Brief for GSDR 2015

Towards an Energy Efficient Oil & Gas Sector

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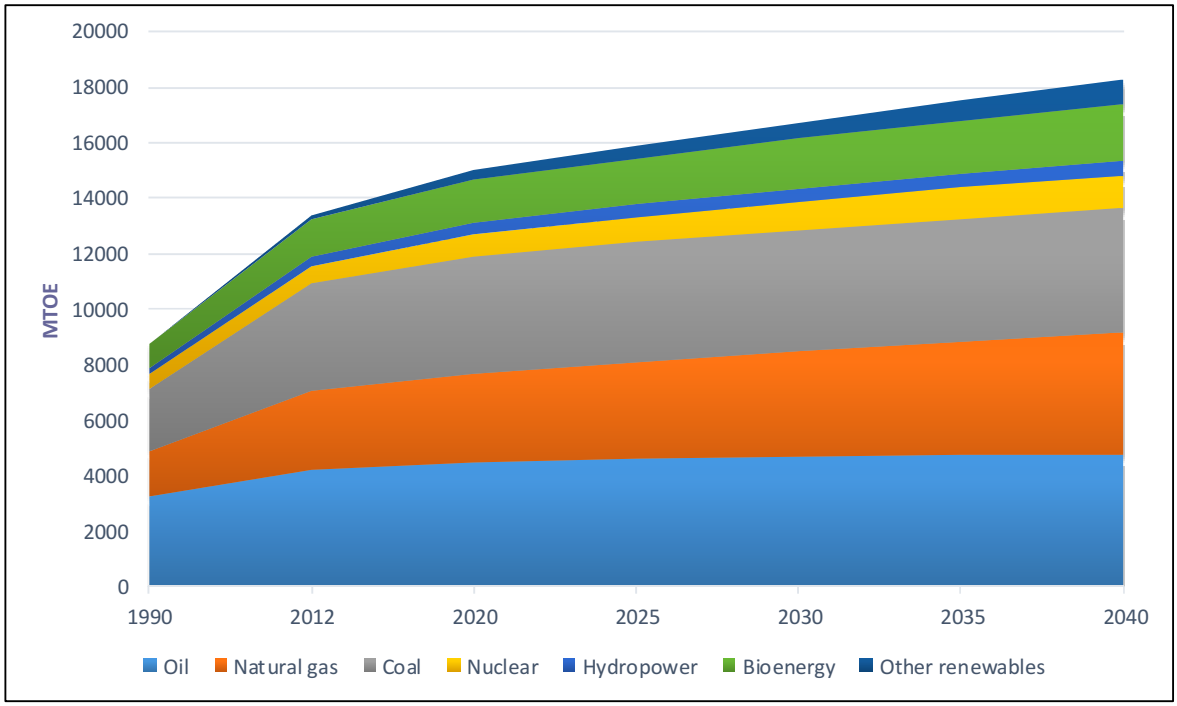
The scope for improving energy efficiency in the oil and gas sector

Hydrocarbons have played one of the most crucial roles in economic history by fuelling globalisation and industrialisation. Today, oil and natural gas form a key lifeline of the global economy, contributing to a 56.6% share in global energy consumption (BP, 2014). Further, in spite of the recent worldwide thrust provided to the renewable sector, International Energy Agency's (IEA) (2014) World Economic Outlook for 2040 projects that oil and gas will remain the single largest energy source throughout the projection period (see Figure 1), as developing countries experience growth. In particular, transport, heating, and cooking energy requirements will largely continue to be powered by oil and natural gas.

Figure 1: World Primary Energy Demand Projections. Source: (International Energy Agency, 2014)



The continued dominance of hydrocarbons in the energy mix can be explained by the presence of a *lock-in* of fossil fuel energy systems. This carbon lock-in has occurred globally through the systemic *co-evolution* of technology and institutions, thus creating a *Techno-Institutional Complex* of high fossil fuel intensity (Unruh, 2000). Such a lock-in is among the biggest barriers to climate change mitigation and sustainability.

As with any fossil fuels, Green House Gases (GHGs) that emanate from the use of hydrocarbons can be curbed by discouraging the use of the fuel. In theory, some form of resource taxation on the oil and gas industry would discourage fuel extraction and therefore oil and gas use. Several countries

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already tax crude oil extraction (Bentley, et al., 2015), primarily to raise revenues for the state rather than to curb emissions. A more direct way to curb emissions would involve the imposition of a Pigouvian tax on carbon. However, carbon taxes would apply on emissions from the use of other fossil fuels too, and would also apply on fossil fuel consuming industries.

This brief instead suggests short-term policy measures to reduce emissions from the extraction and transformation *industry* itself, i.e. the supply side. The extraction and transformation industry, after all, is a major energy consumer – most of which is met by the use of fossil fuels. IEA (2013) reveals that in 2011, in Million Tonnes of Oil Equivalent (MTOE) terms, 6.9% of the total energy produced by the oil and gas industry was consumed by the industry itself.

Table 1: World Energy-related CO_2 Abatement.

CO_2 abatement	*2020*	*2040*
Energy service demand	19%	11%
End-use efficiency	46%	39%
Supply efficiency	9%	11%
Fuel and technology switching in end-uses	2%	3%
Renewables	17%	24%
Biofuels	3%	3%
Nuclear	3%	7%
CCS	1%	2%

Source: (International Energy Agency, 2014)

There is thus a case for the reduction of GHG emissions from the hydrocarbons supply industry. To this extent, the improvement of energy efficiency within the industry could lead emission reductions. IEA (2014) shows that efficiency measures account for about half of cumulative CO_2 emissions savings, with the share being even higher in the short term. While the largest efficiency savings in 2040 come from end-use sectors, energy supply – including power plants, refineries and oil and gas extraction – is responsible for 9% of cumulative savings.

The cost to implement policies directed towards increasing energy efficiency might be steep, but it can be offset by the positive spill-over effects of decreased emissions that will come from reduced fuel consumption (IPIECA, 2013).

While many oil and gas companies are already pursuing sustainability initiatives, there is room for policy intervention through standardisation of best practices. A few broad themes are discussed below.

Sustainability reporting

Institutional transparency is a prerequisite to promote accountability among players in the industry and to ensure policy efficiency. Further, it increases stakeholder awareness, which creates the necessary environment for greater compliance on emission reduction goals (Ioannou & Serafeim, 2014 and Kolk, 2003).

Global Reporting Initiative (GRI) (2013) reviews global developments in policy and regulation for sustainability reporting. The German government, for example, offers explicit support to EU's Eco-Management and Audit Scheme and has made environmental reporting compulsory. Similarly, UK encourages sustainability reporting by providing guidelines. Such initiatives encourage standardization of sustainability reports, opening up avenues for comparative research (for example, see Cyriac, 2013; Chadha, 2014; and Andelin, et al., 2013). As a first step towards greater compliance of efficiency and emission reduction goals, sustainability reporting must be mandated globally.

The table below highlights the comparability of sustainability reports prepared in compliance with GRI standards.

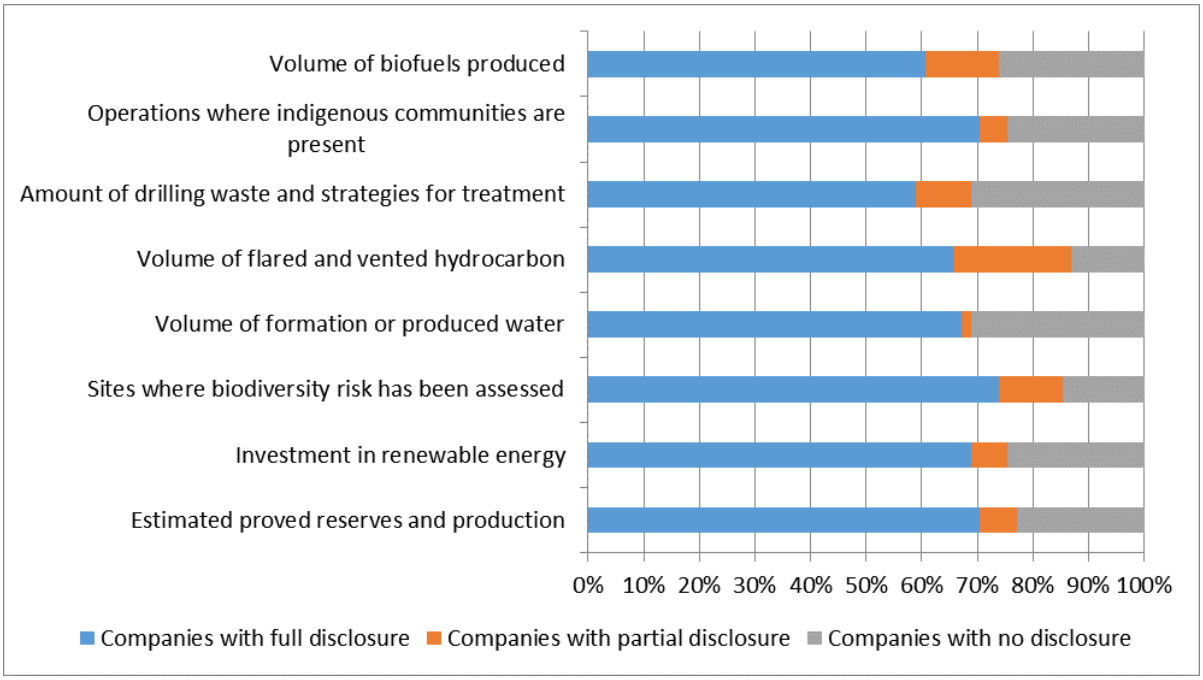

Figure 2: GRI's Compilation of Disclosed Information on Sustainability by Various Oil and Gas Companies. Source: (Global Reporting Initiative, 2013)

Flaring

Approximately 150 BCM of gas is flared* every year globally (Elvidge, et al., 2007), which forms approximately 5% of the global natural gas production. This contributes to approximately 400 million tonnes equivalent of CO_2 emissions every year, which is approximately 2% of global CO_2 emissions from energy sources (GE Energy, 2010).

In order to tackle the wastage of natural gas caused by flaring, there have been several initiatives globally, most notably, the World Bank Global Gas Flaring Reduction Partnership. The World Bank (2011) recommends that in order to curb flaring; firstly, companies must be required to disclose the quantity of gas flared in order foster accountability. Secondly, legislation and licences should be clear about the treatment of associated gas. Thirdly, fiscal terms should encourage investments that lead to the utilization of associated gas. Fourthly, there should be tax based incentives and disincentives to curb gas flaring.

In Norway, for instance, a CO_2 tax has contributed to a reduction of flaring. In the US, on the other hand, royalty payments are imposed on flared associated gas which the regulator deems could have been utilized (World Bank, 2011). Such policy frameworks must be replicated globally through organised efforts by regulators.

Oil and gas transport infrastructure

While most international hydrocarbons trade takes place through deep-sea tankers, road and rail transport continue to be the mainstay domestically in several countries. In India, for instance, 67% of the total petroleum products were transported via rail and road (TERI, 2014 and NTDPC, 2013).

Rail and road are inefficient mediums to transport fuels compared to pipelines, where technically feasible. The European Chemical Industries Council (CEFIC, 2011) estimates that road and rail transport have emission factors of 62 and 22 gCO_2/tonne-km respectively, whereas, pipeline transport, has an emission factor of 5 gCO_2/tonne-km. In addition, an indirect advantage of pipelines over road transport is the lowering of traffic

* Flaring refers to the intentional burning of associated natural gas that is the by-product of crude oil extraction. This gas is burned rather than released into the atmosphere to avoid accidental explosions.

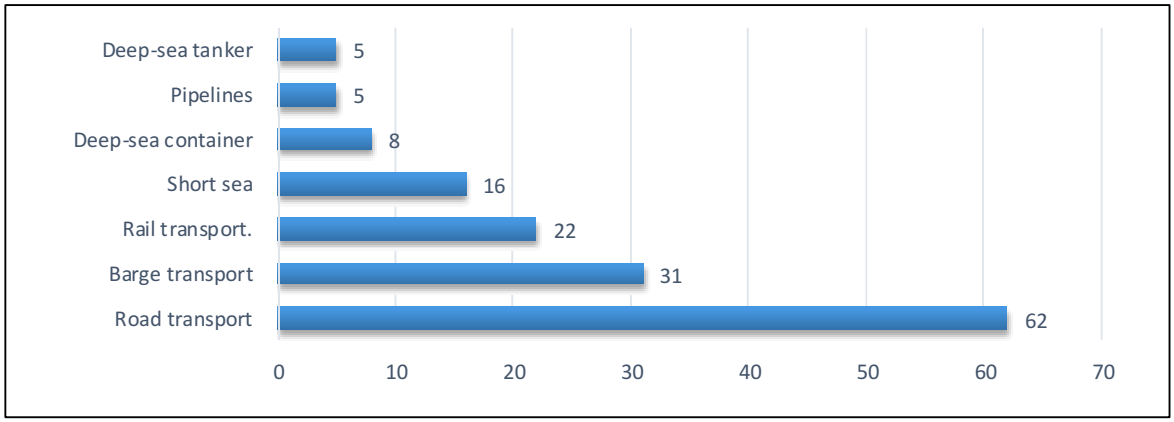

Figure 3: Emission Factors for Different Modes of Transport in the Chemicals Industry. Source: (Guidelines for Measuring and Managing CO_2 Emissions from Freight Transport Operations, CEFIC, n.d.)

congestion on highways, improving average traffic speed and therefore efficiency of other vehicles. Governments must thus pursue the implementation of pipelines over rail and road wherever capacity permits.

Efficiency in refining

Oil refining is the most energy intensive activity in the industry. It accounts for nearly half of all the energy consumed by the industry. Energy costs are also the key expenditure items for refineries. In Central and Southern Europe for instance, energy costs accounted for 64% of total pre-tax revenue in 2010 (Solomon Associates, 2010).

Voluntary commitments to improve energy efficiency have led to the energy intensity of refineries in OECD countries falling by as much as 13% since 1980 (IPIECA, 2013). Such commitments have had institutional support. For instance, industry bodies in North America undertook a mission called the Climate Action Challenge to reduce their emissions by increasing their energy efficiency by at least 10% between 2002 and 2012. The Solomon Energy Intensity Index (EII) was adopted to track gains made by each refinery. Individual refineries can use this index to see how they are doing and can identify the avenues of improvement (Solomon Associates, 2010 and Solomon Associates, 2012).

The EII is already in use in the USA, Netherlands, Japan, and New Zealand. With new refineries coming up in emerging economies, their regulators must formally adopt such standard efficiency indicators which promote transparency in efficiency and emissions reporting, apart from fostering a competitive spirit in pursuing efficiency improvement measures. Efficiency targets may also be mandated with favourable credit lines to fund infrastructure overhauls.

Way forward

This policy brief looked at key avenues of improving energy efficiency as a means to reduce GHG emissions within the hydrocarbons industry in the short and medium run. The way forward for hydrocarbon policymakers would be to develop energy efficiency roadmaps drawing from the best practices globally.

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