraries at each site allows end users to shift their scientific production easily from one host institution to another. Should a significant disruption occur, critical scientific production (as determined by the Scientific Program Committee and the Lattice QCD Executive Committee) could continue by such a shift. This may require other less important production to be slowed or delayed. Note that no mitigation strategy is available which could sustain the normal rate of computations should one of the facilities suffer a major utility outage.</p>	<p>Although it is possible to reduce the risk at FNAL by implementing remedial actions, there is no funding available. This is considered as an accepted risk and will remain true during FY12-14. In FY13 Fermilab will site new hardware in a second computing room that is not subject to summer high temperature loadsheds.</p>

<p>The LQCD computing project makes every effort to provide adequate near-line storage to run the simulation jobs. This includes Lustre based storage at FNAL and TJNAF. Related procedures and technologies are refined continuously. Currently, the project has more than adequate near-line storage. A formal decision has been made that LQCD project is not responsible for the archival storage data. The project refreshed all aging storage hardware in FY13, and in FY15 will be migrating from an older Lustre v1.8 to a more stable v2.5 release.</p>	<p>Probability of loss (partial loss) has increased because of the aging of storage hardware at FNAL.</p>
<p>The most precious LQCD data products (i.e., the most expensive to reproduce) are gauge configurations. By USQCD policy, overseen by the Executive Committee, to prevent against loss these configurations are stored on tape at two or more geographically diverse sites. The responsibility for this storage is held by the individual physics collaborations that have generated the particular data ensembles. To guard against silent corruption, by policy these files must be written with checksum (32-bit CRC) data that can be compared on subsequent access to determine whether any data changes have occurred. The USQCD standard I/O library, QIO, can be used to calculate, store, and compare these CRC data. The USQCD user community are also urged in documentation and at the annual collaboration meeting to use this data integrity facility of QIO to guard quark propagator and other data products. Also, single gauge configurations can be regenerated from prior gauge configurations.</p>	<p>TJNAF checks MD-5 checksum of files coming back from tape (and for raw data from experimental program calculates it soon after it is written to disk in the counting house). These checks insure that retrieved data is never corrupted by the tape library. JLab is also using OpenZFS raid-z2's raid check on every read, ensuring that any single disk error is never undetected and is fact corrected on the fly. The minor performance impact is accepted for the sake of higher data reliability.</p>
<p>The project maintains staff depth in key roles: Project Manager, BNL Site Manager, FNAL Site Manager, and TJNAF Site Manager. For these roles, an active deputy exists who can fill the role if and when necessary. This should keep the impact of any one key staff member Low, assuming we lose only one key staff member within a period of 6 months.</p>	<p>While the impact of losing more key staff will be greater, the probability of this happening within a 6 month timeframe is lesser. The case of losing two key staff members for example might have a Moderate impact instead of Low, but the probability of this is considered Low instead of Medium. In either case, the Risk Priority is the same.</p>
<p>Annual review of storage needs and use patterns. Continue to employ storage "costing" in the allocation model to encourage efficient use of storage, as is done with CPU time, without negatively impacting science production. Discourage storage use not directly related to USQCD science goals. Enforce a coherent storage management policy on all sites.</p>	
<p>Annual review of effort expended in Lustre support and revision of forecasted support effort level. In FY15 in particular, we plan to upgrade Lustre systems to v2.5, which could spike the support effort required. We will track the upgrade effort expected/required to determine whether fallback plans are required. We can delay one or both site upgrades, slow one or both site upgrades to reduce effort expended to a tolerable level, or stagger the upgrades across the sites. The real impact is to draw personnel away from other tasks, thus degrading operations, which could have a scientific impact.</p>	

<p>TJNAF has to move to a hot-aisle containment computing center design with a new high efficiency UPS in order to meet a PUE goal value of 1.4 by December 2015. Cooling capacity and efficiency will also be upgraded during this transition. Storage and CPUs will moved a few racks at a time. Chip's plan is to use base-funded computing to augment project computing during this period in order to average 100% up-time for the project site across the year, but some excursions are expected at about the few percent level plus a few days of outages. There is not a lot of contingency in the plan. If a temporary external chiller were to fail, as one did in the past, then this could have a 1-3% impact on the overall average uptime for TJNAF.</p>	<p>All compute nodes and the tape library have now been moved. The storage, interactive, and admin nodes will move in the next month (May-June 2017). Operational impacts have been minor, as expected.</p>
<p>It is not necessary to suddenly have 100% of our software able to absorb a new architecture, as we are always running machines as much as 4 years older. Thus, in a single year, the newest machine might be only 25% - 40% of the total project capacity. In each procurement, we optimize the old+new machines to maximize science across a portfolio of applications (some more mature than others with respect to newest hardware). The computing project does not develop application software, and so can only interact with the complementary projects to attempt to optimize the science output across all relevant projects and machines.</p>	<p>The new Xeon Phi coupled to the new Intel OmniPath fabric has challenges in achieving high bandwidth utilization. This was a known problem at procurement, and is addressed by using multiple threads to do the communication. This requires an evolution in software, and most recent codes are achieving good bandwidth, but there are still many codes that will need changes to run on large number of nodes.</p>
<p>At any given time, this risk is low for the current budget year since price/performance is reasonably well known for the coming year. Since there are 2 current advanced architectures and possibly more in the near future, our mitigation is to look for where the software portfolio can get the best gain, while also feeding technology trends back into the software development projects so that they are aware of changes that need to be absorbed</p>	<p>Conventional processors are no longer doubling in performance per dollar even on a 24 month schedule, and thus the project is dependent on an increasing percentage of our portfolio being able to move to advanced architectures in order to see the assumed 24 month doubling of the project's portfolio's performance per dollar.</p>
<p>The project must accept this risk. Since we will not know the future project/extension funding decision until after FY19 funds have been committed, we will address this by adding some flexibility to the FY19 acquisition in case some funds need to be held for operations of existing facilities to their end-of-life. We will prepare and circulate a few alternative scenarios to possibly modify our FY18 and FY19 funding profile and/or acquisition plans in case DOE funding is not available after FY19.</p>	<p>During CR16-01/02 discussion, the CCB recommended preparing a few alternative scenarios for funding post-FY19 operations with project funds. 3/15/2017 Status: USQCD (Paul M) to present scenarios at upcoming DOE Review.</p>

Probability	Value
High	0.75
Medium	0.50
Low	0.25

Impact	Value
Severe	0.9
Moderate	0.5
Low	0.1

<== 1. Change these values to control Probability, Impact ranges.

Risk Rating Table

Prob \ Impact	Severe	Moderate	Low
High	0.675	0.375	0.075
Medium	0.450	0.250	0.050
Low	0.225	0.125	0.025

<== 3. Then, manually change shading in matrix to represent Prioritization
Conditional formatting not programmed in the table yet.

Risk Priorities

Prioritization	Low Value	High Value	Risk Planning Level
1 - High	0.500	1.000	Detailed Risk Plan
2 - Medium	0.150	0.500	Modest Risk Plan
3 - Low	0.000	0.150	Minimal Risk Plan

<== 2. Change "2 - Medium" low/high values to alter Prioritization assigns i

^^^ 4. And finally, remake the "Summary Table" pivot table

Prioritization values

tion assigns in register

LQCD-ext II Project: Risk Register F

Version	Date	Modifier
1	8/18/09	
2	3/16/10	
3	7/21/10	
4	4/26/11	
5	4/27/12	
6	4/30/13	Rob Kennedy
7	2/18/14	Rob Kennedy
8	3/27/14	Rob Kennedy
9	4/22/14	Rob Kennedy
10	8/20/14	Rob Kennedy
11	10/15/14	Rob Kennedy
12	10/28/14	Rob Kennedy

DO NOT CHANGE "Risk Areas"

Risk Areas
Cost
Schedule
Security
Service
Technology

Risk Register Revision History

Description of Change
Initial Risk Items for LQCD-ext (derived from LQCD project)
Revised Risk Mitigation Strategies
Revised Risk Management Plan V1.2
Revised Risk Register for GPU/Ds extension purchase
Revised Risk Register, particularly for Accelerated (GPU) Clusters
Reorganize and normalize. Updates by FNAL Site Managers. Include input from JLab, add entries for BG/Q.
Update risks based on semi-annual review begun in October 2013
Split Risk Item 12 into technical risk in Risk Item 12 and personnel risk in Risk Item 37. Address succession plan in Risk Item 37.
Update risks per LQCD-ext Risk Review 4/9/2014 (see review notes for details)
Update risks per LQCD-ext Risk Review 8/20/2014 (see review notes for details)
Update risks per LQCD-ext Risk Review 10/15/2014 (see review notes for details)
Adapt to the LQCD-ext II Project (changes to risk items themselves are now tracked in entries and in review notes)