FLEX LTD

# RENEWABLE ENERGY PROGRAM REQUIREMENTS

Compliance with renewable energy program for the data delivery.

Owner: Flex LTD
Flex responsible: Supply Chain Sustainability
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# Contents



# Introduction

This document describes the requirements of the ***Renewable Energy Program*** in order to comply with the deliverables that Flex expects from suppliers regarding their global energy consumption, energy consumption per part number and secondary materials usage.

# Program Deployment

| | |
|---|---|
| First webinar | Nov 30th 2022 |
| Disclosure cycle | Jan 2023 to Aug 2023 |
| Training period | Nov 2022 to Aug 2023 |
| Assistance period | Nov 2022 to Aug 2023 |
| Last day to submit disclosure | Aug 31 2023 |

Suppliers will receive through email webinars invites, resources for disclosure, and any other requirements to be complied in accordance to this program.

# Background

There is a trend within customers' requirements to reduce greenhouse gas impact of energy related activities, to support this Flex has launched a Renewable Energy Program directed to our supply chain partners.

*Energy related activities are responsible for 75% of the global greenhouse gas emissions1*, therefore renewable energy is an approach to reduce emissions associated to energy use.

It is expected that renewable energies play a higher role on greenhouse gas emission reduction due to the feasibility and energy crisis, according to the International Energy Agency, *global renewable capacity is expected to increase by almost 2400GW (75%) from 2022 to 2027*[2].

Initiatives as the European Green Deal are pushing the industry to achieve a sustainable manufacturing through a carbon neutrality and the efficiency of processes.

Flex's Renewable Energy program is focused on electricity and fuels for electricity generation, due to the trend for electrification our facilities and how renewables play a higher role for this carrier.

# Renewable Energy

Renewable energy is defined in the GHG Protocol as *fuels and energy obtained from sourced that are ultimately replenished from natural solar and gravitational energy flows*[3].

Sources are:

- Solar
- Wind
- Hydro
- Geothermal
- Biomass
- Ocean based

Electricity must be generated from any of these sources in order to be considered renewable electricity.

# Applicable sources and technologies

For renewable electricity generation Flex has considered seven applicable sources and technologies:

### Solar PV

Radiation from the sun capable to generate electricity through the photovoltaic effect. Energy will be generated when light impacts a solar module, and this will release an electron.

**Technologies**: Solar PV modules and solar inverters.

### Solar heat

Radiation from the sun capable to generate thermal energy through heat harvesting of water. Electricity is generated by the movement of heated water and steam which rotate a turbine.

**Technologies:** Reflectors and collectors.

### Wind

Energy from the movement of laminar wind. Electricity is generated through the movement of wind which rotates a turbine.

**Technologies:** Wind turbines (offshore & onshore)

### Hydro

Energy sourced by the movement in water, heightened with elevation difference, typically done with a dam. Electricity can be generated through the movement in water which rotates a turbine.

**Technologies:** Turbines (francis, pelton, kaplan, turgo, etc.)

### Biomass*

Fuel in any state (gas, solid or liquid) from organic matter. Electricity can be generated through the combustion of fuels and usage of an internal combustion engine.

**Technologies:** Turbines, IC engines, cogeneration and trigeneration.

**Geothermal**

Energy in the form of heat, emitted from the Earth's crust, typically in the form of hot water or steam. Electricity can be generated through the movement in steam which rotates a turbine.

This process' hot water is reinjected into Earth's reservoir for reheating.

**Technologies:** Turbines

**Ocean-based**

**Tidal energy:** movement of tides, generates electricity through the movement of turbines

**Wave energy:** movement of waves, generates electricity through the rotation or turbines

**Technologies:** tidal stream generators and wave energy converters.

## Procurement Mechanisms

There are two types of renewable energy that can be procured with different mechanisms. Bundled and unbundled energy.

**Bundled energy:** Supply of renewable energy purchased alongside with proof of origin through unbundled energy.

**Unbundled energy:** Tracking system for the proof of origin of renewable energy without actual consumption nor supply, but with credit for CO2 avoidance on energy related activities.

In non-regulated and regulated energy markets, procurement mechanisms represent a method to purchase bundled and unbundled energy, each mechanisms behaves differently and has different requirements.

1. **Power purchase agreements**
   **On-site**
   Agreements by on-site generation, typically free of charge for installation and users get billed for energy generation at a lower fee than their energy suppliers, contracts usually take in place for a specific time, after that the user can become the owner of the power plant.
   **Off-site**

agreement between a consumer and a generator of renewable energy, **a contract takes in place with a fixed price**, this provides a guarantee of predicting your energy prices, nevertheless consumer must pay fees for sleeving (utility & network) management.

### Virtual PPA

Agreement between a consumer and generator of renewable electricity, this were designed for large scale consumers, giving a possibility of being 100% RE. In the contract the energy is defined at a fixed price, but the generator receives the floating market price, further on this:

- If the energy market price is lower than the fixed price, off-taker must pay the market price
- If the energy market price is higher than the fixed price, off-taker will receive the difference.

Energy will never be provided to the off-taker, energy will be assured in energy attribute certificates.

## 2. Energy attribute certificates

Contractual instruments to convey information about produced renewable electricity, such as source and amount, one EAC is equivalent to one megawatt hour of renewable energy

### On-site

Through a certified renewable energy power plant installed within the organizational boundary limits through a GHG approved tracking system or in a local energy market tracking system

### Off-site

Through a certified renewable energy power plant installed outside the organizational boundary limits through a GHG approved tracking system or in a local energy market tracking system

### Tracking system

Through another party (generator of energy) must have validity in a tracking system approved by GHG or in a local energy market tracking system.

There are over 12 approved GHG protocol tracking systems for unbundled energy and numerous local energy market tracking systems.

Any of these have validity for claiming renewable energy environmental benefits.

### Energy supplier

#### Green tariff

Long term program used in regulated energy markets to procure renewable electricity at a special utility tariff rate, this mechanism can be used up to 100% of RE, are accompanied with an attribute certificate to claim sustainable benefits.

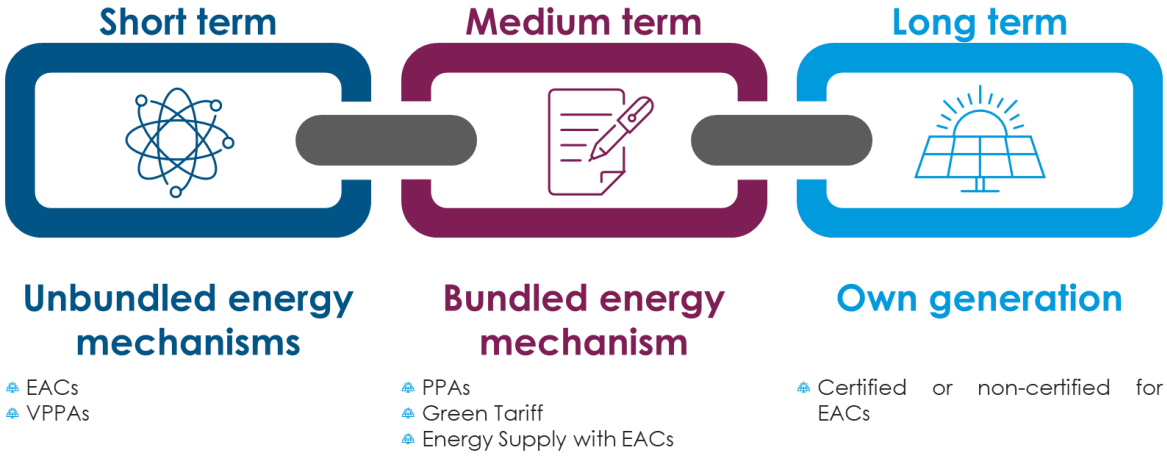
#### Proof of origin (EACs)

Agreements between supplier and consumer can be held for the procurement of the EACs from the energy sold.

Each mechanism has different characteristics that define their market behavior, as well as their opportunity to be implemented throughout an organization.

Flex has categorized them into short, medium, and long-term depending on their feasibility and accessibility.

A configuration between any of these can provision a more reliable renewable energy transition.



# Deliverables

The program is focused on electricity and fuels for electricity generation in case a supplier has its own energy plant powered with biofuels or fuels.

Supplier has been or will be provided with an excel file ***RE_PROGRAM_DISCLOSURE.xlsx*** for disclosing global energy consumption, renewable electricity, renewable fuels consumption, procurement methods, targets and more.

Flex has developed a guide for users to understand how to use provided calculation tools.

## Energy scope

An example with created data.

**Supplier Data**

| | | | |
|---|---|---|---|
| Supplier Name | XXXX | Supplier's Contact Details | XXXX |
| | | Supplier's POC | aaa@abc.com |
| | | Supplier's POC Role | GAM |

**Global Questions**

| | |
|---|---|
| Initial date for Energy Base Line (12 months) | 1/1/2022 |
| End date for Energy Base Line (12 months) | 12/31/2022 |

| 1 Are you using renewable energy (RE)? | 2 Future Global RE strategies | 3 RE100 Member? | 4 Consumption of RE in (MWH) | Total=electricity+steam+heat+cooling+fuels: Consumption of non-RE in (MWH) | Total=electricity+steam+heat+cooling+fuels: Total Consumption in MWH | Total=electricity+steam+heat+cooling+fuels: RE Usage |
|---|---|---|---|---|---|---|
| Yes | We introduced renewable energies and planing to incr | No | 83,711 | 3,033,762 | 3,117,473 | 3% |

**Global Questions by Energy Carrier**

| 5 Energy Carrier | Consumption of RE in (MWH) | 6 Consumption of non-RE in (MWH) | Procurement Strategies: Only required for RE: 7 Procurement Method | 8 Actual RE Source | 9 RE Usage % | 10 Site where energy is being used | 11 EACs Applicable to energy market |
|---|---|---|---|---|---|---|---|
| Electricity | 74,218.00 | 1,189,190.00 | On site generation: EACs gene | Solar Power | 16% | Guad North | Other, specify in next colum |
| | | | On site generation: EACs gene | Solar Power | 12% | Milpitas | REC |
| | | | Off-site generation: PPA/sleev | Renewable mix | 14% | Zala | GOO |
| | | | Unblundled EAC's (GOOs, REC | Renewable mix | 18% | Zhenzhen | I-REC |
| | | | Unblundled EAC's (GOOs, REC | Solar Power | 6% | San Luis Rio Colorado | I-REC |
| | | | Unblundled EAC's (GOOs, REC | Biomass (biofuels) | 16% | Wuzong | I-REC |
| | | | Off-site generation: Green Pov | Renewable mix | 18% | Penang | Other, specify in next colum |
| Fuels | 15.00 | 383,309.00 | Other: my organization does n | Biomass (biofuels) | 100% | Mexico | None, this procurement method doesn |

**Global Renewable Energy Targets**

| Year | 12 Renewable energy targets | 13 Renewable energy consumption estimation | 14 Energy source planned to achieve target | 15 Procurement Method planned to achieve target | 16 Comments |
|---|---|---|---|---|---|
| 2025 | 60% | 100,453.20 | Renewable mix | Off-site generation: PPA/sle | RE usage through procurement of energy attributes & power agreements |
| | | | Renewable mix | Unblundled EAC's (GOOs, R | |
| 2030 | 75% | 125,566.50 | Renewable mix | Off-site generation: PPA/sle | Planned increase through power agreements |
| 2040 | 90% | 156,958.13 | Biomass (biofuels) | Onsite generation: NO EAC | Planned increase through installation of cogeneration plant |
| 2050 | 100% | 196,197.66 | Renewable mix | Unblundled EAC's (GOOs, R | Planned increase through procurement of unbundled I-RECs |
| 2050 | 100% | 2,788,389.84 | | | |

**1** For organizations that consume renewable energy all points are mandatory.
For organizations that are not consuming renewable energy, points 7,8,9,10&11 are not mandatory.

**2** If your organization has considered increasing your renewable energy consumption, select one strategy that fits the most to yours.

**3** Select Y/N/I don't know if your organization is part of the RE100 initiative

**4** Auto-calculated answer

**5** The two energy carriers the program is focused on

**6** Consumption must be separated between renewable and non-renewable, considering sources described in applicable sources and technologies.

**7** Select the procurement method, described in

**8** Select renewable source considering sources described in applicable sources and technologies.

**9** 100% of RE consumption must be disclosed

**10** The sites/facilities where renewable energy is being procured/consumed must be disclosed

**11** Disclosure of the name from the energy attribute certificate, it can be found on the data validation or can be written in the next column

**12** If organization has set renewable targets, share % consumption aligned to established years.
If organization has not set renewable targets, share an estimate % consumption aligned to established years.

**13** If organization has set renewable targets, share consumption aligned to established years.
If organization has not set renewable targets, share an estimate consumption aligned to established years.

**14** If organization has set renewable targets, share renewable sources aligned to established years.
If organization has not set renewable targets, share an estimate of renewable sources aligned to established years.

**15** If organization has set renewable targets, share procurement methods aligned to established years.
If organization has not set renewable targets, share an estimate of procurement methods sources aligned to established years.

**16** Empty space to write any comments for each target year

# Greenhouse gas scope

| Global Questions for GHG | | | | | | |
|---|---|---|---|---|---|---|
| Initial date for GHG data | 1/1/2022 | | | | | |
| End date for GHG data | 12/31/2022 | | | | | |
| 17 Do you calculate Greenhouse gas (GHG) emissions? | 18 According to which guideline? | 19 What were your organizations gross global Scope 1 emissions in metric Tons CO2 e? | 20 For scope 2, are your calculations location or market based? | 21 What were your organizations gross global Scope 2 emissions in metric Tons CO2e? | 22 Did you have an emissions target that was active in the reporting year? | 23 In case you didn't have an emissions target, explain how this will change in the next 5 years |
| Yes | GHG Protocol | 84,053.00 | Location-based | 8,349,383.00 | None | Other, specifiy in next line |

**17** Select Y/N if your organization calculates greenhouse gas emissions If your organization doesn't calculate emissions, point 18 to 22 are not mandatory

**18** Write to which guideline does your organization calculates emissions

**19** Open question to your direct emissions in metric tons of CO2e

**20** Select your calculation for scope 2

**21** Open question to your indirect emissions of scope 2 in metric tons of CO2e, either in location or market based.

**22** If your organization had an emissions target in 2022, select Y/N

**23** If your organization has not set an emissions target, describe if your organization has a plan to set one.

# Scrap scope

| Global Questions for Scrap | | | | | | |
|---|---|---|---|---|---|---|
| Initial date for scrap data | 1/1/2022 | | | | | |
| End date for scrap data | 12/31/2022 | | | | | |
| 24 Do you know an average on your products secondary materials? | 25 Please share an average on your products pre-consumer material % | 26 Please share an average on your products post-consumer material % | 27 Please share an average on your products re-utilization material % | | | |
| Yes | 12.00% | 8.00% | 7.00% | | | |
| 28 Do you produce plastics? | 29 Please share an average on the filler content % | 30 Please share an average on the secondary filler content % | 31 In case you produce plastics, do you know the fiber content? | 32 Please share an average on the fiber content % | 33 Please share an average on the secondary fiber content % | |
| Yes | 14% | 4% | Do not know | NA | NA | |

**24** Select Y/N if you have an average of secondary materials usage on your manufacturing processes

**25** Write an estimate % of the pre-consumer material usage on your products

**26** Write an estimate % of the post-consumer material usage on your products

**27** Write an estimate % of the re-utilization material usage on your products

**28** Select Y/N if your organization manufactures

**29** Write an average % of the filler use on your plastic products

**30** Write an average % of the secondary filler use on your plastic products

**31** Select Y/N/Don't know of the fiber content of your plastic products

**32** Write an average % of the fiber use on your plastic products

**33** Write an average % of the secondary fiber use on your plastic products

# Energy per part number (energy intensity)

| Energy usage | | | Energy model | | 35 CORRECT |
|---|---|---|---|---|---|
| Month | 33 Electricity + Fuels for electricity generation (kWh) | 34 End product (pcs) | Predicted | Deviation | EE |
| 1 | 15,094,869 | 7,857,783 | 15,700,789 | -605,920 | -0.58555246 |
| 2 | 14,136,148 | 7,610,815 | 15,541,196 | -1,405,048 | -1.35781847 |
| 3 | 16,893,312 | 10,316,339 | 17,289,529 | -396,217 | -0.38289827 |
| 4 | 15,371,029 | 8,299,455 | 15,986,201 | -615,172 | -0.59449326 |
| 5 | 17,863,939 | 11,362,757 | 17,965,733 | -101,794 | -0.09837242 |
| 6 | 17,924,053 | 11,835,524 | 18,271,239 | -347,186 | -0.33551518 |
| 7 | 18,453,976 | 10,392,839 | 17,338,964 | 1,115,013 | 1.07753228 |
| 8 | 18,570,216 | 10,726,077 | 17,554,305 | 1,015,912 | 0.98176227 |
| 9 | 17,637,648 | 13,234,706 | 19,175,402 | -1,537,754 | -1.48606321 |
| 10 | 18,771,607 | 10,448,107 | 17,374,678 | 1,396,928 | 1.34997139 |
| 11 | 17,250,821 | 8,992,037 | 16,433,754 | 817,068 | 0.78960227 |
| 12 | 16,967,410 | 8,790,068 | 16,303,240 | 664,171 | 0.64184505 |
| Grand Total | 204,935,029 | 119,866,507 | 204,935,029 | 0.00000000 | 0.00000000 |
| Average | 17,077,919 | | | | |
| Std deviation | 1,483,616 | | | | |
| CV | 9% | | | | |

| | | |
|---|---|---|
| 36 T statistic | 3.55 | 5.77 |
| Coefficients | 0.6462 | 10,623,024 |
| EE Coffiecients | 0.18 | 1,841,987 |
| 37 R2 & REMC | 0.5578 | 1,034,784 |
| Estad. F & GL | 12.61 | 10.00 |
| Cuadratic sum | 13,504,521,378,306 | 10,707,772,232,943 |
| 38 CV (REMc) | 6% | |

| | | |
|---|---|---|
| Extrapolated energy used for MFG 39 | 0.6462 | kWh/end product |
| Estimated energy usage for non MFG 40 | 127,476,284 | kWh/yr |

**33** Electricity / fuels for electricity generation consumption per month

**34** Quantity of end products to correlate point 33

**35** If model is correct/incorrect, excel will provide feedback

**36** Correlation between coefficients, must be over 2.

**37** Correlation between different values of electricity, must be over 0.50

**38** Variation of the quadratic error must be lower than 20%

**39** Energy is separated from manufacturing processes and other services and can be extrapolated

**40** Energy is separated from manufacturing processes and other services and can be extrapolated

## References

1. Initiative for Climate Action Transparency (2020). "*Renewable Energy Methodology: Assessing the greenhouse gas impacts of renewable energy policies*".
2. International Agency of Energy (2022), "*Renewables 2022*".
3. Greenhouse Gas Protocol (2004). "*The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard*".

FLEX LTD

# 可再生能源计划要求

符合可再生能源计划的数据传输

所有者: Flex LTD
FLEX 负责任的: Supply Chain Sustainability
联系人: flex.gpsc@flex.com

# 内容



# 介绍

本文件描述了可再生能源计划的要求，以符合 Flex 期望供应商在全球能源消耗、每个零件号的能源消耗和二次材料使用方面的可交付成果。

# 项目部署

| | |
|---|---|
| 首次网络研讨会 | 2022 年 11 月 30 日 |
| 披露周期 | 2023 年 1 月至 2023 年 8 月 |
| 培训期 | 2023 年 11 月至 2023 年 8 月 |
| 援助期 | 2023 年 11 月至 2023 年 8 月 |
| 提交披露的最后一天 | 2023 年 8 月 31 日 |

供应商将通过电子邮件收到网络研讨会邀请、披露资源以及根据本计划应遵守的任何其他要求。

## 背景

客户要求减少能源相关活动对温室气体的影响，为支持这一趋势，Flex针对我们的供应链合作伙伴推出了一项可再生能源计划。

能源相关的活动造成了全球温室气体排放 1 类的 75%，因此使用可再生能源是减少与能源使用相关排放的一种方法。

由于可行性和能源危机，预计可再生能源将在温室气体减排方面发挥更大的作用。根据国际能源署（IEA）的数据，从 2022 年到 2027 年，全球可再生能源容量预计将增加近 2400GW（75%）[2]。

欧洲绿色协议等倡议正在推动该行业通过碳中和和提高流程效率实现可持续制造。

FLEX 的可再生能源计划专注于用于发电的电力和燃料，这是由于我们厂区的电气化趋势以及可再生能源如何在该运营商中发挥更大的作用。

## 可再生资源

《温室气体议定书》将可再生能源定义为最终由自然太阳能和重力能量流 3 补充的燃料和能源。

来源指：

- 太阳能
- 风能
- 水电
- 地热

- 生物量
- 基于海洋

电力必须由这些来源中的任何一种产生，才能被视为可再生电力。

## 适用的来源和技术

对于可再生能源发电，FLEX 考虑了七种适用的来源和技术：

### 太阳能光伏

来自太阳的辐射能够通过光生伏电效应产生电能。当光撞击太阳能模块时，就会产生能量，并释放出一个电子。

**技术：**太阳能光伏组件和太阳能逆变器。

### 太阳热

来自太阳的辐射能够通过水的热量收集产生热能。电是通过热水和蒸汽的运动使涡轮机旋转产生的。

**技术：**反射器和收集器。

### 风

来自层流风运动的能量。电力是通过风力带动涡轮机旋转而产生的。

**技术：**风力涡轮机（海上和陆上）

### 水电

能量来源于水中的运动，随着高差而升高，通常由水坝完成。电力可以通过在水中旋转涡轮机的运动来产生。

**技术：**涡轮机（弗朗西斯、佩尔顿、卡普兰、图尔戈等）

### 生物量*

来自有机物的任何状态（气体、固体或液体）的燃料。电可以通过燃料的燃烧和内燃机的使用来产生。

**技术：**涡轮机，内燃机，热电联产和三联产。

### 地热

以热的形式存在的能量，从地壳中散发出来，通常以热水或蒸汽的形式存在。可以通过使涡轮机旋转的蒸汽运动来发电。在这个过程中，热水被重新注入到地球的水库中进行再加热。

**技术：**涡轮机

### 基于海洋

**潮汐能：**潮汐的运动，通过涡轮机的运动产生电力

**波浪能：**波浪的运动，通过旋转或涡轮发电

**技术：**潮汐流发电机和波浪能转换器。

## 采购机制

有两种类型的可再生能源可以通过不同的机制获得。捆绑和非捆绑能量。

**捆绑式能源：**通过非捆绑能源购买的可再生能源供应以及原产地证明。

**非捆绑能源：**可再生能源来源证明的跟踪系统，没有实际消费及供应，但在能源相关活动中避免二氧化碳排放。在非监管和监管的能源市场中，采购机制代表了一种购买捆绑和非捆绑能源的方法，每种机制的行为不同，要求也不同。

1. 购电协议

现场

现场发电协议，通常免费安装，用户以比其能源供应商更低的费用收取能源发电费用，合同通常在特定时间内生效，之后用户可以成为发电厂的所有者。

场外

消费者和可再生能源发电商之间的协议，以固定价格签订合同，这为预测能源价格提供了保证，但消费者必须为套管（公用事业和网络）管理支付费用。

**虚拟**

消费者和可再生电力发电商之间的协议，这是为大规模消费者设计的，提供了 100%可再生能源的可能性。在合同中，能源被定义为固定价格，但发电商收到的是浮动市场价格，进一步说明：

- 如果能源市场价格低于固定价格，承购商必须支付市场价格
- 购电方将获得差价。

能源将不会提供给承购商，能源将在能源属性证书中得到保证。

2. 能量属性证书

合同工具传达有关生产的可再生电力的信息，如来源和数量，一个 EAC 相当于一兆瓦时的可再生能源

### 现场

通过在组织边界范围内安装的经认证的可再生能源发电厂，通过经批准的 GHG 跟踪系统或当地能源市场跟踪系统

### 场外

通过在组织边界限制之外安装的经认证的可再生能源发电厂，通过经批准的 GHG 跟踪系统或在当地能源市场跟踪系统中

### 追踪系统

通过另一方（能源生产商）必须在 GHG 批准的跟踪系统或当地能源市场跟踪系统中有效。

有超过 12 个经批准的非捆绑能源温室气体协议跟踪系统和众多的本地能源市场跟踪系统。

其中任何一个都可以有效地宣称可再生能源的环境效益。

## 能源供应商

### 绿色关税

在受监管的能源市场中使用的长期计划，以特殊的公用事业费率采购可再生电力，该机制可用于高达 100%的可再生能源，并附有属性证书，以获得可持续利益。

### 原产地证明（**EACS**）

供应商和消费者之间可以达成协议，从出售的能源中采购 EAC.

每个机制都有不同的特征，这些特征定义了它们的市场行为，以及它们在整个组织中实施的机会。

根据其可行性和可访问性，Flex 将其分为短期、中期和长期。

任何这些之间的配置都可以提供更可靠的可再生能源过渡。

## 可交付成果

如果供应商拥有自己的以生物燃料或燃料为动力的能源工厂，则该计划的重点是用于发电的电力和燃料。

供应商已经或者将收到一个 Excel 文件"_计划_披露.xlsx "，用于披露全球能源消耗、可再生电力、可再生燃料消耗、采购方法、目标等。

Flex 为用户开发了一个指南，以了解如何使用所提供的计算工具。

## 能量范围

已创建数据的示例

**供应商数据**

| | | | |
|---|---|---|---|
| 供应商名称 | XXXX | 供应商联系方式 | XXXX |
| | | 供应商负责人 | aaa@abc.com |
| | | 供应商负责人角色 | GAM |

**全球问题**

| | |
|---|---|
| 能量基准线的初始日期 | 1/1/2022 |
| 能量基准线的结束日期 | 12/31/2022 |

| 1 您在使用可再生能源吗: | 2 未来的全球可再生能源战略 | 3 是RE100成员吗？ | 总计=电力+蒸汽+热能+冷能+燃料 4 可再生能源消耗量（单位兆瓦时） | 非可再生能源消耗量（单位兆瓦时） | 总消耗量（单位兆瓦时） | 可再生能源使用 |
|---|---|---|---|---|---|---|
| Yes/是 | We introduced renewable energies and planing to incr | No/否 | 804,623 | 2,383,234 | 3,187,857 | 25% |

**能源载体的全球问题**

| 5 能源载体 | 可再生能源消耗量（单位兆瓦时） | 6 非可再生能源消耗量（单位兆瓦时） | 采购策略：仅可再生能源需要 7 采购方法 | 8 实际可再生能源来源 | 9 再生能源使用 | 10 能源使用的工厂 | 适用于能源市场的能源属性证书 11 |
|---|---|---|---|---|---|---|---|
| 电力 | 237,229.00 | 2,383,234.00 | On site generation: EACs gene | Solar Power/太阳能 | 16% | Guad | Other,specifiy in next line/其他CEL |
| | | | On site generation: EACs gene | Solar Power/太阳能 | 12% | Milpitas | REC |
| | | | Off-site generation: PPA/sleev | Renewable mix/可再生源混合 | 14% | Zala | GOO |
| | | | Unblundled EAC's//不明原因的 | Wind/风能 | 22% | Zhenzhen | I-REC |
| | | | Onsite generation: NO EACs g | Solar Power/太阳能 | 18% | SLC | I-REC |
| | | | Unblundled EAC's//不明原因的 | Biomass (biofuels)/生物能（ | 10% | Wuzong | I-REC |
| | | | Unblundled EAC's// 不明原因的 EAC | Wind/风能 | 8% | Penang | Other,specifiy in next line/其他mGAT |
| 发电燃料 | 567,394.00 | 0.00 | Other: my organization does n | Biomass (biofuels)/生物能（ | 100% | Mexico | None, this procurement method doesn |

**全球可再生能源目标**

| 年 | 12 可再生能源目标 | 13 可再生能源消耗估算 | 14 计划实现目标的能源来源 | 15 计划实现目标的采购方法 | 16 评论 |
|---|---|---|---|---|---|
| 2025 | 60% | 100,453.00 | Renewable mix/可再生源混合 | Off-site generation: PPA/sle<br>Unblundled EAC's//不明原因 | |
| 2030 | 75% | 125,566.00 | Renewable mix/可再生源混合 | Onsite generation: NO EAC<br>Unblundled EAC's//不明原因 | |
| 2040 | 90% | 156,958.00 | Renewable mix/可再生源混合 | On site generation: EACs ge<br>Off-site generation: Green F<br>Unblundled EAC's//不明原因 | |
| 2050 | 100% | 196,197.00 | Renewable mix/可再生源混合 | On site generation: EACs ge<br>Off-site generation: Green F<br>Unblundled EAC's//不明原因 | |
| 2050 | 100% | 196,197.00 | Renewable mix/可再生源混合 | On site generation: EACs ge<br>Off-site generation: Green F<br>Unblundled EAC's//不明原因 | |

**1** 对于使用可再生能源的组织，所有部分都是强制性的。对于不使用可再生能源的组织，第 7、8、9、10 和 11 点不是强制性的。

**2** 如果您的组织已考虑增加可再生能源消耗，请选择一种最适合您的策略。

**3** 选择 Y/N/我不知道您的组织是否是 RE100 计划的一部分

**4** 自动计算答案

**5** 该计划关注的两个能源载体

**6** 考虑到适用的来源和技术中所述的来源，消耗必须区分可再生能源和不可再生能源。

**7** 选择采购方法，如文中所述

**8** 考虑到适用来源和技术中所述的来源，选择可再生来源。

**9** 必须披露 100%的可再生能源消耗量

**10** 必须披露采购/消耗可再生能源的厂区/设施

**11** 从能源属性证书的名称披露，可以在数据验证上找到或可以写在下一栏。

**12** 如果组织设定了可再生能源目标，则应根据既定年份分配消耗百分比。
如果组织尚未设定可再生能源目标，则分享与既定年份一致的估计消耗百分比。

**13** 如果组织已设定可再生能源目标，则应根据既定年份分配消耗量。
如果组织尚未设定可再生能源目标，则分享与既定年份一致的估计消耗量。

**14** 如果组织设定了可再生能源目标，则共享与既定年份一致的可再生能源。
如果组织尚未设定可再生能源目标，则分享与既定年份一致的可再生能源估计值。

**15** 如果组织已设定可更新目标，则共享与既定年份一致的采购方法。
如果组织没有设定可更新的目标，则分享与既定年份一致的采购方法来源的估计。

**16** 为每个目标年写下任何评论的空白空间

# 温室气体范围

| 温室气体全球问题 | | | | | | |
|---|---|---|---|---|---|---|
| 温室气体数据的初始日期 | 1/1/2022 | | | | | |
| 温室气体数据的结束日期 | 12/31/2022 | | | | | |
| 17 | 18 | 19 | 20 | 21 | 22 | 23 |
| 您计算了温室气体排放量吗？ | 根据哪个指南？ | 您的组织的全球范围1排放总量是多少（单位：公吨二氧化碳当量） | 对于范围2，您的计算是基于位置还是基于市场？ | 您的组织的全球范围2排放总量是多少（单位：公吨二氧化碳当量） | 报告年度，您是否有现行的排放目标？ | 如果您还没有排放目标，请解释未来5年将会发生的变化 |
| Yes/是 | GHG Protocol | 84,053.00 | ocation-based/基于位置 | 8,349,383.00 | No/否 | Important but not an immediate bu |

**17** 如果您的组织计算温室气体排放量，请选择是/否；如果您的组织不计算排放量，则第 18 至 22 点不是强制性的。

**18** 请写下您的组织按照什么准则计算排放量

**19** 关于你的直接排放量（以公吨二氧化碳当量为单位）的开放式问题

**20** 选择范围 2 的计算

**21** 对您的间接排放范围 2（以公吨二氧化碳当量为单位）的开放式问题，无论是基于地点还是基于市场。

**22** 如果您的组织在 2022 年有排放目标，请选择 Y/N

**23** 如果您的组织尚未设定排放目标，请说明您的组织是否有设定排放目标的计划。

# 报废范围

| 全球废料问题 | | | | | | |
|---|---|---|---|---|---|---|
| 废料数据的初始日期 | 1/1/2022 | | | | | |
| 废料数据的结束日期 | 12/31/2022 | | | | | |
| 您知道您的产品二次材料的平均值吗？ | 请分享您的产品消费前材料的平均值% | 请分享您的产品消费后材料的平均值% | 请分享您的产品再利用材料的平均值% | | | |
| 24 Yes/是 | 25 12.00% | 26 8.00% | 27 7.00% | | | |
| 您生产塑料吗？ | 请分享填料含量平均值% | 请分享二次填料含量平均值% | 如果您生产塑料，您知道纤维含量吗？ | 请分享填料含量平均值% | 请分享二次填料含量平均值% | |
| 28 Yes/是 | 29 14% | 30 4% | 31 Do not know/不知道 | 32 NA | 33 NA | |

**24** 如果您的制造流程中有平均次级物料用量，请选择 Y/N

**25** 写下产品消费前材料使用的估计百分比

**26** 写下产品消费后材料使用的估计百分比

**27** 写下您的产品上重复利用材料使用的估计百分比

**28** 如果您的组织是制造商，请选择 Y/N

**29** 在塑料产品上写下填料使用的平均百分比

**30** 写下塑料制品上使用的二次填料的平均百分比

**31** 选择是/否/不知道塑料产品的纤维含量

**32** 写下你的塑料产品使用的纤维的平均百分比。

**33** 写下塑料产品中二次纤维使用的平均百分比

## 每个零件号的能量（能量强度）

| Energy usage | | | Energy model | | 35 CORRECT |
|---|---|---|---|---|---|
| Month | 33 Electricity + Fuels for electricity generation (kWh) | 34 End product (pcs) | Predicted | Deviation | EE |
| 1 | 15,094,869 | 7,857,783 | 15,700,789 | -605,920 | -0.58555246 |
| 2 | 14,136,148 | 7,610,815 | 15,541,196 | -1,405,048 | -1.35781847 |
| 3 | 16,893,312 | 10,316,339 | 17,289,529 | -396,217 | -0.38289827 |
| 4 | 15,371,029 | 8,299,455 | 15,986,201 | -615,172 | -0.59449326 |
| 5 | 17,863,939 | 11,362,757 | 17,965,733 | -101,794 | -0.09837242 |
| 6 | 17,924,053 | 11,835,524 | 18,271,239 | -347,186 | -0.33551518 |
| 7 | 18,453,976 | 10,392,839 | 17,338,964 | 1,115,013 | 1.07753228 |
| 8 | 18,570,216 | 10,726,077 | 17,554,305 | 1,015,912 | 0.98176227 |
| 9 | 17,637,648 | 13,234,706 | 19,175,402 | -1,537,754 | -1.48606321 |
| 10 | 18,771,607 | 10,448,107 | 17,374,678 | 1,396,928 | 1.34997139 |
| 11 | 17,250,821 | 8,992,037 | 16,433,754 | 817,068 | 0.78960227 |
| 12 | 16,967,410 | 8,790,068 | 16,303,240 | 664,171 | 0.64184505 |
| Grand Total | 204,935,029 | 119,866,507 | **204,935,029** | **0.00000000** | **0.00000000** |
| Average | 17,077,919 | | | | |
| Std deviation | 1,483,616 | | | | |
| CV | 9% | | | | |

| | | |
|---|---|---|
| 36 T statistic | **3.55** | **5.77** |
| Coefficients | **0.6462** | **10,623,024** |
| EE Coffiecients | 0.18 | 1,841,987 |
| 37 R2 & REMC | **0.5578** | 1,034,784 |
| Estad. F & GL | 12.61 | 10.00 |
| Cuadratic sum | 13,504,521,378,306 | 10,707,772,232,943 |
| 38 CV (REMc) | **6%** | |

| | | |
|---|---|---|
| Extrapolated energy used for MFG 39 | **0.6462** | **kWh/end product** |
| Estimated energy usage for non MFG 40 | 127,476,284 | kWh/yr |

**33** 每月发电消耗的电力/燃料

**34** 关联点 33 的最终产品数量

**35** 如果模型正确/不正确，Excel 将提供反馈

**36** 系数之间的相关性必须大于 2。

**37** 不同电量值之间的相关性必须大于 0.50

**38** 二次误差的变化必须低于 20%

**39** 能源是从制造过程和其他服务中分离出来的，可以外推。

**40** 能源是从制造过程和其他服务中分离出来的，可以外推。

## 参考文献

1. *气候行动透明度倡议（2020）。 "可再生能源方法：评估可再生能源政策的温室气体影响"。*
2. *国际能源机构（2022）， "可再生能源 2022 "。*
3. *温室气体议定书（2004 年）。"温室气体议定书：公司会计和报告准则"*

# Energy Calculations

## Conversions for energy carriers

In order to create a single unit for all energy uses, in **Table 1.3 from RE Survey Calculations** file you will be able to **convert energy units to MWh.**

## Table 1.3 Conversion of units for Energy Carriers to MWh.

**Results**

| Table 1.3 For Energy Carriers | | | | |
|---|---|---|---|---|
| Energy Carrier | Energy unit | | Amount to convert | Converted amount |
| | | | | MWh |
| Cooling | TOR | | 789,966.00 | 2,776 |
| Steam | btu/hr | | 1,229,844,000.00 | 360 |
| Heat | GJ | | 511.00 | 141,945 |
| Fuels | GJ | | 1,320.00 | 366,667 |
| Electricity | HP/hr | | 123,460.00 | 92 |
| Steam | btu | | 6,743,334,000.00 | 1,975 |
| Fuels | GJ | | 8,876.00 | 2,465,558 |
| Cooling | TOR | | 987,654.00 | 3,471 |
| Heat | GJ | | 987.00 | 274,167 |

1 Select energy unit from your energy carrier

2 Write energy amount to convert

# 能量计算

## 能源载体的转换

为了给所有能量的消耗建立一个统一的度量单位，在可再生能源测量计算（ RE Survey Calculations）文件的表1.3中，您可以把能量单位转换为兆瓦时（ MWh）。

## 表 1.3能源载体单位转换成兆瓦时（ MWh）

转换结果

| Table 1.3 For Energy Carriers | | | | |
|---|---|---|---|---|
| | | | | |
| | | | | |
| Energy Carrier | Energy unit | | Amount to convert | Converted amount |
| | | | | MWh |
| Cooling | TOR | | 789,966.00 | 2,776 |
| Steam | btu/hr | | 1,229,844,000.00 | 360 |
| Heat | GJ | | 511.00 | 141,945 |
| Fuels | GJ | | 1,320.00 | 366,667 |
| Electricity | HP/hr | | 123,460.00 | 92 |
| Steam | btu | | 6,743,334,000.00 | 1,975 |
| Fuels | GJ | | 8,876.00 | 2,465,558 |
| Cooling | TOR | | 987,654.00 | 3,471 |
| Heat | GJ | | 987.00 | 274,167 |

从能源载体中选择能量单位

写入要转换的能量数额

# Energy Calculations

**Create an energy baseline of volume state fuel.**

**There are two options for calculating the baseline, this is the needed data:**

| Option 1 | Option 2 |
|---|---|
| Invoice data:<br>• Heating value<br>• Consumption | Measure data:<br>• Consumption<br>Data from tables:<br>• Heat value<br>• Density |

Tables are referenced on excel file.

## Table 3. Energy baseline for fuel consumption in volume state

| Table 3. Energy conversions: From volume | | | | |
|---|---|---|---|---|
| How do you procure/obtain this energy? | | m3 | Are these lectures metered / invoiced? | Invoiced |
| | | | Write Heat Value in TJ/GG | 98.00 |
| | | | Write Density (kg/m3) | 0.6 |
| Timeline | Consumption | HV in TJ/M3 | MWh for Opt 1 | MWh for Opt 2 |
| Month 1 | 1,320,647.71 | 0.000036174355 | 13,270.45 | 21,570.60 |
| Month 2 | 1,163,592.88 | 0.000036341285 | 11,746.25 | 19,005.37 |
| Month 3 | 1,414,138.92 | 0.000036298147 | 14,258.52 | 23,097.62 |
| Month 4 | 1,258,305.83 | 0.000036127967 | 12,627.80 | 20,552.34 |
| Month 5 | 1,463,618.77 | 0.000036069071 | 14,664.28 | 23,905.79 |
| Month 6 | 1,457,867.65 | 0.000036118272 | 14,626.58 | 23,811.86 |
| Month 7 | 1,487,182.61 | 0.000036227601 | 14,965.86 | 24,290.67 |
| Month 8 | 1,497,334.75 | 0.000036222830 | 15,066.04 | 24,456.49 |
| Month 9 | 1,448,267.46 | 0.000036031071 | 14,495.19 | 23,655.05 |
| Month 10 | 1,521,716.96 | 0.000035963824 | 15,201.89 | 24,854.73 |
| Month 11 | 1,394,504.71 | 0.000035919113 | 13,913.73 | 22,776.93 |
| Month 12 | 1,416,023.47 | 0.000036061562 | 14,184.46 | 23,128.40 |
| Grand total | 16,843,201.72 | | 169,021.04 | 275,105.85 |

Opt 1 Results

Opt 2 Results

| | OPTION 1: INVOICE DATA | OPTION 2: CDP TABLES |
|---|---|---|
| 1 | Select volume unit from your fuel | Select volume unit from your fuel |
| 2 | Write your fuel consumption | Write your fuel consumption |
| 3 | Write your heat value monthly variation | Write your heat value and density from CDP tables |

# 能量计算

## 创建体积状态燃料的能量基线（12个月）

## 计算基线有两个选项，这是所需的数据

| 选项 1 | 选项 2 |
|---|---|
| • 带有下列信息的发票：<br>• 热值<br>• 消耗 | • 消耗<br>• 表中较高热值和较低热值<br>• 表中的密度 |

表格引自于excel文档

## 表 3. 体积状态燃料的能量基线

表 3. 体积能量转换

| How do you procure/obtain this energy? | | m3 | Are these lectures metered / invoiced? | Invoiced |
|---|---|---|---|---|
| | | | Write Heat Value in TJ/GG | 98.00 |
| | | | Write Density (kg/m3) | 0.6 |
| Timeline | Consumption | HV in TJ/M3 | MWh for Opt 1 | MWh for Opt 2 |
| Month 1 | 1,320,647.71 | 0.000036174355 | 13,270.45 | 21,570.60 |
| Month 2 | 1,163,592.88 | 0.000036341285 | 11,746.25 | 19,005.37 |
| Month 3 | 1,414,138.92 | 0.000036298147 | 14,258.52 | 23,097.62 |
| Month 4 | 1,258,305.83 | 0.000036127967 | 12,627.80 | 20,552.34 |
| Month 5 | 1,463,618.77 | 0.000036069071 | 14,664.28 | 23,905.79 |
| Month 6 | 1,457,867.65 | 0.000036118272 | 14,626.58 | 23,811.86 |
| Month 7 | 1,487,182.61 | 0.000036227601 | 14,965.86 | 24,290.67 |
| Month 8 | 1,497,334.75 | 0.000036222830 | 15,066.04 | 24,456.49 |
| Month 9 | 1,448,267.46 | 0.000036031071 | 14,495.19 | 23,655.05 |
| Month 10 | 1,521,716.96 | 0.000035963824 | 15,201.89 | 24,854.73 |
| Month 11 | 1,394,504.71 | 0.000035919113 | 13,913.73 | 22,776.93 |
| Month 12 | 1,416,023.47 | 0.000036061562 | 14,184.46 | 23,128.40 |
| Grand total | 16,843,201.72 | | | |

选项1结果　　选项2结果

### 选项1: 发票数据

从燃料中选择体积单位

写入您的燃料消耗量

写入您的热量值每月变化

### 选项2: CDP 表格

从燃料中选择体积单位

写入您的燃料消耗量

从CDP表中写入热量值和密度

# Energy Calculations

**Create an energy baseline from mass state fuel.**

**There are two options for calculating the baseline, this is the needed data:**

| Option 1 | Option 2 |
|---|---|
| Invoice data:<br>• Heating value<br>• Consumption | Measure data:<br>• Consumption<br>Data from tables:<br>• Heat value |

Tables are referenced on excel file.

## Table 4. Energy baseline for fuel consumption in solid state

| Table 4. Energy conversions: From solid | | | | |
|---|---|---|---|---|
| How do you procure/obtain this energy? | | tonne | Are these lectures metered / invoiced? | Invoiced |
| | | | Write Heat Value in TJ/GG | 15.60 |
| | | | No density needed for this conversion | |
| Timeline | Consumption | HV in TJ/Ton | MWh for Opt 1 | MWh for Opt 2 |
| Month 1 | 1,320,647.71 | 15.600000 | 5,722,811,321.58 | 5,722,811,321.58 |
| Month 2 | 1,163,592.88 | 15.600000 | 5,042,239,847.12 | 5,042,239,847.12 |
| Month 3 | 1,414,138.92 | 15.600000 | 6,127,940,222.35 | 6,127,940,222.35 |
| Month 4 | 1,258,305.83 | 15.600000 | 5,452,662,958.79 | 5,452,662,958.79 |
| Month 5 | 1,463,618.77 | 15.600000 | 6,342,353,077.21 | 6,342,353,077.21 |
| Month 6 | 1,457,867.65 | 15.600000 | 6,317,431,537.27 | 6,317,431,537.27 |
| Month 7 | 1,487,182.61 | 15.600000 | 6,444,463,132.23 | 6,444,463,132.23 |
| Month 8 | 1,497,334.75 | 15.600000 | 6,488,455,774.09 | 6,488,455,774.09 |
| Month 9 | 1,448,267.46 | 15.600000 | 6,275,830,680.66 | 6,275,830,680.66 |
| Month 10 | 1,521,716.96 | 15.600000 | 6,594,112,101.95 | 6,594,112,101.95 |
| Month 11 | 1,394,504.71 | 15.600000 | 6,042,858,577.62 | 6,042,858,577.62 |
| Month 12 | 1,416,023.47 | 15.600000 | 6,136,106,612.21 | 6,136,106,612.21 |
| Grand total | 16,843,201.72 | 15.600000 | 72,987,265,843.10 | 72,987,265,843.10 |

Opt 1 Results

Opt 2 Results

| | OPTION 1: INVOICE DATA | OPTION 2: CDP TABLES |
|---|---|---|
| 1 | Select volume unit from your fuel | Select volume unit from your fuel |
| 2 | Write your fuel consumption | Write your fuel consumption |
| 3 | Write your heat value monthly variation | Write your heat value and density from CDP tables |

# 能量计算

## 创建固体状态燃料的能量基线（12个月）

## 计算基线有两个选项，这是所需的数据

| Option 1 | Option 2 |
|---|---|
| • 带有下列信息的发票：<br>• 热值<br>• 消耗 | • 消耗<br>• 表中较高热值和较低热值 |

表格引自于excel文档

## 表 4. 固体燃料消耗的能量基线

表 4. 固体能量转换

| How do you procure/obtain this energy? | | tonne | Are these lectures metered / invoiced? | Invoiced |
|---|---|---|---|---|
| | | | Write Heat Value in TJ/GG | 15.60 |
| | | | No density needed for this conversion | |
| Timeline | Consumption | HV in TJ/Ton | MWh for Opt 1 | MWh for Opt 2 |
| Month 1 | 1,320,647.71 | 15.600000 | 5,722,811,321.58 | 5,722,811,321.58 |
| Month 2 | 1,163,592.88 | 15.600000 | 5,042,239,847.12 | 5,042,239,847.12 |
| Month 3 | 1,414,138.92 | 15.600000 | 6,127,940,222.35 | 6,127,940,222.35 |
| Month 4 | 1,258,305.83 | 15.600000 | 5,452,662,958.79 | 5,452,662,958.79 |
| Month 5 | 1,463,618.77 | 15.600000 | 6,342,353,077.21 | 6,342,353,077.21 |
| Month 6 | 1,457,867.65 | 15.600000 | 6,317,431,537.27 | 6,317,431,537.27 |
| Month 7 | 1,487,182.61 | 15.600000 | 6,444,463,132.23 | 6,444,463,132.23 |
| Month 8 | 1,497,334.75 | 15.600000 | 6,488,455,774.09 | 6,488,455,774.09 |
| Month 9 | 1,448,267.46 | 15.600000 | 6,275,830,680.66 | 6,275,830,680.66 |
| Month 10 | 1,521,716.96 | 15.600000 | 6,594,112,101.95 | 6,594,112,101.95 |
| Month 11 | 1,394,564.71 | 15.600000 | 6,042,858,577.62 | 6,042,858,577.62 |
| Month 12 | 1,416,023.47 | 15.600000 | 6,136,106,612.21 | 6,136,106,612.21 |
| Grand total | 16,843,201.72 | 15.600000 | | |

选项1结果

选项2结果

### 选项1: 发票数据

从燃料中选择体积单位

写入您的燃料消耗量

写入您的热量值每月变化

### 选项2: CDP 表格

从燃料中选择体积单位

写入您的燃料消耗量

从CDP表中写入热量值和密度

# Conversions

**Heat Value**
**Density**

In order to obtain heat value and density in the necessary units to use **energy calculations, Table 1.1** was developed for **Heat Value conversions** and **Table 1.2** for **Density conversions.**

## 1. Heat Value

Heat released when a fuel goes to combustion. When using tables from CDP, it is recommended to use HHV when the fuel comes from USA or Canada, use LHV for other locations.

**Results**

Table 1.1 For Heat Value

| Energy Unit | Mass/Volume Unit | Amount to convert | Converted amount | |
|---|---|---|---|---|
| | | | Volume | Mass |
| | | | TJ/M3 | TJ/Ton |
| Btu | g | 456,789.00 | 0.00 | 481.91 |
| J | g | 23,456,789.00 | 0.00 | 23.46 |
| Cal | galUK | 12,345.00 | 0.00 | 0.00 |
| Tce | m3 | 123,456.00 | 3,618.50 | 0.00 |
| Toe | tonne | 12,345,678.00 | 0.00 | 516,913.54 |

**1** Select mass/volume unit from your energy unit

**2** Write heat value amount to convert

## 2. Density

Degree of consistency measured by the quantity of mass per unit volume.

**Results**

Table 1.2 For Density

| Mass Unit | Volume Unit | Amount to convert | Converted amount |
|---|---|---|---|
| kg | m3 | 0.70 | 0.70 |
| lb | ft3 | 25.00 | 400.42 |

**1** Select volume unit from your mass unit

**2** Write density amount to convert

# 转换

热值
密度

为了获得使用能量计算所需单位的热值和密度，**表1.1**用于**热值转换**，**表1.2**用于**密度转换**

## 1. 热值

燃料燃烧时释放的热量。当使用CDP的表格时，建议当燃油来自美国或加拿大时使用较高热值，在其他位置使用较低热值。

结果

表 1.1 用于热值转换

| Energy Unit | Mass/Volume Unit | Amount to convert | Converted amount | |
|---|---|---|---|---|
| | | | Volume | Mass |
| | | | TJ/M3 | TJ/Ton |
| Btu | g | 456,789.00 | 0.00 | 481.91 |
| J | g | 23,456,789.00 | 0.00 | 23.46 |
| Cal | galUK | 12,345.00 | 0.00 | 0.00 |
| Tce | m3 | 123,456.00 | 3,618.50 | 0.00 |
| Toe | tonne | 12,345,678.00 | 0.00 | 516,913.54 |

从能量单位中选择质量/体积单位

写入要转换的热值

## 2. 密度

通过每单位体积的质量测量的稠度。

结果

表 1.2 用于密度转换

| Mass Unit | Volume Unit | Amount to convert | Converted amount |
|---|---|---|---|
| kg | m3 | 0.70 | 0.70 |
| lb | ft3 | 25.00 | 400.42 |

从能量单位中选择体积单位

写入要转换的密度值

# Conversions

## International system

Metric prefix is used to indicate if a unit is multiple or submultiple from the **International System of Units.**

## Table 2. International system conversions.

For converting any number into international system prefixes, use Table 2.

| Table 2. International System | | | | |
|---|---|---|---|---|
| For obtaining any number into international system | | | | |
| In which prefix do you have your numbers? | **Kilo** | | Amount to convert | **47,463.00** |
| | | | Without prefix | 4.75E+07 |
| **Deca** | 4.7463E+06 | | **Deci** | 4.75E+08 |
| **Hecto** | 4.7463E+05 | | **Centi** | 4.75E+09 |
| **Kilo** | 4.7463E+04 | **Results** | **Mili** | 4.75E+10 |
| **Mega** | 4.7463E+01 | | **Micro** | 4.7463E+13 |
| **Giga** | 4.7463E-02 | | **Nano** | 4.7463E+16 |
| **Tera** | 4.7463E-05 | | **Pico** | 4.7463E+19 |
| **Peta** | 4.7463E-08 | | **Femto** | 4.7463E+22 |

1. **Select the original prefix of your unit**
2. **Write the amount for the table to convert**

# 转换

## 国际体系

公制前缀用于表示度量单位是国际单位制的倍数或子倍数.

## 表 2. 国际体系转换

要将任何数字转换为国际系统前缀，请使用表2.

| 表 2. 国际体系 | | | | |
|---|---|---|---|---|
| For obtaining any number into international system | | | | |
| In which prefix do you have your numbers? | Kilo | | Amount to convert | 47,463.00 |
| | | | Without prefix | 4.75E+07 |
| **Deca** | 4.7463E+06 | | **Deci** | 4.75E+08 |
| **Hecto** | 4.7463E+05 | | **Centi** | 4.75E+09 |
| **Kilo** | 4.7463E+04 | 结果 | **Mili** | 4.75E+10 |
| **Mega** | 4.7463E+01 | | **Micro** | 4.7463E+13 |
| **Giga** | 4.7463E-02 | | **Nano** | 4.7463E+16 |
| **Tera** | 4.7463E-05 | | **Pico** | 4.7463E+19 |
| **Peta** | 4.7463E-08 | | **Femto** | 4.7463E+22 |

选择您所使用单位的原始前缀

写入要转换的数额

# Energy model

- Representative process of energy consumption regarding a group of variables and constants.
- A baseline is needed for any energy model to be created; this baseline requires a minimum of 12mo data.
- Six parameters are considered for a correct model:
  - Predicted energy
  - Total deviation
  - Total Standard Error (EE)
  - T statistic
  - R2
  - CV REMc (Coffiecient of Variation of Cuadratic Error)

Electricity and fuels for electricity generation can be correlated to any variable, such as end product, headcount, area and more.

Energy is divided into two categories: energy used in MFG processes and others, such as services (HVAC, fixtures, warehouse, etc.)

Energy for a specific product can be obtained without actual measure in each step.

| | Energy usage | | Energy model | | CORRECT |
|---|---|---|---|---|---|
| Month | Electricity + Fuels for electricity generation (kWh) | End product (pcs) | Predicted | Deviation | EE |
| 1 | 15,094,869 | 7,857,783 | 15,700,789 | -605,920 | -0.58555246 |
| 2 | 14,136,148 | 7,610,815 | 15,541,196 | -1,405,048 | -1.35781847 |
| 3 | 16,893,312 | 10,316,339 | 17,289,529 | -396,217 | -0.38289827 |
| 4 | 15,371,029 | 8,299,455 | 15,986,201 | -615,172 | -0.59449326 |
| 5 | 17,863,939 | 11,362,757 | 17,965,733 | -101,794 | -0.09837242 |
| 6 | 17,924,053 | 11,835,524 | 18,271,239 | -347,186 | -0.33551518 |
| 7 | 18,453,976 | 10,392,839 | 17,338,964 | 1,115,013 | 1.07753228 |
| 8 | 18,570,216 | 10,726,077 | 17,554,305 | 1,015,912 | 0.98176227 |
| 9 | 17,637,648 | 13,234,706 | 19,175,402 | -1,537,754 | -1.48606321 |
| 10 | 18,771,607 | 10,448,107 | 17,374,678 | 1,396,928 | 1.34997139 |
| 11 | 17,250,821 | 8,992,037 | 16,433,754 | 817,068 | 0.78960227 |
| 12 | 16,967,410 | 8,790,068 | 16,303,240 | 664,171 | 0.64184505 |
| Grand Total | 204,935,029 | 119,866,507 | **204,935,029** | **0.00000000** | **0.00000000** |
| Average | 17,077,919 | | | | |
| Std deviation | 1,483,616 | | | | |
| CV | 9% | | | | |

| | | |
|---|---|---|
| T statistic | **3.55** | **5.77** |
| Coefficients | **0.6462** | **10,623,024** |
| EE Coffiecients | 0.18 | 1,841,987 |
| R2 & REMC | **0.5578** | 1,034,784 |
| Estad. F & GL | 12.61 | 10.00 |
| Cuadratic sum | 13,504,521,378,306 | 10,707,772,232,943 |
| CV (REMc) | **6%** | |

| | | |
|---|---|---|
| Extrapolated energy used for MFG | **0.6462** | **kWh/end product** |
| Estimated energy usage for non MFG | 127,476,284 | kWh/yr |

# 能量模型

关于一组变量和常数的代表性能耗过程

创建任何能量模型都需要一个基线；该基线至少需要12个月的数据。

正确的模型需要考虑六个参数：

- 预测能量
- 总偏差
- 总标准误差(EE)
- 统计T （ Statistic T）
- 相关系数 （R2）
- 平方误差变化系数 （ CV REMc ）

发电所需的电力和燃料可以与任何变量相关，如最终产品、人口、面积等。

能源分为两类：生产制造过程中使用的能源和其他，如服务（ 暖通空调 、固定装置、仓库等

特定产品的能量无需实际在每个步骤中进行测量。

| | Energy usage | | Energy model | | CORRECT |
|---|---|---|---|---|---|
| Month | Electricity + Fuels for electricity generation (kWh) | End product (pcs) | Predicted | Deviation | EE |
| 1 | 15,094,869 | 7,857,783 | 15,700,789 | -605,920 | -0.58555246 |
| 2 | 14,136,148 | 7,610,815 | 15,541,196 | -1,405,048 | -1.35781847 |
| 3 | 16,893,312 | 10,316,339 | 17,289,529 | -396,217 | -0.38289827 |
| 4 | 15,371,029 | 8,299,455 | 15,986,201 | -615,172 | -0.59449326 |
| 5 | 17,863,939 | 11,362,757 | 17,965,733 | -101,794 | -0.09837242 |
| 6 | 17,924,053 | 11,835,524 | 18,271,239 | -347,186 | -0.33551518 |
| 7 | 18,453,976 | 10,392,839 | 17,338,964 | 1,115,013 | 1.07753228 |
| 8 | 18,570,216 | 10,726,077 | 17,554,305 | 1,015,912 | 0.98176227 |
| 9 | 17,637,648 | 13,234,706 | 19,175,402 | -1,537,754 | -1.48606321 |
| 10 | 18,771,607 | 10,448,107 | 17,374,678 | 1,396,928 | 1.34997139 |
| 11 | 17,250,821 | 8,992,037 | 16,433,754 | 817,068 | 0.78960227 |
| 12 | 16,967,410 | 8,790,068 | 16,303,240 | 664,171 | 0.64184505 |
| Grand Total | 204,935,029 | 119,866,507 | **204,935,029** | **0.00000000** | **0.00000000** |
| Average | 17,077,919 | | | | |
| Std deviation | 1,483,616 | | | | |
| CV | 9% | | | | |

| | | |
|---|---|---|
| T statistic | **3.55** | **5.77** |
| Coefficients | **0.6462** | **10,623,024** |
| EE Coffiecients | 0.18 | 1,841,987 |
| R2 & REMC | **0.5578** | 1,034,784 |
| Estad. F & GL | 12.61 | 10.00 |
| Cuadratic sum | 13,504,521,378,306 | 10,707,772,232,943 |
| CV (REMc) | **6%** | |

| | | |
|---|---|---|
| Extrapolated energy used for MFG | **0.6462** | **kWh/end product** |
| Estimated energy usage for non MFG | 127,476,284 | kWh/yr |