Europump

The Voice of the European Pump Industry

USE PHASE GHG EMISSIONS FROM PUMP UNITS

A Europump Guide

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Final Version

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Foreword

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This guideline will serve as a tool for pump manufacturers to calculate the Green House Gas (GHG) emissions from pump units in their use phase according to category 11 of the GHG protocol. The guideline presents potential approaches and concepts to consider when e.g. setting Science Based Targets in relation to the Science Based Targets initiative (SBTi) or in general when calculating the GHG emission from pump units in their use phase

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1 Introduction

There is widespread agreement that the release of greenhouse gases to the atmosphere, are contributing to climate change, which effects include increasing global average temperatures, more frequent and more severe drought and storm events.

Pumps transform mechanical energy into hydraulic energy to support many aspects of modern life from buildings to water cycles industry and power generation[1]. Pumps are often driven by electric motors. Europump estimates that 10% of the total electrical energy consumed in the world is consumed by pump motors.[2]

Until power generation is completely decarbonized, greenhouse gas emissions will be associated with equipment requiring electricity, including motors used to drive pumps in its wide range of applications.

When using the GHG Protocol to estimate carbon emissions, 95-99% of a pumps lifetime emissions are deemed to be emitted during its use phase. Use phase emissions are the major contribution to the overall emissions. On the other hand manufacturers can only indirectly affect them. This guideline has its focus on the use phase of the pump units to assist and simplify the complex reporting of their use phase emissions.

1.1 The Paris Agreement and the Science-Based Target initiative

In December, 2015, 196 parties met at the UN Climate Change Conference (COP21) in Paris to develop and ratify a legally binding international treaty to address climate change risk. The resulting Paris Agreement seeks to maintain global average temperature well below 2°C compared to pre-industrial levels, and pursue efforts to limit the temperature increase to 1.5°C.

To support the Paris Agreement climate goals, a partnership between the Carbon Disclosure Project (CDP), the United Nations Global Compact, World resources Institute (WRI) and the World Wide Fund for Nature (WWF) created the Science-Based Target initiative (SBTi). SBTi established near-term and long-term carbon reduction targests for companies to achieve net-zero carbon emissions by 2050. Manufacturers can voluntarily commit to SBTi targets based on GHG Protocol reporting standards.

International pressure to reduce carbon emissions and mitigate climate change risk continues to drive change in global activity. The 2022 IPCC report Summary for Policymakers stresses in its section on *“Risks in the near term (2021- 2040)”* that “*Global warming , reaching 1.5°C in the near-term, would cause unavoidable increases in multiple climate hazards and present multiple risks to ecosystems and humans (very high confidence) […] Near term actions that limit global warming to close to 1.5°C would substantially reduce projected losses and damages related to climate change in human systems and ecosystems, compared to higher warming levels, […]”* [1]

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[1] use cases for pumps include inter alia: fuel production, fresh water production/desalination, waste management, chemical and pharmaceutical manufacturing, flood control, air emissions abatement and refrigeration

[2] The European Union states that electric motors represent around 50% of the global electricity consumption [10]. Approx. 20% of electric motors are used for pumping applications.

1.2 Green House Gas Protocol

To better understand global carbon emissions, the World Resource Institute (WRI) and World Business Council for Sustainable Development (WBCSD) created the GHG Protocol - a global standard and framework to measure and manage greenhouse gas (GHG) emissions from private and public sector operations, including electric power generation [2].

GHG protocol requires reporting of emissions in three different categories or “scopes”. Scope 1 are an operator’s emissions from hydrocarbon fuel use, i.e. the combustion byproducts as a direct result of the operator’s business activity.
In contrast, Scope 2 emissions are assigned to an operator using electricity (and other forms of energy) generated by third-party combustion of hydrocarbon fuels e.g. an electric utility business. The greenhouse gas emissions associated with the production of electricity are Scope 1 emissions for the business producing the electricity, while simultaneously being Scope 2 emissions for the operator consuming the electricity – hence Scope 2 emissions are referred to as indirect emissions for the business consuming the energy. Note, the assignment of the same greenhouse gas emissions to both the producer and the consumer of electricity double-counts emissions and care should be taken when aggregating Scope 1 and Scope 2 emissions.
Scope 3 emissions are all other emissions indirectly associated with an operator’s business. It includes the emissions from third-party business activity upstream and downstream of an operator – commonly referred to as the operator’s “value chain”. Scope 3 emissions are subdivided into 15 categories[3] - One of these is the “use of sold product”

Figure 1 - Green House Gas (GHG) Protocol Scopes

Proper accounting of Scope 3 greenhouse gas emissions can also be challenging when one considers the same emissions can be reported as Scope 1, Scope 2 and Scope 3 - depending on if the reporting party acts as operator, electricity provider or the business using the pump product.

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[3] The 15 categories are: 1. Purchased goods and services; 2. capital good; 3. fuel- and energy-related activities;4. upstream transportation and distribution; 5. waste generated in operations;6. business travel;7. employee commuting;8. upstream leased assets;9. downstream transportation and distribution;10. processing of sold products;11. use of sold products;12. end-of-life treatment of sold products;13. downstream leased assets;14. Franchises;15. investments

1.3 Scope 3 – Use of sold products

Scope 3 emissions from the use of sold product (Category 11) are of particular importance to pump manufacturers because they represent the great majority (>99%) of a manufacturers overall Scope 3 emissions - based on the present mix of fuels used to produce electricity globally.

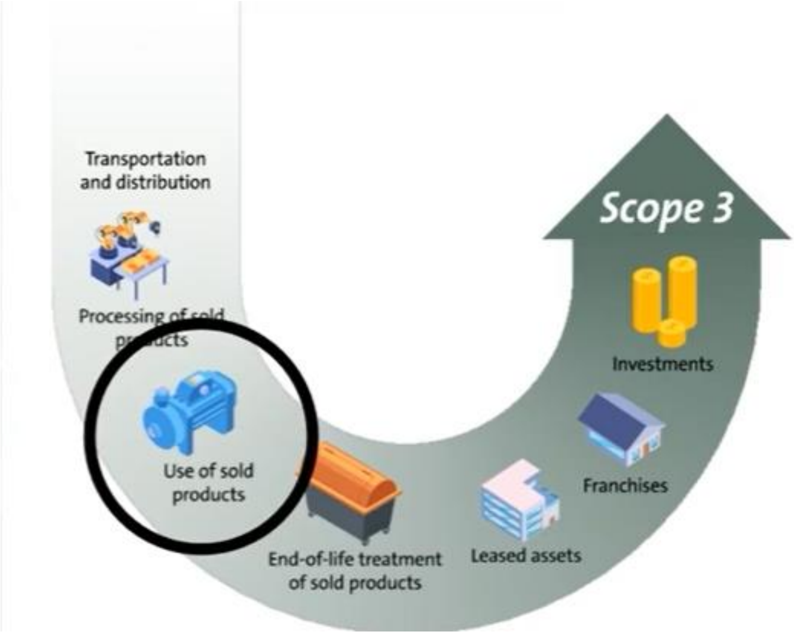

Figure 2 – Scope 3 use of sold products

1.3.1 Limitations

As previously mentioned, pump manufacturer Scope 3 use phase emissions are directly linked to the Scope 1 and Scope 2 emissions of a pump operator. Therefore, pump manufacturers can reduce GHG emissions by helping pump operators to reduce their scope 1 and scope 2 emissions through pump and/or process efficiency improvements. To date there is no standard method to report the resulting emissions reductions at operator level in the scope 3 use phase emissions for pump manufacturers when a pump operator reduces Scope 1 and Scope 2 emissions. It is therefore recommended that pump manufacturers report emission reduction that results from system optimization services separately e.g. as comparative emissions. [2]

There are two important levers to reduce the GHG emission in the use phase of a pump:
Improving overall system operating efficiency and reducing carbon intensity of consumed electricity.
Overall system efficiency defines how well the pump unit meets the system or application demands at each point in time. The level of adaption is therefore reflected with the efficiency at product, extended product and system level.
GHG emissions from the electricity production is expressed by the "grid factor", which is a factor expressing the GHG emissions in kg from producing and transmitting one kWh of electricity. Even though a lot can be done to optimize the energy efficiency, the science based targets can never be met without the contribution from the grid factor, which is projected to decline due to greening of the electricity production

For all calculations that are done as part of GHG/SBTi reporting it is important to keep in mind that the focus on reduction of GHG emissions must not interfere with the safety or reliability of the service that the pump or pump unit is used in.[4]
Improvements of a pump or system efficiency therefore must take into account all dimensions of the ESG sector i.e. Environmental, Social and Governance requirements. Optimization to reduce energy consumption and resulting emissions will always be subject to physical principles and technical boundaries that naturally occur when energy is transferred.

1.3.2 Opportunities for greater reporting transparency

Greenhouse gas emissions reporting requirements are subject to an ever evolving understanding and therefore change over time. The rules that a company must follow may differ depending on the date of commitment to a target. This subgroup identified opportunities to increase reporting transparency and improve the understanding of challenges in GHG reporting in the pump industry.

Pump control can also have an influence on the energy consumption and saving of the systems where they are installed i.e. controlling the flow/temperature across a boiler or heat pump. This can increase the efficiency of those heating/cooling appliances and imply savings and GHG emissions reductions even bigger than possible with the pump itself. Although these saving are very important they are not counted for in Scope 3. These emission reductions are sometimes denoted as “Avoided emission” and even “Scope 4”, which is not a defined scope in the GHG Protocol at the moment.
There is different understanding if and how manufacturers can take credit for efficiency improvements of the installed base and set a sensible baseline for reporting purposes. Efficiency improvements in the installed base can create real emissions savings that are achieved when pump manufacturers share their engineering expertise with pump operators to optimize already installed systems. Having a clear guidance for calculation and reporting of these savings will encourage pump manufacturers to increase interaction with operators to reduce their Scope 2 emissions.

1.4 GHG emissions reduction initiatives landscape

The German funded “Pathways to Paris” initiative identified approx. 20 other initiatives where companies can sign up for climate reductions goals, calculate and report their emission reductions or find assistance to reduce their emissions[5] (cf. Table 1). Concluding there is not one single set of requirements to follow but instead there are several ways to reach the same goal of reducing a companies impact on climate change that must be navigated.

Table 1 – Pathways to Paris initiatives

ACT Assessing Low Carbon Transition	Race to Zero Business Ambition for 1.5	CDP Carbon Disclosure Project	Climate Governance Initiative Germany
Climate Neutral Now	Climate Pledge	Race to Zero Exponential Roadmap Initiative	GHG Greenhouse Gas Protocol
Klimaschutz-Unternehmen	Leaders for Climate Action	NZI Net Zero Initiative	Net-Zero 2050/B-Team
Race to Zero Planet Mark	Race to Zero	Race to Zero SME Climate Hub	TCFD Task Force on Climate-related Financial Disclosures

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[4] For instance, any energy saving measure has to be evaluated in the context of eventual complex processes that may not allow established production parameters to be modified.
[5] https://pathwaystoparis.com/toolbox/klimaziele/

UN Global Compact Deutschland	VBA Value Balancing Alliance	We mean Business Coalition	WBA World Benchmarking Alliance

2 Pumps in scope

For products not using a so-called “emission free” electricity mix the electrical power consumption and GHG emission are directly linked.

All pump types supplied to the operator with a motor will potentially produce pump manufacturer Scope 3 use phase emissions during operation which should be reported per the GHG Protocol.

Pumps that are supplied without motor attached consume mechanical energy that can be provided by an electrical motor or other means. It is therefore recommended to decide on a case by case basis if the assumptions in this guideline are suitable for bare shaft pumps or need to be adapted to reflect the actual use of the product

Energy consumption, energy savings, pump efficiency, and degree of adaptation to system demand provide distinct perspectives and express values which can be used for calculating GHG emissions from a pump.

Most significant energy savings come from attention to the way in which a pump system is designed and controlled. This is by means of optimal pump selection and pump sizing e.g. standard, special or engineered pump according to desired duty point. Where optimization of operating pressures is possible and adequate controls can be installed this can lead to energy savings of approx. 30% compared to a non-optimized pump unit/system.

The main benefit of pumps equipped with a VSD is that they can be adapted to nearly any flow-time profile and therefore reduce the power consumption and GHG emissions in a wide range of applications.

Bigger and engineered pump types are generally optimized to meet a specific system demand. Due to their motor size and high energy consumption these pumps are typically engineered and tested to meet and confirm a defined efficiency at their specific duty point. Such pump types are optimized to meet the specific system demand and will work close to the physically achievable system optimum while ensuring safe operation and process safety. For bigger size pumps it must be decided on a case by case basis if the addition of a VSD or application of other measures is a reasonable option to improve the overall performance of the system.

It must be noted that a significant portion of the installed base may not be optimized for the actual system demand which results in unnecessary emissions. Although the optimization of already installed pumps cannot be directly reflected in the formula presented in this guideline there is a high potential for emission savings due to system optimization that can be reported separately and will reduce an operators Scope 1 and Scope 2 emissions.

3 Calculation of GHG Emissions from Pump Units

The use phase GHG emission from a pump unit is calculated as:

$$GHG[kg\ CO_{2e}] = P_{1,nominal}[kW] \cdot CF[-] \cdot RH\left[{}^{h}/_{year}\right] \cdot Life\ time\ [year] \cdot Grid\ factor\left[{}^{kg\ CO_{2e}}/_{kWh}\right]$$

, where

$$CF = Control\ factor[-] = f(flow - time\ profile,\ Control\ method,\ Part\ load\ efficiency)$$[6]

$$RH\left[{}^{h}/_{year}\right] = Running\ Hours$$

$$P1_{nominal}[kW] = Hydraulic\ power/(\eta_{pump} \cdot \eta_{motor} \cdot \eta_{VSD})$$[7]

$$Hydraulic\ power\ [kW] = Q\left[{}^{m^3}/_{h}\right] \cdot H[m] \cdot Conversion\ factor$$

The following subsections will explain the different parts of this equation in details

3.1 Nominal Power

Figure 3 shows the different powers in a pump unit and how they are defined. The hydraulic power P_{hyd} is the power determined by the flow through the pump and the head across the pump. The shaft power is the power determined by the torque and speed of the shaft driving the pump. The power input P_1 is the electrical power delivered by the grid to the VSD or the motor in cases where no VSD is fitted.

The nominal Power could be the average for a pump type or if there is proven record for bigger engineered pumps the actual consumption at the duty point.

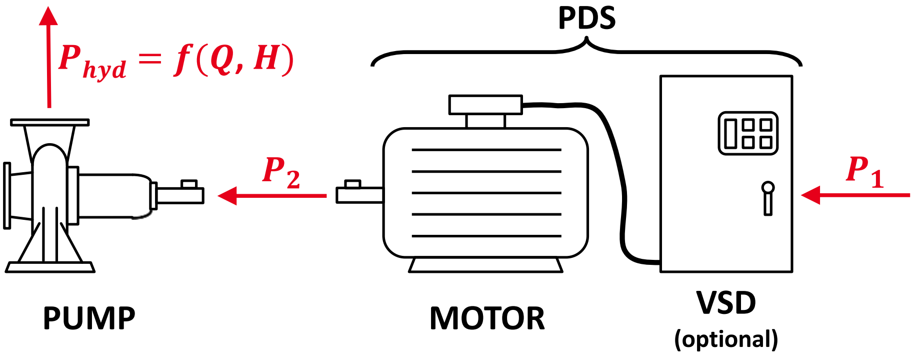

Figure 3 - Definition of *Powers* in a pump unit. The combined motor and CDM (VSD) is referred to as a Power Drive System (PDS)

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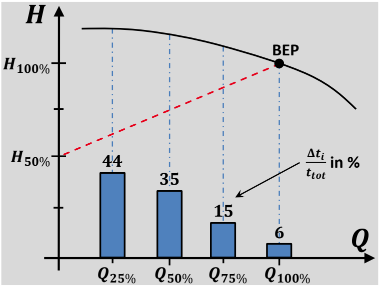
[6] The control factor converts the nominal power input ($P_{1,nominal}[kW]$) into an annual average power input

[7] The efficiency of the variable speed drive (η_{VSD}) is set to 1.0 as it is included in the control factor for use with VSD

3.1.1 Flow-time profile for variable flow systems

Based on studies of HVAC systems a load time profile has been developed [4]. The load profile for these systems is shown in Figure 4



	Flow [%]	Time [%]
L_1	100	6
L_2	75	15
L_3	50	35
L_4	25	44

Figure 4 - Flow-time profile variable flow systems

The flow-time profile distribution shows that these pumps are running a significant amount of the time at part load. Nearly 80% of the time at 50% load or below and only 6% of the time at full load. This is due to the heating and cooling load and the nonlinearities in the HVAC system.

This load profile provides a reasonable basis to reflect variable system demand in various applications and therefore can be used to derive the default value for GHG emissions calculation for variable loads. If specific use cases require a more in-depth analysis and creation of a dedicated load profile these assumptions can be used instead but need to be documented for future review.

3.1.2 Reference control curve for variable flow systems

At part load the pump head can be reduced due to reduction in friction losses in the system. An energy efficient pump control must take that into account. For that reason a reference control curve for variable flow systems (variable system demand) in building services applications is defined as a linear curve defined by $(Q_{100\%}, H_{100\%})$ and $(Q_{0\%}, H_{50\%})$. Figure 5 shows the reference control curve as defined for these systems (green line).

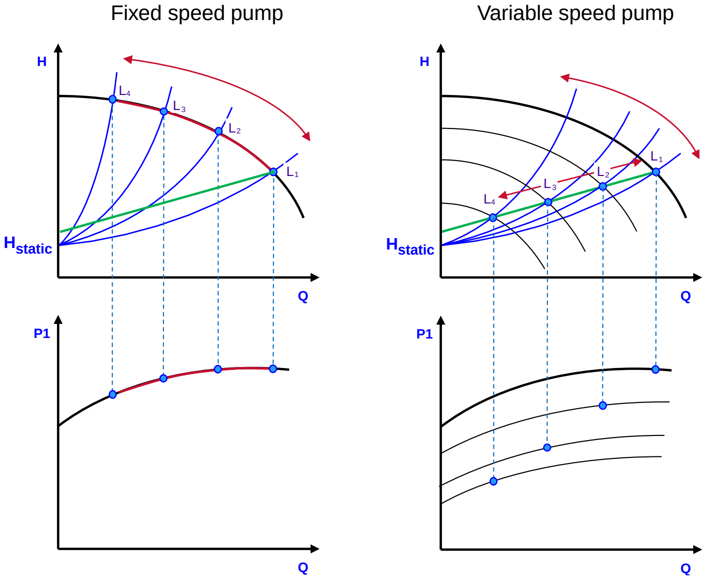


Figure 5 - Reference control curve for variable flow systems

As shown on 5 a reference control like this will imply that a variable speed pump will have considerable lower power input at part load compared to a fixed speed pump as it can adapt itself to the variable system demand.

This means that a variable speed pump, which can operate closer to or at the reference control curve will have lower use phase emissions in an application that demands variable flow.

The formula for the GHG emission calculation for pump units does not reflect differences between variable and constant flow applications. For GHG calculation it is assumed that all systems have variable flow.

3.2 Control factors

For applications with variable load and where the pump can be adapted to this load (e.g. by the use of a VSD) there will be reduced energy consumption compared to a calculation for a static load. These savings can be reflected by a control factor. The control factor is derived from the power consumption at the 4 load points shown in Figures 4 and 5. It combines the flow-time profile, control method and part load efficiency into one number.

A dimensionless pump model is used to calculates the control factors. This model describes the flow depending head as:

$$H = H_0 - \left(\frac{Q}{Q_0}\right)^2$$

, where H_0 and Q_0 are 1.0 at maximum speed of the pump and are adjusted to following values at reduced speed:

H0% values	1,00	0,77	0,59	0,44

These values were adjusted so the pump curve exactly intersect the reference control curve (green line) in at the part flows defined by the flow-time profile.

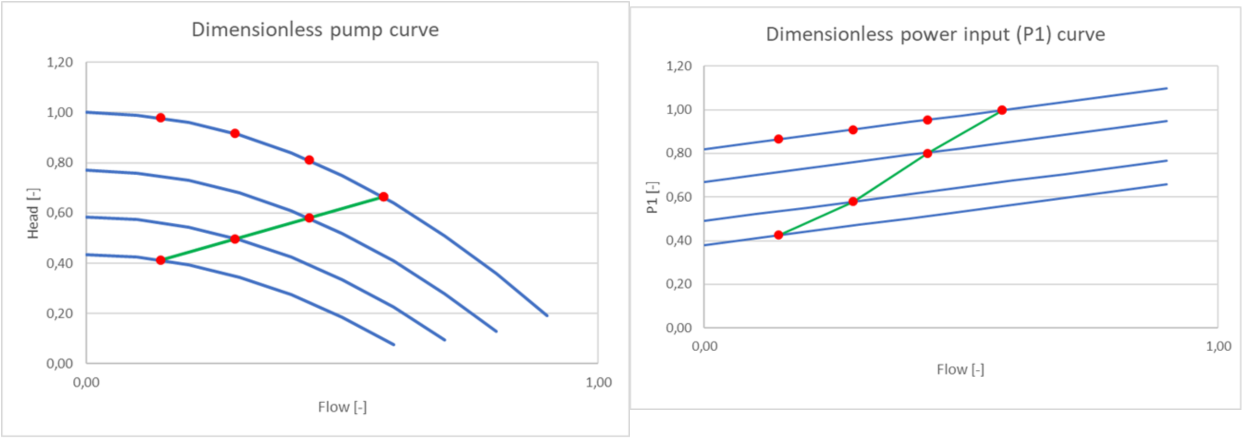


Figure 6 - Dimensionless pump curve and power input curve

The power input of the pump units is modelled as:

$$P_1 = P_0 + Q/\alpha$$

, where $\alpha = 3{,}25$ and P_0 is set to:

P1_max	**P1_75%**	**P1_50%**	**P1_25%**
0.82	0.67	0.49	0.38

The power input model is adjusted to give 1,0 at $Q_{100\%}$, $H_{100\%}$

The Control Factor (CF) converts the nominal power input $P1$ of a pump unit (pump + motor with or without VSD) into an average power input $P1_{AVG} = CF \cdot P1$ therefore reflecting the adaptation to the system demand i.e. lower power input at reduced flow.

Table 2

Control Factor Fixed speed	Q100%	H100%	Flow-time profile	P1 average
	0,58	0,66	0,06	0,06
	0,44	0,81	0,15	0,14
	0,29	0,92	0,35	0,32
	0,15	0,98	0,44	0,38
				0,90
			CF	**0,90**
Control Factor Variable speed	Q100%	H100%	Flow-time profile	P1 average
	0,58	0,66	0,06	0,06
	0,44	0,58	0,15	0,12
	0,29	0,50	0,35	0,20
	0,15	0,41	0,44	0,19
				0,57
			CF	**0,57**

Following control factors can be used as general reference values for emission calculations:

Pumps without VSD[8] : $CF = 0.9$

Pumps with VSD[9]: $CF = 0.57$

If the average power is known or calculated directly or when other, more suitable load profiles are used for specific applications this may result in other control factors. These numbers can be used instead but need to be documented for future review.

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[8] This an average value between S-pumps in variable and constant flow systems. In variable flow systems the value is typically between 0.7-0.8. EC report uses a more conservative value i.e. 0.9 for those systems alone. The value is close to 1.0 in variable flow systems

[9] This is a conservative value taken from EC review report [5]. Most pumps today will have control factors between 0.4-0.5

3.3 Running hours per year

For pump units where running conditions are unknown a value of 5000 hours per year is recommended as the average value across all sectors. This should be used as default value. The default can be reduced or increased accordingly if there is evidence of shorter or longer running hours.

For example GHG emissions for water pump units can use the review study report [5] that indicates running hours from variable flow and constant flow systems. If it is unknown to the manufacturer in which system the pump unit will be installed the average (3625 hours per year) can be used.

Pumps that are sold as backup pumps (redundant service[10]) or for other specific applications e.g. storm water pumps used only in case of flooding will have significantly shorter running hours. In these special cases other running hours (e.g. 250 hours per year) should be used based on empirical knowledge of the specific application.

3.4 Life time

The total life time of a pump depends on the application and pump type. Typical projected lifetimes are in the range between 10 to 20 years. This guidance recommends 10 years as default value.

If other sector specific and publicly accepted data is available the default lifetime should be corrected accordingly e.g. the API 610 11th ed. defines that the design life for pumps according to this standard has to be greater than 20 years.

Lifetime extension can be achieved by correct selection, proper maintenance and operation in the efficiency optimum. The extension of the lifetime of an energy consuming product negatively affects its lifetime emissions and therefore produces a target conflict between durability and use-phase emissions reduction. The GHG protocol guideline proposes to report intensity metrics *“to reduce the potential for emissions data to be misinterpreted”.* [5]

It must be noted that currently applicable intensity metrics that are based on static efficiency like the MEI or efficiency measured according to ISO 9906 do typically not reflect the emissions savings that can be achieved by optimizing the pump for the real system demand over time.

3.5 Grid factor

GHG emissions from the electricity production is expressed by the “grid factor”, which is a factor expressing the GHG emissions in kg of CO2e (total of relevant GHG missions converted to CO2 equivalent emissions) from producing and transmitting one kWh of electricity.[11]
From a technical perspective grid factors can only be seen as a thought model to link emissions caused by power plants to the electricity used. In reality the grid is typically a blend of electricity from many sources with differing carbon intensities, therefore grid factors are an estimate of GHG emissions for a pump motor at any given facility

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[10] Sometimes the load is split equally in redundant services: i.e. if you have 3 pumps, each operates only 33% of the time.

[11] (In literature, emissions factors for producing electricity are reported separately from transmission and distribution (“T&D”) factors. The grid factor is the sum of these two factors.)

Not all grid factors are publicly available but part of paid subscriptions to emissions databases. There are free sources though such as Our World in Data[12] and the IEA[13], which can provide realized estimated grid factor, but projected grid factors which are needed for the emission calculation are normally not free

The European Environment Agency (EEA)[14] provides a projection of all emissions caused by electricity generation within Europe. The projected values are in line with currently applicable reduction targets until 2030 and a presupposition to meet carbon neutrality by 2050. (Figure 7) Reduction of GHG emissions in electricity generation are the most important lever to meet the reductions targets of high energy consuming products such as pumps.
Pumps that are operated solely with energy sources from so-called “emission free” energy sources (e.g. renewables, nuclear energy) would have close to zero emissions during their use phase. It is challenging for pump manufacturers to get a credit for pumps that are used with these energy types, especially for pump types/application where the manufacturer cannot trace the pumps final destination of use.
As pumps have a broad field of application there will be cases where pumps will be operated off-grid e.g. on ships or with different forms of energy like steam turbines or hydraulic power recovery turbines. These use-cases are not reflected in the GHG use phase emissions calculation approach in this EUROPUMP guideline and therefore must be approached with individual formulas based on the specific application type.
For pumps with a long lifetime the grid mix will change over the course of their complete use phase. The savings caused by grid-mix reduction can be implemented by calculating the mean value of emissions at time of placing on the market and end of life of the pump.

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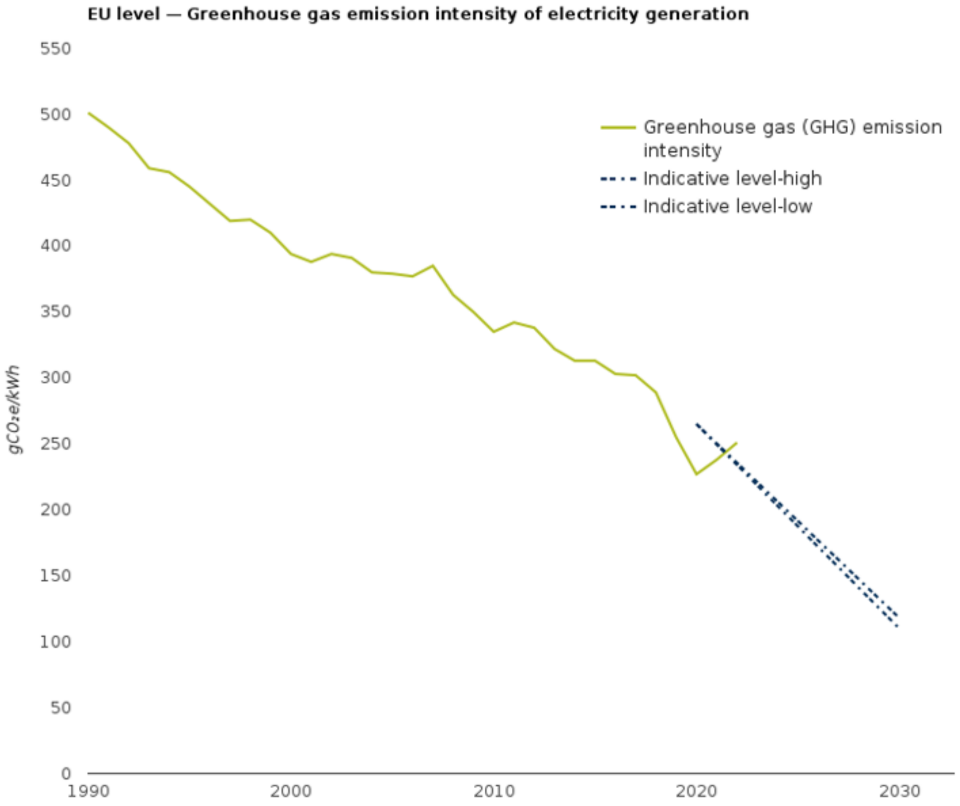
[12] https://ourworldindata.org/grapher/carbon-intensity-electricity

[13] https://www.iea.org/data-and-statistics/charts/development-of-co2-emission-intensity-of-electricity-generation-in-selected-countries-2000-2020

[14] https://www.eea.europa.eu/ims/greenhouse-gas-emission-intensity-of-1



More informationData sources:
National emissions reported to the UNFCCC and to the EU Greenhouse Gas Monitoring Mechanism, October 2023 provided by European Environment Agency (EEA)
Complete energy balances (nrg_bal_c) provided by Statistical Office of the European Union (Eurostat)

Figure 7 - Expected emissions reduction in EU-27

3.6 Calculation examples

The first calculation example is done for a standard ESOB pump for industrial use with a nominal power of 100kW at BEP. The pump is equipped with a VFD. The actual grid mix from the EU-27 is used for the calculation. The pump was taken into service in January 2020.

This leads to the following values:
$P1_{nominal}[kW] = 100\ kW$
$CF[-] = 0.57$

$RH\left[{}^{h}/_{year}\right] = 5000\ h/year$
$Life\ time\ [year] = 10\ years$

$Grid\ factor\left[{}^{g\ CO_{2e}}/_{kWh}\right] @time\ of\ taking\ into\ service = 265\ {}^{g\ CO_{2e}}/_{kWh}$
$Grid\ factor\left[{}^{g\ CO_{2e}}/_{kWh}\right] @time\ of\ taking\ into\ service + 10\ years = 118\ {}^{g\ CO_{2e}}/_{kWh}$

$$100\ kW \cdot 0.57 \cdot 5000\frac{h}{year} \cdot 10\ years \cdot 191.5\left[{}^{g\ CO_{2e}}/_{kWh}\right] = 545775000\ g\ CO_{2e}$$

$$\approx \mathbf{546\ t\ CO_{2e}}$$

The ESOB pump from this example emits approx. 546 tons of CO2 equivalents during its expected use phase.

The second example are two big engineered pumps used for power generation with a nominal power of 300kW at BEP. They are not equipped with a VFD. The place of installation is Sweden and these pumps were taken into service in January 2000. From discussions with the customer it is known that these pumps are running with high availability and in parallel service to ensure continuous operation of 8760 hours/year i.e. only one pump is always running and the other pump acts as backup. The lifetime for both pumps is expected to be at least 20 years.

This leads to the following values:
$P1_{nominal}[kW] = 300\ kW$
$CF[-] = 0.9$

$RH\left[{}^{h}/_{year}\right] = \ 8760\ h/year$
$Life\ time\ [year] = 20\ years$

$Grid\ factor\left[{}^{g\ CO_{2e}}/_{kWh}\right] @time\ of\ taking\ into\ service = 17\ {}^{g\ CO_{2e}}/_{kWh}$
$Grid\ factor\left[{}^{g\ CO_{2e}}/_{kWh}\right] @time\ of\ taking\ into\ service + 20\ years = 8\ {}^{g\ CO_{2e}}/_{kWh}$

$$300\ kW \cdot 0.9 \cdot 7884 \frac{h}{year} \cdot 20\ years \cdot 12.5\left[{}^{g\ CO_{2e}}/_{kWh}\right] = 532170000\ g\ CO_{2e}$$
$$\approx \mathbf{532\ t\ CO_{2e}}$$

Although the 2 pumps in the second example have a significant higher power consumption and are running for longer time their overall emissions are lower (532 tons of CO2 equivalents) than the emissions from one smaller pump with VFD in the first example. This shows the interdependency between the several variables, specific application and effect of the grid factor. In both examples the grid factor is calculated as the average between 2020 grid factor and the 2030 grid factor assuming a linear trend in grid factor reduction. If the trend is not linear the average of every year should be used in the calculations.

4 Conclusion

The purpose of this guideline is to provide guidance for GHG calculation for pump products produced by EUROPUMP members. The actual GHG protocol reporting standard includes that pump manufacturers report Scope 3 downstream emissions including the use phase. In using this guidance, it is important to emphasize use phase emissions will also be reported in the Scope 2 reports of a pump operator. This leads to double counting of emissions.

For the calculation of GHG emissions several variables must be taken into account. The formula used for GHG reporting does not reflect different pump types, service conditions, operation modes and specific applications. EUROPUMP and its United States sister association Hydraulic Institute have created many publications that provide detailed insight into ways to reduce electrical energy consumption of pumps and pump units. These publications had been created from a mainly economical perspective to minimize life cycle cost of pumps but are also useful resources to investigate ways for an emissions reduction in the use phase. [6]

Due to the wide range of products manufactured by EUROPUMP members, a sound and consistent reporting methodology may force for a compromise between accuracy and simplicity. Publicly available and accepted data was used as a basis for this guideline. Where deemed reasonable and accurate the data points are extrapolated from the water sector to other sectors.

The assumed values provided in this guideline give a starting point for GHG emissions calculation and have a conservative bias (i.e. likely overestimate actual use). As more accurate data becomes available calculations can be refined to improve the overall reporting quality.

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