| | NCSX Work Approval | Form (| WAF) | |
|--|---|--|--|------------------|
| WBS Num WBS Title: Job Numb Job Title: Job Manag | ber: 76 : Tooling Design & Fabrication er: 7601 Tooling Design & Fabrication ger: Erik Perry | | | |
| Description: | | | | |
| | This WBS element consists of the activities fabrication of tooling required to assemble includes the design and fabrication of sperequired during final assembly of the NC NCSX test cell. To the extent feasible, sassembly of the field periods in the TFTF | es associate e the NCSX ecial fixtures SX machine special toolir test cell wi | ed with the design and (device. The work scop s and tooling which will e components in the C-s ng utilized in the pre- Il be utilized. | pe be site |
| Schedule: | See Attached | | | |
| Approvals: | | | | |
| | Job Manager | | Date | |
| | Responsible Line Manager | | Date | |
| | Project Manager | - | Date | |
| | Engineering Department Head | | Date | |

NCSX June 2007 ETC TABLE I - DESIGN LABOR

| WBS Number: 76 | | | | | | | | | | | | | | | |
|--|---|---|-----------------|----------|------------------|--------------|---------------|---|--------------|--------------|--------------|------|--------------|-----|-------------------|
| WBS Title: Tooling Design | & Fabrica | ation | | | | | | | | | | | | | |
| Job Number: 7601 | | | | | | | | | | | | | | | |
| Job Title: Tooling Design 8 | Fabrica | ion | | | | | | | | | | | | | |
| Job Manager: Erik Perry | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| |) 1 | | - 1 - 1 | 1 | .) | () | 1 | 1 1 | 1 1 |) | 1 | | • • | 13 | |
| Description: | | | | l | 1 | | | 1 | | | 1 | | | | |
| Title Land II Engineering for PE Coils and | Title III Suppor | t of Fabricatio | on Effort. | i | | | | 4 | | | | L | | | |
| | | | | | | | | | | , | | | | | |
| The Fand II Engineering for FT Cons and | nue in Suppor | | | | | | | | | | | | | | |
| | | <u>FY07\$K</u> | | | | | | HOURS | | | | | | | |
| Task | SW14 SW14 | FY07\$K SW84 SW87 | 351KVL 310T | OR NL EM | OKNL USN EMEM | EMSM EMSB | EMTB EAEM | HOURS USU WBY HOURS | EASB EEEM | EESM | EETB ECEM | ECSB | RM2 | RM3 | Basis of Estimate |
| Task ID | S S S S S S S S S S S S S S S S S S S | FY07\$K SW87 | 310T | OR NL EM | OKNL USN EMEM | EMSM EMSB | EMTB EAEM | HOURS USU WEYE | EASB | EESM EESB | EETB ECEM | ECSB | RM2 | RM3 | Basis of Estimate |
| Task ID | S S S S S S S S S S S S S S S S S S S | FY07\$K SW87 375 800 800 800 800 800 800 800 800 800 80 | 351 KVL 310T | ORNL EM | | EMSM EMSB | EM TB EAEM | HOURS USU EVEN DSU EVEN EVEN | EASB EEEM | EESM | ECEM | ECSB | RM2 | RM3 | Basis of Estimate |
| Task ID None - this is an assembly operation | SW 54 | FY07\$K SW87 SW87 SW87 SW87 SW87 SW87 SW87 SW87 | 310T | ORNLEM | EMEM | EMSM | EMTB EAEM | HOURS usq WBY HOURS | EASB | EESM | ECEM | ECSB | ECIB RM2 | RM3 | Basis of Estimate |
| Task ID None - this is an assembly operation | SN S | FY07\$K SW84 | 310T | ORNLEM | EMEM | EMSB | EAEM | HOURS usq Way Ya | EASB | EESB | ECEM | ECSB | RM2 | RM3 | Basis of Estimate |
| Task ID None - this is an assembly operation | SW 54 | FY07\$K SW87 SW87 | 351KVL 310T | ORNLEM | | EMSB | EMTB | HOURS USQ WBYB | EASB | EESB | ECEM | ECSB | RM2 | RM3 | Basis of Estimate |
| Task ID None - this is an assembly operation | S S S S S S S S S S S S S S S S S S S | FY07\$K SW87 | 331KVL 310T | | | EMSM | EAEM | HOURS EYEW DSU EYEW DSU EYEW DSU | EASB | EESM | EC EM | ECSB | EC ID RM2 | RM3 | Basis of Estimate |

NCSX June 2007 ETC TABLE II - Materials and Subcontracts

| WBS Number: 76 | | | | |
|---|---------|---------------|-----|----------------|
| WBS Title: Tooling Design & Fabrication | | | | |
| Job Number: 7601 | | | | |
| Job Title: Tooling Design & Fabrication | | | | |
| Job Manager: Erik Perry | | | | |
| | Weldmen | ts & Assy H/w | | |
| | 1 | | | |
| Materials and Subcontracts (M&S) | | | Bas | is of Estimate |
| | | | Buo | |
| Description: | | | Duc | |
| Description: | | | | |
| Description: None - this is an assembly operation | | | | |
| Description: | | | | |

NCSX June 2007 ETC TABLE III - Fabrication/Assembly Installation

| M/DC Number 70 | | | | | | | | | | | |
|--------------------------------------|-----------|---------|------|-----------|-------|------|------|-------------|-----------|-------------|---|
| WBS Number: 70 | | | | | | | | | | | |
| WBS Title: Tooling Design & Fab | orication | 1 | | | | | | | | | |
| Job Number: 7601 | | | | | | | | | | | |
| Job Title: Tooling Design & Fabr | ication | | | | | | | | | | |
| Job Manager: Erik Perry | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| In-house Fabrication and Assembly a | and Insta | llation | | | | | | | | | |
| | | | | | | | | | | | |
| Job 7601 - Tooling Design & Fabricat | tion | | | | | | | | | | Basis of Estimate |
| | | K\$ | | 1 | Hours | | | Duration in | Persons | Assumptions | Estimates are based on similar assembly, installation |
| | | | | | | | | Shifts | per Shift | | for TFTR and NSTX |
| Description of Task | ACT | M&S | EAEM | Metrology | EMEM | EMSM | EMTB | | | | |
| Lab Fab/Assy/Installation | 713.020 | | | | 80 | 42 | 140 | | | | |
| Tooling,assy fixtures,misc equipt | 713.030 | \$60K | | | | | | | | | |
| General procurements | 713.040 | \$45K | | | | | | | | | |
| Welding tools, materials & equipt | 713.050 | \$80K | | | | | | | | | |
| Torque wrenches and multipliers | | \$80K | | | 40 | | | | | | |
| | | | | | | | | | | | |
| Subtotal Job 7301 | | \$265K | 0 | 0 | 120 | 42 | 140 | | | | |

NCSX June 2007 ETC TABLE IV - Uncertainty of Estimate and Residual Risk Assessment

| WBS Number: 76 | | | | | | | | | | | | |
|--|--|--|---|---|--|------------------|------------------------|------------------------|---------------|---------------|-----------------|----------------|
| WBS Title: Toolin | g Design & Fabricatio | on | | | | | | | | | | |
| Job Number: 760 [,] | 1 | | | | | | | | | | | |
| Job Title: Tooling | Design & Fabricatio | n | | | | | | | | | | |
| Job Manager: Eri | k Perry | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | 1 | | | |
| Uncertainty of the Estin | nate | | | | | | | | | | | |
| | | | | <u>Uncertainty</u> | | | | | | | | |
| | <u>High</u> | <u>Medium</u> | Low | <u>Range (%)</u> | | | | Comments/O | ther Consid | derations | | |
| Design Maturity | | | X | 450/1-050/ | Have exte | nsive experien | ce building | g and using special to | ooling for f | abrication | and decon | nmissionir |
| Design Complexity | | | Y | -15%/+25% | Nothing e | votic anticipate | d | | | | | |
| Design complexity | | | ~ | | Nothing e | | u. | | | | | |
| Note: High/Medium/Low une | certainty assessment from Job Ma | anager. Un | certainty ran | ge based on A | ACEI recon | nmended pract | ice 18R-97 | as amended for NCS | SX. | | | |
| | | | | Ĭ | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| Residual Impacts | | | | | | | | | | | - | |
| Residual Impacts | | | | | | | | | Cost I | mpact | Schedule | Impact |
| | Risk Description | | | Likelihood of | Mitia | ation Plan | Ba | sis of estimate | Cost I | mpact High | Schedule | Impact High |
| Job | Risk Description | | | Likelihood of Occurring | Mitiga | ation Plan | Bas | sis of estimate | Cost I Low | mpact High | Schedule Low | Impact High |
| | Risk Description | | | Likelihood of Occurring | Mitiga | ation Plan | Ba | sis of estimate | Cost I Low | mpact High | Schedule Low | Impact High |
| | Risk Description | | | Likelihood of Occurring | Mitig | ation Plan | Ba | sis of estimate | Cost I Low | mpact High | Schedule Low | Impact High |
| | Risk Description | | | Likelihood of Occurring | Mitig | ation Plan | Bas | sis of estimate | Cost I Low | mpact High | Schedule Low | Impact High |
| | Risk Description | | | Likelihood of Occurring | Mitig | ation Plan | Ba | sis of estimate | Cost I Low | mpact High | Schedule Low | Impact High |
| Kesiduai Impacts Job NONE Notes: | Risk Description | | | Likelihood of Occurring | Mitig | ation Plan | Ba | sis of estimate | Cost I Low | mpact High | Schedule Low | Impact High |
| Kesidual Impacts Job NONE Notes: [1] Low cost and schedu | Risk Description | nimum (0-p | percentile) in | Likelihood of Occurring | Mitig: | ation Plan | Ba | sis of estimate | Cost I Low | mpact High | Schedule Low | Impact High |
| NONE Notes: [1] Low cost and schedu High cost and schedu [2] | Risk Description Risk D | nimum (0-p | percentile) in 00-percentile | Likelihood of Occurring | Mitig: he event or ld the even | ation Plan | Ba | sis of estimate | Cost I Low | mpact High | Schedule Low | Impact High |
| Kesidual Impacts Job NONE Impacts Notes: [1] Low cost and schedu High cost and schedu [2] Cost impacts should Cost impacts should | Risk Description Risk Description lle impacts are considered the mi lle impacts are considered the mi be entered as man-hours (by den NOT include standing army cost | nimum (0-p aximum (10 aximum (10 | percentile) in 00-percentile and M&S dir 2 separately of | Likelihood of Occurring | Mitig: he event or ld the even basis of es | ation Plan | Ba | sis of estimate | Cost I Low | mpact High | Schedule Low | Impact High |
| Residual Impacts Job NONE Impacts Notes: [1] Low cost and schedu High cost and schedu Cost impacts should Cost impacts should Project control is rep | Risk Description Risk Description le impacts are considered the mi ule impacts are considered the mi be entered as man-hours (by den NOT include standing army costs onsible for guantifying the low ar | nimum (0-p aximum (11 nographic) s which are d high cos | percentile) in 00-percentile and M&S dir separately o t impacts ba | Likelihood of Occurring pacts should t impacts should t impacts shou ect cost under calculated from ised on the labo | Mitig: he event oo Id the even basis of es the sched or hours an | ation Plan | Ba | sis of estimate | Cost I Low | mpact High | Schedule | Impact High |
| Residual Impacts Job NONE Impacts Notes: [1] Low cost and schedu High cost and schedu [2] Cost impacts should Project control is rep [3] The schedule impact | Risk Description Risk Description le impacts are considered the mi le impacts are considered the mi be entered as man-hours (by den NOT include standing army costs onsible for quantifying the low ar s should be entered as the min ar | nimum (0-p aximum (11 nographic) s which are id high cos ind max imp | percentile) in 00-percentile and M&S dir separately o t impacts ba acts on the o | Likelihood of Occurring pacts should ti) impacts shoul ect cost under calculated from ised on the labo critical path. | Mitig he event oo Id the even basis of es the sched or hours an | ation Plan | Bas | sis of estimate | Cost I Low | High | Schedule | Impact High |
| Kesidual Impacts Job NONE Impacts Notes: [1] Low cost and schedu High cost and schedu [2] Cost impacts should Cost impacts should Project control is rep [3] The schedule impact If there is no critical | Risk Description Risk Description le impacts are considered the mi ule impacts are considered the mi be entered as man-hours (by den NOT include standing army costs onsible for quantifying the low ar s should be entered as the min ar oath impact then the schedule entered | nimum (0-p aximum (11 nographic) s which are ad high cos ad max imp tries should | percentile) in 00-percentile and M&S dir separately o st impacts ba pacts on the d be zero. | Likelihood of Occurring pacts should ti) impacts shoul ect cost under calculated from used on the labo critical path. | Mitig he event oo Id the even basis of es the sched or hours an | ation Plan | Bas | sis of estimate | Cost I Low | High | Schedule | Impact High |
| Kesidual Impacts Job NONE Impacts NONE Impacts Impacts | Risk Description Risk D | nimum (0-p aximum (10 nographic) s which are ad high cos ad max imp ries should t with our r | percentile) im D0-percentile and M&S dir e separately o at impacts ba pacts on the o d be zero. risk classifica | Likelihood of Occurring pacts should t) impacts should ect cost under calculated from used on the labo critical path. | Mitig he event or Id the even basis of es the sched or hours an ogy, i.e. | ation Plan | Bas | sis of estimate | Cost I | High | Schedule Low | Impact High |
| Kesidual Impacts Job NONE Impacts NONE Impacts Impacts | Risk Description Risk Description le impacts are considered the mi ule impacts are considered the mi be entered as man-hours (by den NOT include standing army costs onsible for quantifying the low ar s should be entered as the min ar path impact then the schedule entered ence should be entered consisten 10%), L=Likely (80%>P>40%), U=U | nimum (0-p aximum (10 nographic) s which are ad high cos ad max imp ries should t with our r nlikley (40 | bercentile) im D0-percentile and M&S dir e separately o t impacts ba bacts on the o d be zero. isk classifica %>P>10%), \ | Likelihood of Occurring pacts should t) impacts should rect cost under calculated from used on the labo critical path. ation methodolo /U=Very Unlike | Mitig: he event or Id the even basis of es the schedr or hours an ogy, i.e. by (P<10%), | ation Plan | Bas ed ble (P<1% | sis of estimate | Cost I | High | Schedule Low | Impact High |
| Kesidual Impacts Job NONE Ill Low cost and schedu High cost and schedu [2] Cost impacts should Cost impacts should Project control is rep [3] The schedule impact If there is no critical µ [4] Likelihood of occurre VL= Very Likely (P>8 | Risk Description Risk Description le impacts are considered the mi ule impacts are considered the mi be entered as man-hours (by den NOT include standing army costs onsible for quantifying the low ar s should be entered as the min ar path impact then the schedule entered ence should be entered consisten 10%), L=Likely (80%>P>40%), U=U | nimum (0-p aximum (10 nographic) s which are nd high cos nd max imp ries should t with our r nlikley (40 | Dercentile) im D0-percentile and M&S dir e separately o timpacts ba bacts on the o d be zero. isk classifica %>P>10%), \ | Likelihood of Occurring pacts should ti impacts should ti impacts should rect cost under calculated from used on the labo critical path. ation methodole /U=Very Unlike | Mitig: he event or ld the even basis of es the schedu or hours an ogy, i.e. ly (P<10%); | ation Plan | Bas ed ble (P<1% | sis of estimate | Cost I | High | Schedule | Impact High |

| | Activity | MILE- | Activity | Duration | Baseline | Baseline | Shifts | Total | % | Proposed | | | | | | | | | | | | | | | | |
|----|---------------------------|------------------|-----------------------------------|----------|----------|----------|--------|-------|-------|------------|-----|---|----|----|---|-----|----------|-----|-----|-----|----------------|------------------|--------------|-------|-------|---------|
| | ID | stones | Description | (work | Start | Finish | | Float | cmplt | Budgeted | FY0 | 7 | FY | 08 | F | Y09 | | | FY1 | 0 | | FY1 [·] | 1 | | FY12 | 2 |
| | | (level 2 & 3) | | uays | | | | | | | | | | | | | | | | | | | | | | \prod |
| 7 | <mark>76 - Tooli</mark> i | ng De | esign & Fabrication | | | | | | | | | | | | | | | | | | | | | | | |
| ٦. | lob: 7601 - T | ooling | Design & Fabrication-PERRY | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | 1 | 1 | | | | | | | | | | | | | | | | | | | | |
| | 713.020 | | Lab Fab/Assy/Installation | 348 | 26JAN09* | 15JUN10 | | 154 | | 31,010.80 | | | | | | | == | -iu | | | Л//ЕМ Л//ТЕ | / =80h 3 =140 | nr;El hr; | M//SI | M =4 | 2hr |
| | 713.030 | | Tooling,assy fixtures,misc equipt | 348 | 26JAN09* | 15JUN10 | | 154 | | 84,863.97 | | | | | | | == | | | 41: | =603 | Sk; | | | | |
| | 713.040 | | General procurements | 348 | 26JAN09* | 15JUN10 | | 154 | | 63,647.97 | | | | | | | E | | | 41: | =45\$ | Sk; | | | | |
| | 713.050 | | Welding tools, materials & equipt | 348 | 26JAN09* | 15JUN10 | | 154 | | 113,151.95 | | | | | | | == | | | 41: | =803 | šk; | | | | |
| | 713.060 | | Torque wrenches and multipliers | 348 | 26JAN09* | 15JUN10 | | 154 | | 119,883.90 | | | | | | | = | | | 41: | =803 | Sk;EN | ///EN | 1 =40 |)hr ; | |
| ę | Subtotal | | | 348 | 26JAN09 | 15JUN10 | | 154 | | 412,558.59 | | | | | | | | | | | | | | | | |

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|-----------|-------------------|---------------------------------------|--|----------------|--|
| Run Date | 18JUL07 07:31 | ETCZ | Z NCSX Project Resource Loaded Schedule | Sheet 85 of 99 | |
| © Primave | era Systems, Inc. | | EAC | | |