

# POLICY BRIEF

## Emissions from flaring Jubilee field gas

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### Abstract

With the oil production in the Ghanaian Jubilee oil field, a substantial amount of associated gas will be produced. This gas will need to be stored, transported or disposed. There is high uncertainty if reinjection (storage) will succeed and there is no pipeline to transport the gas. Flaring to dispose the gas may therefore be the only alternative to stopping production. Against this reality, this policy brief shows the greenhouse gas emissions of flaring the Jubilee gas, and the potential for using the gas for power production.

## WHAT IS GAS FLARING?

Gas flaring is the direct burning of natural gas on an oil production site. Flaring is environmentally harmful due to the release of toxic components into the atmosphere and the emission of the greenhouse gas CO<sub>2</sub>. Moreover, resulting water pollution from flaring may threaten the local fishing industry. At the Jubilee field, the fuel comes from the well as a hot mixture of oil and gas. On the Floating Production, Storage and Offloading (FPSO) vessel, oil and gas are separated, and the valuable oil is shipped. Part of the gas is reinjected into the well for enhanced oil recovery, and part of it is used to generate power for the FPSO. The rest of the gas must be stored (reinjected), transported or disposed.

## WHAT TO DO WITH ASSOCIATED GAS IN GHANA?

The government of Ghana has a policy of zero flaring. There is however a reasonable chance that at the Jubilee field, storage may not be possible to the extent expected, and the infrastructure will not be ready in time for 'first oil'. Two gas injection wells have been drilled, but it remains uncertain whether the geological formation allows for the anticipated re-injection. If not, the only alternative is to start flaring or stop oil production (until a gas infrastructure is established). Gas flaring is considered undesirable by both the government of Ghana and the oil producers, but both depend on the oil for revenues.

### Box 1: How much gas from the Jubilee field?

Currently, the "Jubilee field" is the only field offshore that is in the development stage. Potential additional finds will take 4-6 years to begin production. The target production level of the Jubilee field is 120,000 bbl/oil per day, and an associated 120 units (mmscfd, million standard cubic feet per day) of gas. Around 20 units are used to power the FPSO and another 30 for injection to enhance oil recovery. The remaining 70 units can be brought onshore. Assuming that the processing plant takes out around 20% of LPG and condensates, this leaves enough gas to continuously power a 380 MWe modern gas power plant, which can supply 3 TWh annually, around 35% of national grid electricity production.

Geological **storage** of gas in underground layers of rock (like the oil wells) may be possible, but there is a large uncertainty on how long the geological formation will allow reinjection. Current estimates vary from 18-24 months, and possibly longer, while it is not certain that all of the gas can ultimately be recovered. Two gas reinjection wells have been drilled and technically the FPSO is ready for reinjection.

There is currently no infrastructure to **transport** the gas from the FPSO. The minimal infrastructure to utilize the gas would consist of a pipeline to the shore, a processing plant and a power plant. The lead time for this combination is at least 3-4 years after the investment decision has been made. Existing infrastructure plans vary from the 'basic combination' of pipeline, processing plant and power plant, to more extensive layouts where the pipeline is eventually connected to the West African Gas Pipeline in Takoradi. Given the currently confirmed gas finds, there is only enough gas to supply an initial basic configuration. An alternative to transport using pipelines, is to create an offshore liquid natural gas (LNG) processing plant and ship the liquified gas. LNG plants are not widely used because of high costs. The lead time for an LNG plant is significant, and the amount of gas currently declared commercial in Ghana is insufficient to make an LNG plant economically viable.

**Disposal** of excess natural gas into the atmosphere can be direct (venting) or by controlled burning (flaring). For environmental and security reasons, venting is not preferred. Flaring of natural gas however, releases the greenhouse gas CO<sub>2</sub> into the atmosphere. Box 2 shows that the emissions from flaring alone are substantial, around 7% of total national emissions.

Flaring technology is simple and leaves little room for improvement. Flaring installations are available on the FPSO, as part of standard safety procedure. Under normal conditions, flaring will only take place in the start-up phase of the production.

#### **Box 2: How much emissions from gas flaring?**

Flaring of the Jubilee gas (see Box 1), would cause around 1.5 Mton of CO<sub>2</sub> emissions annually. If the gas is not flared, but used to replace heavy oil in a power plant, it saves over 13.000 bbl/oil per day and reduces another 0.9 Mton of CO<sub>2</sub>. Total reduction potential of using the gas for power production instead of flaring is therefore 2.4 Mton CO<sub>2</sub>-eq. (10% of national emissions). Domestic use of LPG may result in further emission reduction, provided it replaces diesel generation.

## **HOW CAN FLARING BE AVOIDED?**

By active intervention, because a passive no flaring policy may not be enough to prevent flaring in the coming years. Why is this important? Because flaring is environmentally hazardous, has serious greenhouse gas emissions and presents Ghana with a reputational risk, and flaring may not be unavoidable! Moreover the overall benefits, environmental and economic, of using the gas for consumption seem promising it is important to use the gas in the most economically beneficial way, which is using for consumption. What are the next steps? Proactively seek to develop the transport infrastructure so that the gas can be used in a beneficial way.

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