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PBL Netherlands Environmental Assessment Agency

MANUFACTURING INDUSTRY DECARBONISATION DATA EXCHANGE NETWORK – THE DATABASE

K.M. Schure, A. van Dril, W. Wetzels

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MIDDEN

Manufacturing Industry Decarbonisation Data Exchange Network

Manufacturing Industry Decarbonisation Data Exchange Network – The database

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Authors
K.M. Schure, A. van Dril, W. Wetzels

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MIDDEN project coordination and responsibility
The MIDDEN project (Manufacturing Industry Decarbonisation Data Exchange Network) was initiated and is also coordinated and funded by PBL and TNO Energy Transition Studies[1]. The project aims to support industry, policymakers, analysts, and the energy sector in their common efforts to achieve deep decarbonisation. Use of data from the database is entirely at your own risk and responsibility. PBL and TNO do not accept any liability or responsibility for the consequences of the use of the MIDDEN data or database.
Correspondence regarding the MIDDEN project may be addressed to:
D. van Dam (PBL), Dick.vanDam@pbl.nl, or S. Gamboa (TNO), Silvana.Gamboa@tno.nl.

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TNO Energy Transition Studies has a twofold mission: to accelerate the energy transition and to strengthen the competitive position of the Netherlands. TNO conducts independent and internationally leading research and we stand for an agenda-setting, initiating and supporting role for government, industry and NGOs.

This document was previously published on 21 November 2019, with the previous version of the MIDDEN database.

[1] TNO Energy Transition Studies was named ECN part of TNO at the time of initiation of the MIDDEN project.

Contents

Summary

This document describes the database of the MIDDEN project (Manufacturing Industry Decarbonisation Data Exchange Network). The database contains information on current energy and material consumption of the manufacturing industry in the Netherlands and options for decarbonisation of its processes.

The MIDDEN project aims to support industry, policymakers, analysts, and the energy sector in their common efforts to achieve deep decarbonisation. The project will continue to update and elaborate further on options in the future, in close collaboration with the industry. The database will also be updated accordingly.

Data is aggregated, to a certain extent, and based on information from public sources and/or own calculations where required. It does not represent the actual situation at any of the locations, but is a rather high-level representation. No conclusions regarding an individual industry or company can be deduced from this data set.

Our database depends on contributions and checks from our entire network and other stakeholders. If you wish to share any corrections or updates on the information in the database, please contact the project leaders (see the colophon or the website www.middenweb.nl).

Purpose of the database

By co-signing the Paris Agreement (United Nations, 2015), the Netherlands, as part of the EU, has committed (Rijksoverheid, 2016) to far-reaching greenhouse gas emission reduction targets for 2050, in order to mitigate global warming and the associated climate risks. For energy consumption and energy-consuming processes that currently rely heavily on fossil fuels, the consequences are wide-ranging. One of the areas where many changes are required — with large uncertainties about what these entail — is the manufacturing industry. Many goods that we, as consumers, have come to depend on are produced in industrial processes. Industry will need to make certain changes to those processes, in order to both provide the desired products and help the Netherlands reach its emission reduction target.

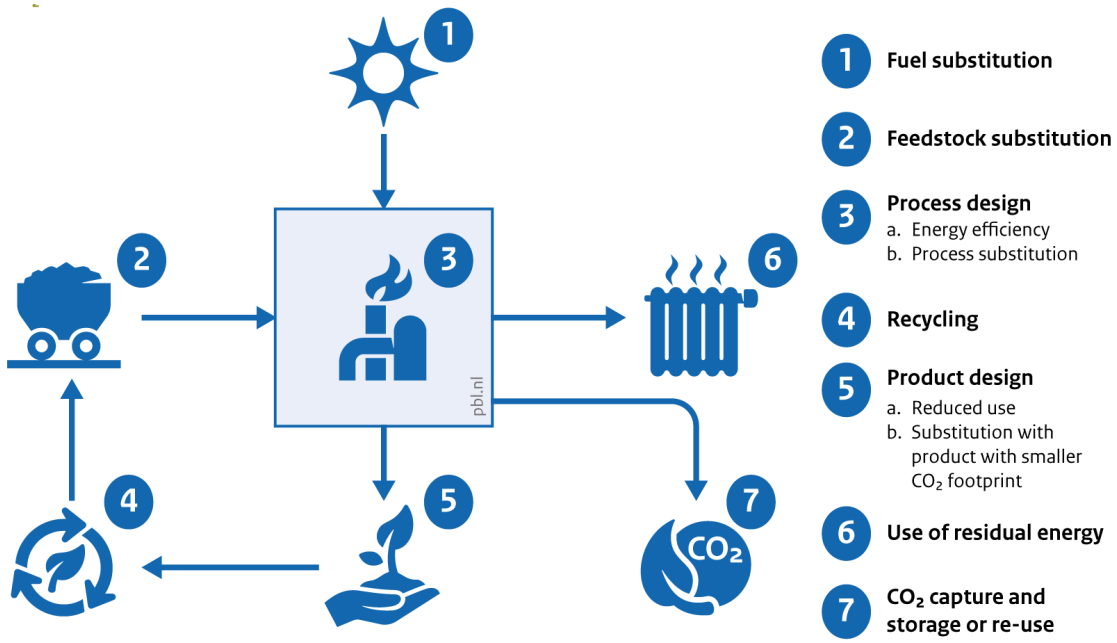
The MIDDEN project aims to support industry, policymakers, analysts, and the energy sector in their common efforts to achieve deep decarbonisation. More specifically, in this project we look at the current situation of the manufacturing industry in the Netherlands and its options for producing the same products and/or functionality of products but with net zero greenhouse gas emissions. These options for reducing greenhouse gas emissions, now or in

the future, are referred to as decarbonisation options, and may also include those that have an impact on indirect emissions or end-of-life emissions. None are automatically zero-emission options or produced without any emissions throughout the value chain. However, this aspect was outside of the scope of this project.

In order to determine whether options are feasible in a net zero-emission industry, we assumed future energy resources of electricity and biomass to have net zero-emissions. This requires the electricity generation in the power sector to operate fully with net zero emissions, while for biomass, sustainability criteria are important.

Figure 1 illustrates the various categories of emission reduction, targeting either fuel, feedstock, or other options in process, recycling or product design. The categories include use of residual energy and end-of-pipe solutions (carbon capture and storage or reuse). In this respect, we look beyond merely the direct emissions.

Figure 1 CO_2 reduction categories



Source: PBL

Consumption and production in 2050 will look very different from that of today. Other types of products may exist, companies may have started or ceased production in the Netherlands, and consumers may have other types of preferences. However, these are uncertain elements and scenario-dependent, and do not fall within the scope for this database. Moreover, in this project, we describe options and costs to the best of our ability, but please note that these may be incomplete or rapidly become out of date. Many of the short-term and smaller energy-efficiency options are not included. We are open to any corrections and updates, in order to keep data as accurate as possible.

Data is aggregated, to a certain extent, and based on information from public sources and/or own calculations where required. They may therefore not represent the exact circumstances in individual situations. Since options are listed per location, they may refer to the required infrastructure in the future or indicate possible synergies. No conclusions regarding individual industries or companies can be deduced from this data set. Instead, it is our intention to illustrate the challenges that lie ahead, the types of energy that may be required, the

innovation that is needed, and help to gain an understanding of where our industrial sector may be heading when it comes to energy and emissions.

More context on types of industries and how we arrived at the data presented in this database is provided in separate reports. These reports can also be found online, at www.middenweb.nl.

Scope of the database

Our scope is based on the entities that report their direct emissions to the Dutch Emissions Authority (NEa, 2018). Furthermore, we apply the following two selection criteria:

- Emissions over the 2013–2017 period must average more than 10 kt CO_2 equivalents.
- The entities do not solely produce electricity.

Structure of the database

The database contains two supporting sheets (README and MIDDEN) and four sheets with data (GPD, PCD, TC and CD):

README: Sheet with a summary of the current coverage of the database and where changes with respect to previous versions will be highlighted.

MIDDEN: This sheet consists of a list of entities regarded within the scope of the MIDDEN project. It provides certain basic information on the locations and indicates the report in which the particular entity is further discussed and whether data on the entity are available in the current database. The starting point for this list is the manufacturing industry in the Netherlands that is part of the EU ETS and has average emissions exceeding 10 kt CO_2 eq over the 2013–2017 period as reported to the Dutch Emissions Authority (NEa, 2018).

General Plant Data (GPD): General plant data contains the basic information about the plants that are included in the data set. Note that data regarding these plants in the data set do not necessarily represent actual values for the company, but include high-level estimates based on publicly available data, average energy consumption values for certain processes, and our own assumptions and calculations. No conclusions for individual plants should be drawn on the basis of these data.

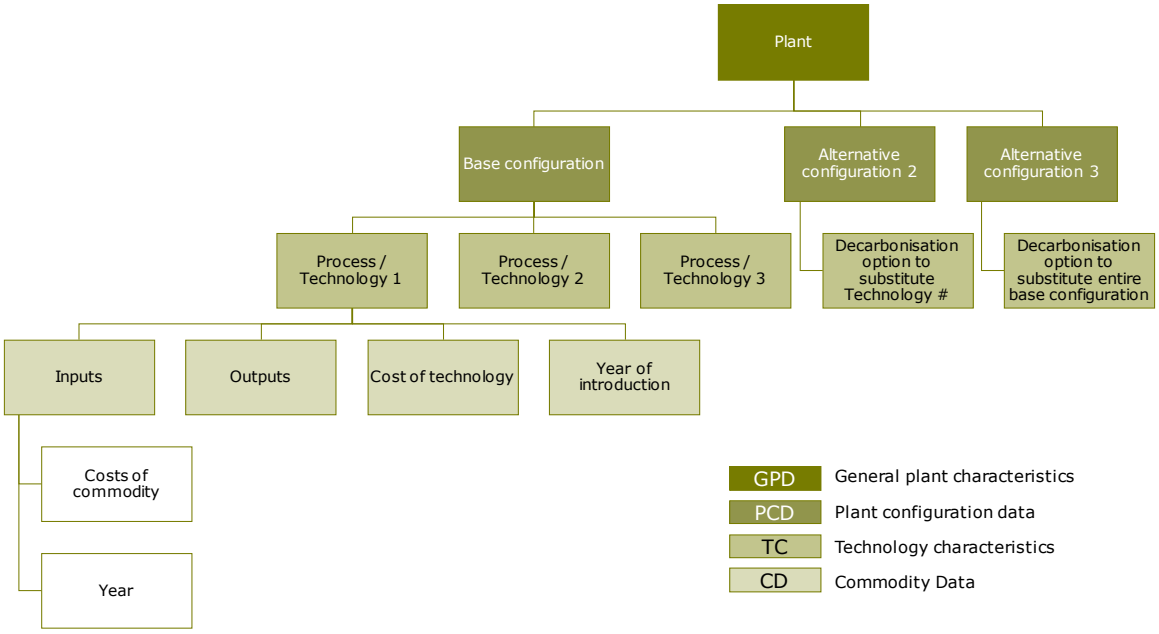
Plant Configuration Data (PCD): Plant configuration data link plants to the applied technologies. It provides information on which technologies are or can be applied, on annual production capacities, load factor/utilisation rates, and may include the total annual consumption of certain energy carriers. A base configuration may consist of multiple technologies, each in a separate column. For each site, decarbonisation options are listed in alternative configurations, and it is indicated which technology a decarbonisation option substitutes compared to the base configuration. Alternative configurations may indicate a single substitute technology, substitute the entire base configuration, or add another technology to the base configuration. In the case of substituting one technology or including an 'add-on' technology, this should be added to the base configuration to obtain the complete plant configuration.

Technology Characteristics (TC): Technology characteristics specify information on the technologies applied in the plant configurations. They contain information on the inputs and

outputs of the processes. For decarbonisation options, it may also provide information on TRL (technology readiness level), expected year of introduction, and costs. This information, especially regarding more innovative options, may require regular updating.

Commodity Data (CD): Commodity data contain a list of all the raw material, energy and product inputs and outputs represented in the data set.

Figure 2 Schematic of the data contained in the data sheets GPD, PCD, TC, and CD of the MIDDEN database



References

NEa (2018). Emissiecijfers industrie 2013-2017 [Emission data industry 2013–2017]. Nederlandse Emissieautoriteit [Dutch Emissions Authority], The Hague.

Rijksoverheid (2016). Staatssecretaris Dijksma ondertekent Klimaatakkoord bij Verenigde Naties [State Secretary Dijksma signs the Climate Agreement at the United Nations]. https://www.rijksoverheid.nl/actueel/nieuws/2016/04/22/staatssecretaris-dijksma-ondertekent-klimaatakkoord-bij-verenigde-naties.

United Nations (2015). The Paris Agreement. https://unfccc.int/sites/default/files/english_paris_agreement.pdf.