# Conceptual Design Review Results for the BES Shutter Upgrade

### CDR summary: NSTXU_1-4-1-7-1_CDRs_100

### REVISION 0

### October 15, 2019

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|---|---|---|
| **PREPARED BY:** | **Kathleen Lukazik** | 9/23/2019 2:58:10 PM |
| | Kathleen Lukazik, | |
| **REVIEWED BY:** | **Michael Kalish** | 9/23/2019 3:52:09 PM |
| | Michael Kalish, | |
| **REVIEWED BY:** | **Brentley C. Stratton** | 9/23/2019 4:10:49 PM |
| | Brentley C. Stratton, | |
| **REVIEWED BY:** | **Robert A. Ellis** | 10/15/2019 8:25:22 AM |
| | Robert A. Ellis, | |
| **APPROVED BY:** | **Yuhu Zhai** | 10/15/2019 8:31:15 AM |
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**DESIGN REVIEW DOCUMENTATION – RESULTS – No: NSTXU_1-4-1-7-1_CDRS_100**

**Title: BES Shutter Upgrade CDDR** **CAT: ☒A1 ☐A2 ☐A3**

**Type of Review: ☐ Peer ☒ CDR ☐ PDR ☐ FDR**

**Cognizant Individual: Robert Ellis / (Austin Cao presenting) Date of Review: 9/19/2019**

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**Review Board Members:**

**M. Kalish (sub for V. Riccardo) DRC**
**V. Riccardo Alt. Chief Engineer**
**W. Blanchard TA, Vacuum**
**D. Loesser TA, Mechanical**
**B. Stratton RE, Diagnostics**
**P. Dugan System Engineering**
**A. Khodak TA, Analysis**
**R. Ellis COG or SME**
**Y. Zhai NSTX-U Project Engineer**
**N. Gerrish ES&H**
**A. Castaneda QA**
**Scott Gifford SME Assembly**

**Other Attendees**

**Stefan Gerhardt**
**John Mitchell**
**Les Hill**
**Tim Stevenson**
**B. Blanchard**
**Moji Safabakhsh**
**John Galayda**
**Bill Gattoni**
**Mark Cropper**

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| **Items Reviewed:** | **Sat.** | **Unsat.** | **Comments or n/a if not applicable** |
|---|---|---|---|
| Appropriate requirements identified | ☒ | ☐ | |
| Development plans and schedules | ☒ | ☐ | |
| Reg. compliance incl. USI/USID and NEPA | ☒ | ☐ | |
| Disposition of CHITS from previous reviews | ☐ | ☐ | N/A |
| Cost objectives | ☒ | ☐ | |
| Other review objectives addressed | ☒ | ☐ | |

**SUMMARY OF RESULTS:**

.The review covered all of the elements required by the design review plan. An updated design was presented along with supporting calculations that showed the shutter can meet the EM loading requirements. Also methods were presented to reduce the probability of switching low pressure and high pressure lines

- Implemented a strongback to reduce stress in the boron nitride shutter covers at low cost.
- Implement different thread sizes on shutter actuator inlet and outlets to ensure proper installation of air lines.
- Implement an installation procedure that includes stopwatch timing and adjustment of shutter closing speed before vessel pump down.
- Replace the existing Belleville washer stack with an updated design that uses wave springs for more accurate preload.
- CAD models are ready for drafting.
- Calculation document ready for review

Five chits were generated. Much of the discussion revolved around the original cause of the Shutter failure which was presented as a mis-wiring which caused high pressure air to go to the low pressure side and close the shutter with too much force. Outside the scope of the review the discussion included what the implications are to other systems. It was stated that this is the only shutter that is this sensitive to the reversal of the pressure lines.

The review committee deemed the design review successful pending resolution of the chits.

**Disposition:** [check one]
_____ **Acceptable**
__X__ **Acceptable pending resolution of concerns**- CHITS identified above must be resolved prior to installation.
_____ **Incomplete -** Additional design work is required prior to another design review.
_____ **Unsuccessful** – Corrective actions must be taken and another review process must be initiated.

**Design Review Chair Person** Mike Kalish Digitally signed by Mike Kalish Date: 2019.09.20 16:33:51 -04'00' Date: _____

**Cognizant Individual Acceptance** _____ Date: _____

**Distribution**: Review Board Members, Operations Center, Responsible Engineer (RE), Cognizant Individuals, Project Manager, Project Director, relevant Technical Authorities (TAs), Chief Engineer (CE), Fire Protection Engineer, Attendees, QA, ES&H, Security, Requesting & Performing Dept. Head

Revised 8/10/18