Collision Avoidance Sub-Group
Fort Worth – 2nd March

2016 Progress Report

SPE International

Wellbore Positioning Technical Section

ISCWSA

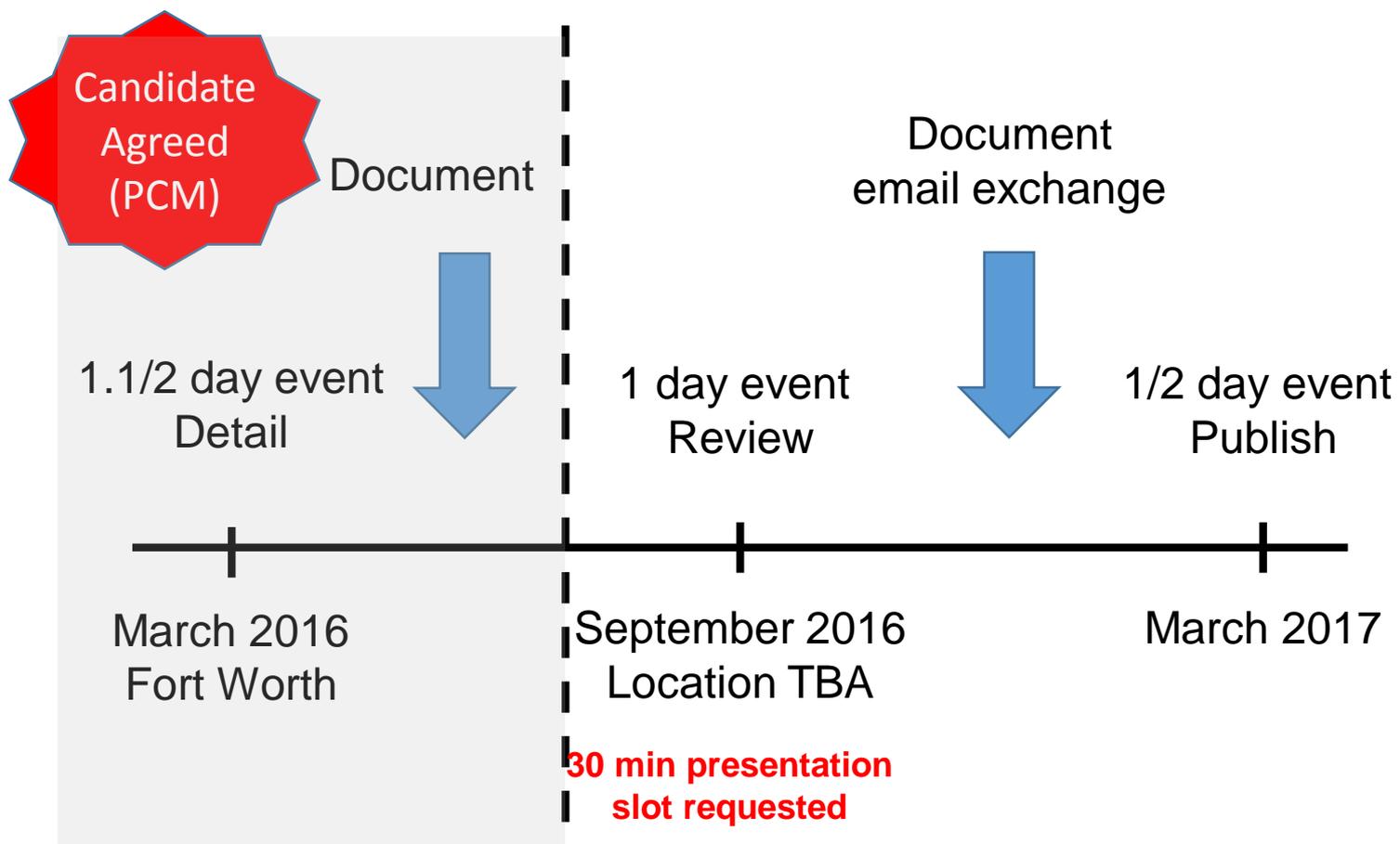The Industry Steering Committee on Wellbore Survey Accuracy (ISCWSA)

Meeting Objective

To articulate the complete collision rule, with parameters and caveats together with written notes in sufficient detail to enable an individual / subgroup to elaborate and document the conclusions.
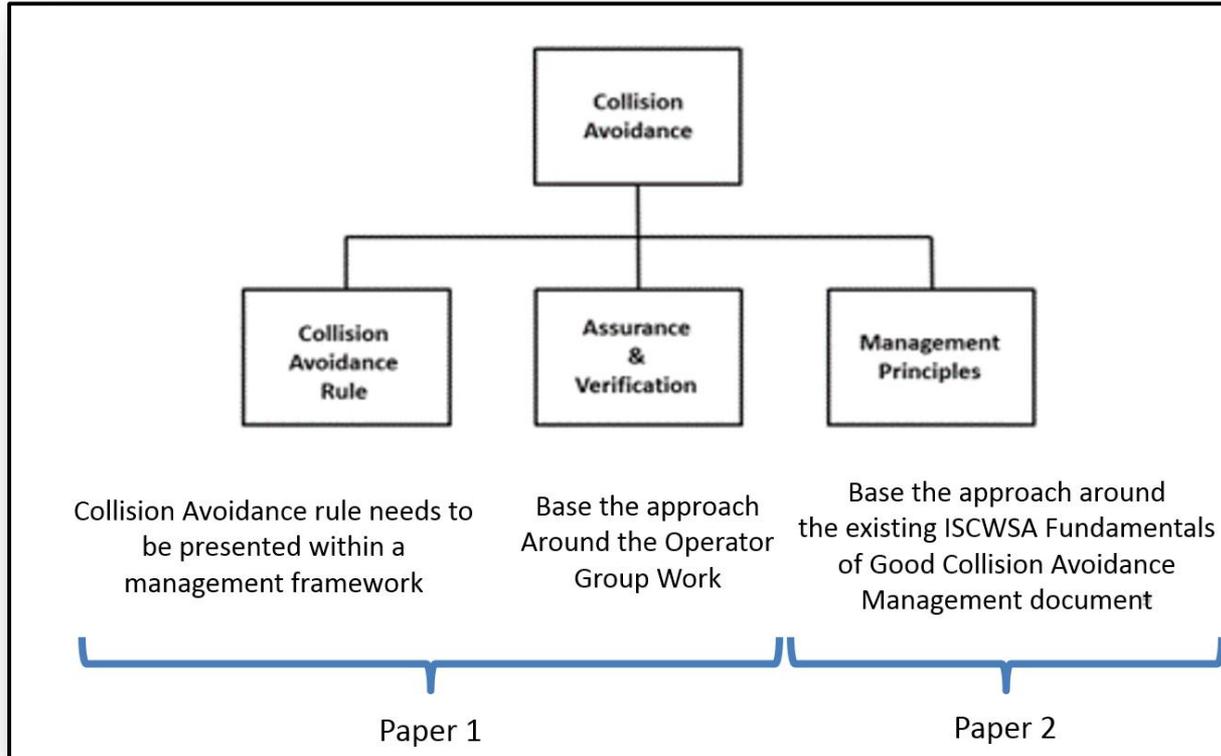
Clarity, Conciseness, Communication

Documentation

43rd General Meeting
March 4th, 2016
Fort Worth, Texas

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Timeline

Candidate Agreed (PCM)

Document

Document email exchange

1.1/2 day event
Detail

1 day event
Review

1/2 day event
Publish

March 2016
Fort Worth

September 2016
Location TBA

March 2017

30 min presentation slot requested

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Work Structure

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Questions

1. What probability distribution should be adopted?

2. Not just a go / no go, but also need a numerical value which quantifies the risk. These will be governed by the choice of constants e.g. Confirmation of the number of SDs.

3. Define the limitations of standards and algorithms.

4. Need to define a point of interest on the offset well based on the expansion of the ellipsoid (PCM or not).

5. PCM is not intuitive, how do we make it so?

6. The PCM (and SCEM) require accurate definition and calculation of the probability of well collision?

7. The PCM (and SCEM) need to normalize the SF when using a single ellipse?

8. Test the applicability to the well stock drilled to date?

9. Others, e.g. correlation, presentation of information

Collision Avoidance Rule

$$SF = \frac{\Delta C - (R_r + R_o) - S_m}{K (\sigma_s^2 + \sigma_d^2)^{\frac{1}{2}}} \qquad (K_{init} = 3.5) \qquad \ldots (1)$$

Draft

- *SF* - Separation Factor, a ratio related to the probability of the reference well colliding with or crossing the offset well over the next drilled interval.
- ΔC - The distance between the point of interest on the centreline of the reference well and a point on the centreline of the offset well. The point on the offset well is determined by the 3D closest approach or Travelling Cylinder plane method, dependent on the application of the rule.
- R_r - The radius of the reference wellbore at the point of interest.
- R_o - The radius of the offset wellbore at the point of interest.
- S_m - The Surface Margin, a fixed value intended to avoid contact between the reference and offset wells at near surface.
- *K* - The scaling factor applied to the 1 sigma position uncertainty estimate to define a MASD that represents a suitably low probability of collision or crossing. Initial recommendation for HSE risk offset wells is 3.5, based on the range of current Industry practice (this may be redefined to relate to a specified probability of collision).
- σ_s - The magnitude of the pedal vector of the relative uncertainty of the surveyed positions of the points of interest on the two wells, along the C vector, assuming a normal distribution and specified at 1 sigma. The calculation of relative uncertainty should account for correlation of errors.
- σ_d - The estimate of position uncertainty associated with the projection of the current surveyed position in the reference well to the point of interest at the end of the next drilled interval. Applies to both planned and actual wellpaths.

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Actions

A. Test the SF expression, starting with existing AC test wells – errors not currently consistent. Work with error model group use updated error models? As a starting point we will assume these values as a first pass ($K = 3.5$, $S_m = 1m$, $\sigma_d = 1.5m$).

B. Description of Pedal Curve and link to probability.

C. Complete the Management Practices Document

D. Complete the Verification and Assurance Descriptions

E. Complete the Planning and Operational Flowcharts

F. Incorporate the Presentation of Information

SPE Papers (2) will act as the normative references:

1. Unified Collision Avoidance Rule / Assurance and Verification

2. Management Practices

Main Standards Document: a clear and concise document describing the structure, purpose and recommended practice for well collision avoidance.

Principles

- The standards may only refer to existing methods and algorithms, described in a recognised, publically available paper (preferably peer reviewed).

- We will recognise that future improvements are likely and we will be open to evolving the standard in a controlled manner, through peer review and management of change.

- The adopted method will distinguish between HSE and non-HSE collisions and be risk-sensitive.

- We will address rule(s) for both planning and for execution.

- Qualify first, then quantify.

- We will test the feasibility and practicality of execution of any proposal.

- We commit to developing and adopting the minimum set of rules that satisfies existing operating envelopes.

- We will define the limitation of the stated standards, or algorithms.

- The output generated by the attendees will be compiled into a draft standard by a group of 5 or so members endorsed by the wider group.

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