

Proposed Industry Response to BSEE Bolting Safety Alert 318

API Bolting Workgroup - BSEE Meeting #2

**Wednesday
June 22, 2016**

Attendees - Introductions

- BP Trent Fleece
- Shell Jose Meraz
- Anadarko Ken Armagost
- Chevron Frank Gallander

- TOI Rob Turlak
- Diamond Jon Shoemaker
- Pacific Peter Bennett
- Maersk Martin Carnie

- NOV Chris Johnson
- Cameron Frederic Oleron
- GE Louise Goetz,
Eric Larson

- API Holly Hopkins
- API David Miller

June 22, 2016 Meeting Agenda

- I. Call to Order, Housekeeping and Safety Items, Anti-Trust Guidelines
- II. New/Ongoing Issues
 1. Update from API Standards Work & QAQC Work
 2. Follow up from March 31st meeting
 - a) General discussion from BSEE on the proposed Industry action plan provided
 - b) Address BSEE questions from March 31st meeting
 - i. BSEE would like to know the population impacted of > 35 HRC
 - ii. BSEE would like to know the timeline for the replacement of this bolting
 - iii. BSEE asked what could be done to check the integrity of this bolting before their replacement
 - c) Any other items/actions
 3. GE BSR bolting failure
 - a) Discussion on differences between the GE BSR bolt failure and previous bolt failures
 - b) Update on GE BSR RCA

4. BSEE Update

- a) National Academy Task
- b) Bolting Workshop – who/when/where/agenda
- c) Documentation of known bolt failures

5. Research

- a) Industry to date/planned
- b) BSEE to date/planned

III. Any Other Business

IV. Review Action Items

V. Plans for Next Meeting

VI. Adjourn

Standards - API Multi-Segment Bolting Task Group

Initial driver for Formation of the TG

- QC-FIT Evaluation of Connector and Bolt Failures
Summary of Findings – BSEE 2014-01 Report

Charge of TG

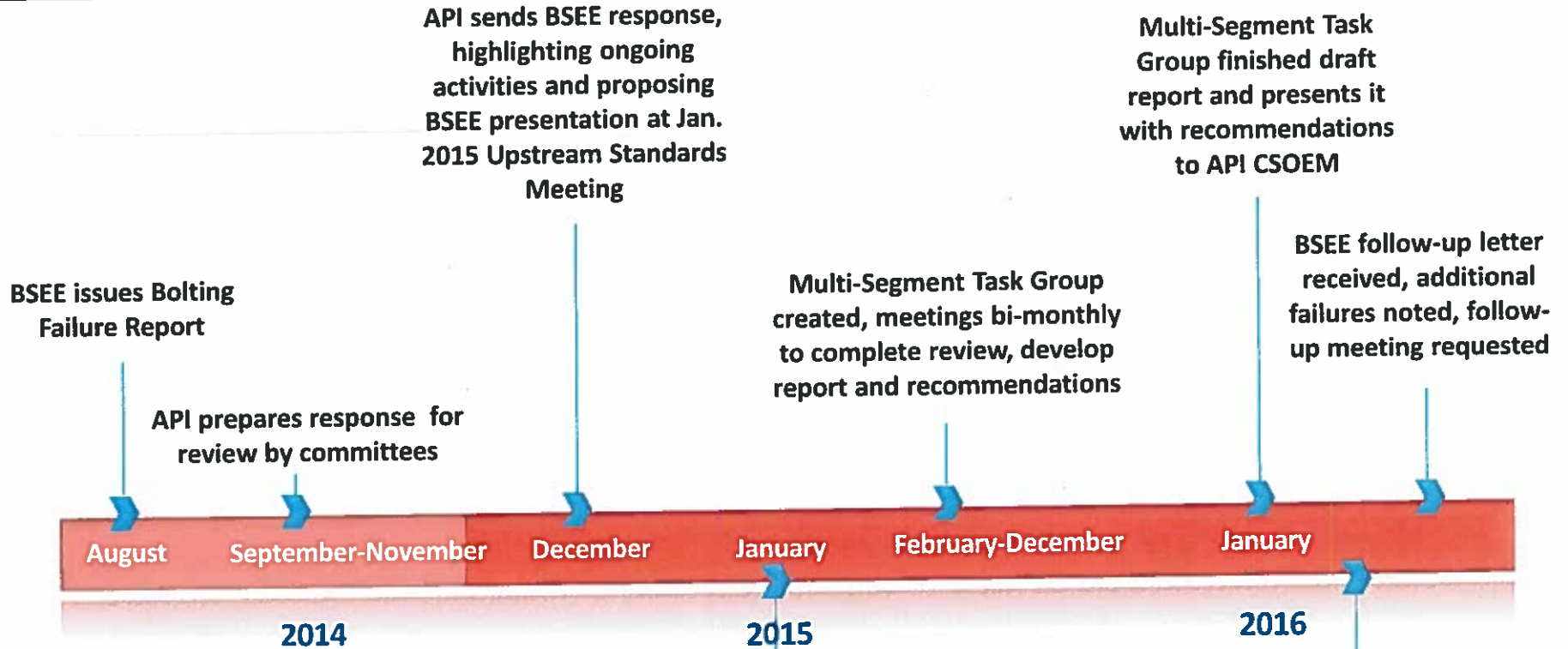
- Evaluate types of bolting failures likely to occur in the upstream oil and gas industry and report findings and recommendations to CSOEM
- Determine contributing factors, identifying current mitigations and recommend changes to industry standards

Approach of the Task Group

- Identify failure mechanisms that effect bolting in the oil and gas industry
- Identify contributing factors and associated processes around those failure mechanisms
- Identify existing mitigations across the industry including both API and other industry controls
- Make recommendations where current mitigations are deemed to be inadequate



Bolts Timeline – future activities shown in red



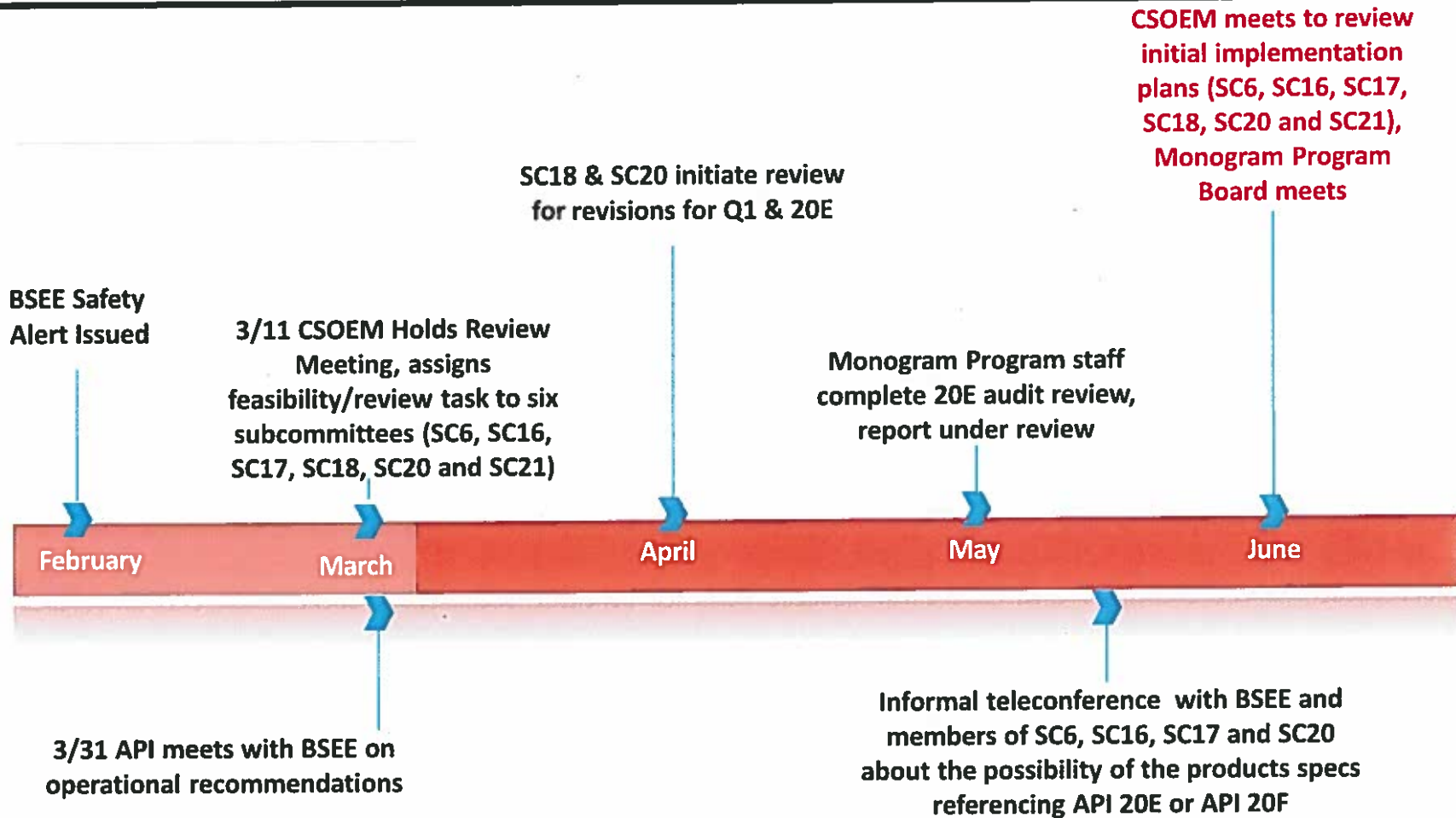
Comments:

- Initial report – August 2014
- Multi-Segment Task Group includes 24 subject matter experts from oil companies, manufacturers, class societies, service & supply companies and drilling contractors

BSEE presents report, API Agrees to form Multi-Segment Task Group to review report and make recommendations

CSOEM reviews report and recommendations, requests final comments to Task Group Chair by Feb. 18 with final report and comments by Feb 29. Initial implementation plan required by June

Bolts Timeline – 2016 and Recommendation Status – future activities shown in red



- Comments:**
- 20E, 2nd edition ballot issued May 31.
 - **Q1 revisions ballot by September**

20E Monogram Study - Background and Process

- First Spec 20E *Alloy and Carbon Steel Bolting for Use in the Petroleum and Natural Gas Industries* audit in October 2013, first license in November 2013
- Review Monogram/APIQR program audit reports related to
 - Identify possible trends in non-conformities related to raw materials provided to API Spec 20E licensees by their suppliers
 - Where possible, differentiate between technical (API Spec 20E) and quality management process (API Spec Q1) issues
 - Recommend possible improvements in API Spec 20E, API Spec Q1, and other API standards to address BSEE concerns about quality control over materials and processes provided by suppliers
 - Identify ways to improve auditing of licensees and their suppliers

Findings – Frequency of API Spec 20E NCs by Section and Requirements

- Record Retention Requirements
- Qualification of Procurement Sources
- Marking Process Requirements
- Technical nature of the API Spec 20E non-conformities cited show auditors
 - Used API product questionnaire
 - Verified Spec 20E requirements

Findings – Percentage of Total NCs Documented Against API Spec Q1

- **Purchasing Requirements and Qualification of Suppliers**
- **QMS Monitoring and Calibration of Measuring Processes**
- **API Spec Q1 satisfied 20E requirements in control of**
 - Production process
 - Documents and records
 - Monitoring and measuring devices

March 31, 2016 Proposed Action Plan

Summary of Proposed Actions to be Taken by Industry:

- a) Defined “critical bolting” as bolting that the failure of which could result in loss of containment of wellbore fluids to the environment
- b) Voluntary industry adoption of API 20 E/F for critical BOP bolting
- c) Voluntary industry upgrade of critical bolting with hardness > 35 HRC
- d) Enhanced QAQC of 3rd party manufactured bolting (i.e., sampling, 20 E/F requirements)
- e) Updated make-up procedures, with additional engineering rigor and oversight
- f) Elimination of electroplated Zinc coatings
- g) Enhanced failure reporting with wider distribution
- h) Consistent with the direction of API standards work

March 31, 2016 BSEE Question Follow-Up

1. Question - Population of critical bolting > 35 HRC critical bolting
 - a) Based on analysis, <5% of critical BOP bolting > 35 HRC
 - i. GE PNI on upgrade to wellhead and LMRP connector bolting (spec 34-38 HRC, replacement \leq 34 HRC) (PNI included in backup)
 - ii. NOV PIB on replacement of all > 35 HRC bolting (PIB in backup)
 - iii. Cameron – no specified critical bolting > 35 HRC
2. Question - BSEE would like to know the timeline for the replacement of this bolting
 - a) As proposed during March 31st meeting, conducting replacement of >35 HRC through 2016/2017
3. Question - BSEE asked what could be done to check the integrity of this bolting before their replacement.
 - a) Pressure testing per API53 verifies the integrity of the bolted connections
 - b) Many Rig Contractors perform spot checks on bolts to verify torque values during between well maintenance (BWM)

Bolting Failure Classification

Bolting Failure Category 1 – brittle failure

- a) Typically associated with EAC (Environmentally assisted cracking, of which Hydrogen Embrittlement (HE) is included)
- b) Can be due to material out of specification
- c) The focus of the multi-segment task group, QC-Fit reports, and the historical critical bolting failures

Bolting Failure Category 2 –Overload of material beyond rated yield strength

- a) Typically ductile overload of the material
- b) Can be a bolting design issue
- c) Can be influenced by something not accounted for in design
- d) The recent GE BSR bolting failures may fall within this category

Improper make-up can contribute to failure of either of the first 2 categories

- a) *3 OEMs working on (or have published) updated make-up guidance as proposed in the March 31, 2016 meeting*
- b) *Additional rig contractor oversight on critical connections*