The Environmental Effects of Onshore Oil and Gas Licensing - Two Page Synopsis

The likely significant environmental effects of further onshore oil and gas licensing have been identified, described and evaluated in order to comply with the requirements of the Strategic Environmental Assessment Directive (2001/42/EC). The licences could cover: conventional oil and gas exploration and production; unconventional oil and gas exploration and production (shale oil and gas, virgin coalbed methane); and natural gas storage in hydrocarbon reservoirs. Consideration was given to all the stages in the oil and gas production and development lifecycle, under high and low activity scenarios[1] for both conventional and unconventional oil and gas.

The assessment did not identify any likely significant environmental effects for conventional oil and gas exploration and production, virgin coalbed methane or underground gas storage. The assessment did, however, identify some likely significant effects for shale oil and gas production, either as compared to the existing oil and gas sector, or at local community level. These effects are set out in the table below.

Likely Significant Environmental Effects of Shale Oil and Gas When Compared to the Existing Oil and Gas Sector

- **Employment** - the high activity scenario, during the peak development phase, could create 16,000-32,000 new full time equivalent positions (including direct, indirect and induced jobs), an increase of up to 7% in the level of employment supported by the UK oil and gas industry sector. The extent to which these jobs might directly benefit local communities would depend on the availability of skills and experience in the local labour market.
- **Hydrocarbon reserves** - the high activity scenario could generate in total some 0.12 to 0.24 trillion cubic metres (4.32 to 8.64 trillion cubic feet) of gas, more than six times the 0.037 trillion cubic metres (1.31 trillion cubic feet) of gas produced in the UK in 2012 or more than twice the approximate 0.1 trillion cubic metres (3.52 trillion cubic feet) of gas consumed in the UK per annum.
- **Climate change** - greenhouse gas emissions during exploration could be up to 0.96 million tonnes of carbon dioxide equivalent (M tCO_2eq) per annum under the high activity scenario while greenhouse gas emissions during production are estimated at between 0.71M and 1.42M tCO_2eq per annum. This is equivalent to up to 15.3% of the 9.3 M tCO_2eq emissions from the exploration, production and transport of oil and gas in the UK in 2011, the most recent year for which final data is available (but less than 0.3% as compared to current UK annual GHG emissions). Domestic shale gas production and consumption could help to reduce net greenhouse gas emissions associated with imports of liquefied natural gas (LNG) in particular; however, if LNG or other fossil fuel displaced from the UK is used elsewhere, that could lead to an increase in global GHG emissions.
- **Wastewater** - flowback (the fracturing fluid injected into the shale rock during hydraulic fracturing which returns to the surface) could range from 3,000 cubic metres to 18,750 cubic metres of water per well. Under the high activity scenario, this could mean that up to 108 million cubic metres of wastewater would require treatment. Depending on where the wastewater is treated, the additional volume could place a significant burden on existing wastewater treatment infrastructure capacity, and require further or new investment. However, if on-site treatment and recycling could occur, wastewater volumes (and associated vehicle movements) could be reduced.

Likely Significant Environmental Effects of Shale Oil and Gas for Local Communities

- **Community economic contributions** - under the commitments of the United Kingdom Onshore Operators' Group (2013) Community Engagement Charter, shale gas exploration could provide a community contribution of £100,000 per hydraulically fractured site as an initial benefit, equivalent to total UK payments of between £3 million and £12 million. A further £2.4 to £4.8 million per site (or nearly £0.6 billion in total) could be generated in a production phase, reflecting the 1% contribution from revenue over the lifetime of each well.
- **Other community effects** - it is estimated that there will be approximately 14 to 51 vehicle movements to a site each day during exploration and site preparation over a 32 to 145 week period, depending on the activity scenario and assumptions concerning volumes, sources and transport of water and wastewater. This could have an adverse impact on traffic congestion, noise or air quality depending on existing roads, traffic and air quality. It could have a more sustained and locally significant effect on communities adjacent to the development sites, or adjacent to the routes to the sites, during exploration and site preparation.

[1] The low and high activity scenarios for unconventional gas include the following assumptions: between 50 to 150 licences being awarded; 30 to 120 well pads being developed (each having between 6 to 24 wells and occupying 3 hectares of land); peak number of wells drilled in a year of 360 and a maximum of 2880 wells drilled, production of 85.6 million m3 of gas (3 billion cubic feet) per well; and a lifetime of each well assumed to be 20 years.

Other Environmental Effects from Shale Oil and Gas with the Potential to be Significant

- **Water use** – on the conservative assumption that each well is re-fracked once in its lifetime, total water consumption associated with hydraulic fracturing could be between 57.6 million to 144 million cubic metres under the high activity scenario. On that scenario, annual water use could be up to 9 million cubic metres, which would be approximately 18% of the 48.5 million cubic metres of mains water presently supplied to the energy, water and waste sectors annually. The potential impacts that this could have on, for example, water resource availability, aquatic habitats and ecosystems and water quality is, however, more uncertain. Water would typically be sourced from a mains water supply which would need agreement from the relevant water company, or could be abstracted from groundwater or surface water which would need an abstraction licence; in either case, any addition to demand would only be granted where assessed by the regulator as sustainable. Demand could however be substantially reduced if it could be met from recycling and reuse of flowback water.
- Other effects from exploration and production of shale oil and gas with the potential to be significant under the high activity scenario have also been identified in respect of **land use, geology and soils, air, resource use and landscape;** however, the significance of these effects depends on many factors that are uncertain at this stage, including:
  - The location, distribution and phasing of sites and any associated infrastructure; and
  - The nature, quality and proximity of sensitive receptors (whether communities, habitats, and/or landscapes).

These likely significant effects are generally expected to occur in the development and production phases, and it is noteworthy that the industry is not expected to be at substantial scale before the 2020s. This will allow time for any necessary new investment in infrastructure such as waste water treatment capacity.

The application and enforcement of existing regulatory requirements can be expected to ensure that effects at the project level will be identified, assessed and mitigated to an acceptable level. These requirements include:

- Gaining planning permission from the relevant minerals planning authority. This will include addressing the effects of siting, landtake, community disturbance, flood risk, contamination and traffic. Effects on European designated conservation sites will be assessed as part of the Habitat Regulations Assessment process and will also be considered by Natural England and/or Natural Resources Wales or Scottish Natural Heritage;
- Gaining permits, licences, consents and/or authorisations under environmental regulations implemented in England by the Environment Agency, Wales by the Natural Resources Wales and in Scotland by the Scottish Environment Protection Agency;
- Addressing health and safety legislation implemented by the Health and Safety Executive, including well integrity assurance.

Permits and consents will require operators to provide information on chemicals used, gas produced, emissions, discharges, and well design, construction and testing.

It is considered likely that, through the use of construction and operation best practice, environmental effects resulting from licensing of onshore exploration and production activities could be minimised and managed to be acceptable to regulators, decision makers and communities. Mitigation measures include: careful site selection to avoid adverse impacts on sensitive land uses, important soil types, biodiversity and water courses; the systematic use of "reduced emissions completions" or "green completions"; phasing water demand to avoid periods of low flow or water stress; onsite recycling and reuse of flowback water; ensuring waste management plans include the transport and treatment of the flowback and produced water generated; ensuring transport plans include measures to address the effects on local communities including vehicle frequency, scheduling, speed restrictions and routing.