

# NATIONAL COMPACT STELLARATOR PROJECT

## Engineering Change Proposal (ECP)

### COVER PAGE

*(TO BE COMPLETED BY SYSTEMS ENGINEERING SUPPORT MANAGER)*

|                         |                                                                                           |
|-------------------------|-------------------------------------------------------------------------------------------|
| Originator: Bob Simmons | Date: June 22, 2004                                                                       |
| ECP No: 04-008          | ECP Title: Update of Technical Baseline to Reflect VVSA and MCWF FDR Design Configuration |

### Required Reviewers

Required Reviewers for this ECP:  
Stellarator and Ancillary Systems Project Engineers, NCSX Project Control Manager, NCSX Engineering Manager

### ECP Approval Level

Expedited ECP? ☐ Yes ☒ No

Change Level: 2 Federal Project Director

Approving Official: 2 Federal Project Director

### Actions

- (1) Update technical, cost, and schedule baselines
- (2) Update WAFs to reflect the new detailed costs and schedules
- (3) Report status against these revised baselines, starting with the July statusing
- (4) Update DOE PARS as necessary to reflect this information

### APPROVALS

*(TO BE COMPLETED BY APPROVING OFFICIALS)*

| Change Level          | Approving Official            | Approval?                                                           | Signature |
|-----------------------|-------------------------------|---------------------------------------------------------------------|-----------|
| 3                     | NCSX Project Manager          | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No |           |
| 3a<br>(Expedited ECP) | NCSX Engineering Manager      | <input type="checkbox"/> Yes <input type="checkbox"/> No            |           |
| 2                     | NCSX Federal Project Director | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No |           |
| 1                     | Associate Director OFES       | <input type="checkbox"/> Yes <input type="checkbox"/> No            |           |
| 0                     | Under Secretary of Energy     | <input type="checkbox"/> Yes <input type="checkbox"/> No            |           |

# NATIONAL COMPACT STELLARATOR PROJECT

## Engineering Change Proposal (ECP)

### PART I (TO BE COMPLETED BY ORIGINATOR)

Originator: Bob Simmons

Date: June 21, 2004

#### Overview of Change

Type of ECP: ☐ EXPEDITED ☒ STANDARD

Type of Change: ☒ TECHNICAL ☒ COST ☒ SCHEDULE ☐ EDITORIAL

(Check all that Apply)

#### Reason for Change:

- (1) Revised design configurations for the VVSA and MCWF were presented at the VVSA and MCWF FDR held May 19-20, 2004. This ECP updates the performance baselines to reflect the FDR configuration. The activities added represent entirely new scope.
- (2) An additional MCWF prototype will be initiated to provide for early identification of technical issues and to increase schedule contingency by 1 month.

#### Impacted WBS Elements:

WBS 12 (Vacuum Vessel), WBS 14 (Modular Coils), and WBS 18 (Field Period Assembly).

#### Impacts of Change (Briefly Describe):

The major scope change in the VVSA design configuration was the net addition of 27 new ports. These ports were added to meet the requirements for heating and diagnostic access. Flanges and outer (stainless steel) port extensions were added to the port extensions outside the modular coil shell. This feature provides flexibility to change the geometry of the outer port extensions to accommodate evolving diagnostic needs during operation.

The initiation of an additional MCWF prototype was added to the MCWF scope. The additional prototype is fully representative of the production article and would allow early identification of any technical issues by the suppliers. It would also increase the schedule contingency along the critical path by 1 month.

**As a result of the above changes, it is proposed to draw down contingency by \$542K from \$14,722K to \$14,180K.**

#### Assessment of Other Options:

Studies were conducted that considered adding fewer than 27 ports and adding more ports (up to 45). Due to port structural considerations, the higher number was rejected. The final selection of 27 new ports provided adequate access for heating and diagnostics.

Not initiating the additional MCWF prototype would decrease the schedule contingency by 1 month relative to what could be achieved by initiating the additional prototype.

# NATIONAL COMPACT STELLARATOR PROJECT

## Engineering Change Proposal (ECP)

### **PART I** **(TO BE COMPLETED BY ORIGINATOR)**

**Originator:** Bob Simmons

**Date:** June 21, 2004

#### **Detailed Description of the Change:**

#### **List Attachments, Impacted Documents, etc.**

- Attachment 1 – Detailed Breakdown of Cost Impacts
- Attachment 2 – Updated ECP-04-008 Bar Charts

#### **Description of Change:**

The following items provide details of the components making up this ECP:

- ❖ WBS 121 (Vacuum Vessel Assembly)
  - Technical Impacts: This ECP will result in creating an additional 27 port extensions as part of the VVSA. Outer port extensions, attached at flanges located outside the modular coil shell, have been added to provide flexibility during operations to accommodate evolving diagnostic needs. The outer port extensions are constructed from stainless steel.
  - Cost impacts:
    - Addition of 27 new ports (+\$240K)
      - Port 3 – 3 additional ports (4 inch o.d.) - \$10K cost increase for each additional port (+\$30K)
      - Port 9 – 6 additional ports (6 inch o.d.) - \$10K cost increase for each additional port (+\$60K)
      - Port 10 – 6 smaller, round ports (10 inch o.d.) - \$5K cost reduction for each modified port (-\$30K)
      - Port 15 – 6 additional ports (4 inch o.d.) - \$10K cost increase for each additional port (+\$60K)
      - Port 17 – 6 additional ports (4. inch o.d.) - \$10K cost increase for each additional port (+\$60K)
      - Port 18 – 6 additional ports (4 inch o.d.) - \$10K cost increase for each additional port (+\$60K)
    - Addition of outer port extensions on those ports not already extending through the cryostat (+\$150K)
  - Schedule Impact: None.
- ❖ WBS 141 – Modular Coil Winding Form
  - Technical Impact: The MCWF manufacturing developing and prototype fabrication effort was revised to include the padding, flow solidification analysis, pattern making, and casting of an additional prototype reflecting the final design configuration. The technical impact of the change is that it provides early identification of any casting-related problems with the final design configuration, reducing associated risks during the production phase.
  - Cost Impact: The only cost impact will be the incremental cost of having a second supplier work on a MCWF prototype through the point of making a pattern for casting. (+ \$75K).
  - Schedule Impact: The prototype casting should be useable as a production article. Initiating this work during the manufacturing development and prototype fabrication phase accelerates delivery of the first casting by 1 month. Since this is a critical path activity, the project schedule contingency would be increased by the same amount.

# **NATIONAL COMPACT STELLARATOR PROJECT**

## **Engineering Change Proposal (ECP)**

### ***PART I***

#### ***(TO BE COMPLETED BY ORIGINATOR)***

**Originator: Bob Simmons**

**Date: June 21, 2004**

#### **Detailed Description of the Change:**

- ❖ WBS 18 (Field Period Assembly)
  - Technical Impact: The addition of the 27 new ports will necessitate a greater than planned effort to weld on those ports. .
  - Cost Impacts: Additional welding of new ports – (+\$75K)
  - Schedule Impact: None