The Applicant’s response to the P66 Report
Appendix Q to the Response submitted for Deadline III
Application Reference: EN010033

24 February 2014
Response by the Applicant to Phillips 66 Report (Report RPT-11-577-02 Rev 5)

Background

1. This technical note provides the Applicant’s response to a report submitted by Phillips 66 Ltd (“P66”) appended to their Written Representation submitted to the Examining Authority (Ex. A) at Deadline II on 20th January 2014 entitled “Review of the Stray Current Interference Risks and Costs from the Proposed HVDC and HVAC Transmission Systems on the 22” Pipeline” (Reference RPT-11-577-02 Rev 5), written by IACS Corrosion Engineering Ltd and dated December 2013 (hereafter referred to as the “Report”).

General Assertions of the P66 Report Related to Risks

2. The main risks identified by IACS are presented on page 4 of the Report:

   “The implications of the proposed HVDC power transmission system on the 22” crude oil pipeline are the risk of stray current interference and corrosion on the pipeline due to stray current leakage, together with the increased safety risk to personnel and the general public in the event of power line to earth faults on the buried cable system or changes in the power line operating configuration.

   The implications of the proposed HVAC transmission system are the risk of AC corrosion on the pipeline due to inductive coupling and the increased safety risk to personnel and the general public in the event of electrical faults on the buried cable system. The purpose of this report is to provide outline information on the risks of corrosion on Phillips 66 Ltd’s asset and personnel safety due to electrical interference from either of the power cable transmission systems.”

3. Further elaboration on the perceived risks of HVDC are presented on page 5 of the Report, as follows:

   “It should be noted that it is considered for the purposes of this discussion that the HVDC system is a bipolar system as that is the indicative system proposed by SMart Wind. If there is DC current leakage it could cause significant corrosion problems on adjacent associated buried pipeline systems. Smart Wind would be recommended to address all these risks.”

4. With regards to HVDC, the Report frequently refers to a report entitled “High Voltage Direct Current Interference on Underwater and Underground Pipelines” (Paper 10102, Corrosion 2010) by P Nicholson. The findings of this report are based on observations and tests of the ‘Quebec-New England Intertie’, a current source, bi-polar, multi-terminal HVDC link between Canada and the north east of the USA.

5. The Report does not make any estimation of the actual current leakage from DC cables, but does suggest that the corrosion resulting from 1% leakage from the Project cables would cause significant corrosion over a short period of time. They also mention that the largest leakages would be associated with faults.

6. With regard to HVAC, the Report states that the impacts of HVAC would be due to stray currents and inductive coupling. However, the Report also states that stray currents from HVAC are only 1% of those of HVDC for similar currents. Also, it is stated in the Report that the impacts of HVAC stray currents are mitigated somewhat by the configuration proposed by the Applicant when burying the cables, which will have a much lower impact than equivalent overhead lines. However, the Report states that there could be issues relating to the cumulative impacts of the Project cables and the existing overhead line cables already in proximity to the P66 22” pipeline at Healing, where “the AC voltage sometimes exceeds or approaches the maximum permissible value of 4V”.

Response to the Report’s Assertions Related to Risks

7. With regard to the HVDC option, the Applicant agrees with the statement in the Report that the main risk to pipelines posed by HVDC during their operation is stray current. However, it the Applicant considers that the Report overestimates the severity of this risk and draws conclusions on HVDC option based on a report that is not relevant if the Project selects an HVDC electrical system. In particular, the Project system will be a voltage source, symmetrical monopole system whereas the report assumes a current source, bi-pole system. Because a voltage source, symmetrical monopole system will be used, no such earthing will exist meaning neither will stray currents arising from differential currents.
Stray currents may only arise during fault events, but these are expected to be localised at the joint bays, of extremely short duration (several milliseconds), and not thought to be significant for a pipeline some tens of metres away.

8. With regard to the HVAC option, the Applicant agrees with the statement in the Report that the physics of phenomenon of inductive coupling, but are incorrect to apply it to the Project’s cables. If the Applicant installs HVAC cables, they will contain sheaths which will be insulated and grounded using sheath voltage limiters at cross bonding joint bays. These serve dual purposes of eliminating any electric field outside of the cables and preventing stray currents under normal circumstances – during faults where the induced sheath voltage might rise above a prescribed value, the sheath voltage limiters will start to conduct and some small earth currents will be experienced at joint bays, but as with HVDC these are expected to be localised at the joint bays, of extremely short duration (several milliseconds), and not thought to be significant for a pipeline some tens of metres away.

9. The Applicant acknowledges that if HVAC cables are used that they will create a time altering magnetic field in their immediate proximity that could induce a current in metallic objects. However, Volume 6, Annex 6.9.1: Electromagnetic Fields Study of the ES (Doc ref No 7.6.9.1) presents the potential strength of these magnetic fields and this concludes that they will be immeasurably small at a distance beyond around 30 or 35m from the Project’s cables. The closest distance the Project’s cables are located from P66 assets are 63 m and it is therefore the conclusion of the Applicant that the effects on P66 assets will be insignificant.

Additional Risks to the P66 22” Pipeline

10. The Report mentions a number of risks in Table 1 of Appendix B which are not applicable to the 22” pipeline in question, namely risks from: driving over the pipeline, working within the pipeline way-leave, piling nearby, and crossing the pipeline with trenchless methods. The Applicant does not expect to require access across the pipeline (except over pre-existing and suitable public highways) or to the pipeline way-leave, to carry out any piling in the vicinity of the pipeline, or cross the pipeline with its cables.

Conclusions

11. The Applicant has incorporated the specific risks posed by its HVDC and HVAC cable designs into the form of proximity agreement adopted for other parties whose assets have been identified as requiring a similar proximity agreement. This acknowledges that whilst the exact quantification of the risks is difficult prior to detailed design, in the context of the conclusions stated above in relation to the insignificance of stray currents, these risks will be relatively minor and easily managed using industry best practice.

12. As such, the Applicant proposes that:
   a) Final detailed cable design for the Project are shared with pipeline owners, along with specific risk assessments;
   b) Mitigations suggested by the risk assessments are proposed to the pipeline owner prior to the commencement of construction for agreement;
   c) Pre-construction surveys are undertaken to determine the condition of the pipeline;
   d) Agreed mitigations are put in place in co-operation with the pipeline owner;
   e) Post-construction surveys and monitoring are undertaken to determine any impacts the cables may have on the pipeline.
   f) All mitigations and survey requirements are proportional to the risks identified by the risk assessments.