PPU Risk Register - Active Risks

												Pre - Mitigation								Mitigation Approach				Post - Mitigation							
Enabled	ID	Type	Risk Status	WBS L2	L3 Owner	Name	Risk Description	Risk Trigger	Risk Expiration	RBS	Impact Type	Probability	Schedule	Cost	Technical	Score	Probability	Schedule Impact (d)	Cost Impact	Enabled	Description	Duration	Cost	Probability	Schedule	Cost	Technical	Score	Residual Probability	Residual Schedule Impact (d)	Residual Cost Impact
Yes	T-P.1-004	Threat	Open	P.01	P.01	Difficulty in finding/retaining staff (does not apply to Davis-Bacon or UT-B craft)	If the project cannot get the resources required to execute the plan, schedule delays are inevitable and cost increases are likely.	1/1/2018	10/1/2025	Management	PPU Project	High	Medium	High	Very Low	16	70%	120	$ 1,000,000	Yes	Monitor staffing plans vs actual staffing; start the recruiting of professional staff at least 4 months before needed hire data; start the recruiting of technician staff at least 1 month in advance. Utilize contractors and ORNL staff from other directorates when necessary. Establishment of BOA for staff augmentation.	0d	$0	Medium	Medium	High	Very Low	12	50%	120	$1,000,000.00
Yes	T-P.1-006	Threat	Open	P.01	P.01	Safety incident occurs on project	A safety incident, involving personnel or equipment injury/damage occurs on the project during installation that causes the project to be delayed and/or requires replacement of equipment.	1/19/2019	10/1/2025	Management	PPU Project	Medium	Medium	Medium	Very Low	9	50%	81	$ 500,000	Yes	ESH oversight during all installation activities; JHA process implemented; daily 'tool box' meetings and constant reinforcement of safety principles and basics.	0d	$0	Low	Medium	Medium	Very Low	6	20%	81	$ 500,000.00
Yes	T-P.1-007	Threat	Open	P.01	P.01	SNS operating schedule changes delays project by 6 months	If the SNS changes the outage plan and PPU installation is delayed because either the outage moves up in time and the equipment is not here to be installed or because the outage is scheduled later in time and the work in that outage and all subsequent follow-on work is delayed by the amount that the outage has shifted.	1/1/2019	10/1/2025	Management	PPU Project	Medium	High	High	Very Low	12	50%	121	$ 1,000,000	Yes	Ensure a member of the PPU team is on the NScD scheduling committee to represent the PPU needs. Communicate PPU requirements well and often throughout the directorate. Ensure PPU priorities are NScD priorities.	0d	$0	Medium	High	High	Very Low	12	40%	121	$1,000,000.00
Yes	T-P.1-015	Threat	Open	P.01	P.01	Actual funding profile received by project does not match profile used for planning	If the funding profile actually received is "stretched out," then the project could take longer to finish and cost more.	8/1/2018	10/1/2025	Management	SNS Operations	Low	High	High	Very Low	8	25%	160	$ 2,000,000	Yes	Maintain good communication with BES to make sure PPU funding needs are clearly understood. Promptly respond to requests for information from BES and congress regarding project funding needs. Ensure field work proposals and project data sheets are completed promptly and reflect project funding needs.	0d	$0	Low	High	High	Very Low	8	25%	160	$ 2,000,000
Yes	T-P.1-016	Threat	Open	P.01	P.01	Operations tasks required for PPU not complete when required	The PPU Assumptions Document articulates all the assumptions made when estimating the total cost of the PPU Project. All the scope identified in these assumptions are required for PPU to successfully demonstrate the required KPPs. If funding is not available, the project may need to absorb these tasks.	10/1/2017	10/1/2025	Management	SNS Operations	Medium	High	High	Medium	12	50%	121	$ 2,000,000	Yes	Maintain good communication with RAD and NTD to minimize risk.	0d	$0	Medium	Medium	Medium	Very Low	9	40%	120	$ 500,000
Yes	T-P.1-018	Threat	Open	P.01	P.01	Critical SNS component failure delays PPU by at least 12 months or delays KPP demonstration	Critical component required for PPU (e.g. klystrons, servo-manipulator crane, IRP, injection dump) fails prior to PPU completion. These items require multi-year procurement cycles, have a replacement cost in excess of $2M and, with the exception of the IRP, are not in current SNS plans for replacement prior or during PPU.	10/1/2018	10/1/2025	External	PPU Project	Low	Very High	High	Very Low	10	20%	240	$ 2,000,000	Yes	Maintain good communication between PPU, SNS Operations, and NScD management team. Conduct periodic Vulnerability Workshops to assess vulnerabilites within the SNS neutron production systems. (recent workshop conducted March 11, 2021). PPU personnel participate in these workshops. Include identified mitigations in the SNS operations plans, including annual budget allocations.	0d	$0	Low	Very High	High	Very Low	10	20%	240	$ 2,000,000
Yes	T-P.1-020	Threat	Open	P.01	P.01	Equipment experiences infant mortality resulting in not meeting KPP	If the equipment experiences infant mortality resulting in not meeting a KPP, then a schedule delay could push CD4	6/1/2023	10/1/2025	Technical	PPU Project	Low	Very High	Very High	High	10	20%	161	$ 2,000,000	Yes	Develop and maintain critical spares list for PPU and include in the project baseline.	0d	$0	Low	High	High	High	8	20%	121	$1,000,000.00
Yes	T-P.1-021	Threat	Open	P.01	P.01	Outage dependant task causes or reveals damage to a system	If an outage dependant task causes or reveals damage to a system, then repairs would need to be made during the outage which would result in a potential delay/increased cost.	2/18/2019	10/1/2025	Technical	PPU Project	Very Low	Low	Medium	Medium	3	10%	21	$ 250,000	Yes	Safety and technical training; SNS supervision of external labor; Monitoring of system condition in advance of outage.	0d	$0	Very Low	Low	Low	Low	2	10%	21	$ 100,000.00
Yes	T-P.1-022	Threat	Open	P.01	P.01	Emergent operational event requires matrixed staff	If there is an emergent operational event operations has priority and matrix staff will be utilized which will result in a project delay.	2/18/2019	10/1/2025	External	PPU Project	High	Medium	Very Low	Very Low	12	80%	81	$ 50,000	Yes	Succession planning results in broadening of work force during the project	0d	$0	Medium	Low	Very Low	Very Low	6	60%	21	$ 50,000.00
Yes	T-P.1-024	Threat	Open	P.05	P.05.01	IRP is not capable of PPU beam	The IRP is not part of PPU project scope. It has been agreed that the next generation IRP, that is planned for installation just prior to PPU, will be ready for PPU beam: 2 MW at 1.3 GeV. The risk is that some issue arise that makes this IRP not capable of PPU beam.	12/31/2022	12/31/2023	Management	SNS Operations	Very Low	Very High	Very Low	High	5	15%	200	$ -	Yes	Monitor progress in the Neutron Technologies Division on the design and fabrication of the next IRP so that problems can be discovered and mitigated early.	0d	$0	Very Low	Very High	Very Low	High	5	15%	200	$ -
Yes	T-P.1-028	Threat	Open	P.01	P.01	Standing Army Cost for Schedule Contingency	If the project extends past early CD-4 for 22 months, then additional standing army staff would be required and result in a cost increase (10% of $1M/mo).	1/24/2025	7/31/2028	Management	PPU Project	Low	Very Low	Very High	Very Low	10	25%	0	$ 2,200,000	Yes	PPU management will monitor progress and will seek to minimize early-finish delays.	0d	$0	Low	Very Low	Very High	Very Low	10	25%	0	$ 2,200,000
Yes	T-P.1-029	Threat	Open	P.01	P.01	Craft Resource Availability During Installations	If there is a shortage of craft personnel (research mechanics, electricians, riggers, etc.) during outages when PPU equipment needs to be installed, then it will result in project delays.	5/20/2021	3/31/2024	Management	PPU Project	Medium	Medium	Low	Very Low	9	50%	90	$ 100,000	Yes	Plan ahead to ensure needed personnel are available when needed. Engage with NScD Chief Operating Officer if needed to bring in additional craft from ORNL Facilities & Operations. Utilize subcontract craft personnel when feasible (GEM Tech or similar).	0d	$0	Low	Medium	Low	Very Low	6	35%	90	$ 100,000.00
No	T-P.1-030	Threat	Open	P.01	P.01	COVID-19 Impacts Project Cost or Schedule	The COVID-19 pandemic may cause cost increases and schedule delays due to increased commodity costs, supply chain problems, vendor pandemic protocols, worker productivity, and availability of PPU staff.	3/1/2020	2/12/2025	External	PPU Project	High	Very High	Very High	Low	20	65%	240	$ 16,000,000	Yes	Frequent vendor communication, use of alternate vendors if needed, vendor oversight by local experts, vaccinations, masking, social distancing, and work-from-home.	0d	$0	High	Very High	Very High	Low	20	65%	240	$ 16,000,000
Yes	T-P.2-013	Threat	Open	P.02	P.02.03	Cryomodule Shipment	If the Cryomodules shipment produces unintended performance degradation in the CMs, then repairs are required prior to test cave testing	6/11/2021	1/31/2023	External	PPU Project	Low	Low	Low	Very Low	4	25%	60	$ 200,000	Yes	Conduct shipping tests on Cryomodule shipping fixture to measure g-loading and adjust fixture or re-route truck along different roads to minimize impact to Cryomodule	20d	$30,000	Very Low	Low	Low	Very Low	2	5%	60	$ 200,000.00
Yes	T-P.2-014	Threat	Open	P.02	P.02.03	First 2 Cryomodule Delivery Is Late	If the first two Cryomodules are delayed from the partner laboratory and not ready to be installed during scheduled outage, then installation is delayed	6/11/2021	5/15/2022	Management	PPU Project	Medium	High	Medium	Very Low	12	45%	125	$ 300,000	Yes	Negotiate with SNS operations to adjust maintenance outage schedule to accommodate actual CM delivery dates	0d	$0	Very Low	Low	Very Low	Very Low	2	10%	60	$ 25,000.00
Yes	T-P.2-016	Threat	Open	P.02	P.02.03	Final 2 Cryomodule Delivery Is Late	If the final two Cryomodules are delayed from the partner laboratory and not ready to be installed during scheduled outage, then installation is delayed	2/9/2022	1/31/2023	External	PPU Project	Low	Medium	Medium	Very Low	6	25%	120	$ 300,000	Yes	Negotiate with SNS operations to adjust maintenance outage schedule to accommodate actual CM delivery dates	0d	$0	Very Low	Low	Very Low	Very Low	2	10%	60	$ 25,000.00
Yes	T-P.2-017	Threat	Open	P.02	P.02.03	Second delivery of 3 Cryomodules Is Late	If the three Cryomodules are delayed from the partner laboratory and not ready to be installed during scheduled outage, then installation is delayed	11/3/2021	10/1/2022	External	PPU Project	Low	Medium	Medium	Very Low	6	25%	120	$ 300,000	Yes	Negotiate with SNS operations to adjust maintenance outage schedule to accommodate actual CM delivery dates	0d	$0	Very Low	Low	Very Low	Very Low	2	10%	60	$ 25,000.00
Yes	T-P.2-020	Threat	Open	P.02	P.02.03	Partner Laboratory Priorities	If the partner laboratory faces resource constraints due to shifting project priorities, then CM delivery is delayed	4/1/2019	1/31/2023	External	PPU Project	Low	Medium	Low	Very Low	6	25%	90	$ 150,000	Yes	Add SNS personnel or contract labor at partner laboratory to meet production schedule, as needed (60 days, $307K)	0d	$0	Very Low	Medium	Low	Very Low	3	10%	90	$ 150,000.00
Yes	T-P.2-022	Threat	Open	P.02	P.02.04	Cryogenic Sequence Development	If the controls sequence development exceeds allotted schedule maintenance outage, then pumpdown of the LINAC will not occur and delay restart of beam	8/2/2022	12/1/2022	Technical	PPU Project	Medium	Very Low	Low	Very Low	6	40%	5	$ 50,000	Yes	Conduct work in advance, to the extent possible, so that the work can be efficiently executed during the outage.	0d	$0	Medium	Very Low	Low	Very Low	6	40%	5	$ 50,000.00
Yes	T-P.2-026	Threat	Open	P.02	P.02.06	Cryomodule Performance	If the average operating gradient achieved is lower than expected and the design energy margin in PPU cavities is not adequate, then beam output energy is affected	5/5/2022	3/31/2023	Technical	PPU Project	Very Low	Very Low	Low	Very High	2	10%	15	$ 125,000	Yes	Plasma process and/or rework selected PPU cavities	40d	$153,000	Very Low	Very Low	Low	Very Low	2	10%	15	$ 125,000.00
Yes	T-P.2-028	Threat	Open	P.02	P.02.06	Installation of Cryomodules	If the installation of CMs exceeds allotted schedule maintenance outage, then beam operation is delayed	12/20/2021	12/1/2022	Management	PPU Project	Medium	Very Low	Very Low	Very Low	3	50%	8	$ 40,000	Yes	Add overtime and add multiple shifts for installation tasks, as needed. (60 days, $307K)	0d	$0	Low	Very Low	Very Low	Very Low	2	25%	8	$ 25,000.00
Yes	T-P.2-040	Threat	Open	P.02	P.02.03	Cryostat component (spaceframe) is dimensionally out of tolerance	If a cryostat component (spaceframe) comes in dimensionally out of tolerance, then it will need to be reworked resulting in increased cost and delays in schedule.	6/1/2021	3/1/2022	Technical	PPU Project	Low	Low	Very Low	Very Low	4	25%	60	$ 25,000	Yes	Maintain good communication between PPU and cryomdule component vendors so that nonconformances can be discovered and mitigated early. Perform inspections promptly upon receipt of materials. Perform vendor visits as needed to ensure quality.	0d	$0	Low	Low	Very Low	Very Low	4	25%	60	$ 25,000
Yes	T-P.2-041	Threat	Open	P.02	P.02.06	CM is damaged during movement or testing	If the CM is damaged during movement or testing, then rework is required resulting in increased cost and schedule delay.	6/1/2021	4/1/2024	Technical	PPU Project	Very Low	Very Low	Low	Very Low	2	15%	10	$ 100,000	Yes	Carefully plan and document the procedures for moving and testing of cryomodules. Ensure personnel are qualified to perform these activities. Ensure adequate front-line supervision. An eighth cryomodule was added as a spare to the plan to mitigate potential performances issues with CMs 1-7.	0d	$0	Very Low	Very Low	Low	Very Low	2	15%	10	$ 100,000
Yes	T-P.2-043	Threat	Open	P.02	P.02.06	Cryomodule vacuum loss during testing or commissioning	If there is a CM loss of vacuum event during testing or commissioning, then the CM will need to be rebuilt resulting in increased cost and schedule delay.	6/1/2021	4/1/2024	Technical	PPU Project	Very Low	High	High	Medium	4	10%	121	$ 750,000	Yes	Install high beta spare CM in PPU CM slot and run at a limited gradient if needed (20d, $100K)	0d	$0	Very Low	High	High	Very Low	4	10%	121	$ 750,000.00
Yes	T-P.3-008	Threat	Open	P.03	P.03.04	Replacement LLRF control system is late	There is a risk that the design of the replacement LLRF control system is late or does not meet the requirements	8/1/2020	12/31/2021	External	PPU Project	Medium	Low	Medium	Medium	9	60%	20	$ 375,000	Yes	Early start for prototype development based on VME FMC carrier card and test in SCL23d. Install existing spare SNS LLRF systems as a stop-gap until new system is available.	0d	$0	Low	Low	Low	Low	4	30%	21	$ 125,000.00
Yes	T-P.3-012	Threat	Open	P.03	P.03.08	Controls Software Requirements	If controls software requirements are incomplete or significantly changed after design and development are scheduled to begin, then development and testing of controls software may extend past the scheduled completion date.	11/1/2020	7/31/2021	Technical	PPU Project	High	Medium	Low	Low	12	80%	120	$ 50,000	Yes	Carefully monitor development of requirements to push completion prior to software development. Perform requirements reviews for complex areas.	0d	$0	High	Very Low	Very Low	Very Low	4	80%	20	$ 50,000.00
Yes	T-P.3-020	Threat	Open	P.03	P.03.02	Transmitter vendor delivery slips due to workload/competition	If the transmitter vendor delivery slips due to subcontractor performance, workload, or competition	8/1/2020	8/30/2022	External	PPU Project	Medium	Medium	Very Low	Very Low	9	40%	120	$ 50,000	Yes	Maintain good communication between PPU and L3Harris so that schedule challenges can be discovered early and mitigated. Perform periodic vendor visits to assess progress.	0d	$0	Medium	Medium	Very Low	Very Low	9	40%	120	$ 50,000
Yes	T-P.3-025	Threat	Open	P.03	P.03.04	Delivery of boards delayed due to unavailable ceramic capacitors or other integrated circuits.	If vendor Vadatech delivery of boards is delayed due to unavailable ceramic components, then it will result in schedule delay	11/1/2020	10/1/2021	External	PPU Project	Medium	Low	Very Low	Very Low	6	50%	80	$ 50,000	Yes	Maintain good communication between PPU and Vadatech so that schedule challenges can be discovered early and mitigated if possible.	0d	$0	Medium	Low	Very Low	Very Low	6	50%	80	$ 50,000
Yes	T-P.3-030	Threat	Open	P.03	P.03.07	Installation does not match 3D model	If the installation does not match the 3D model because the vendor does not have the skill, then it will result in rework which will increase cost and schedule delays.	8/25/2020	9/1/2022	Technical	PPU Project	Low	Medium	Low	Very Low	6	20%	100	$ 150,000	Yes	Ensure adequate Quality Controls Oversight	120d	$150,000	Low	Very Low	Very Low	Very Low	2	20%	20	$ 50,000.00

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Enabled	ID	Type	Risk Status	WBS L2	L3 Owner	Name	Risk Description	Risk Trigger	Risk Expiration	RBS	Impact Type	Probability	Schedule	Cost	Technical	Score	Probability	Schedule Impact (d)	Cost Impact	Enabled	Description	Duration	Cost	Probability	Schedule	Cost	Technical	Score	Residual Probability	Residual Schedule Impact (d)	Residual Cost Impact
Yes	T-P.3-031	Threat	Open	P.03	P.03.07	Availability of Davis-Bacon craft personnel is compromised	If the availabilty of Davis-Bacon craft personnel (electricians, pipefitters) is compromised, then we could have increased cost, delays in schedule, possibly rework	1/1/2021	10/1/2021	External	PPU Project	Low	Low	Medium	Very Low	6	40%	80	$ 500,000	Yes	Work with the PPU installation coordinator, who also manages the GEM Technologies contract, to ensure needed craft resources are available when needed. Consider premium payments and/or overtime to compete with other local projects, e.g., UPF	0d	$0	Low	Low	Medium	Very Low	6	40%	80	$ 350,000
Yes	T-P.3-033	Threat	Open	P.03	P.03.02	Onsite klystron testing reveals that it does not meet specs	If onsite Klystron testing reveals that it does not meet specs, then it would result in increased cost and schedule delay.	8/1/2020	12/31/2022	Technical	PPU Project	Very Low	Very High	Very Low	Medium	5	20%	250	$ 50,000	Yes	P.03.02 - use in house spares. P.03.03 - Accept	0d	$0	Very Low	Medium	Very Low	Very Low	3	20%	120	$ 50,000.00
Yes	T-P.3-034	Threat	Open	P.03	P.03.05	Prototype results require redesign of subsystem(s) for upgrades of the existing linac modulators	If it is discovered that the system does not meet the requirements then a second design iteration will be required which will result in a schedule delay and increased cost.	2/1/2021	7/15/2021	Technical	PPU Project	Low	Medium	Low	Medium	6	25%	120	$ 100,000	Yes	Perform testing as early as possible to allow time for an additional design iteration if necessary.	0d	$0	Low	Medium	Low	Medium	6	25%	120	$ 100,000.00
Yes	T-P.3-035	Threat	Open	P.03	P.03.02	Circulator Performance	If the circulator does not pass the operations site acceptance test, the project would experience a schedule delay and a cost increase.	2/26/2021	6/30/2021	Technical	PPU Project	Medium	Low	High	Very Low	12	60%	60	$ 700,000	Yes	Purchase a stand-alone directional coupler that will solve the problem caused by the integrated unit.	60d	$30,000	Very Low	Low	High	Very Low	4	10%	60	$ 700,000.00
Yes	T-P.4-005	Threat	Open	P.04	P.04.02	Ring Vacuum Vessel Fabrication Complications	Difficulty in getting well-built vacuum vessels fabricated on time based on recent experience with similarly complicated vessels.	3/1/2020	3/31/2022	Management	PPU Project	High	Low	Low	High	8	80%	80	$ 200,000	Yes	Stringent management of the fabrication of the vessels including a fabrication plan, fabrication schedule, fabrication milestones, scheduled meetings, and vendor visits.	20d	$40,000	Low	Very Low	Very Low	Very Low	2	25%	20	$ 50,000.00
Yes	T-P.4-010	Threat	Open	P.04	P.04.02	Equipment is damaged during removal/installation of new magnets	If operational equipment (Magnets or Vacuum Equipment) is damaged during removal/installation of new magnets, then it will need to be repaired or replaced resulting in increased cost and schedule delay.	12/15/2022	6/30/2023	Technical	PPU Project	Very Low	Low	Low	High	2	20%	60	$ 150,000	Yes	Carefully plan and document the removal/installation work in advance of the long PPU outage. Use mockups where appropriate to validate plans. Access the injection area during maintenance periods to validate understanding of existing systems.	0d	$0	Very Low	Low	Low	High	2	10%	60	$ 150,000
Yes	T-P.4-013	Threat	Open	P.04	P.04.02	Fermilab has competing projects or resource issues	If Fermilab has competing projects, issues with resources or issues with vendors, then there could be a delay in the delivery of the magnets	2/1/2019	6/30/2022	External	PPU Project	High	High	Medium	High	16	75%	121	$ 250,000	Yes	Maintain good communication between PPU and Fermilab so that schedule challenges can be discovered early and mitigated. Engage project management and Fermilab management as needed to ensure this work receives adequate priority. Perform periodic visits to Fermilab to assess progress.	0d	$0	High	High	Medium	High	16	75%	121	$ 250,000
Yes	T-P.4-023	Threat	Open	P.04	P.04.06	Beam Power Limit System Redesign	If recommendations from PDR or FDR result in BPLS design changes, a redesign w	3/1/2021	10/31/2022	Technical	PPU Project	Low	High	High	Very Low	8	35%	160	$ 1,000,000	Yes	Implement administrative controls on the first cryomodule run, as needed. (0 day	0d	$0	Low	Low	Medium	Very Low	6	35%	160	$ 500,000.00
Yes	T-P.5-005	Threat	Open	P.05	P.05.09	Late delivery of target module	The PPU beam capable target module delivery is late.	12/23/2023	6/30/2023	Management	PPU Project	Medium	Low	Low	High	6	40%	80	$ 200,000	Yes	Continue to maintain good communication with the target vendor, including frequent vendor visits, so that schedule challenges can be discovered early and mitigated to the extent possible.	0d	$0	Medium	Low	Low	High	6	40%	80	$ 200,000
Yes	T-P.5-016	Threat	Open	P.05	P.05.10	Failed certification for safety or controls during last outage	Several main components in WBS P5 will be installed during the last outage and will require a final approval (controls certification and safety approval) at the end of the project. Any failure in this approval will lead to delays and potentially redesign of some components.	11/1/2023	12/1/2023	Technical	PPU Project	Medium	High	Low	Very Low	12	40%	150	$ 200,000	Yes	Leverage the lessons learned in GI3 to develop a reasonable schedule and make sure some time is in the planning to address any potential failure in any certification.	0d	$0	Very Low	High	Low	Very Low	4	20%	121	$ 50,000.00
Yes	T-P.5-024	Threat	Open	P.05	P.05.10	Analysis reveals additional controls and/or protection system requirements for 2 MW target.	Analysis is needed to determine the required changes to existing target controls and protection systems or if addition systems are needed. If significant new scope needed, especially if indicated by the safety analysis, the cost of providing appropriate controls will increase.	11/1/2021	11/1/2022	Technical	PPU Project	High	Medium	Medium	Low	12	60%	100	$ 500,000	Yes	Ensure analysis is completed well in advance of CD-2 so proper estimates for target control and protection systems can be developed and included in the project baseline.	0d	$0	Medium	Low	Low	Low	6	40%	60	$ 200,000.00
Yes	T-P.5-027	Threat	Open	P.05	P.05	IRP is not installed prior to the long outage	If operations must replace IRP during the extended outage, resource and physical work conflicts will lead to lengthening of extended outage	12/1/2021	12/15/2022	Technical	PPU Project	Low	Low	Very Low	Very Low	4	35%	60	$ -	Yes	Continue to maintain good communication within NScD regarding PPU long outage plans. If the IRP must be installed during the PPU long outage, sequence the work efficiently so that it does not delay planned PPU installation.	0d	$0	Low	Low	Very Low	Very Low	4	35%	60	$ -
Yes	T-P.5-028	Threat	Open	P.05	P.05.03	Remote handlers are not available	If remote handlers are not available, progress would slow resulting in a delay of schedule.	12/15/2022	6/30/2023	Technical	PPU Project	Very Low	Medium	Very Low	Low	3	20%	90	$ 50,000	Yes	Work with NScD divisions to ensure remote handling resource needs are well understood and receive high priority so that PPU can be completed on schedule.	0d	$0	Very Low	Medium	Very Low	Low	3	20%	90	$ 50,000
Yes	T-P.5-030	Threat	Open	P.05	P.05	CMS is not capable of 2MW operations	If the CMS is not currently capable of 2MW operations and the cause is not understood and operations does not take the steps to make it 2 MW capable, then the project will be delayed until acheivable.	6/1/2024	5/31/2025	Technical	PPU Project	High	Very High	Very Low	Very High	20	70%	200	$ -	Yes	Biannual status reports on the health of the CMS, its outlook for 2MW operations, and activities to improve 2MW readiness are now provided from the CMS System Engineer to the FTS Systems Level 2 Manager. Notable issues or concerns by the L2 lead will be elevated to Project Leadership's attention.	0d	$0	Low	Very High	Very Low	Very High	10	30%	200	$ -
Yes	T-P.5-032	Threat	Open	P.05	P.05.09	Late delivery of test targets	The PPU test target module delivery is late.	12/15/2021	1/31/2022	Management	PPU Project	Low	Very Low	Very Low	Low	2	35%	0	$ -	Yes	Continue to maintain good communication with the target vendor, including frequent vendor visits, so that schedule challenges can be discovered early and mitigated to the extent possible.	0d	$0	Low	Very Low	Very Low	Low	2	35%	0	$ -
Yes	T-P.6-002	Threat	Open	P.06	P.06.02	Contractor Claims for RTBT Stub for Weather or Other Impacts	Contractor could submit significant claims associated with RTBT Stub schedule. Since the schedule is so important, penalties and incentives will likely be employed and contractor will be expected to work multiple shifts and likely 7 days/week in some cases. Differing field conditions or ORNL hold-up and many other risks to the construction schedule could result in claims.	9/30/2023	11/1/2023	External	PPU Project	Medium	Low	Medium	Very Low	9	40%	20	$ 500,000	Yes	Carefully craft contract to minimize risks. Reasonable durations based on past experience will be built into the schedule and released if needed during construction to partially mitigate unanticipated impacts.	0d	$0	Medium	Low	Low	Very Low	6	40%	21	$ 250,000
Yes	T-P.6-011	Threat	Open	P.06	P.06.02	STS design impacts the RTBT stub design	STS design progression could cause design impacts to the RTBT stub	2/1/2019	9/30/2023	Technical	PPU Project	High	Very Low	Low	Very Low	8	60%	10	$ 200,000	Yes	Ensure there is coordination between the STS and PPU design thru routine meetings and discussions	0d	$0	Medium	Very Low	Very Low	Very Low	3	40%	10	$ 50,000
Yes	T-P.6-012	Threat	Open	P.06		STS construction field work area overlaps with RTBT stub construction area	If actual work areas, site access, and laydown areas overlap with STS and result in competing priorities between projects, the project could experience schedule delays.	8/1/2021	6/30/2023	External	PPU Project	Medium	Low	Medium	Very Low	9	50%	40	$ 350,000	Yes	Utilize the STS CM to procure and manage RTBT Stub construction in conjunction with STS work if needed. If STS scheduled is delayed, there is no conflict with STS construction and project will be managed by PPU project management.	0d	$150,000	Low	Very Low	Low	Very Low	4	25%	20	$ 200,000
Yes	T-P.6-013	Threat	Open	P.06		RTBT Stub Construction cannot be completed within the scheduled outage for FTS.	If RTBT Stub construction subcontractor does not complete work within the SNS outage to enable restart, then schedule delays could result.	12/1/2022	6/30/2023	External	PPU Project	Medium	Low	High	Very Low	12	40%	60	$ 750,000	Yes	Procurement approach will ensure the best available construction subcontractor is selected and work will be managed by the subcontractor and PPU project management to be completed to support SNS restart date.	0d	$300,000	Low	Very Low	Medium	Very Low	6	20%	20	$ 350,000
Yes	T-P.6-014	Threat	Open	P.06	P.06.02	Construction competition for RTBT	Construction competition in the area may cause market area resources to be higher in cost than estimated for the RTBT	2/1/2019	9/30/2023	External	PPU Project	High	Very Low	Medium	Very Low	12	80%	20	$ 500,000	Yes	Communicate early with potential vendors to attract interest and to keep abreast of local market developments. Monitor other conventional facilities projects at ORNL and surrounding DOE facilities, e.g., Y-12. Consider the use of incentives for early completion, which may also serve to attract potential bidders.	0d	$0	High	Very Low	Medium	Very Low	12	80%	20	$ 500,000

PPU Risk Register - Issues List

													Pre - Mitigation									Mitigation Approach			Post - Mitigation							
Enabled	ID	Type	Risk Status	WBS L2	WBS L3	Name	Risk Description	Risk Trigger	Risk Expiration	RBS	Impact Type	Probability	Schedule	Cost	Technical	Score	Probability	Schedule Impact (d)	Cost Impact	Enabled	Description	Duration	Cost	Probability	Schedule	Cost	Technical	Score	Residual Probability Impact	Residual Schedule Impact (d)	Residual Cost Impact
No	T-P.2-004	Threat	Open	P.02	P.02.03	Integration of Helium Vessel & Cavity	If the partner laboratory produces defective titanium welds on any production cavity or bead pull reveals field flatness distortion, then rework is required for all failed cavities	4/8/2020	8/1/2021	Technical	PPU Project	Low	Medium	Low	Very Low	6	25%	90	$ 150,000	Yes	Initial 3 qualification cavities used as test articles for qualifying partner laboratory welding process using SNS welding procedure for additional test titanium helium vessels	60d	$150,000	Very Low	Very Low	Very Low	Very Low	1	10%	10	$ 25,000
No	T-P.2-024	Threat	Open	P.02	P.02.05	Cryomodule Vacuum Gas Load	If the actual gas load total for the new CMs exceeds the maximum scenario the IVS has been designed for, then design changes will be required	5/5/2022	6/16/2022	Technical	PPU Project	Very Low	Low	Low	Very Low	2	10%	21	$ 100,000	Yes	Add additional turbo pump to spare port on foreline manifold at a cost of ~$100k to achieve nominal operating pressure at the CM IVS	20d	$100,000	Very Low	Very Low	Very Low	Very Low	1	0%	0	$ -
No	T-P.2-025	Threat	Open	P.02	P.02.05	Vacuum Components Delivery Is Late	If the IVS or beamline vacuum components are delayed, then cryomodule cooldown is delayed	8/2/2022	8/15/2022	External	PPU Project	Low	Medium	Very Low	Very Low	9	25%	81	$ -	Yes	Use temporary pump carts in the tunnel with similar configurations to what is currently being used until permanent hardware becomes available	0d	$0	Very Low	Very Low	Very Low	Very Low	1	0%	0	$ -
No	T-P.2-036	Threat	Open	P.02	P.02.02; P.02.	RF test stand is not available for coupler processing testing due to operations conflict	If the RF test stand is not available for coupler processing or CM testing due to operational needs, then there will be a delay in the schedule.	6/1/2020	7/9/2021	Technical	PPU Project	Very Low	Low	Low	Very Low	2	15%	40.00	$ 55,000	Yes	Building redundant RF system - Operations	0d	$0	Very Low	Very Low	Very Low	Very Low	1	5%	10	$ -
No	T-P.2-044	Threat	Open	P.02	P.02.02; P.02.	RF test stand is not available for coupler processing testing due to equipment failure	If the RF test stand is not available for coupler processing or CM testing due to equipment failure, then there will be a delay in the schedule.	6/1/2020	7/9/2021	Technical	PPU Project	Low	Very Low	Very Low	Very Low	2	30%	15	$ 35,000	Yes	Building redundant RF system - Operations	0d	$0	Very Low	Very Low	Very Low	Very Low	1	5%	10	$ -
No	T-P.3-007	Threat	Open	P.03	P.03.03	DTL or CCL RF-Vacuum windows or iris couplers inadequate	There is a risk that that the existing DTL or CCL RF-Vacuum windows or iris couplers cannot operate reliably at the increased RF power levels required for PPU.	5/1/2022	3/18/2024	Technical	PPU Project	Low	High	Low	Medium	8	20%	160	$ 100,000	Yes	Engineering analysis to see if adequate.	80d	$25,000	Very Low	Very Low	Very Low	Medium	1	20%	160	$ 100,000
No	T-P.3-017	Threat	Open	P.03	P.03.09	Deferred AIP-39 completion	Unable to support system installations with current inventory levels. AIP-39 funding is required to expand the MPS to support PPU installations in the Linac.	9/30/2017	1/1/2022	Management	PPU Project	Very Low	Very Low	Very Low	Very Low	1	20%	20	$ 50,000	Yes	Unable to support system installations with current inventory levels. AIP-39 completion is required to expand the MPS to support PPU installations in the Linac.	0d	$0	Very Low	Very Low	Very Low	Very Low	1	20%	20	$ 50,000
No	T-P.3-035	Threat	Open	P.03	P.03.05	Problems during installation / commissioning	If we encounter issues during the scheduled installation period and we risk not completing before the outage ends then there would be a delay in resumption of operations.	12/1/2022	9/30/2023	Technical	PPU Project	Low	Very Low	Very Low	High	2	20%	20	$ 20,000	Yes	Trial fits and trial assemblies and extensive sub assembly testing prior to installation.	20d	$15,000	Very Low	Very Low	Very Low	Very Low	1	5%	0	$ -
No	T-P.4-006	Threat	Open	P.04	P.04.02	Injection Region requires longer than 30 days to cool down for work ALARA	If the radiation levels exceeds safe levels after planned 30 day cool down period, then there will be a delay in schedule.	6/23/2023	6/23/2023	Management	PPU Project	Medium	Very Low	Very Low	High	3	60%	0	$ -	Yes	Measurements of decay rates will be performed multiple times during normal SNS maintenance shutdowns between now and the start of work in 2023 to identify highest areas of concern and to characterize the decay rate. Detailed work planning will be done to limit worker exposure.	0d	$0	Very Low	Very Low	Very Low	Very Low	1	0%	0	$ -
No	T-P.4-008	Threat	Open	P.04	P.04.02	Chicane magnet performance does not meet desired objectives	The chicane magnet design is complex and it is possible we might miss an important detail. The magnet performance might be compromised, leading to consequences such as elevated beam loss.	6/1/2018	1/1/2024	Technical	PPU Project	Low	Very Low	Very Low	Medium	2	25%	10	$ 25,000	Yes	Detailed particle tracking analysis and extensive reviews	60d	$120,000	Very Low	Very Low	Very Low	Very Low	1	0%	0	$ -
No	T-P.4-011	Threat	Open	P.04	P.04.02	Damage is discovered on the cabling/vacuum/Beamline during magnet removal	If damage is discovered to the cabling/vacuum/BI when removing the Injection Region magnets, then replacement is needed with an additional cost of time materials.	12/15/2022	6/30/2023	Technical		Medium	Low	Very Low	High	6	50%	75	$ 40,000	Yes	Spare connectors and cables on hand	0d	$10,000	Very Low	Very Low	Very Low	Very Low	1	0%	0	$ -
No	T-P.4-012	Threat	Open	P.04	P.04.02	Mechanical interfaces are not as expected	If the mechanical interfaces (Vacuum Interfaces) are not as expected, then the new equipment may not fit as expected and modifications may be required.	12/15/2022	6/30/2023	Technical		Low	Medium	Low	High	6	20%	90	$ 200,000	Yes	Inspect dimensions of existing flanges prior to final design	10d	$5,000	Very Low	Very Low	Very Low	Very Low	1	0%	0	$ -
No	T-P.4-014	Threat	Open	P.04	P.04.02	Crane is unavailable	If crane is not operable or not certified, then that would cause delays and increase in costs	12/15/2022	6/30/2023	Technical		High	Medium	Very Low	High	12	80%	85	$ 50,000	Yes	Develop plan that does not require crane in the event that it is not available	10d	$5,000	Very Low	Very Low	Very Low	Very Low	1	5%	0	$ -
No	T-P.4-016	Threat	Open	P.04	P.04.02	Resources are unavailable for integrated functional testing	If resources are not available for the integrated functional testing, then the schedule could be delayed	12/15/2022	6/30/2023	Technical	PPU Project	Medium	Very Low	Very Low	High	3	40%	15	$ -	No	Plan ahead and work with NScD divisions to ensure needed personnel are available when needed.	0d	$0	Very Low	Very Low	Very Low	High	1	15%	15	$ -
No	T-P.4-018	Threat	Open	P.04	P.04.06	Availability of key personnel to work on tasks	The scheduled FDR is January 2022. Installation of the components in the tunnel is June 2022. A slip of a schedule because of availability of key experienced personnel will slip schedule, which slips reviews, which slips installation. The next opportunity for installation is the long outage, and likely issues with new installation will cause delays in neutron production for the commissioning of the system.	3/1/2020	1/1/2022	Management	PPU Project	Medium	High	Low	Low	12	50%	160.00	$ 250,000	Yes	Fill open positions on protection system team	730d	$300,000	Very Low	Very Low	Very Low	Very Low	1	0%	0	$ -
No	T-P.4-019	Threat	Open	P.04	P.04.06	Production of beamline component is delayed due to manufacturing issues. May have to remake the component if there is a leak in a braze	It is estimated that the fabrication of the beamline component is 6 months. An additional 6 month delay would guarantee that installation could not occur during the long outage. Installation will require a minimum 3 week window, which would likely occur later.	8/1/2021	12/31/2021	External	PPU Project	Low	Medium	Very Low	High	6	35%	120	$ 10,000	Yes	Order beamline CT before the FDR. Minimal risk of early procurement of the CT as this is a commercial component.	180d	$0	Very Low	Very Low	Very Low	Low	1	5%	0	$ -
No	T-P.4-020	Threat	Open	P.04	P.04.06	Beamline component (the CT) is likely going to be manufactured by a foreign vendor. Procurement delay due to the foreign vendor is likely.	A design that incorporates the vacuum aspect of the design reduces the number of competitive bids. The procurement of a CT with the vacuum installed highly reduces the risk of an in-house design, where there is little-to-no experience in braze welding. A foreign vendor has this capability and routinely sells this as part of their product line	8/1/2021	6/1/2022	External	PPU Project	Medium	Medium	Low	Low	9	50%	20.00	$ 50,000	Yes	Start the procurement early. Consistent with Risk T-P.4-019	180d	$0	Very Low	Very Low	Very Low	Very Low	1	5%	0	$ -
No	T-P.5-020	Threat	Open	P.05	P.05.01; P.05.	Failure of Crane or Servo Manipulator Delays Installations	The PPU project involves a significant amount of effort installing modifying equipment in the service bay. Due to radiation and contamination, work in the service bay is performed using a combination of an in-bay crane, a robotic servo-manipulator, and through-the-wall master-slave manipulators. Failure of the crane or servo-manipulator could jeopardize the ability to perform the needed work.	12/1/2022	12/31/2023	Management	SNS Operations	Medium	High	Very Low	Very Low	12	50%	150	$ -	Yes	Transfer to ops	0d	$0	Very Low	Very Low	Very Low	Very Low	1	10%	0	$ -
No	T-P.5-025	Threat	Open	P.05	P.05.03	New vent line shield block not installed during the long outage	If the new vent line shield block is not installed for PPU during the long outage, then it would delay readiness for the ARR.	12/15/2022	6/30/2023	Technical	PPU Project	Low	Medium	Low	High	6	20%	100	$ 50,000	Yes	Responsibilities for fabrication and delivery of VSLB will be formalized with operations. Installation of the VSLB and removal will be added to PPU in-cell activities	60d	$50,000	Very Low	Very Low	Very Low	Very Low	1	10%	0	$ -
No	T-P.6-004	Threat	Open	P.06	P.06.02	Delay awarding RTBT Stub	The RTBT Stub needs to be a best value type contact to manage the construction schedule risks. If the contract is late to be awarded, it could extend accelerator shutdown period. It is likely the low bidder will not be the successful bidder and these types of contracts require a significant time for ORNL and DOE procurement approvals.	1/2/2023	1/2/2023	Management	PPU Project	Very Low	Low	Medium	Very Low	4	20%	40	$ 500,000	Yes	Final design will be completed July 2019. Outage is in 2022, allowing time for the procurement process	0d	$0	Very Low	Very Low	Very Low	Very Low	1	10%	20	$ 50,000
No	T-P.6-006	Threat	Open	P.06	P.06.02	Contractor Damages RTBT Equipment	Contractor damages existing RTBT equipment during stub construction which could require repairs or replacement of RTBT equipment to allow SNS start-up.	7/1/2023	11/1/2023	Management	PPU Project	Low	Medium	Medium	Low	6	20%	80	$ 500,000	Yes	Ensure requirements for protecting equipment is in contract and excellent coordination with Operations. Operations might consider temporary protection of any critical components.	0d	$0	Very Low	Very Low	Low	Very Low	1	10%	20	$ 250,000

PPU Risk Register - Retired/Realized

												Pre - Mitigation								Mitigation Approach				Post - Mitigation									
Enabled	ID	Type	Risk Status	WBS L2	WBS L3	Name	Risk Description	Risk Trigger	Risk Expiration	RBS	Impact Type	Probability	Schedule	Cost	Technical	Score	Probability	Schedule Impact	Cost Impact	Enabled	Description	Duration	Cost	Probability	Schedule	Cost	Technical	Score	Residual Probability	Residual Schedule Impact	Residual Cost Impact	Retired/Realized Justification	Retired Date
No	O-P.1-001	Opportunity	Realized	P.01	P - Total Project	PPU is considered LI project	If PPU is classified as a line item project, the additional 4% LDRD tax that is applied is not applicable.	10/1/2017	10/1/2019	Management	PPU Project	Very High	Very Low	High	Very Low	20				No		0d	$0	Very High	Very Low	High	Very Low	20					
No	O-P.1-003	Opportunity	Realized	P.01	P - Total Project	On-site ORNL provided storage becomes available	If the PPU Project is able to obtain storage space paid for by ORNL, this will result in a cost savings to the project	12/2/2019	9/30/2024	Management	PPU Project	Medium	Very Low	Very Low	Very Low	3				Yes	Work with ORNL Management team to locate or build on-site storage. Storage would be used by PPU initially and later by other future projects.	120d	$1,000,000	High	Very Low	Very Low	Very Low	4					
No	T-P.1-001	Threat	Retired	P.01	P - Total Project	Late arrival of funding delays project	Delay in distribution of FY funding due to continuing resolution would require work be rescheduled, increasing the cost of the project and its duration.	10/1/2017	10/1/2023	Management	PPU Project	Very High	Very Low	Very High	Very Low	25				Yes	Plan the schedule so that no procurements can be made in the first 3 months of any fiscal year.	0d	$0	Medium	Very Low	Very High	Very Low	15					
No	T-P.1-002	Threat	Retired	P.01	P - Total Project	Inflation exceeds estimate	If the rate of inflation exceeds that used in development of the baseline, contingency will be required to offset the increase.	1/2/2018	10/1/2025	Management	PPU Project	Very Low	Very Low	Very High	Very Low	5				Yes	Project will incorporate escalation based on a tailored approach	0d	$0	Very Low	Very Low	Very High	Very Low	5					
No	T-P.1-009	Threat	Retired	P.01	P - Total Project	Storage space for equipment is required	If equipment arrives early or the outage schedule changes, the project many be in the position of needing to store equipment off-site or at other locations at the lab.	10/1/2020	12/1/2022	Management	PPU Project	Medium	Very Low	Very Low	Very Low	3				Yes	Work with vendors and set up contracts consistent with the baseline schedule. However, if the schedule changes, then the cost impact is minimal if storage is required although moving equipment has its own risk.	0d	$0	Medium	Very Low	Very Low	Very Low	3					
No	T-P.1-012	Threat	Retired	P.01	P - Total Project	Required safety approvals are delayed	If interim or final approvals required to demonstrate the KPPs are delayed due to unexpected findings by a safety committee or changes in regulations, then the project will be delayed.	8/1/2017	1/1/2023	Management	PPU Project	Medium	High	Low	Very Low	12				Yes	Completing the anticipated USIs as planned, concurrent with design, will go a long way to ensuring that no hitches will occur later on. Similarly, continued engagement with the ES&H experts during procurement and installation should be able to substantially mitigate this risk. Estimates for closing recommendations from the various reviews are included in the schedule.	0d	$0	Very Low	Very High	Very Low	Very Low	5					
No	O-P.1-002	Opportunity	Retired	P.01	P - Total Project	Inflation rates are less than those estimated	If inflation rates are less than those used to develop the estimate, the project will requested more funding than is required to accomplish the current baseline, opening up the possibility for increased scope within the TPC.	1/2/2018	1/1/2022	Management	PPU Project	Medium	Very Low	Low	Very Low	6				No		0d	$0	Medium	Very Low	Low	Very Low	6					
No	T-P.2-007	Threat	Retired	P.02	P.02.02	Material Scanning Results	If material scanning results indicate greater than 5% embeded foreign material in production cavity niobium sheets, then additional material and scanning is required	6/15/2018	10/3/2018	Management	PPU Project	Very Low	Low	Low	Very Low	2				No		0d	$0	Very Low	Low	Low	Very Low	2					
No	T-P.2-031	Threat	Retired	P.02	P.02.02	Cavity Foreign Procurement Exchange Rate	Given that the current known vendors for cavities are from Europe, if the euro/dollar exchanger rate increases, then the project cost for cavities will increase.	1/4/2018	11/23/2020	External	PPU Project	Very Low	Very Low	High	Very Low	4				No		0d	$0	Very Low	Very Low	High	Very Low	4					
No	T-P.2-032	Threat	Retired	P.02	P.02.02	Coupler Foreign Procurement Exchange Rate	Given that previously procured couplers are from Japan, if the yen/dollar exchange rate increases, then the project cost for cavities will increase.	1/4/2018	2/10/2020	External	PPU Project	Very Low	Very Low	Low	Very Low	2				No		0d	$0	Very Low	Very Low	Low	Very Low	2					
No	T-P.2-034	Threat	Retired	P.02	P.02.02	Material QA Foreign Procurement Exchange Rate	Given that the current known vendor for material QA is in Europe, if the euro/dollar exchanger rate increases, then the project cost for material QA will increase.	8/2/2019	2/15/2019	External	PPU Project	Very Low	Very Low	Very Low	Very Low	1				No		0d	$0	Very Low	Very Low	Very Low	Very Low	1					
No	O-P.2-030	Opportunity	Retired	P.02	P.02.03	Cryomodule Cost Is Low	If the current Cryomodule cost estimates are high, then project CM cost will decrease	4/1/2019	2/9/2022	Management	PPU Project	Very Low	Very Low	Medium	Very Low	3				No		0d	$0	Very Low	Very Low	Medium	Very Low	3					
No	T-P.2-001	Threat	Retired	P.02	P.02.03	CM Cost Is High	If the current Cryomodule cost estimates are low, then project Cryomodule cost will increase	4/1/2019	2/9/2023	Management	PPU Project	High	Very Low	Very High	Very Low	20				No		0d	$0	High	Very Low	Very High	Very Low	20					
No	T-P.2-023	Threat	Retired	P.02	P.02.04	4K Cold Box Shield Capacity	If the installed CM shield heat load is above the capacity of the 4K cold box circuit, then shield operating temperature rises	1/4/2023	1/18/2023	Technical	PPU Project	Very Low	Very Low	Very Low	Low	1				Yes	Replace T1 wheel inside the CHL 4KCB to increase shield capacity and restore current CM shield operating temperature	20d	$50,000	Very Low	Very Low	Very Low	Very Low	1					
No	T-P.2-029	Threat	Retired	P.02	P.02.07	Controls Software Requirements	If controls software requirements are incomplete or significantly changed after design and development are scheduled to begin, then development and testing of controls software may extend past the scheduled completion date.	11/1/2020	11/1/2021	Technical	PPU Project	High	Medium	Medium	Medium	12				Yes	Carefully monitor development of requirements to push completion prior to software development. Perform requirements reviews for complex areas.	0d	$0	High	Low	Very Low	Very Low	8					
No	O-P.3-003	Opportunity	Retired	P.03	P.03.02	Pre-Assembly of Piping & Waveguides to Simplify Assembly	Coordinate effort between P.3.7.2 Cooling Systems & P.3.2.4 RF waveguides to preassembly and install together to minimize installation time, simplify labor coordination, improves worker safety, and save costs of support systems.	10/2/2017	10/1/2018	Management	PPU Project	Very Low	Very Low	Low	Very Low	2				Yes	Include the coordination in the design plans for these 2 systems.	0d	$20,000	Very Low	Very Low	Low	Very Low	2					
No	O-P.3-010	Opportunity	Retired	P.03	P.03.02	Limited Vendors for High Value Components	The limited competition for high value project components and the desire to maintain component compatibility presents a risk to the RF costs. There is an opportunity to reduce the equipment costs.	3/1/2019	10/1/2019	External	PPU Project	High	Very Low	Medium	Very Low	12				Yes	Competitively bid items where possible.	0d	$0	High	Low	High	Very Low	16					
No	T-P.3-006	Threat	Retired	P.03	P.03.02	Existing SCL transmitters do not deliver enough power	If the existing SCL transmitters do not deliver enough power, then the overall project objective for power on target is jeopardized.	9/30/2017	9/30/2017	Technical	PPU Project	Very Low	Very Low	Medium	High	3				No		0d	$0	Very Low	Very Low	Medium	High	3					
No	O-P.3-001	Opportunity	Retired	P.03	P.03.03	Dual 3.0 MW klystron HVCM upgrade not required	Initial accelerator physics studies indicate that the primary limitation to transporting 38 mA of beam current through the linac is associated with insufficient power in DTL2. DTL4 and DTL5 may have sufficient power under current operating levels to accelerate beam and therefore upgrading to 3.0 MW klystrons may not be required.	9/30/2017	9/30/2017	Technical	PPU Project	Medium	Very Low	High	Very Low	12				Yes	Perform accelerator physics studies to determine need for upgrade.	120d	$0	Medium	Low	Very High	Very Low	15					
No	T-P.3-024	Threat	Retired	P.03	P.03.04	LLRF engineer unable to be replaced by March 1	If the LLRF engineer is unable to be replaced by March 1st, then PPU would have to use partner lab which may delay the design.	2/1/2019	3/30/2019	Management	PPU Project	Medium	High	Low	Very Low	12				Yes	Subcontract to partner lab	80d	$50,000	Very Low	Very Low	Very Low	Very Low	1					
No	T-P.3-018	Threat	Retired	P.03	P.03.05	RFQ Modulator	Based on recent beam studies, the RFQ modulator (RFQ-Mod1) will need to be operated at unprecedented DC bus voltage levels which may reduce overall reliability of this system.	2/1/2019	9/30/2023	Technical	PPU Project	High	Very Low	Low	Low	8				Yes	Perform extended duration operational runs of RFQ-Mod1 at PPU levels during maintenance periods. Assess a scaled-down version of the HVCM as an option for powering a single RFQ klystron. Obtain quote(s) from industry for a dedicated RFQ modulator.	240d	$1,800,000	Very Low	Very Low	Very Low	Very Low	1				Upgrade of the RFQ modulator has been absorbed into the project under P.3.5.6.	
No	O-P.3-002	Opportunity	Retired	P.03	P.03.06	Include active front end / buck converter in design of Alternate Topology Modulator	An active front end, developed at ESS, could be scaled and integrated into the new HVCM systems. If successful, it promises cost savings in the elimination of harmonic filters in the transformers and reduction of the substation filters. Reduction of reactive power also can result in lower electricity bills and improved reliability for distribution equipment.	4/1/2018	4/1/2018	Technical	PPU Project	High	Low	Low	Low	8				Yes	Incorporate active front end into new HVCM systems for PPU	120d	$20,000	High	Medium	Medium	Very Low	12					
No	T-P.3-005	Threat	Retired	P.03	P.03.06	Alternate Topology Modulator does not meet requirements	If prototype results indicate modulator requirements cannot be met with the AT-HVCM and a 2nd prototype iteration is unsuccessful, then it may be necessary to resort to a modified design of the existing HVCM system to achieve new modulator requirements.	1/1/2018	1/1/2018	Technical	PPU Project	Medium	Very Low	Low	Very Low	6				Yes	Develop a new baseline design that is based on a modified existing HVCM.	120d	$268,700	Very Low	Very Low	Low	Very Low	2					
No	O-P.4-001	Opportunity	Realized	P.04	P.04.04	Extraction kicker system does not need new magnets	If the existing extraction kicker system can be upgraded to higher voltages we may not need to install the two additional kickers	1/1/2017	1/1/2019	Technical	PPU Project	High	Very Low	High	Very Low	16				Yes	Build prototype system and operate for a few months to test viability	0d	$37,000	High	Very Low	Very High	Very Low	20					
No	T-P.5-012	Threat	Retired	P.05	P.05.02; P.05.06	Water loop 4 not converted to heavy water	FTS PPU neutronic performance assumes that water loop 4 will have been converted to heavy water by the time PPU operations begin. If not, instrument performance will be less than estimated. The conversion is being covered by SNS operations - it is not part of PPU project scope.	12/31/2018	12/31/2023	Management	SNS Operations	Very Low	Very Low	Medium	Very Low	3				No		0d	$0	Very Low	Very Low	Medium	Very Low	3					
No	O-P.5-002	Opportunity	Retired	P.05	P.05.04	Ortho-para converters not needed	If that ortho-para converters are not essential, then they can be deleted from project scope.	12/31/2017	1/1/2018	Technical	PPU Project	Medium	Low	High	Medium	12				Yes	A defense of inclusion in project scope is under preparation. This includes simulations showing effects of sub-100% para LH2, discussion and feedback with neutron scientists on impact of < 100% para LH2 on their instruments.	0d	$0	Medium	Low	High	Medium	12					
No	T-P.5-021	Threat	Retired	P.05	P.05.06; P.05.09	Proposed 2nd Gas Supply Path Unsuitable	"The plan is based on the ability to provide two independent flow of helium for gas mitigation into the target. It is assumed that the GI3 project outside of PPU scope will provide for two gas supplies to be delivered via a single spare water line to the service bay. In addition, it is assumed that a separate spare water line in the target carriage will be suitable for gas supply routing.	10/31/2017	11/1/2017	Technical	PPU Project	Medium	Very Low	Low	Very Low	6				No		0d	$0	Medium	Very Low	Low	Very Low	6					
No	T-P.6-007	Threat	Retired	P.06	P.06.02	Geotechnical Issues RTBT Stub	Soil geotechnical properties at the RTBT Stub may be inadequate for current soils supported design. This would require installation of load transfer platform to prevent excessive settlement.	5/1/2023	9/30/2017	Technical	PPU Project	Medium	Medium	Medium	Very Low	9				Yes	Perform geotechnical borings and testing of soil in area of RTBT Stub to have a good design basis.	0d	$0	Very Low	Very Low	Very Low	Very Low	1					
No	T-P.3-001	Threat	Retired	P.03	P.03.03; P.03.05	Insufficient RF power margin in normal-conducting Linac	Data obtained during accelerator physics studies indicates RF power margin may be insufficient on some NCL RF stations (excepting DTL4-5, where an upgrade is planned). If the RF power margin is insufficient, then it will not be possible to provide a 38 mA beam current without adding scope to PPU. Present thinking is that two additional 3 MW klystrons would be needed for stations DTL3 and DTL6.	12/1/2017	5/1/2018	Technical	PPU Project	High	Very Low	High	High	16				No		0d	$0	High	Very Low	High	High	16					
No	T-P.4-002	Threat	Retired	P.04	P.04.03	Injection dump view screen cost	The injection dump view screen does not yet have a strong conceptual design (as reflected by the high estimate uncertainty) and the current estimate could be low.	1/1/2017	1/1/2019	Management	PPU Project	Low	Very Low	Low	Very Low	4				No		0d	$0	Low	Very Low	Low	Very Low	4				Design maturity of imaging system has made significant progress and the cost and schedule have been updated. Ongoing efforts, including planned bench testing, will improve accuracy further.	
No	T-P.4-017	Threat	Retired	P.04	P.04.03	RID vacuum window requires unique equipment for coating	If Stoneybrook requires unique equipment for the coating of the RID vacuum window, then there will be additional cost and scope and possibly schedule delays.	9/30/2019	4/30/2022	Technical		High	Very Low	Very Low	High	4				Yes	Ensure advanced planning with Stoneybrook and continual communication	0d	$0	Low	Very Low	Very Low	Very Low	2				Stoneybrook was provided drawings for the window design and replied that no unique equipment would be required. Test article of the flame spray will confirm.	
No	T-P.3-002	Threat	Retired	P.03	P.03.05	All HVCM systems in existing linac need to be upgraded for higher power delivery	T-P.3-001 characterizes the possibility of inadequate power margin in the warm linac. Since requirements for the existing cold linac HVCM systems were also based on calculations and have not been scaled from existing operating levels, the possibility of inadequate control margin exists in the cold linac HVCM systems as well. Establishing adequate control margin would require higher modulator operating levels than the current baseline design achieves. Therefore PPU scope would have to be modified to include upgrading affected HVCM systems' baseline design to meet the new requirements.	12/1/2017	5/1/2018	Technical	PPU Project	Medium	Very Low	Low	Low	6				No		0d	$0	Medium	Very Low	Low	Low	6				RF Task force measurements and transmitting 38 mA of beam through the warm linac in 2018 indicated that there is no need to upgrade systems for higher power.	
No	T-P.4-001	Threat	Retired	P.04	P.04.02; P.07.02	Stripper foil will not survive 2MW beam power	If the stripper foil cannot survive higher beam power then we would have to either use 2 stripper foils or develop a new foil (new technology).	1/1/2018	1/8/2018	Technical	PPU Project	Very Low	Very Low	Low	Low	2				No		0d	$0	Very Low	Very Low	Low	Low	2				It has been shown that foils should survive at 2MW	
No	O-P.4-003	Opportunity	Retired	P.04	P.04.02	May not need additional injection dump beam line magnet	The baseline project will add a quadrupole magnet to the injection dump beam line to better control the beam distribution in the beam line and at the injection dump. Once the beam optics have been better studied we may determine that these components are not necessary.	8/31/2019	9/30/2019	Technical	PPU Project	Medium	Very Low	Very Low	Very Low	3				Yes	Beam optics studies	20d	$40,000	Medium	Very Low	Medium	Very Low	9				This opportunity was not realized. A new dump beam line magnet is needed.	
No	T-P.3-004	Threat	Retired	P.03	P.03.06	2nd design iteration required on Alternate Topology Modulator	Current prototype testing includes upgraded components based on design simulations and calculations. If these components and/or subsystems do not achieve the desired results, then a 2nd iteration and associated testing may be required to meet the modulator requirements.	10/1/2017	5/21/2019	Technical	PPU Project	Medium	Very Low	Low	Very Low	6				Yes	Modify component and/or subsystem design, if required, and perform a second round of testing.	60d	$145,300	Very Low	Very Low	Low	Very Low	2				A successful series of tests, followed by a successful final design review, supports no additional design iteration is required on the AT-HVCM.	
No	T-P.3-022	Threat	Retired	P.03	P.03.05; P.03.06	Results of modulator development program indicate we cannot meet requirements by final design	If the test results of development program AT-HVCM (or similar) indicate we cannot meet requirements of that system by final design review, then we will have to re-evaluate and there might be another design iteration	3/31/2019	9/30/2023	Technical	PPU Project	Low	Medium	Low	Low	6				No		0d	$0	Low	Medium	Low	Low	6					
No	T-P.3-023	Threat	Retired	P.03	P.03.05; P.03.06	Stangenes Industries loses critical personnel	If Stangenes lose critial personnel before we procure components, then we will have to find an alternate vendor or design in house which will cause schedule impacts.	2/1/2019	9/30/2023	External	PPU Project	Very Low	Low	Low	Low	2				No		0d	$0	Very Low	Low	Low	Low	2					
No	T-P.5-007	Threat	Retired	P.05	P.05.02; P.05.07; P.05.10	Instrument beamline shielding is not adequate	Neutronics studies outcomes reveal that the dose rates outside instrument beamline shielding is above 0.25 mrem/h. Shielding supplements / modifications will be needed which previously were assumed unnecessary.	12/31/2018	12/31/2019	Technical	PPU Project	Very Low	Medium	Medium	Very Low	3				Yes	This outcome is judged unlikely so the assumption is that shielding is adequate. Timely completion of shielding in evaluation phase will confirm the assumption early.	0d	$0	Very Low	Very Low	Very Low	Very Low	1				the assessment of the neutron source terms for PPU conditions (report SNS-107030700-DA0007-R00) and the assessments of the CNCS and CORELLI beamline shielding (reports CNCS-05-70-DA0017-R00 and SNS-106100200-DA0041-R01) allow to conclude that the beamline shielding for all instruments is adequate for 2 MW 1.3GeV proton beam operations.	
No	T-P.1-005	Threat	Retired	P.01	P - Total Project	SNS not operating when needed to demonstrate KPPs	If some operational issue (either related to PPU or independent) prevents beam to target when required to demonstrate the PPU KPPs, PPU will not meet CD-4 requirements.	1/31/2024	2/1/2024	Management	PPU Project	Very Low	Very High	Very High	Very High	5				Yes	Include sufficient float to allow for SNS to recover from some unexpected failure. Ensure the PPU timeline KPP requirements are communicated well and often. Partner in the development of the SNS operating schedule.	0d	$0	Very Low	Low	Low	Low	2				This risk was combined with T-P.1-018	
No	T-P.1-019	Threat	Retired	P.01	P - Total Project	Project replan is required due to funding	If a project replan is required due to funding, a replanning exercise would result in new cost and schedule estimates	9/1/2019	10/1/2025	External	PPU Project	Medium	Very High	High	Very Low	15				Yes	Assume continuing resolutions and plan for no procurements in the first 3 months of any fiscal year.	0d	$0	Medium	High	High	Very Low	12				This risk was combined with T-P.1-015	
No	O-P.5-005	Opportunity	Retired	P.05	P.05.08	2nd MOTS carbon delay bed is found unnecessary	A 2nd MOTS carbon delay bed (adsorber) is planned for in PPU to deal with anticipated greater hot offgas from high-flow gas injection. A first added delay bed is part of GI3 (low-flow gas injection). A lesson from GI3 operation may be that a 2nd delay bed is not essential for PPU gas injection.	12/31/2020	12/31/2020	Technical	PPU Project	Medium	Very Low	Medium	Medium	9				Yes	Push operations to commence GI3 as soon as possible and progress with gas rates as much as possible over the coming years.	0d	$0	Medium	Very Low	Medium	Medium	9					
No	O-P.5-006	Opportunity	Retired	P.05	P.05.09	Performance improvements from GI3 simplify PPU target design	The erosion reductions demonstrated by GI3 simplify the PPU target design by eliminating the requirement for the protective gas wall at the inner window.	12/31/2020	12/31/2022	Management	PPU Project	Very Low	Very Low	Very Low	Very Low	1				Yes	Execute Target Management Plan with operation of low-flow gas injection of small bubbles from now on.	0d	$0	Medium	Very Low	Very Low	Very Low	3					
No	T-P.5-002	Threat	Retired	P.05	P.05.03; P.05.10	Mercury pump must be replaced for PPU power or gas injection	P.5 assumes that the existing mercury pump is adequately compatible with PPU power and gas injection. If found to be wrong the pump will have to be replaced with one that meets requirements.	12/31/2019	12/31/2022	Technical	PPU Project	Medium	High	Medium	Medium	12				No		0d	$0	Medium	High	Medium	Medium	12					
No	T-P.5-004	Threat	Retired	P.05	P.05.06	Required Target Utility upgrades greater than expected for PPU beam	Unexpected cooling upgrades beyond those planned for to accommodate PPU beam on the FTS could expand Target Utility requirements.	12/31/2018	12/31/2020	Technical	PPU Project	Medium	Medium	Low	Low	9				Yes	Make rapid progress on FTS evaluations with PPU beam to find out if more utility upgrades are needed than estimated.	0d	$0	Very Low	Very Low	Low	Low	2					
No	T-P.5-010	Threat	Retired	P.05	P.05.03; P.05.08; P.05.09; P.05.10; P.07.01	GI3 results come too late to benefit PPU target gas injection	Results from GI3 operation come too late to benefit the final design of the PPU target and related gas injection and overflow hazard mitigations (Hg return line GLS, Hg pump tank overflow, HX and pump compatibility with high-flow gas injection).	12/31/2017	12/31/2019	Management	SNS Operations	Medium	Medium	Medium	Low	9				No		0d	$0	Medium	Medium	Medium	Low	9					
No	T-P.5-017	Threat	Retired	P.05	P.05.01; P.05.03; P.05.06; P.05.08; P.05.09; P.05.10; P.07.01	Target Management Plan progress limits PPU schedule	"Progress expected with Target Management Plan does not come and needed outcomes delay PPU schedule for 2 MW target design and high-flow gas injection.	2/28/2019	12/31/2019	Management	SNS Operations	High	Medium	High	Medium	16				Yes	Continuous project communication and oversight with operations and leadership to complete TMP goals in timely manner that achieve desired outcomes needed for PPU.	0d	$0	Medium	Medium	Medium	Low	9					
No	T-P.5-022	Threat	Retired	P.05	P.05.03	Hg Overflow Tank and Shielding Incompatible with Current Shielding	PPU scope includes the addition of a Hg overflow tank. This tank will have to be shielded. Its location is likely to be at a location where this is already shielding. As the shielding and tank must be seismically qualified, it is possible that the new tank and shielding will not be compatible with the existing shielding.	10/31/2023	10/31/2023	Technical	PPU Project	High	Very Low	Low	Very Low	8				No		0d	$0	High	Very Low	Low	Very Low	8					
No	T-P.1-023	Threat	Retired	P.01	P - Total Project	PPU does not receive approval for CD-3B by mid FY2019	If CD-3B is not approved by mid FY2019, then it will impact schedule.	4/1/2019	8/30/2019	Management	PPU Project	High	Medium	Very Low	Very Low	12				Yes	CD-3B will be combined with CD-2 end of FY19	0d	$0	High	Medium	Very Low	Very Low	12				This risk was retired when PPU received CD3b approval August 30th, 2019	
No	T-P.4-007	Threat	Retired	P.04	P.04.06	Controls Software Requirements	If controls software requirements are incomplete or significantly changed after design and development are scheduled to begin, then development and testing of controls software may extend past the scheduled completion date.	11/1/2021	11/1/2022	Technical	PPU Project	High	Low	Low	Low	8				Yes	Carefully monitor development of requirements to push completion prior to software development. Perform requirements reviews for complex areas.	20d	$40,000	Very Low	Very Low	Very Low	Very Low	1				Retire - Requirements are now sufficiently defined 10/28/2019	
No	T-P.2-006	Threat	Retired	P.02	P.02.02	Inner Conductor Delivery Is Late	If the long lead coupler inner and outer conductors are delayed, then coupler qualification is delayed	1/4/2018	2/10/2020	External	PPU Project	Low	Low	Low	Very Low	4	25%	21	$ 75,000	No		0d	$0	Low	Low	Low	Very Low	4	25%	21	$ 75,000	Inner Conductors Received October 28 2019	
No	T-P.2-012	Threat	Retired	P.02	P.02.02	Qualification Cavity Performance	If the cavity vendor is unable to achieve desired performance specification on the qualification cavities, then cavity production will be delayed	2/28/2019	10/30/2019	Technical	PPU Project	Low	Low	Low	Very Low	4	25%	25	$ 55,000	Yes	Additional SNS personnel would be needed at vendor facility to oversee the extra processing and testing	20d	$30,000	Very Low	Low	Low	Very Low	2	15%	40	$ 55,000.00	Tested 3 cavities; two of the cavities met spec, 1 was used to set up the facilities	
No	T-P.2-009	Threat	Retired	P.02	P.02.02	Niobium Delivery to Vendor	If the long lead cavity niobium material is delayed and only a partial shipment is initially received, then cavity production is delayed	1/4/2018	11/23/2020	Management	PPU Project	Very Low	Low	Very Low	Very Low	2	10%	20	$ 25,000	Yes	Additional material on hand	0d	$0	Very Low	Very Low	Very Low	Very Low	1	5%	10	$ 25,000	Niobium was received at RI	
No	O-P.5-001	Opportunity	Retired	P.05	P.05.03	GLS in mercury return pipe is not needed	P.7.1 R&D for gas injection and experience with GI3 low flow gas injection made provide positive results that a mercury return pipe gas liquid separator (GLS) is not necessary for PPU high flow gas injection. P.5 assumes the GLS is necessary; the installation challenges alone are worth avoiding if possible.	12/31/2019	12/31/2021	Technical	PPU Project	Medium	Low	Low	Very Low	6	45%	40	$ 175,000	No		0d	$0	Medium	Low	Medium	Very Low	6				The project has made a programmatic decision to include the GLS in the mercury return pipe. The status of the GLS R&D and preliminary design provide confidence that it can be accomplished successfully.	1/7/2020
No	O-P.5-003	Opportunity	Retired	P.05	P.05.04	Moderator LH2 ortho/para diagnostic not required	The essential need for ortho/para diagnostics for the three LH2 moderator loops may be questioned. Should the reasons for PPU scope necessity not be sufficient, total or partial elimination (e.g., only 1 of 3 LH2 loops require it) of this work scope is possible.	12/31/2017	12/31/2019	Technical	PPU Project	Medium	Medium	High	High	12	50%	120	$ 750,000	Yes	Prepare material thoroughly describing the arguments to include ortho/para diagnostics in PPU scope.	0d	$0	Medium	Medium	High	High	12	50%	120	$ 750,000	Senior leadership within the Neutron Scattering Division have confirmed the value and necessity of a real-time ortho-/para- hydrogen diagnostic. A successful bench-top demonstration of an approach utilizing a through-the-window Raman spectroscopy measurement was achieved.	
No	T-P.5-001	Threat	Retired	P.05	P.05.03	Need to replace mercury heat exchanger for gas injection	If a the mercury heat exchanger cannot operate at higher volume gas injection then the spare mercury heat exchanger will need to be modified to be compatible with gas injection and installed (below the floor in the service bay) via remote handling.	12/31/2019	12/31/2019	Technical	PPU Project	Low	High	High	Medium	8	30%	150	$ 1,000,000	Yes	Included installation of gas liquid separator in mercury return pipe as part of the project scope.	0d	$0	Very Low	High	High	Medium	4	15%	150	$ 1,000,000	The status of the GLS R&D and preliminary design provide confidence that separation of the helium gas from the mercury in the return line can be accomplished successfully thus avoiding the need to replace the heat exchanger.	
No	O-P.5-004	Opportunity	Retired	P.05	P.05.06	Target Utility upgrades needed for PPU beam are less than estimated.	If FTS systems evaluations turn out favorably for required utility upgrades then P.5.6 scope could be reduced.	12/31/2018	12/31/2021	Technical	PPU Project	High	Low	Medium	Very Low	12	80%	25	$ 250,000	Yes	Prompt completion of FTS systems evaluations will inform leadership if scope can be reduced as soon as possible.	0d	$0	High	Low	Medium	Very Low	12	80%	25	$ 250,000	This risk is captured in the cost uncertainty assigned to the procurement in the PPU schedule.	
No	T-P.5-013	Threat	Retired	P.05	P.05.02; P.05.03: P.05.07	Mercury return GLS cannot fit under dog-house shielding	R&D outcomes reveal that the required mercury return pipe GLS design cannot be made to fit under the existing service bay "doghouse" shielding. New removable shield blocks must be designed, neutronically analyzed, fabricated and installed. These activities are not assumed in the baseline.	10/1/2019	12/31/2021	Technical	PPU Project	Medium	Low	Low	Low	6	40%	60	$ 100,000	No		0d	$0	Medium	Low	Low	Low	6	40%	60	$ 100,000	The status of the GLS R&D and preliminary design provide confidence that GLS can be designed to fit successfully within the dog-house shielding.	
No	T-P.3-015	Threat	Retired	P.03	P.03.02	Currency exchange fluctuations may increase costs for P.3.2 SCL HPRF	If Euro to Dollar exchange rates fluctuate excessively, the cost for the SCL circulators will increase. This component will very likely be sourced from a European vendor.	6/4/2018	12/1/2019	External	PPU Project	Medium	Very Low	Low	Very Low	6	40%	0	$ 250,000	No		0d	$0	Medium	Very Low	Low	Very Low	6	40%	0	$ 250,000	No equipment is being purchased from a foreign vendor.	
No	T-P.3-014	Threat	Retired	P.03	P.03.03	Currency exchange fluctuations may increase costs for P.3.3 NCL HPRF	If Euro to Dollar exchange rates fluctuate excessively, the cost of the circulators will increase. Components will very likely be sourced from European vendors.	6/14/2019	6/3/2020	External	PPU Project	Medium	Very Low	Low	Very Low	6	40%	0	$ 250,000	No		0d	$0	Medium	Very Low	Low	Very Low	6	40%	0	$ 250,000	No equipment is being purchased from a foreign vendor.	
No	T-P.2-045	Threat	Retired	P.02	P.02.02	Outer conductor delivery is late	If the long lead coupler outer conductors are delayed, then coupler qualification is delayed	9/1/2019	5/5/2020	External	PPU Project	Low	Low	Low	Low	4	30%	40	$ 75,000	Yes	Use operational spares	0d	$0	Very Low	Low	Low	Very Low	2	15%	40	$ 55,000.00	All has been delivered.	5/1/2020
No	T-P.3-010	Threat	Retired	P.03	P.03.02	Preferred Vendor costs substantially exceed estimate	It is desirable to maintain spare parts continuity across the existing and new RF systems. This places the existing equipment vendor in preference over the others, but opens the project to a cost risk if that vendor bid substantially exceeds the present cost estimate.	10/1/2019	6/30/2020	External	PPU Project	Medium	Very Low	High	Very Low	12	60%	60	$ 1,000,000	Yes	Competitively bid to entice the best price from the preferred vendor	0d	$0	Low	Very Low	Medium	Very Low	6	40%	60	$ 500,000.00	Most 3B components have been procured.	4/16/2020
No	T-P.2-010	Threat	Retired	P.02	P.02.02	Production Cavity Performance	If VTA testing at the partner laboratory reveals cavities requiring reprocessing exceeds plans, then baseline reprocessing cost is increased	2/12/2020	4/1/2021	Technical	PPU Project	Medium	Low	Low	Low	6	50%	40	$ 55,000	No	The project will exercise an option to purchase two additional cavities. This will require only one additional cavity to be reprocessed.	0d	$300,000	Medium	Low	Very Low	Very Low	6	50%	40	$ 55,000	Retired with PCR for additional cavities	5/1/2020
No	T-P.1-008	Threat	Retired	P.01	P.01.03	Safety basis for added hydrogen inventory in moderator cryogenic system not obtained in time.	It is assumed that the additional hydrogen inventory required in the moderator cryogenic system for the addition of ortho- to para-hydrogen converters will be evaluated in the facility safety basis revisions for PPU and approved in time for the installation to be completed and ready for operation. If this turns out wrong it could delay PPU operation.	10/1/2022	10/1/2023	Management	PPU Project	Medium	Low	Medium	Low	9	40%	80	$ 250,000	Yes	Maintain visibility and communication between P.5, P.5.4 and ESH&Q L2 to assure steps are taken in a timely manner to achieve authorization. Scope could be reduced to stay within the approved envelope.	0d	$0	Low	Low	Medium	Low	6	20%	80	$ 250,000.00	Safety basis was approved in February 2020	5/22/2020
No	T-P.2-033	Threat	Retired	P.02	P.02.02	Coupler Outer Conductor Copper Plating Failure	The original outer conductors had an initial 50% failure rate for copper plating. There is currently no certified copper plating vendor for this application. If the copper plating of more than 2 outer conductors fail, then all additional failures will require stripping and re-plating.	8/2/2019	5/5/2020	External	PPU Project	Low	Low	Low	Very Low	4	30%	40	$ 75,000	Yes	Vendor is actively persuing the quality during processing & testing.	0d	$0	Low	Very Low	Low	Very Low	4	30%	15	$ 55,000.00	All of the outer conductors have been received and inspected. The copper plating meets requirements.	6/4/2020
No	T-P.5-014	Threat	Retired	P.05	P.05.02; P.05.06	Water Delay- and GLS-tank shielding inadequate	Evaluation of water delay tank and GLS tank shielding may show that the dose rates on the high bay floor is exceeding 0.25 mrem/hr with water activated at PPU conditions 1.3 GeV and 2MW beam. The consequence would be either to add shielding or re-posting the area.	12/31/2018	12/31/2020	Management	PPU Project	Low	Low	Low	Very Low	4	20%	80	$ 150,000	No		0d	$0	Low	Low	Low	Very Low	4	20%	80	$ 150,000	Analyses documented in the report PPUP-502-DA0001-R00 show that the shielding provided by the 145-cm-thick HD concrete covers for the delay tank, and 85-cm-thick HD concrete covers over the GLS tank are sufficient to attenuate the decay gamma and neutron source terms to below 0.25 mrem/h on contact in the high bay area for operating at 2MW 1.3 GeV proton beam power and energy.	6/9/2020

PPU Risk Register - Retired/Realized

Enabled	ID	Type	Risk Status	WBS L2	WBS L3	Name	Risk Description	Risk Trigger	Risk Expiration	RBS	Impact Type
No	T-P.3-013	Threat	Retired	P.03	P.03.05	Loss of expertise at HVCM boost transformer manfuacturer	One vendor in the world is currently capable of designing and manufacturing boost transformer winding assembles for HVCM boost transformers. The engineer who performs the design is beyond retirement age, and to the best of our knowledge, there is no replacement being trained in the design of pulse transformers. Should a design not exist at the time of this individual's departure it will be difficult to find an alternative.	10/1/2017	7/31/2020	External	PPU Project
No	T-P.3-028	Threat	Retired	P.03	P.03.03	3 MW klystrons don't meet design specs by final design	If the 3MW klystrons don't meet the design specs by final design, then we would have to introduce additional scope which would increase cost or delay schedule.	7/1/2019	7/1/2020	Technical	PPU Project
No	T-P.3-011	Threat	Retired	P.03	P.03.03	New NCL Klystron Technology	If needed, the new normal conducting klystrons will require upfront development from the vendor as they are new models. The development and testing could have a negative impact on project schedule.	10/1/2019	7/31/2020	Technical	PPU Project
No	T-P.1-010	Threat	Retired	P.01	P - Total Project	Time and materials installation contract not in place	If the existing GEM contract is not extended through the time PPU will need it, then a new contract will need to be negotiated and established which will take time.	10/1/2018	1/1/2023	Management	PPU Project
No	T-P.2-003	Threat	Retired	P.02	P.02.03	Helium Vessel Delivery Is Late	If the helium vessel with bellows is delayed, then cavity string assembly is delayed	4/1/2019	3/25/2020	External	PPU Project
No	T-P.2-015	Threat	Retired	P.02	P.02.03	Tuner Delivery	If the tuner harmonic drive is delayed, then cryomodule production is delayed	9/28/2020	8/23/2021	Management	PPU Project
No	T-P.2-019	Threat	Retired	P.02	P.02.03	Heat Exchanger Delivery Is Late	If the cryomodule heat exchanger is delayed, then cryomodule production is delayed	4/1/2019	8/15/2020	Management	PPU Project
No	T-P.5-033	Threat	Retired	P.05	P.05.08	Moisture in MOTS	If the moisture in MOTS is an ongoing problem, then redesign of MOTS (P.05.08) and utilities gas recirculation (P.05.06) will be necessary and will result in increased cost and delays of schedule.	1/7/2020	6/30/2020	Technical	PPU Project
No	T-P.2-005	Threat	Realized	P.02	P.02.02	Cavity Delivery Is Late	If mechanical failures occur during cavity production, then cavity delivery to partner laboratory will be delayed	6/5/2018	1/31/2021	External	PPU Project
No	T-P.2-008	Threat	Retired	P.02	P.02.02	New Coupler Performance	If the couplers tested at SNS do not meet performance peak power rating of 700 kW, then repair and retesting is required	8/28/2020	4/15/2021	Technical	PPU Project
No	T-P.4-004	Threat	Retired	P.04	P.04.04	May require 4 skew quadrupole magnets in the RTBT	If the proposed solution (new shims) to the extraction septum magnet skew quad components is deemed to be inadequate, we may need to instead install four skew quadrupole corrector magnets in the RTBT.	1/1/2019	9/15/2020	Management	PPU Project
No	O-P.4-002	Opportunity	Retired	P.04	P.04.04	May not need new extraction septum magnet shims	Magnet simulations and particle tracking simulations may reveal that the existing shims are acceptable.	4/1/2020	1/30/2022	Technical	PPU Project
No	O-P.4-004	Opportunity	Retired	P.04	P.04.02	May not need new foil changers	New foil changers will not be needed if the existing changers will work with the new vacuum changers and new magnets.	4/1/2020	1/30/2022	Technical	PPU Project
No	T-P.4-022	Threat	Retired	P.04	P.04.06	Introduction of noise in the system causes algorithm of sliding window integrator to not work	Having a good understand of the tunnel environment can only be known once the installation takes place. Having an early installation date before the long outage is planned so that the environment can be measured and countermeasures take place. Slipping the schedule has a serious impact on demonstrating that the system is ready for startup after the long outage. Experience with beam measurements in the RTBT have demonstrated already that the extraction kickers introduce significant signal integrity issues	11/1/2019	11/1/2020	Technical	PPU Project
No	T-P.5-018	Threat	Retired	P.05	P.05.04	Lack of capable MCS ortho-para diagnostic vendors	MCS upgrades include in-situ diagnostics to monitor LH2 ortho-para fractions. Technology is not "off the shelf" so capable vendors are not assured. One company did provide a quote so outlook not terrible; ESS is also developing a diagnostic.	12/31/2020	4/30/2023	External	PPU Project
No	T-P.5-023	Threat	Retired	P.05	P.05.09	Limited target vendors lead to higher costs	To date, only four companies have built mercury targets. The low number of suitable companies for target fabrication may lead to higher costs than expected.	10/1/2022	10/1/2022	External	PPU Project
No	T-P.3-019	Threat	Retired	P.03	P.03.02	Transmitter vendor delivery slips due to business unit shutting down	If transmitter vendor delivery slips due to the business unit shutting down, then will cause schedule delays and impact system testing.	8/1/2020	10/1/2021	External	PPU Project
No	T-P.4-009	Threat	Retired	P.04	P.04.02	New injection area magnets may cost more due to cost plus contract with partner lab	Lack of control over work at partner lab my cause the cost of the chicane magnets to increase.	1/1/2020	3/1/2021	External	PPU Project
No	T-P.6-005	Threat	Retired	P.06	P.06.02	RTBT Stub Construction Encounters Activated Soil	Activated soil or activated concrete could be encountered during construction of the RTBT Stub. If it is encountered, delays and cost increases will occur.	7/1/2023	1/9/2023	Management	PPU Project
No	O-P.5-007	Opportunity	Retired	P.05	P.05.09	Front Body Development	The front body development test article is intended to prove in the manufacturing processes for the 2MW targets. The test article may be used as an actual production component in a PPU Test Target 2 or a 2MW Target. If this component can be used in a target, PPU would benefit from a cost savings for not having to produce another front body article.	5/1/2020	3/1/2021	Technical	PPU Project
No	T-P.2-018	Threat	Realized	P.02	P.02.03	End Can Delivery Is Late	If the supply or return end cans are delayed, then cryomodule production is delayed	9/12/2019	7/12/2021	Management	PPU Project
No	T-P.2-035	Threat	Retired	P.02	P.02.02	Cavity Damage during Shipment to Partner Lab	If any cavity is damaged in shipment, then additional cavities will need to be purchased.	6/1/2020	3/1/2021	External	PPU Project
No	T-P.2-021	Threat	Realized	P.02	P.02.03	Vacuum Vessel Delivery Is Late	If the vacuum vessel is delayed, then cryomodule production is delayed	2/24/2020	5/20/2021	Management	PPU Project
No	T-P.5-003	Threat	Retired	P.05	P.05.02; P.05.03; P.05.04; P.05.05; P.05.06; P05.07; P.05.08; P.05.09: P.05.10	Aluminum PBW assumption turns out wrong	P.5 assumes the proton beam window material will be aluminum at the time of PPU. Heretofore they have been made of Inconel. The material affects neutronics heating and damage rate predictions, which in turn feed systems evaluations and possibly required upgrades. Much work may have to be repeated and documented if the aluminum assumption turns out wrong.	1/1/2020	1/1/2022	Technical	PPU Project
No	T-P.5-011	Threat	Retired	P.05	P.05.03	Spare mercury pump not modified for gas injection by operations	The spare mercury pump has a known incompatibility with gas injection. ISD has agreed to modify it to make it compatible. If the pump needs to be replaced and the modification is not done, PPU will not be able to use gas injection and 2 MW will not be possible.	12/31/2022	12/31/2023	Management	SNS Operations
No	T-P.1-025	Threat	Retired	P.01	P - Total Project	Storage space for equipment is required	Additional storage space will be provided by ORNL beginning in FY21. If there is a delay to the availability of on-site ORNL funded storage space or the space does not become available, then off-site storage would be needed.	10/1/2020	10/1/2021	Management	PPU Project
No	T-P.6-010	Threat	Realized	P.06	P.06.02	Construction competition for Klystron Gallery	Construction competition in the area may cause market area resources to be higher in cost than estimated	2/1/2019	9/30/2023	External	PPU Project
No	T-P.5-034	Threat	Retired	P.05	P.05.09	Target Fabrication Repairs	If there are problems in target fabrication that result in repair or rework of the target module, then the repair and rework will result in increased cost and a delay in schedule.	1/7/2020	10/1/2025	Technical	PPU Project
No	T-P.5-031	Threat	Retired	P.05	P.05.09	Critical weld problem occurs late in fabrication of target	If a critical weld problem occurs late in the fabrication of the target, then a significant delay will occur and possibly affect KPP.	6/1/2021	6/1/2022	Technical	PPU Project
No	T-P.5-006	Threat	Retired	P.05	P.05.03	Problems remotely installing hardware in mercury loop	"The remote handling operation to replace the existing mercury return jumper with a GLS integrated jumper is a risk. If the alignment is insufficient to allow sealing of the hubs at carriage installation, the mercury loop will be inoperable.	10/18/2022	10/18/2022	Technical	PPU Project
No	T-P.3-027	Threat	Retired	P.03	P.03.08	Key software developer is unavailable	If a key software developer becomes unavailable, then PPU would need to hire new resource which will impact schedule.	2/1/2019	6/30/2021	Technical	PPU Project
No	T-P.4-015	Threat	Retired	P.04	P.04.02	Riggers are unavalable during long outage	If installers (Riggers) are not available during the long outage, then there could be a schedule delay	12/15/2022	6/30/2023	Technical	PPU Project
No	T-P.5-029	Threat	Retired	P.05	P.05.06; P.05.03; P.05.04; P.05.09; P.05.08	Shortage in craft (Research Mechanics, Electricians) during outages	If there is a shortage in craft people (research mechanics, electricians) during outages when PPU equipment needs to be installed, then it will result in project delays.	6/1/2022	12/30/2023	Technical	PPU Project
No	T-P.6-008	Threat	Realized	P.06	P.06.02	If tie-ins to Klystron Gallery utilities do not occur as scheduled, the contractor may be delayed resulting in additional cost and possibly delays in follow on WBS elements.		1/31/2020	1/30/2021	Management	PPU Project
No	T-P.6-009	Threat	Realized	P.06	P.06.02	Schedule pressure requires Klystron Gallery installation to be concurrent with CF Construction.	If PPU schedule pressures require Klystron Gallery RF equipment to be installed concurrently with CF construction then contractor delays may result.	2/1/2018	4/30/2021	Management	PPU Project
No	T-P.6-001	Threat	Retired	P.06	P.06.02	High Bids for RTBT Stub	Due to tight schedule requiring multiple shifts and tight site, competition may be minimal or bidders may cover their risk with high bids. Contingency will be required if this happens to avoid delays.	9/1/2022	1/1/2023	External	PPU Project
No	T-P.5-015	Threat	Retired	P.05	P.05.03; P.05.09; P.05.10	Mercury loop safety basis concerns	Unforeseen safety concerns that are not addressed by the current preliminary design of the mercury loop upgrade (GLS+overflow). Additional engineering and controls could be required to satisfy the safety.	10/1/2018	8/1/2023	Management	PPU Project
No	T-P.2-002	Threat	Retired	P.02	P.02.01	Can't Repair Cavity 11b	If the medium beta spare Cryomodule is not completed prior to June 2020, then cavity 11b would not be repaired before project completion and beam energy wll be affected	6/1/2020	2/1/2021	Management	PPU Project
No	T-P.2-027	Threat	Retired	P.02	P.02.06	Existing Accelerator Performance	If plasma processing of existing medium beta CMs in the LINAC is unsuccessful at increasing operating gradient (gain 10% performance improvement on average), then output energy is affected	12/20/2019	2/1/2021	Technical	PPU Project
No	T-P.3-026	Threat	Retired	P.03	P.03.04	Results of LLRF development program indicate PPU cannot meet specs by final design	If the development program indicates that PPU cannot meet specs by final design, PPU will have to seek alternatives	8/1/2020	9/30/2021	Technical	PPU Project

ID	Pre - Mitigation								Mitigation Approach			
	Probability	Schedule	Cost	Technical	Score	Probability	Schedule Impact	Cost Impact	Enabled	Description	Duration	Cost
T-P.3-013	Medium	Medium	Low	Very Low	9	50%	120	$ 100,000	Yes	Prototype a suitable boost transformer design for the impacted applications. Perform extensive testing of the prototype to fully qualify the transformer and assure it meets reliability requirements.	80d	$50,000
T-P.3-028	Very Low	Medium	Very Low	Medium	3	20%	120	$ 50,000	No		0d	$0
T-P.3-011	Medium	Low	Very Low	Very Low	6	60%	80	$ 50,000	No		0d	$0
T-P.1-010	Low	Medium	Medium	Very Low	6	20%	81	$ 500,000	Yes	Keep the GEM contract in place, if at all possible, with the AIP and instrument upgrade activities, along with those on the main campus. At a minimum, monitor the contract status so that it is extended/renewed prior to its expiration.	0d	$0
T-P.2-003	Medium	Low	Low	Very Low	6	45%	60	$ 150,000	Yes	Use spare helium vessels and bellows from original SNS project for the first 2 PPU cryomodules	5d	$0
T-P.2-015	Medium	High	Medium	Very Low	12	50%	140	$ 400,000	Yes	Utilize 8 existing SNS spare harmonic drives, including those currently installed on spare HB Cryomodule and replace when delivered	0d	$0
T-P.2-019	Very Low	Medium	Low	Very Low	3	15%	90	$ 150,000	No		0d	$0
T-P.5-033	Low	Low	Low	Low	4	20%	80	$ 150,000	Yes	If the source is determined to be the mercury pump seal, the gas flow can be increased to prevent air intrusion.	0d	$0
T-P.2-005	Medium	Low	Low	Very Low	6	45%	60	$ 100,000	No		0d	$0
T-P.2-008	Very Low	Low	Low	Very Low	2	19%	40	$ 55,000	No			
T-P.4-004	Very Low	Very Low	Medium	Very Low	3	10%	5	$ 350,000	No		0d	$0
O-P.4-002	Medium	Very Low	Low	Very Low	6	50%	20	$ 50,000	No		0d	$0
O-P.4-004	High	Low	Medium	Very Low	12	65%	21	$ 375,000	No		0d	$0
T-P.4-022	Medium	High	Low	High	12	60%	160	$ 150,000	Yes	procure a test CT and install in the tunnel at CDR. CT = $50k, cables = 3k, stands = 5k, new beampipe = 10k, labor = 20k	60d	$88,000
T-P.5-018	High	Low	Medium	Low	12	60%	80	$ 400,000	Yes	As specifications are developed, communication with prospective vendors and ESS will allow early assessment of vendor capabilities. The option to build upon the ESS developed diagnostic will also be pursued.	0d	$0
T-P.5-023	Medium	Medium	Low	Very Low	9	50%	90	$ 200,000	Yes	Target purchases will continue during the development of the PPU target. Additional vendors may be developed and supply chain issues can be addressed early.	0d	$0
T-P.3-019	Very Low	Very High	Very High	Low	5	20%	161	$ 2,000,000	No		0d	$0
T-P.4-009	Low	Very Low	Low	Very Low	4	40%	0	$ 200,000	Yes	Maintain ongoing discussions and partner lab visits to monitor and encourage progress	120d	$0
T-P.6-005	Medium	Very Low	Low	Very Low	6	40%	10	$ 50,000	Yes	Geotechnical investigation with rad survey within 10 feet of tunnel indicate lower than background radiation readings	0d	$0
O-P.5-007	High	Very Low	Medium	Very Low	12	75%	0	$ 287,000	No	Requirements are in place on the fabrication to ensure that the quality and pedigree of the test article will be sufficient to allow use in a target if possible. The expected completion of the front body test piece allows for use in TT#2	0d	$0
T-P.2-018	Very Low	Medium	Low	Very Low	3	15%	90	$ 150,000	No		0d	$0
T-P.2-035	Very Low	Low	Low	Very Low	2	5%	20	$ 100,000	No		0d	$0
T-P.2-021	Very Low	Medium	Low	Very Low	3	15%	90	$ 150,000	No		0d	$0
T-P.5-003	Low	Very High	Medium	Low	10	40%	250	$ 500,000	No		0d	$0
T-P.5-011	Very Low	Medium	Medium	Low	3	10%	100	$ 500,000	No		0d	$0
T-P.1-025	Medium	Very Low	Low	Very Low	6	50%	20	$ 100,000	No		0d	$0
T-P.6-010	High	Very Low	Medium	Very Low	12	80%	20	$ 500,000	No		0d	$0
T-P.5-034	High	Low	Low	Very Low	8	80%	40	$ 100,000	No		0d	$0
T-P.5-031	Low	Low	Low	Low	4	30%	80	$ 100,000	Yes	Manufacturing test articles; fabrication reviews; manufacturing oversight	0d	$0
T-P.5-006	High	Low	High	High	16	60%	60	$ 700,000	Yes	"A significant effort will be devoted to remote handling tooling development and testing to ensure that this operation is successful.	0d	$0
T-P.3-027	Low	Medium	Low	Very Low	6	40%	120	$ 250,000	Yes	Hire process is underway	0d	$0
T-P.4-015	Medium	Very Low	Very Low	Very Low	3	50%	15	$ -	No	Plan ahead to ensure needed personnel are available when needed. Engage with NScD Chief Operating Officer if needed to bring in additional riggers from ORNL Facilities & Operations.	0d	$0
T-P.5-029	Very Low	Medium	Very Low	Low	3	20%	90	$ 50,000	No	Project office will keep communication with operations on availability of remote craft. Coordination between project and operations will be implemented.	0d	$0
T-P.6-008	Very Low	Low	Low	Very Low	2	10%	20	$ 50,000	Yes	Tight coordination with SNS Operations and make tie-ins prior to contractor need date by several months. Most tie-ins require shutdowns.	0d	$0
T-P.6-009	Medium	Low	Low	Very Low	6	40%	60	$ 200,000	Yes	Implementation of a CD-3B mitigates. Current schedule shows CF equipment going in 9 months prior	0d	$0
T-P.6-001	Medium	Very Low	High	Very Low	12	50%	20	$ 1,000,000	Yes	Hire additional construction management staff to ensure cost and schedule during design are accurate	0d	$0
T-P.5-015	Medium	Medium	High	Low	12	50%	90	$ 1,500,000	Yes	Work with safety group during implementation of GI3 to understand what would be the challenges in injecting more gas. The current preliminary design has already been presented to the safety group and was informally recognized as a successful path for large gas injection.	360d	$0
T-P.2-002	Very Low	Very Low	Very Low	Very Low	1	15%	0	$ 25,000	Yes	Operating one of the anticipated installed spare cavities in CM 32	0d	$0
T-P.2-027	Very Low	Very Low	Very Low	Medium	1	5%	5	$ -	No		0d	$0
T-P.3-026	Low	High	Medium	Medium	8	30%	140	$ 250,000	Yes	Utilize spares of existing system	80d	$350,000

ID	Post - Mitigation									
	Probability	Schedule	Cost	Technical	Score	Residual Probability	Residual Schedule Impact	Residual Cost Impact	Retired/Realized Justification	Retired Date
T-P.3-013	Very Low	Very Low	Low	Very Low	2	20%	20	$ 20,000.00	New vendor was chosen. This risk no longer applies.	8/25/2020
T-P.3-028	Very Low	Low	Very Low	Medium	3	20%	120	$ 50,000	Simulation and calculation results presented at the final design review indicate that the 3MW klystron design meets or exceeds the specifications.	8/25/2020
T-P.3-011	Medium	Low	Very Low	Very Low	6	60%	20	$ 50,000	Any further risk presented by the NCL klystrons is captured by T-P.3-033, “Onsite klystron testing reveals that it does no meet specs.”	8/25/2020
T-P.1-010	Very Low	Low	Low	Very Low	2	10	21	200000	Contract in place January 2020	8/26/2020
T-P.2-003	Very Low	Very Low	Very Low	Very Low	1	10%	10	$ 25,000	Per E. Daly, as of 9/25, there are 10 HV assemblies on hand	9/25/2020
T-P.2-015	Very Low	Very Low	Very Low	Very Low	1	10%	10	$ 25,000	Per E. Daly, as of 9/25, there are 28 tuner assemblies on hand	9/25/2020
T-P.2-019	Very Low	Medium	Low	Very Low	3	15%	90	$ 150,000	Heat Exchanger Delivered	8/26/2020
T-P.5-033	Very Low	Low	Low	Low	2	10%	80	150,000	The moisture issue was addressed with the addition of a molecular sieve skid to be installed in the Gold Amalgamation Room upstream of the carbon delay beds.	10/7/2020
T-P.2-005	Medium	Low	Low	Very Low	6	45%	60	$ 100,000	Delayed cavity delivery has impacted cryomodule fabrication at Jlab. Additional funding may need to be allocated to Jlab, pending an ETC analysis	10/22/2020
T-P.2-008	Very Low	Very Low	Very Low	Very Low	1	19%	40	$ 55,000	The engineering design has been verified and a beam test has been conducted.	12/1/2020
T-P.4-004	Very Low	Very Low	Medium	Very Low	3	10%	5	$ 350,000	New skew quadrupoles are not required.	12/1/2020
O-P.4-002	Medium	Very Low	Low	Very Low	6	50%	20	$ 50,000	New shims are needed.	12/1/2020
O-P.4-004	High	Low	Medium	Very Low	12	65%	21	$ 375,000	Only small changes are needed to the foil changes	12/1/2020
T-P.4-022	Very Low	Very Low	Very Low	Very Low	1	5%	0	$ -	The test article was used to evaluate the noise environment where the production components will be installed. The requirements of the test article were written to circumvent known issues with similar devices that are similarly co-located. Measurements were performed during operations and these measurements have demonstrated that the newly developed requirements show that the envisioned algorithms will be sufficient and that the system should perform as designed.	12/2/2020
T-P.5-018	Medium	Very Low	Low	Very Low	6	40%	0	$ 75,000.00	The approach for the diagnostic switched to the 'window' approach. This risk was for the 'fiber/probe' approach. The window approach is with off-the-shelf components, gives a better signal, and it's robustness has been confirmed via laboratory integrity testing. We still intend to deploy a fiber diagnostic into the CMS before the catalyst installation to directly characterize current ortho/para hydrogen state. The fiber is custom hardware, but supplier responsiveness has improved.	1/5/2021
T-P.5-023	Low	Medium	Low	Very Low	6	40%	90	$ 200,000.00	The fabrication of the PPU target modules is now under contract. The contract was awarded to the most reliable target vendor who has delivered 23 targets to date. The contract price was lower than expected due to early development and design modifications for fabrication. Since the build is under contract, and the costs were lower than expected, this risk in the risk registry should be retired.	1/19/2021
T-P.3-019	Very Low	Very High	Very High	Low	5	20%	161	$ 2,000,000	As of the end of January 2021, the transmitter design effort is complete, all major subcontracts have been placed and all major subcomponents are under fabrication. L3 has met all agreed-upon milestones to date and the project is over 70 percent complete by cost. The risk of the business unit shutting down is no longer valid and may be retired.	1/27/2021
T-P.4-009	Very Low	Very Low	Low	Very Low	2	10%	0	$ 200,000.00	Represents Cost Uncertainty	1/27/2021
T-P.6-005	Very Low	Very Low	Low	Very Low	2	10%	10	$ 50,000	UTB has performed geotechnical investigation in the area of the soils to be removed for construction-surveys by RCT's measured no activation above background levels. Additionally, UTB has performed concrete core samples inside the RTBT tunnel at the location of the beam penetration through wall and man-door location; no activation was measured on the concrete surface or core samples. Based on these two measurements, UTB expects no concrete or soil activation requiring will require special handling or disposal costs.	1/27/2021
O-P.5-007	High	Very Low	Medium	Very Low	12	75%	0	$ 287,000	The front body test article will be used for Test Target 2.	3/16/2021
T-P.2-018	Very Low	Medium	Low	Very Low	3	15%	90	$ 150,000	The end cans are in fact late. The first supply end can was delivered and did not meet specification. It will be returned to the vendor.	4/1/2021
T-P.2-035	Very Low	Low	Low	Very Low	2	5%	21	$ 100,000	The first 30 cavities have been delivered to JLab. 20 of them have had mechanical and RF inspection and show no signs of damage due to shipping.	4/1/2021
T-P.2-021	Very Low	Medium	Low	Very Low	3	15%	90	$ 150,000	The first vacuum vessel was recently delivered. However, the deliveries are behind schedule.	4/1/2021
T-P.5-003	Low	Very High	Medium	Low	10	40%	250	$ 500,000	There were lingering concerns about fabrication difficulties of aluminum proton beam windows. According to Mark Lyttle, these concerns have been resolved. NTD is now confident that we will be have aluminum PBWs for PPU operation.	4/21/2021
T-P.5-011	Very Low	Medium	Medium	Low	3	10%	100	$ 500,000	The spare mercury pump is presently being retrofitted to be compatible with gas injection.	4/20/2021
T-P.1-025	Medium	Very Low	Low	Very Low	6	50%	20	$ 100,000.00	The project has secured adequate storage space for PPU equipment on the SNS site.	5/4/2021
T-P.6-010	High	Very Low	Medium	Very Low	12	80%	20	$ 500,000	Cost estimate of 5.5M v actual cost of 6.5M on Klyrstron Gallery	5/4/2021
T-P.5-034	High	Low	Low	Very Low	8	80%	40	$ 100,000	Combined with T-P.5-005	5/4/2021
T-P.5-031	Low	Low	Low	Low	4	30%	80	$ 100,000	Combined with T-P.5-005	5/4/2021
T-P.5-006	Low	Medium	Low	Very Low	6	40%	90	$ 100,000.00	GLS removed from PPU scope	5/4/2021
T-P.3-027	Very Low	Low	Very Low	Very Low	2	20%	80	$ 50,000.00	Risk covered by T-P.1-004	5/27/2021
T-P.4-015	Medium	Very Low	Very Low	Very Low	3	40%	15		Retired with the creation of project level risk to address craft shortages, T-P.1-029 Craft Resource Availability during Installations	5/27/2021
T-P.5-029	Very Low	Medium	Very Low	Low	3	20%	90	$ 50,000	Retired with the creation of project level risk to address craft shortages, T-P.1-029 Craft Resource Availability during Installations	5/27/2021
T-P.6-008	Very Low	Very Low	Very Low	Very Low	1	10%	20	$ 25,000	Risk realized. The final electrical tie-in scheduled for March 31, 2021 was delayed until an SNS full maintenance day to lessen potential impact to beam operations until April 6, 2021. There were no subcontractor claims resulting from delay and no impact to milestone achievement.	5/27/2021
T-P.6-009	Very Low	Low	Low	Very Low	2	10%	60	$ 50,000	Risk realized. Construction subcontractor substantial completion April 6, 2021 and Installation subcontractor mobilized April 7, 2021. The two subcontractors are performing work in the Klystron Gallery without cost or schedule impact to either.	5/27/2021
T-P.6-001	Low	Very Low	High	Very Low	8	40%	20	$ 1,000,000	Risk combined with T-P.6-014 Construction Competition for RTBT	5/27/2021
T-P.5-015	Low	Medium	Medium	Low	6	20%	90	$ 500,000.00	GLS removed from PPU scope	5/4/2021
T-P.2-002	Very Low	Very Low	Very Low	Very Low	1	5%	0	$ -	Repaired	6/3/2021
T-P.2-027	Very Low	Very Low	Very Low	Medium	1	5%	5	$ -	Plasma processing is complete and was successful	6/3/2021
T-P.3-026	Very Low	Very Low	Very Low	Very Low	1	20%	20	$ 50,000	Specifications met	6/3/2021