Action 804
0498/0502 Assessment of Environmental Impacts

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Background

- CATS/TGPP existing CO_2 spec is 2.9 mol%
- CATS & TGLP have requested a revised CO_2 spec to 4 mol%
- Two main benefits
  - Avoid restricting throughput of existing gas fields
  - Avoid risk of potential new gas fields not being developed e.g. Jackdaw
- BP assessment of forward CO_2 content
  - 2014-2018
    - CO_2 levels of >2.9 mol% for max of 5% of time at a peak of 4 mol%
    - Occur in summer (2-3 days)
    - Estimate total impact 0.03 mol% on annual average
  - 2019+
    - Potential new gas fields developed
    - Summer months between 2.66 mol% and 3.6 mol% (max 4 mol%)
    - Non-summer months between 2.66 mol% and 3 mol% (max 3.57 mol%)

Action 804 – Assessment of Environmental Impact

- Considered max CO_2 emissions and annual forecast cost for 3 scenarios around a new gas field project in period 2019 to 2040
- Scenario1 – Offshore CO_2 removal
  - Amine unit installed offshore to remove CO_2 down to 2.9 mol% prior to entry into CATS pipeline
- Scenario 2 – Onshore CO_2 removal
  - Amine unit installed onshore to remove CO_2 down to 2.9 mol% prior to entry on to the NTS
- Scenario 3 – NTS Delivery at 4mol%
  - Natural gas is delivered to NTS with a 4 mol% CO_2 content
- In all scenarios the following are calculated:
  - Amount of CO_2 removed plus emissions from associated fuel gas
  - Forecast cost of the amine installation where required
  - Forecast cost of annual emissions from the process

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Assessment of CO2 Removal Cost For Field Development (2019-2040)	Scenario 1 Offshore CO2 Removal	Scenario 2 Onshore CO2 Removal	Scenario 3 NTS Delivery at 4 mol % CO2
CO_2 Removed by Amine unit (4 mol% to 2.9 mol%) (te)	566,214	612,989	0
CO_2 in fuel gas consumed by Amine unit (te)	261,121	266,040	0
CO_2 above 2.9 mol% emitted by consumers (te)	0	0	545,022
Total additional CO_2 emissions (te)	**827,335**	**879,029**	**545,022**
CO_2 Traded Cost (£)	£35,005,686	£36,551,453	£11,517,817
CO_2 Non-Traded Cost (£)	£0	£0	£20,564,628
Cost of Amine Unit (£)	£122,000,000	£200,000,000	£0
Total Cost (£)	**£157,005,686**	**£236,551,453**	**£32,082,445**
Cost per Tonne	**£190**	**£269**	**£59**

- Forecast production from Jackdaw using data provided by Jackdaw Operator
- CO_2 costs derived from DECC - Valuation of Energy Use and GHG Emissions Toolkit
- Assumed 50/50 split between traded and non-traded cost in Scenario 3

Teesside Gas Processing Plant

Action 804 – Conclusions

- **Single field case is the max impact case – assume full field CO_2 at 4 mol%, in reality will be diluted by other gas**
- **CO_2 removal at "source" (scenarios 1 & 2) creates 60% more CO_2 emissions than emitting by user (scenario 3)**
- **Increased electrical load to drive amine units will further add to emission in Scenarios 1 & 2 but are not included in model**
- **No account taken of additional Benzene and Methane emitted from amine units**
- **Cost of mitigation at "source" is between 3x and 4.5 times more expensive per tonne of CO_2 than emitting by user**
- **Dilution of CO_2 by other gas will reduce overall additional CO_2 emissions but will make amine solutions (scenarios 1 & 2) more costly relative to scenario 3 – similar capital to remove less CO_2**