As diesel's price is per litre and natural gas is per kilogram, comparing the prices of the two is not a straightforward process. We have considered the energy content of both products, as well as their engine efficiency differences, to create a Diesel Litre Equivalence (DLE) for natural gas. This allows you to compare the prices of the two fuels as if they were both diesel.

A fuel's energy content is provided in its Lower Heating Value (LHV), generally expressed in MJ/kg. The LHV varies between fuels, and even within one type of fuel, as the quality may differ depending on its origin. However, they can be compared through their calorific value: L_D = 43MJ/kg for diesel and L_G = 45MJ/kg for natural gas. Additionally, for diesel, the fuel density is ρ_D = 0.84kg/L.

Engine designs are different for diesel (compression ignition) and natural gas (spark ignition). The efficiency of the two engines also varies. Therefore, for the calculation, based on our expertise, we took the average values of ηD = 43% and ηG = 35% for diesel and natural gas engines, respectively.

Given that we are interested in knowing how much diesel and natural gas is needed to obtain the same amount of energy, we are using the following equation:

$$E = \frac{L_D . m_D}{\eta_D} = \frac{L_G . m_G}{\eta_G}$$

By having V_D as the volume of fuel per litre, we obtain:

$$V_D = m_D . \rho_D$$

$$V_D = \frac{L_G . \eta_D . m_G}{L_D . \eta_G} . \rho_D$$

$$m_G = \frac{L_D . \eta_G . V_D}{L_G . \eta_D . \rho_D}$$

Thus, 1 litre of diesel is equivalent to 0.93kg of natural gas, and 1kg of natural gas is 1.08DLE.