

# Appendix E

## Project Risk Registry

NSTX Upgrade Project Risk & Opportunity Registry, rev 26 3/20/2015																
Number	CA	Job Title	Risk Description	Mitigation Plan	Corrective Action, if Risk Occurs	Risk or Absorb. Impact	Owner	Current Status	Likelihood of Occurrence	Consequences	Risk Ranking	Basis of Estimate	Cost Impact (\$K)	Critical Path Schedule Impact (weeks)	Cost and Schedule Impact Calculation Basis	Cost Considered
															Retired=	\$ 6,243
															Open=	\$ -
1305f	1305		CH bundle - poor VPI impregnation	Engineering of the fill locations and vents will be performed as part of developing the fabrication procedure.	Evaluate condition of coil - Local dry areas could be repaired, but larger failure would require cutting OH coil from TF and rebuilding	Apr-2014	Chrzanowski	Retired	U	Significant	Moderate	cost to rewind per primavera	1279	5 month schedule impact		\$ 1,279
1305g	1305		OH coil fails electrical tests	Include tests (meggar, hydro and hi-pot) at several points in the fabrication process so non-conformances can be identified and corrected as they occur.	If fault can not be repaired, Coil must be cut off and rebuilt	Apr-2014	Chrzanowski	Retired	U	Significant	Moderate	cost to rewind per primavera	1279	5 month schedule impact		\$ 1,279
3200e	8200		Passive Plate Tiles/hardware need upgrading: Possibly ~3500 tiles, 70000 inr's, replacing with 2D-CFC	Finalize disruption and thermal load analysis by FDR	Should replacement be necessary option to defer until later in ops by limiting machine parameters (no cost/schedule impact) or replace all affected PP and tiles during the planned outage (Sign cost impact little schedule impact)	8/1/2011	Tresemer	Retired	U	Significant	Moderate		1000	field removal of PP upgrade attachments and re-install/PP		1000
7100a	7100	Project Management and integration	EVMS implementation requires more project controls, support for training, etc than expected	Assign experienced engineers as CAMs. Minimize the number of CAMs. New PM office.	current usage included in BAC and EAC	Dec-2011	Strykowski	Retired	L	Marginal	likely	Project Manager's estimate	150		additional 1'te for two years	\$ 500
1001d	1001	Centerstack Plasma Facing Components	Passive Plate Tiles/hardware need upgrading: Possibly ~2050 tiles	Design and fab 2D-CFC		6/22/2011	Tresemer	Retired	U	Significant	Moderate		436			436
1305d	1305		TF full bundle - poor VPI impregnation	Engineering of the fill locations and vents will be performed as part of developing the fabrication procedure.	Evaluate condition of coil - Local dry areas could be repaired, but larger failure would require separating quadrants and re-assy and VPI of bundle 1304-5400	Sep-2014	Chrzanowski	Retired	U	Marginal	Low		250	8		\$ 250



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															Retired=	\$ 6,243	
															Open=	\$ -	
2490a	2490	Relocations to Support NB2 Installation	SPRED re-design and re-installation may require more effort than estimated due to the physical constraints in the area of bay L.	Start design work immediately so potential schedule impact can be accommodated if necessary.		Apr-2014	Perry	Retired	U	Marginal	Low	managers estimate	98 to 147	0	Past experience designing and installing this diagnostic on NSTX	\$ 147	
2490b	2490	LOWEUS re-design and re-installation may require more effort than estimated due to the physical constraints in the area of bay L.	Start design work immediately so potential schedule impact can be accommodated if necessary.			Apr-2014	Perry	Retired	U	Marginal	Low	managers estimate	98 to 147	0	Past experience designing and installing this diagnostic on NSTX	\$ 147	
	7100	Generic late vendor delivery	Award contracts early	ASAP, followup vendor calls, timely receipt inspection		Apr-2014	strykowski	Retired	VU					4	\$130k/mo.	\$ 130	
7200a	7200	Centerstack Management	Additional reviews	Increase scope as required	currently underrunning. No unexpected reviews remain	Sep-2013	Dudek	Retired	U	Marginal	Low	Managers estimate	107		additional review every other year	\$ 107	
5100e	7100	project stretchout	CD-4 delayed due to non-project event (ie CRA findings, non-project scope (MPTS, Neutron calibr etc)	conduct ACC and CRA reviews well in advance of the ISTEP project scope (MPTS, Neutron calibr etc)	continue to communicate impacts to the project schedule at weekly rollover meetings.	CD-4	strykowski	Retired	L			Project managers estimate	\$200k/mo	1 to 2 weeks		\$ 100	
	6100	Additional work scope	NSTX operations does not fund work scope as listed in WBS6100 PDR	Continued diligence to assure the program office funds req'd infrastructure improvements. Additional work scope for upgrade		Sep-2014	Sichta	Retired	L	Negligible	Low	Managers estimate	100	0		\$ 100	
2300a	2300	Miscellaneous small appendage reinforcements on vessel	Upgrade may increase EM loads to small items on vessel that may need reinforcement, e.g. shutters, ECH, brackets diagnostic supports.	Design reinforcements as problem areas are identified.	Reinforcements underway for passive plates and RF feed throughs	Sep-2011	Titus	Retired	VU	Marginal	Low	project managers estimate	100			\$ 100	
1304c	1304	Copper extrusion	vendor has difficulty making full length conductors			5/1/2011	Chrzanowski	Retired	U	Marginal	Low	managers estimate	100			\$ 100	

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1305e	1305		TF full bundle fails electrical tests	Include tests (meggar, hydro and hi-pot) at several points in the fabrication process so non-conformances can be identified and corrected as they occur.	Repair electrical short 1304-5400	Sep-2014	Chrzanowski	Retired	U	Negligible	Low		75	8	Retired=	\$ 6,243
7300a	7300	NB2 Management	Additional reviews	Increase scope as required		2/2/2011	Stevenson	Retired	U	Negligible	Low	Managers estimate	75		additional review every other year	75
7700a	7700	HP Allocations	Volatility of overhead rates	ETC reflects revised cost			Strykowski	Retired	L	Negligible	Low	Project Managers estimate	65	0	3% variation	\$ 65
7700b	7700		Volatility of base estimates for the allocated cost centers	ETC reflects revised cost			Strykowski	Retired	L	Negligible	Low	Project Managers estimate	65	0	3% variation	\$ 65
1001c	1001	Centerstack Facing Components	Tiles require unforeseen machining	If schedule critical, and in-house machining will not suffice, seek external machining sources. Additional machining time added to WAF	1302-1500	Jun-2014	Tresemer	Retired	L	Negligible	Low	prior experience on NSTX	15 to 60	1 to 4	3 machinists for 1 to 4 weeks	\$ 60
1200a	1200	Centerstack Structural Supports	All interferences with existing equipment have not been identified	Field audit of interferences is included in estimate, audit included in base estimate		2/2/2011	Mangra	Retired	U			managers experience	60	0	6 weeks of engineer and designer	60
8250a	8250	Centerstack Removal and Re-installation / Pumpdown / Bakeout	Vacuum seals don't pass leakcheck	Lift centerstack out, rework seals, re-install centerstack		Feb-2015	Perry	Retired	VU	Negligible	Low	Construction Managers estimate	28 to 66	1 to 2	Same work previous done on NSTX	\$ 56
6100d	6100	Loss of key personnel	Loss of key personnel	hire replacement and assess schedule impact		Sep-2014	Sichta	Retired	VU	Significant	Low	Managers estimate	10 to 50	9		\$ 50
1306a	1306	Inner PF Coils Design and Fabrication	Poor impregnation	Engineering of the fill locations and vents will be performed as part of developing the fabrication rewinding new coil procedure.	Local dry areas can be repaired. Extensive areas of poor VPI may require rewinding new coil. 1306-5050	Jan-2014	Chrzanowski	Retired	U	Negligible	Low	managers estimate	10 to 50	0	repeat fabrication tasks	\$ 50

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1306b		1306	Inner PF Coils Design and Fabrication	Include tests (meggar, hydro and hi-pot) at several points in the fabrication process so non-conformances can be identified and corrected as they occur.	If coil cannot be repaired, a new coil will need to be wound. 1306-5050	Jan-2014	Chrzanowski	Retired	U	Negligible	Low	manager's estimate	50	0	repeat fabrication tasks	\$	50
1301a		1301	Outer TF Coil Repairs	Engineering of the fill locations and vents will be performed as part of developing the fabrication procedure.	Attempt local repair; if unsuccessful, rebuild coil 1301-0060	May-2013	Chrzanowski	Retired	U	Negligible	Low	manager's estimate	50	0	repeat existing tasks	\$	50
1301b		1301	Coil does not pass final acceptance tests	Include tests (meggar, hydro and hi-pot) at several points in the fabrication process so non-conformances can be identified and corrected as they occur.	Attempt local repair; if unsuccessful, rebuild coil 1301-0060	May-2013	Chrzanowski	Retired	U	Negligible	Low	manager's estimate	50	0	repeat existing tasks	\$	50
1303a		1303	TF Joint Test Stand and TF design concept	Perform additional work		2/1/2011	Kozub	Retired	U	Negligible	Low	manager's estimate	10 to 50		past experience	\$	50
1303b		1303	Increased number of redesigns/revtest cycles	Perform additional work		2/1/2011	Kozub	Retired	U	Negligible	Low	manager's estimate	10 to 50		past experience	\$	50
7100		7100	core competencies-to-critical staff	Cross train and develop backup staff	reduced likely hood	Mar-2015	strykowski	Retired	VU	Significant	Moderate	schedule impact of 2 weeks on critical path		2		\$	45
7710a		7710	Direct Allocations	ETC reflects revised cost			Strykowski	Retired	L	Negligible	Low	Project Manager's estimate	65	0		\$	43
7710b		7710	Volatility of base estimates for the allocated cost centers	ETC reflects revised cost			Strykowski	Retired	L	Negligible	Low	Project Manager's estimate	65	0		\$	43
8250c		8250	Umbrella lids require more than two fit-ups / reworks prior to final installation	Repeat "remove, rework, re-install"		Feb-2015	Perry	Retired	VL	Negligible	Low	Construction Manager's estimate	14 to 42	1 to 2	Same work previous done on NSTX	\$	42



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6100c	8100	Data Acquisition rate	Data acquisition takes too long	Upgrade additional data acq systems and/or networks, revise software		Sep-2014	Sichia	Retired	VU	Marginal	Low	Manager's estimate	5 to 25	0	Retired=	\$ 6,243	
2300c	2300		Diagnostic/waveguide requires more analysis to qualify	Expand analysis models beyond those used in the scoping study		2/2/2011	Titus	Retired		Negligible	Low		25		Open=	\$ -	25
1002a	1002	Passive Plate Analysis	Halo and New/other disruption loads are beyond the capacity of the present hardware	Size modifications based on calculations and implement	Reinforcements underway for passive plates and RF feed thoughts	Sep-2011	Titus	Retired	VU	Negligible	Low	Project Manager's estimate	5 to 20	0	1 to 4 weeks of designer	\$ 20	
3400a	3400	Gas Delivery system mods for Centerstack upgrade	Fueling lines do not adequately deliver gas because of occlusions or leaks	Replace gas delivery line. Minor fix if req'd	3400-0052	Sep-2014	Bianchard	Retired	VU	Negligible	Low	Project manager's estimate	10	0	Similar installation on NSTX	\$ 10	
1305h	1305		Unable to completely remove temporary spacer between OH and TF after completion of fabrication	Administrative controls during operation requiring OH and TF to be powered together	1305-8700	Mar-2014	Chrzanowski	Retired	U	Marginal	Low		0	1		\$ 3	
1302a	1302	Centerstack Assembly	Components do not arrive when required	If schedule is critical, OT or second shift would be required to regain schedule	1302-1500	Jun-2014	Chrzanowski	Retired	U	Negligible	Low		0	0		\$ -	
1307a	1307	Centerstack Casing Assembly Design and Fabrication	Components arrive late	OT required to recover schedule	1307-2030	Apr-2014	Chrzanowski	Retired	U	Negligible	Low		0	0		\$ -	
7100s	7100	Project Schedule	Opportunity to accelerate the schedule by employing 2 shift operation in the CS fab and by applying cost underruns to accelerate scope	Jim chrzanowski to consider two shift ops Strykowski to identify schedule accel tasks	none	Sep-2013	Chrzanowski/Strykowski	Retired	L	Significant		Based on schedule analysis of critical path and at least 3 months savings x standing army cost (strykowski)	-750	-3 mo.		\$ -	
1200b	1200		Engineering total man-hours >1 engineer	obtain requested resources		Sep-2011	Mangra	Retired	VL	Negligible	Low		0			\$ -	
1200c	1200		Schedule is front end loaded	obtain requested resources		Sep-2011	Mangra	Retired	VL	Negligible	Low		0			\$ -	

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8200s	8200	Construction	Opportunity to factor in efficiencies into the construction plan	Enk to do bottoms-up estimate factoring in input from violaf, rafopolous, and jos winston	none	Oct-2011	Perry/Strykowsky	retired	L	Significant		Based on at least 10% savings (strykowsky)	0		Retired= Open=	\$ 6,243 \$ -	
1305a	1305	OH Coil Design and Fabrication	No vendor bids for CHTF fabrication	Fabricate coil in-house (Suggest having bid process include both domestic and international) PPPL to fab			Chrzanowski	Retired	U								0
2440a	2440	Beamline Refurbishment	Further inspections may require additional parts and labor	Inspect all parts promptly so damaged ones can be identified early - all parts and labor now in job estimate		2/2/2011	Denault	Retired	U			project manager's estimate	50				0
2450b	2450		Heat load may be too high	Remake He lines - not a concern		2/2/2011	Denault	Retired	U			project manager's estimate	50	0			0
2440b	2440		Existing copper parts may be reusable (except for the dump)	reduce scope of job - job estimate now includes reduced scope		FY10 PDR	Denault	Retired	L			project manager's estimate	-234				0
7200b	7200		Availability of key personnel	Chrzanowski by Heizenroeder and Kalish; Mangra by Chrzanowski, Mengra, Titus Smith; Titus by Brooks and Heizenroeder - back-up persons identified for key personnel		FY10 PDR	Dudek	Retired									0
2490c	2490		MPTS Beam Dump Window re-design and re-installation may require more effort than estimated due to the physical constraints in the area of bay L	Preliminary design work started to layout MPTS and included VV modifications and interfaces - Job 4500 estimate included to provide larger Bay L port and MPTS interfaces		FY11 FDR	Jones	Retired	U			Engineering estimate	included in NSTXU cost		Past experience designing and installing this diagnostic on NSTX		0
2460a	2460	NB Armor	CFC tiles needed for thermal/structural reasons	Add requirement for redundant plasma control to eliminate need for CFC tiles - Now in job		FY10 PDR	Priniski	Retired	L								0



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2480a	2480	NB2 Duct and VV Mods	Beam too close to bellows/duct	Include molybdenum shielding in estimate - Bay K port plug provides larger free aperture than BL. Some Moly shield for bellows included in job.	FY10 PDR		Priniski	Retired	L			project managers estimate	30 to 60	0	Past experience on NSTX	\$ 6,243	\$ -
2480d	2480		Previous fabricators of rectangular bellows not available	Locate alternate vendors - RFQ with multiple vendors to access vendor and cost for PDR.	Issue requisition for bellows fabrication		Priniski	Retired	U			Project Managers estimate	10 to 100	0		0	
2480b	2480		Difficulty machining vessel	Double estimate for this portion of the job - several methods exist for cutting and job estimate was increased for least efficient process.	Vessel machining		Priniski	Retired	L			project managers estimate	10 to 70	1 to 8	Past experience on NSTX	0	
2480c	2480		J-K cap may not be able to be installed in one piece	Include removal of one TF outer leg (to facilitate access) in the baseline estimate - now in job			Priniski	Retired	U					0		0	
2470b	2470		Old 100 micron fiber cables that are proposed to be used may not be in good condition	Test a prototype with a 62.5 micron cable fused to 100 micron cable - sufficient 100 micron cable located on-site	FY11 FDR		Ramakrishnan	Retired	U			project managers estimate	50		Past experience in installing the NB1 line up for NSTX	0	
2470a	2470	NB Power System	Old RCA tubes are being used and may need a tune-up	Use the 8 additional tubes from TFR - replacements available			Ramakrishnan	Retired	U						Budgetary quotes received for fix and other cables and used in estimates	0	
6100a	6100	Central Instrumentation and Control	Volume of data from diagnostic camera systems exceed capability of network, storage, and backup systems	Install 10 Gb networks and enhance storage and backup systems	FY10 PDR		Sichia	Retired	U	Marginal	Low	Engineering estimate	30 to 200		Similar work at PPL	0	
6100b	6100		EPICS data acquisition takes too long	Include in the base job the upgrade of some data acquisition systems (CAMAC)	FY10 PDR		Sichia	Retired	VL	Marginal	Moderate	Engineering estimate	10 to 100		Similar work at PPL	0	

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2300b							2/2/2011 Titus	Retired		Negligible	Low		0		Retired=	\$ 6,243
			Diagnostic waveguide has a present weakness that hasn't been seen in operation	Reinforce											Open=	\$ -
8200a		Centerstack and Coil Structure Installation	Longer time to remove diagnostics for access	- incorporated into base plan			Viola	Retired	L							0
8200c		remove LLD and replace with existing OD tiles	Perform disruption analysis on LLD or program decision on limiting operation INCLUDE IN BASELINE				Viola	Retired	L			Manager's estimate	0			0
2450a		NB2 Services Garzotto	Availability of V. Garzotto	Desandro / Demault could do this work-replacements available				Retired								0
1001e		Centerstack Plasma Facing Components	May be able to use ATJ on CS VS instead of 2D CFC. Depends on fastening needs			6/22/2011	Tresemmer	Retired	U			Possible outcome of thermal analysis. Is unlikely.	-75			-75
7100b		FY2014 overhead rates		Continue to ensure that outyear rates are conservative		Apr-2014	Stykowski	Retired	L			Project Manager's estimate	-1000	0		\$ (1,000)
2420		Ion sources Use existing S sources		factored into baseline via ecp-004			stykowski	Retired								\$ (1,000)
7100b		FY2015 overhead rates		Continue to ensure that outyear rates are conservative		Apr-2014	Stykowski	open	L			Project Manager's estimate	tbd	0		
1001a		Centerstack Plasma Facing Components	Tiles not delivered on time	If schedule critical, install tiles in vessel.	1001-0066	Jun-2014	Tresemmer	Retired	U			prior experience on NSTX	0	0		
1001b		Centerstack Plasma Facing Components	Special diagnostics for tiles not received on time	If schedule critical, install tiles in vessel.	4100-0066	Jun-2014	Tresemmer	Retired	U			prior experience on NSTX	0	0		
CD0-a			Uncertain of ability to find a cost effective TF joint that works at higher fields	Perform extensive analysis (all operating scenarios) for new joint designs			Dudek	Retired								
CD0-b			Little room to re-enforce outer TF legs and umbrell structure to handle higher loads	Perform detailed design			Dudek	Retired								

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					Risk Occurs	Deadline to Retire Risk or Absorb Impact											Retired=\$	Open=\$
CDO-c			The vacuum vessel may need to be reinforced to accommodate higher loads				Dudek	Retired									\$ 6,243	
CDO-d			Uncertain of level of effort required to decontaminate TFTR NB				Stevenson	Retired										
CDO-e			Uncertain of the commercial availability of high voltage switch-lubes				Stevenson	Retired										
CDO-f			Uncertain of the commercial availability of cabling and terminations for the 100kV accelerator system				Stevenson	Retired										
1001d	1001	Centerstack Plasma Facing Components	Outboard Divertor tile and hardware replacement may be required for extreme operating scenarios	Should replacement be necessary, defer until later in ops by limiting machine parameters (no cost/schedule impact)		8/2/2011	Tresemmer	Retired	VU			Retired. Existing OBD tiles will be used in place of the LLD.						