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Global Guide

ENERGY EFFICIENCY NETWORKS

Germany's Policy Instrument Design, Impacts and Success Factors.

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Global Guide:
Energy Efficiency Networks

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Table of Content

Introduction

Increasing energy efficiency and the sustainable transformation of industries are key elements for the international competitiveness of the German economy. The German government as well as business associations and organisations believe that energy efficiency in the German economy can be promoted effectively and efficiently by the companies themselves.

On December 3rd 2014, representatives of the German government and the leading associations and organisations of the German economy therefore signed an agreement to establish Energy Efficiency Networks. An Energy Efficiency Network is a voluntary exchange of experiences and ideas between 8 to 15 companies over two to three years on average with the aim to jointly increase energy efficiency and implement climate protection, resource efficiency or sustainability measures. The initial goal was to set up around 500 new Energy Efficiency Networks by the end of 2020, saving up to 75 PJ of primary energy and 5 million tonnes of GHG emissions.

Since January 2021, the network initiative has been continued as the Initiative for Energy Efficiency and Climate Action Networks. In addition to increasing energy efficiency in industry, trade, commerce and the energy sector, the focus of the networks was expanded to include measures that advance climate protection, the energy transition and sustainability. By the end of 2025, the aim is to establish 300 to 350 new networks, resulting in savings of 9 – 11 terawatt hours of final energy and 5 – 6 million tonnes of greenhouse gas emissions. With this objective, the initiative is making an essential contribution to achieving Germany's climate and energy policy targets.

This Global Guide provides the political, national and historical context of the policy instrument of the Initiative for Energy Efficiency and Climate Action Networks. It illustrates the impacts, success factors and good practices of this policy instrument in Germany. The Guide is intended for policy makers and industry professionals and hopes to further spread the concept of Energy Efficiency Networks and provide guidance on how to embed this approach in national energy policy instruments.

The first chapter provides an overview of German energy and climate policy as well as the structure and energy consumption of German industry. The second chapter describes the historical background of the Energy Efficiency Networks. The third chapter outlines the design of the Energy Efficiency Networks in Germany. The fourth chapter analyses the impacts, success factors and good practices of Energy Efficiency Networks. The final chapter presents the outlook and transferability of Energy Efficiency Networks.

Executive Summary

For almost 10 years, the German Initiative for Energy Efficiency Networks has demonstrated how a voluntary agreement can have an impressive impact on energy efficiency in the industrial sector among others. The companies from the industrial sector participating in the networks have saved a total of 6 900 GWh of final energy and 2.5 Mt of CO_2.

This guide outlines the key success factors of the Energy Efficiency Networks in Germany. It explains why Energy Efficiency Networks have become so important for a wide variety of companies and why Energy Efficiency Networks are now recognised as an important pillar for the industrial sector's transition to net zero emissions.

There are valuable insights here for professionals worldwide, from industry and policymakers to companies. The guide is relevant for anyone interested in how a collaborative approach can effectively improve energy efficiency and reduce emissions.

The success of Energy Efficiency Networks in Germany is underpinned by seven key principles:

1. **Strong collaboration**
2. **Motivated companies and stakeholders**
3. **Strong governance and trustworthy moderators**
4. **Dedicated time for networking**
5. **Simple and easy-to-perform monitoring process**
6. **Transparent information and reliable and anonymous data collection**
7. **Tangible impact**

Background and Acknowledgement

The German and Australian governments have been formally cooperating on energy issues since the establishment of the Australia–Germany Energy and Resources Working Group (ERWG) in 2017. In 2021, the cooperation was formalised as an Energy Partnership. adelphi has been commissioned by the German Federal Ministry for Economic Affairs and Climate Action (BMWK) to support this Energy Partnership.

In 2019, a sub-working group on energy efficiency was established, which is led by the Australian Energy Efficiency Council (EEC) and the German Business Initiative for Energy Efficiency (DENEFF) and supported by adelphi. The sub-working group was formed to strengthen the cooperation of both countries in the areas of energy efficiency and industrial decarbonisation and identify lessons learned and best practices for the respective partner.

After a delegation of German experts visited Australia in May 2023, it became clear that the Energy Efficiency Networks are a policy instrument of great interest to an Australian audience. adelphi led the work on this guide and collaborated with the Fraunhofer Institute for Systems and Innovation Research (ISI). The report has been funded by the German Federal Ministry for Economic Affairs and Climate Action (BMWK).

Complementing the desk research underlying the report, we would like to also thank and acknowledge certain individuals who have provided valuable insights and feedback.

- **The administrative office of the IEEKN**, dena
- **Mirko Krück**, Krueck Consult
- **Stefan Kesenheimer**, IHK Bodensee-Oberschwaben
- **Torben Harms**, VEA – Bundesverband der Energie-Abnehmer e.V.

Responsibility for all errors lies solely with the authors.

Regulatory Overview

Germany's Energy and Climate Policy

The German Initiative for Energy Efficiency and Climate Action Networks (IEEKN), as a policy measure aimed at companies in the industry sector, operates within a policy and regulatory framework established by the EU and Germany. This section outlines the key milestones that have shaped Germany's energy and climate policy.

The European Union

By signing the Paris Agreement, the 27 EU Member States committed to limiting the global temperature increase to 1.5°C above pre-industrial levels.[1] Both the 'Fit for 55' package and the European Green Deal set out targets and measures to make Europe the first climate-neutral continent by 2050 and consequently reduce net greenhouse gas emissions to zero. Energy consumption currently accounts for 75% of the EU's emissions[2], so transforming the energy system plays a key role in achieving this goal.

European Union's Energy Efficiency Directive
Art. 11 §7 (EU) 2023/1791

"Supporting SMEs to carry out energy audits through the development of Energy Efficiency Networks at EU level"

In addition to an increase in the use of renewable energy sources, the reduction of energy consumption is a priority and energy efficiency is at the forefront of this. When the EU's Energy Efficiency Directive (EED) came into force in 2012, Member States were required to set national energy efficiency benchmarks to meet the EU's overall target of reducing energy consumption. The recast of the EED, adopted in September 2023, highlights the role of Energy Efficiency Networks in encouraging and providing technical support to SMEs to undergo energy audits and subsequently implement the recommendations of those audits.[3]

An **EU directive** has to be transposed into national law by an EU Member State to take effect at national level. The national law must achieve the objectives of the EU directive and be implemented within a set timeframe. In contrast, an **EU regulation** has immediate effect in all member states.

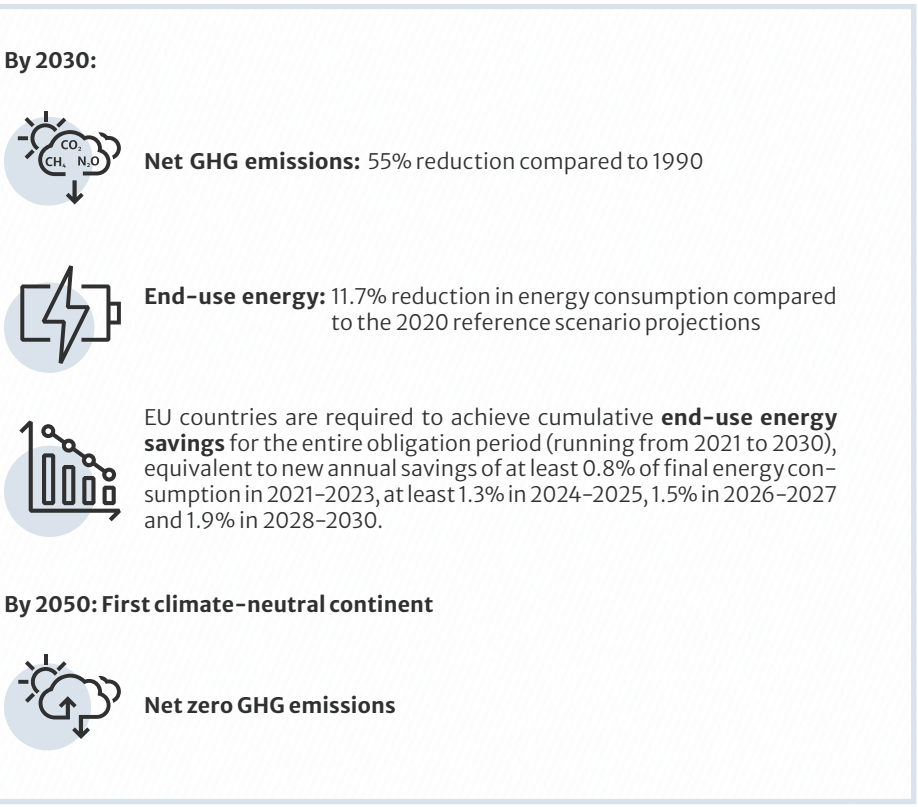
[1] European Union 2016: COUNCIL DECISION (EU) 2016/ 1841. Source (in English)

[2] European Commission 2021: 'Fit for 55'. Source (in English)

[3] European Union 2023: Energy Efficiency Directive (EU) 2023/1791. Source (in English)

Figure 1: Europe's energy and climate targets

European Union 2023: Energy Efficiency Directive (EU) 2023/1791. Source (in English)



Germany

As the country with the largest population and the strongest economy in the EU, Germany has a special role to play. The first debates about the German energy system emerged after the oil crisis in the 1970s. Until then, energy policy had tended to be economically oriented and geared towards meeting increasing energy demand. Although there is no exact date for the start of the so-called energy transition in Germany, known as the *Energiewende*, the term first appeared in 1980. Since then, Germany has undergone an energy transition, which aims at replacing fossil and nuclear energy sources with renewable energy and using energy in an efficient and economical way. Over time, funding measures for renewable energies, laws on feeding electricity into the grid, taxes on energy consumption as well as energy crises and the nuclear disaster in Fukushima in 2011 have all shaped German energy policy.

Over time, "*efficiency first*"[4] has become one of the guiding principles of the Energiewende. This also aligns with Germany's strong interest in reducing energy demand and therefore its dependency on foreign imports of energy. It therefore goes beyond merely saving energy and protecting the climate: efficiency first also means risk management, security of supply and protection against fluctuating prices. This has become particularly salient against the backdrop of the Ukraine-Russia conflict.

Along the way to this guiding principle, there have been several milestones and measures introduced as part of Germany's energy efficiency policy for industry. Table 1 shows a selection of these.

[4] BMWK (formerly BMWi) 2019: Energy efficiency strategy 2050. Source (in German)

Table 1: Milestones in Germany's energy efficiency and climate policy

Year	Milestone / Measure	Content & objectives
2000	**Renewable Energy Source Act (EEG)**	Instrument for the **funding** of electricity from **renewable sources**.
2007	**Integrated Climate and Energy Programme (IEKP)**	Package of 29 measures to reduce Germany's GHG emissions. Measures for **industry** include increasing the market share of **energy-efficient products** and creating incentives for the **introduction of energy management systems** in companies.
2014	**National Action Plan for Energy Efficiency (NAPE)**	Contains packages of short-, medium- and long-term energy-saving measures for several sectors including industry for the period from 2014 to 2020. The **Initiative for Energy Efficiency Networks (IEEN)** is one of the **central measures of the NAPE**.
2016	**Climate Action Plan 2050**	An overall **concept for energy and climate policy up to the year 2050** and orientation for industry and other sectors with the definition of GHG reduction targets.
2019	**Climate Action Programme 2030**	Combines sectoral and cross-sectoral measures to realise medium-term goals from the Climate Action Plan 2050 by 2030. The core elements are the establishment of **funding programmes for GHG reduction** and the introduction of **CO_2 pricing**.
2019	**Federal Climate Change Act (KSG)**	For the first time, the **sector targets** from the Climate Action Plan 2050 are **anchored in law**. It obliges the responsible federal ministries to submit an immediate action programme within three months if the permissible annual emission quantity for a sector is exceeded.
2019	**Energy Efficiency Strategy 2050**	Sets a **reduction of 30 per cent in primary energy consumption by 2030** (compared to 2008) as a concrete **national energy efficiency target** and initiates a broad-based stakeholder process "Roadmap Energy Efficiency 2050" to discuss cross-sectoral pathways.
2019	**National Action Plan for Energy Efficiency 2.0 (NAPE 2.0)**	Part of the Energy Efficiency Strategy 2050. Bundles a large number of **energy efficiency measures for 2021-2030**. Includes targets for the further development of Energy Efficiency Networks (**IEEKN**) and strengthening international collaboration in the area of energy efficiency.
2020	**Coal Phase-out Act**	Defines that Germany will **phase out coal-based electricity generation by 2038** at the latest. The current coalition, which has been in power since the end of 2021, planned to bring forward the coal phase-out ideally to 2030.

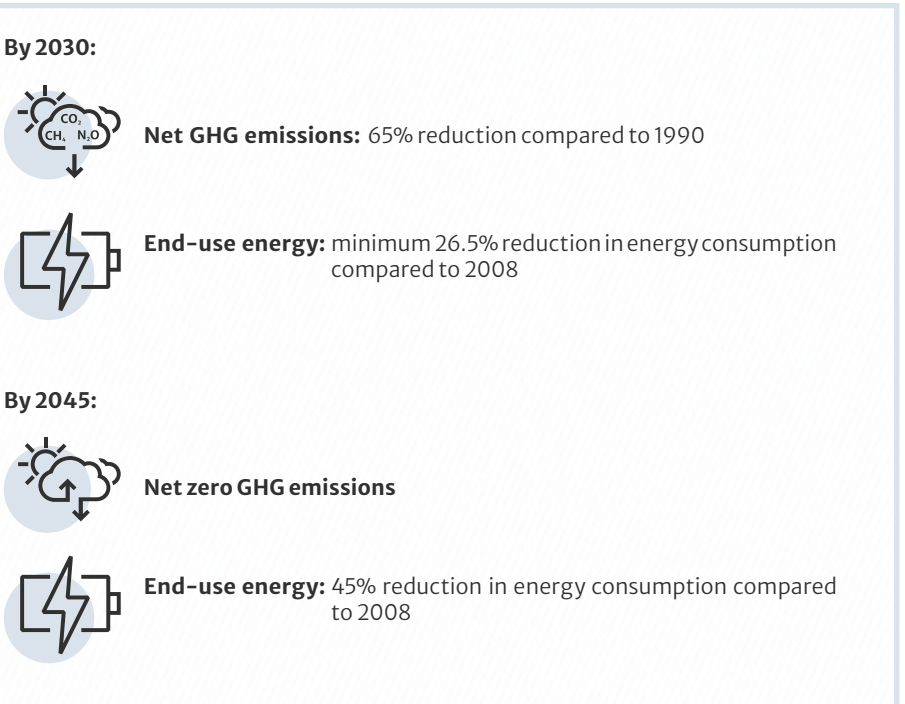
Table 1: Milestones in Germany's energy efficiency and climate policy

Year	Milestone / Measure	Content & objectives
2021	**First revision of the Federal Climate Change Act (KSG)**	Tightens the previous targets for the period up to 2030, particularly for the industrial and energy sectors. The deadline for achieving **climate neutrality** has been **brought forward from 2050 to 2045**. Compared to 1990, **greenhouse gas emissions are to be reduced by 65%** instead of 55% by 2030.
2022	**Immediate Climate Action Programme 2022**	Contains **additional funds** earmarked for specific measures to achieve the climate targets in the revised Climate Change Act. The focus is primarily on **short-term measures** that visibly and measurably reduce GHG emissions. Climate protection is to be promoted above all in those sectors facing the biggest challenges: **industry, buildings and transport**.
2023	**Energy Efficiency Act (EnEfG)**	Sets a **legal framework for energy efficiency targets** in line with the revision of the European Energy Efficiency Directive (EED). Contains obligations to introduce an energy or environment management system for companies with an energy consumption > 7.5 GWh.

This development has led to the current German energy efficiency and climate targets, as legally defined for industry and other sectors in the Federal Climate Protection Act (KSG) and the Energy Efficiency Act (EnEfG).

Figure 2: Germany's energy and climate targets

Federal Climate Change Act 2021. Source (in English) and Energy Efficiency Act 2023. Source (in German)



German Industries

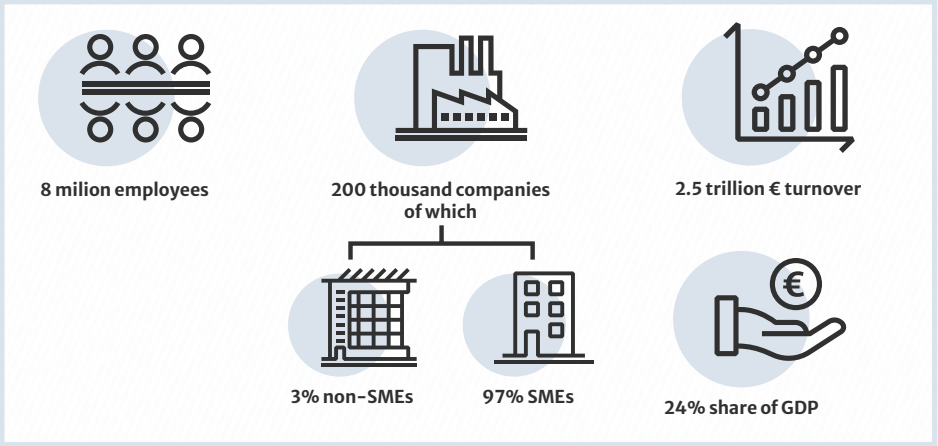
This section contains information on the structure and energy consumption of German industries as well as the latest energy efficiency obligations for German companies in 2023.

Overview over German Industries

Germany is a strong industrial nation at the heart of the EU. German industries accounted for 24% of its GDP in 2022, making it the second most important economic branch after the service sector. The four largest industries in terms of turnover are the automotive industry, mechanical engineering, the chemical-pharmaceutical industry and electrical engineering. In terms of employees, mechanical engineering is the largest sector accounting for 16% of all employees in manufacturing. The heart of Germany's industry is its broad-based SME sector: a good 97 per cent of all manufacturing companies are SMEs.[5] Alongside some well-known larger enterprises, Germany is therefore a country of hidden champions.

Figure 3: German industry at a glance

German Federal Statistical Office. Source (in German) All figures for 2022

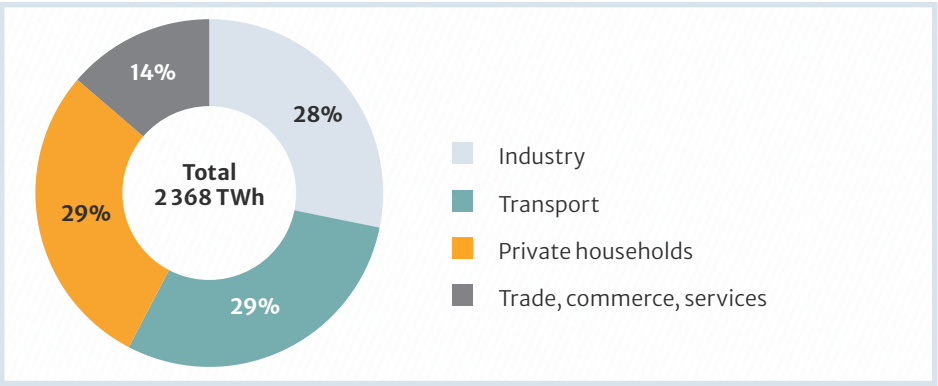


Energy Consumption and GHG Emissions in German Industry

Industrial production accounted for more than a quarter of **final energy consumption** in Germany in 2022, just behind the transport sector and private households (Figure 4). Around two-thirds of final energy consumption in industry is required for process heat. Chemical products and metal production and processing are the industrial branches with the highest demand for energy.

Figure 4: Final energy consumption in Germany in 2022 by sector (in %)

AG Energiebilanzen e.V. 2023: Evaluation tables for the German energy balance. Source (in German)

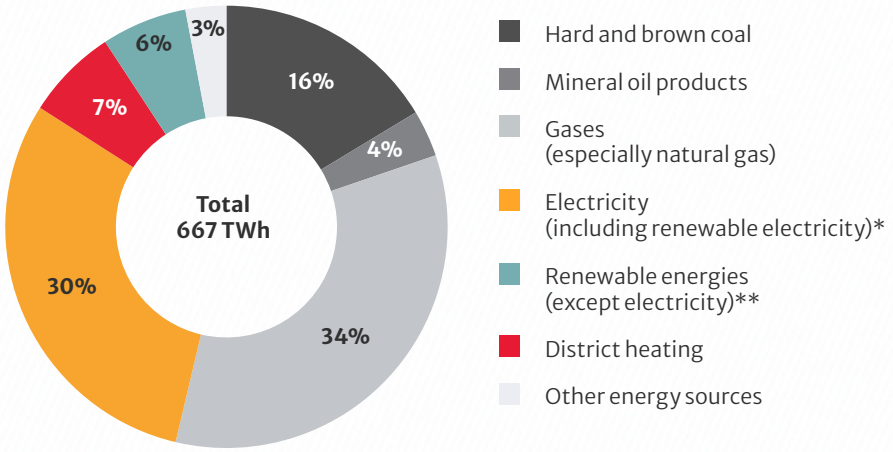


[5] Destatis 2021: Statistics for SMEs. Source (in German)

Much of this industrial energy demand is met by fossil fuels. Gases, especially natural gas, account for more than one third, coal has a share of 16% and mineral oil products a share of 4% (Figure 5). Electricity also plays an important role as an energy source in industrial production (30%) and in 2022 almost half of the total electricity generated in Germany (46%) came from renewable sources.[6]

Figure 5:
Final energy consumption in the German industrial sector in 2022 by energy carrier *(in %)*

AG Energiebilanzen e.V. 2023: Evaluation tables for the German energy balance. Source (in German)



** The way energy statistics are recorded means that electricity consumption cannot be broken down further by energy carrier. Electricity generation in Germany is currently mainly based on renewable energy sources, coal and natural gas.*

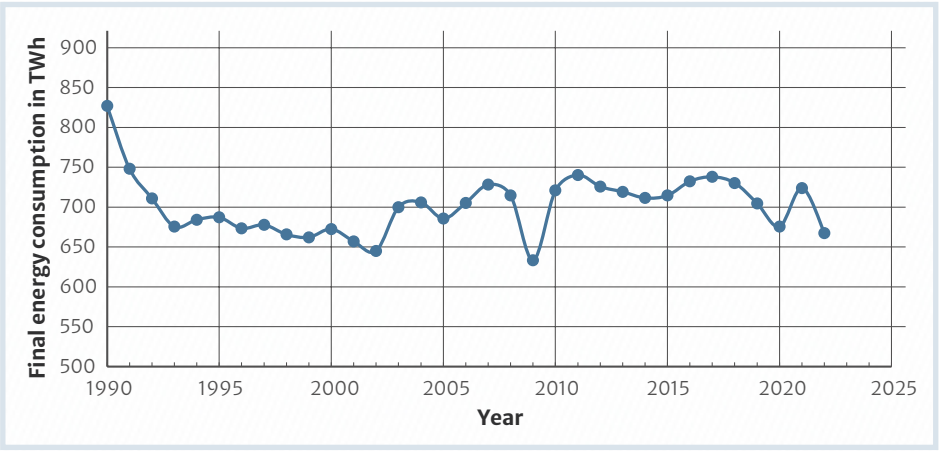
*** Renewable fuels and heat. Electricity from renewable energy sources is considered part of the energy carrier 'Electricity'*

The energy consumption of companies is mainly influenced by the economic situation: the more products are manufactured, the more energy is consumed. Production, in turn, depends on energy prices. Energy-intensive industries in particular were hard hit by the sharp rise in energy prices following the Russian attack on Ukraine, and production in these industries was significantly reduced over the course of 2022, resulting in an almost 8% drop in final energy consumption in Germany compared to the previous year. Apart from years with economic downturns (2009, 2020 and 2022), final energy consumption in the industrial sector has remained more or less constant over the last three decades. Any progress made in terms of improved energy efficiency has been offset by economic growth (Figure 6).

[6] Arbeitsgruppe Erneuerbare Energien-Statistik 2023: Time series on the development of renewable energies in Germany. Source (in German)

Figure 6:
Development of final energy consumption in the German industrial sector 1990–2022

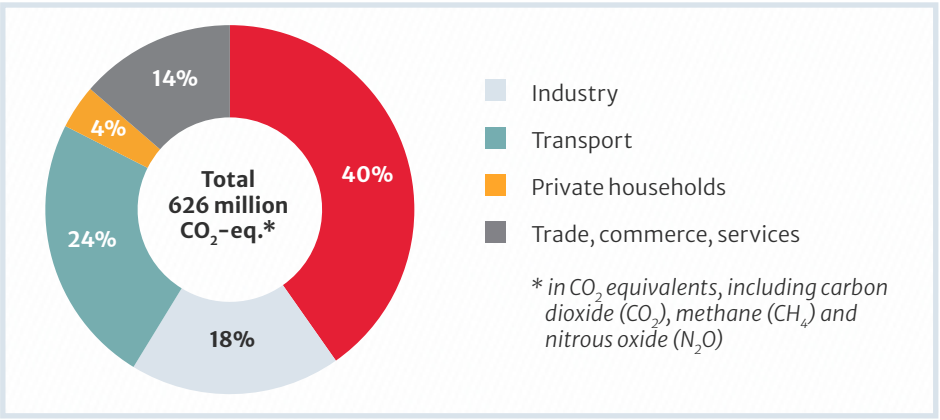
AG Energiebilanzen e.V. 2023: Evaluation tables for the German energy balance. Source (in German)



When excluding the energy industry itself, around 31% of the energy-related greenhouse gases emitted in Germany in 2022 were attributable to the industrial sector (Figure 7). This makes industry the second largest emitter of greenhouse gases after the transport sector. Around two-thirds of industrial greenhouse gas emissions are energy-related, while around one-third are process-related, with the majority of these occurring during the production of raw materials, i.e. in metals (production of iron, steel and aluminium), mineral products (cement, lime and glass) and basic chemicals (primarily ammonia).[7]

Figure 7:
***Energy-related greenhouse gas emissions in Germany 2022 by sector** (in %)*

Umweltbundesamt 2024: National trend tables for the German atmospheric emission reporting 1990–2022. Source (in German)



The federal government has set GHG reduction targets for each sector up to 2030. With the resolution to amend the Federal Climate Change Act in 2023, the focus is now on whether to reduce greenhouse gas emissions overall, regardless of the sector in which they are produced. This should make it possible to implement targeted measures where the greatest savings potential exists.[8]

[7] Umweltbundesamt 2024: Greenhouse gas emissions. Source (in German)

[8] BMWK 2023: Draft of a second law to amend the Federal Climate Protection Act. Source (in German)

Energy Audit and Energy Management System Obligation

In order to achieve the Germany-wide target of reducing final energy consumption by 26.5% by 2030, companies with high energy consumption are obliged to take measures.

Firstly, the German Energy-Related Services Act (EDL-G) introduced an **energy audit obligation for non-SMEs** every four years from 2015 onwards. This is the transposition into national law of the corresponding requirement of Article 8 in the EED. Large companies that have introduced an energy- or environmental management system according to ISO 50001 or EMAS are exempted from the obligation.

With the Energy Efficiency Act (EnEfG), which came into force at the end of 2023, there is now also an **obligation to introduce certified energy or environmental management systems**. It requires all companies with an average total energy consumption of more than 7.5 GWh per year to introduce and operate an energy or environmental management system, making the energy consumption of companies the decisive criterion. This approach affects more than just non-SMEs, as was previously the case in the EDL-G. Another component of the EnEfG is the **obligation to create and publish concrete, practicable implementation plans** for economically viable final energy saving measures. This applies to all enterprises with an average total energy consumption of more than 2.5 GWh per year that operate an energy or environmental management system or that have completed an energy audit in accordance with the EDL-G.[9,10]

These legally binding obligations for industrial companies in Germany are supplemented by government funding programmes and voluntary instruments such as the Initiative for Energy Efficiency and Climate Action Networks.

[9] Energy Efficiency Act 2023. Source (in German)

[10] Energy Services Act 2010. Source (in German)

A Short History of Energy Efficiency Networks

Prof. Dr. Clemens Rohde
Deputy Head of Competence Center Energy Technology and Energy Systems, Coordinator of Business Unit Energy Efficiency, Fraunhofer ISI

"We also like to call it "energy management in the group".

Today, Germany is the largest operator of Energy Efficiency Networks (EEN) worldwide. However, the present successful model, which is built on a voluntary agreement between business associations (including relevant industrial associations) and the federal government, actually originated in Switzerland back in 1987. Let's take a look at the history of Energy Efficiency Networks in Germany and worldwide.

Origin: A Swiss Idea transferred to Germany

The concept of Energy Efficiency Networks is based on an idea from Switzerland, where companies have been forming networks to implement energy efficiency measures since 1987 (Figure 5). The Swiss experience was very successful, with the result that the concept was transferred to Germany in 2002, adapting it to the local context in a **pilot phase** consisting of 30 so-called **Learning Energy Efficiency Networks (LEENs)** from which important lessons were learned. Those networks were made up of 10 to 15 participants (companies/ public institutions), who met around four times a year over the course of three to four years. This pilot project then led to the German "Mari:e" project, which offered a certain format for regional networks of SMEs and larger companies.[11] From 2014 until 2017, the LEEN project[12] was extended as it became clear that the participating companies saved considerable amounts of energy and greenhouse gas emissions. Additionally, it showed that the longer a company was part of the network, the more energy efficiency measures (including complex ones) were recognised and implemented.

According to the final evaluation of the LEEN100 project Fraunhofer ISI and Streks 2019

"75% of the companies supported the statement, that "through the common goal, [our] company has set itself a more ambitious goal than would have been the case without the network".

Germany: From Pilot Project to Energy Transition Milestone

In 2014, Energy Efficiency Networks became one of the pillars in the German "National Action Plan on Energy Efficiency" (NAPE). As a result, the **Initiative for Energy Efficiency Networks (IEEN)** was launched as a **voluntary agreement** between the German government and over 20 business associations (Figure 8). In the first phase from December 2014 to December 2020, the networks established themselves as a successful instrument for increasing energy efficiency and reducing greenhouse gas emissions.

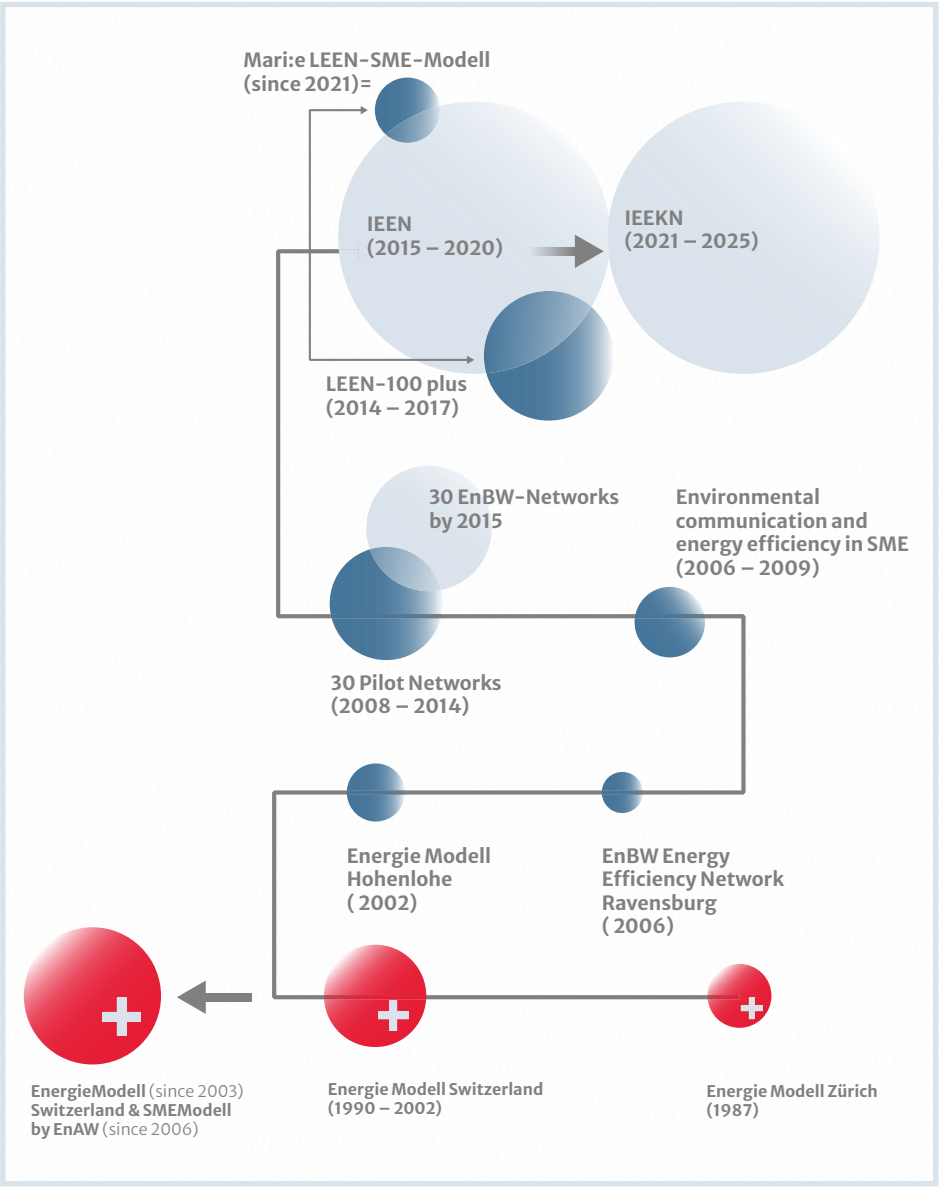
Consequently, the networks became an integral part of the new NAPE 2.0. The German government and business associations continued their joint commitment to supporting the establishment of additional networks and even extended the scope in a second phase from 2021 onwards. The network initiative still has its focus on increasing energy efficiency. However, the scope was expanded so that topics in the context of climate protection and sustainability are also given greater consideration. Under the extended framework **Initiative for Energy Efficiency and Climate Action Networks (IEEKN)**, the aim is to establish 300–350 new networks by the end of 2025, thereby saving 9 to 11 TWh of final energy and 5 to 6 million tons of greenhouse gas emissions. On this trajectory from pilot project to becoming an essential component of the German energy efficiency strategy, the federal government and business associations have worked together to establish the network approach as a permanent instrument for increasing energy efficiency in Germany. In addition, the latest revision of the EED mentions Energy Efficiency Networks as a supportive approach to help SMEs carry out energy audits and subsequently implement the resulting recommendations.

[11] Stiftung für Ressourceneffizienz und Klimaschutz 2014: Mar:ie. Source (in German)

[12] BMWK: Lernende Energieeffizienz-Netzwerke. Source (in German)

Figure 8:
History of energy efficiency networks in Germany

Illustration by adelphi based on Fraunhofer ISI 2016
Source (in German)



Energy Efficiency Networks Worldwide

Since its launch in Switzerland and the adaptation and development of the concept in Germany, the approach has been expanded on a global scale over the last 20 years. Since 1987, networks or pilot projects to increase the energy efficiency and meet the climate protection targets of companies have been launched in more than 20 countries on almost all continents (Figure 9). In 2019, an estimated 1 300 EEN were reported worldwide (involving more than 15 000 companies).[13] Overall, there has clearly been a dynamic development over the years when looking at the number of countries experimenting with the approach.

[13] Durand, Antoine; Damian, Pascal, 2019: Energy Efficiency Networks: Overview of the implementation over the world and lessons learned. Source (in English)

Figure 9:
Energy Efficiency Networks worldwide (as of 2021)

Initiative for Energy Efficiency and Climate Action Networks 2021.
Source (in German)

The idea of Energy Efficiency Networks (1. Phase) and Climate Action Networks (2. Phase) is as simple as it is effective.
That's why it's being implemented internationally as well. In these countries, networks are being implemented to increase the energy efficiency of businesses and to achieve climate protection goals.

Today, some countries, including China, Switzerland, Sweden and the USA, have progressed far beyond a pilot phase and have already implemented large-scale programmes. While the networks in Germany are completely voluntary, the approaches in Switzerland and China go further. Incentives to participate in an EEN are created by exempting companies from taxes or providing them with other additional benefits. In China, Energy Efficiency Networks are considered an effective instrument for demand-side management, which is why the state grid corporation of China has established networks in key economic regions. Additional networks have been established in industrial parks with the support of the China Association of Development Zones, an association of industrial parks in China.[14] To date, China is one of the biggest players with the highest number of Energy Efficiency Networks worldwide, followed by Germany, which is the leader in terms of absolute energy savings achieved.[15] In the USA, utilities had the idea of implementing Energy Efficiency Networks. They initiated the introduction of strategic energy management programmes, which were then integrated into the network concept. In Sweden, on the other hand, the government was responsible for setting up a national Energy Efficiency Network programme for SMEs, resulting in a considerable number of Swedish Energy Efficiency Networks today.

Mirko Krück
CEO Krueck Consult

"The idea of Energie Efficiency Networks works in many countries. The concept is possible across national borders, regardless of the country's development."

Despite the different origins and development histories, these examples show that the concept has already spread and proven itself globally. Countries such as Brazil, Mexico, Chile, Argentina, El Salvador, Jordan, Nigeria, Romania, Ukraine and Vietnam have all recently decided to implement Energy Efficiency Networks, most of them with the aid of German expertise. Experience shows that adapting the network approach to the local context and finding the right stakeholders from the economy and government to promote it are the key success factors in turning a pilot project into a solid instrument for achieving energy efficiency targets.[16]

[14] Quezada, Akamitl et al. 2023: Recommendations for the development of Energy Efficiency Networks in China. Source in (English)

[15] Rohde, Clemens et al. 2020: Energy Efficiency Networks: latest developments in Germany and in the world. Source (in English)

[16] Durand, Antoine; Damian, Pascal, 2019: Energy Efficiency Networks: Overview of the implementation over the world and lessons learned. Source (in English)

Energy Efficiency Networks in the German Context

What is an EEN?

In the German context, an Energy Efficiency Network tends to[17]

- be a group of typically **5 to 15 companies**
- who commit to **cooperating on a voluntary, systematic and non-bureaucratic basis**
- over the course of **24 to 48 months**, sometimes with multiple phases
- with the goal of **improving their energy efficiency and reducing their GHG emissions**
- by first **identifying savings potentials** and **setting a savings target**,
- then **implementing the measures** necessary to achieve it,
- and finally, **agreeing to undergo a monitoring** at the end of the network runtime

Dr. Akamitl Quezada
Expert in Energy Efficiency, dena

"Considering experiences in Germany, the requirements of the German Network's initiative have been defined to ensure a minimum quality that enables Energy Efficiency Networks to achieve concrete results (savings). This shows that the Networks' approach can be adapted to local conditions in a country. The important thing is that the Networks achieve results, which is more than just a simple exchange of experiences."

It should be noted that networks of companies dealing with energy efficiency topics have also been implemented outside of the Initiative (IEEN/IEEKN), often running in an unstable constellation of companies and adopting some but not all of the above elements. Unfortunately, no reliable data exists on the number or structure of such networks. The German networks' initiative has been working to identify such networks and inviting them to modify their model in order to meet the minimum requirements of the Initiative. This has worked in many cases, e.g. with the so called *"Öko-Profit-Klubs"*. This shows that any group (network) of companies can potentially become an Energy Efficiency Network. One advantage in such cases is that the companies already know and trust each other.

The Monitoring Institute

"Of course, companies with little prior knowledge that have been less active in the field of energy efficiency benefit in particular. Nevertheless, the added value of the networks should not be underestimated for (larger) companies who e.g. already implemented ISO50001. Even best-in-class companies can sometimes be trapped in fixed patterns of thinking."

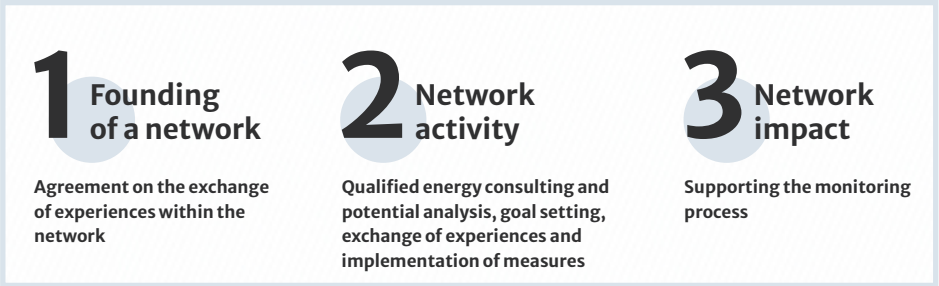
[17] Initiative for Energy Efficiency and Climate Action Networks 2023. Source (in German)

How does an EEN work?

Figure 10 shows the steps of network activity graphically. These are divided into founding of a network, network activity and network impact.[19]

Figure 10:
Network activity step by step

Illustration by adelphi based on Initiative for Energy Efficiency and Climate Action Networks 2023. Source (in German)



→ Founding of a network

In the foundation phase, the participants agree on the duration of the exchange of experiences. According to the German Networks' initiative, this should take place for a maximum of four years. The network is supported by a moderator selected by the network participants for the entire duration.

Energy Efficiency and Climate Action Networks can be formed regionally or nationally and across or within sectors. The size, economic sector or organisational form of the individual participants does not play a role in the success of the network. It is also possible to combine individual locations or operating sites in a company-internal Energy Efficiency and Climate Action Network.

Anton Barckhausen
Head of Progamme Energy, adelphi

"The Energy policy toolbox for the industrial sectors contains many different instruments. The private sector will usually prefer voluntary commitments to regulatory interventions by the government, which makes EEN an attractive option for them."

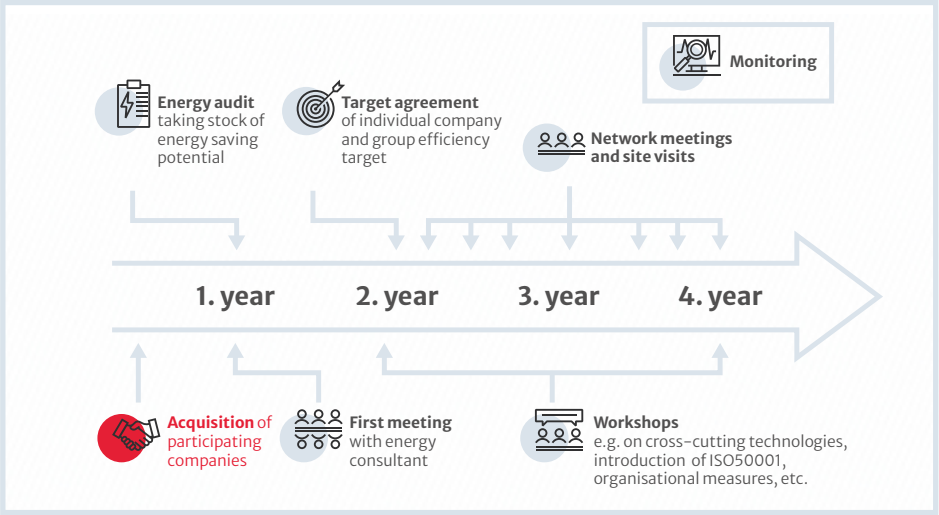
→ Network activity

At the beginning of the network's activity, the participating companies analyse their respective savings potential with the help of qualified internal or external energy consultants. The networks have one year to report their savings target to the administrative office. Based on the potential analysis, the participants identify measures to increase energy efficiency and choose which ones they would like to implement as part of the network's activities. The selected energy efficiency measures result in company-related, non-binding savings targets and a savings target for the network as a whole. Regular moderated network meetings are organised throughout the duration of the network. These meetings serve to exchange information on organisational and technical progress as well as regulatory framework conditions.

The typical implementation steps of an EEN are shown in figure 11.

Figure 11: Typical implementation steps of an EEN

Illustration by adelphi based on Durand, Antoine; Damian, Pascal, 2019: Energy Efficiency Network.Overview of the implementation over the world and lessons learned. Source (in English)



The planned savings of the participating companies result in the network target. The network aims to achieve these savings at the end of the network term and after implementation of the planned measures. Each company sets an energy savings target in megawatt hours per year and optionally a greenhouse gas savings target in tonnes of CO_2 equivalents per year. The companies' individual savings targets are later aggregated into a cumulative network target.

How are savings targets set?

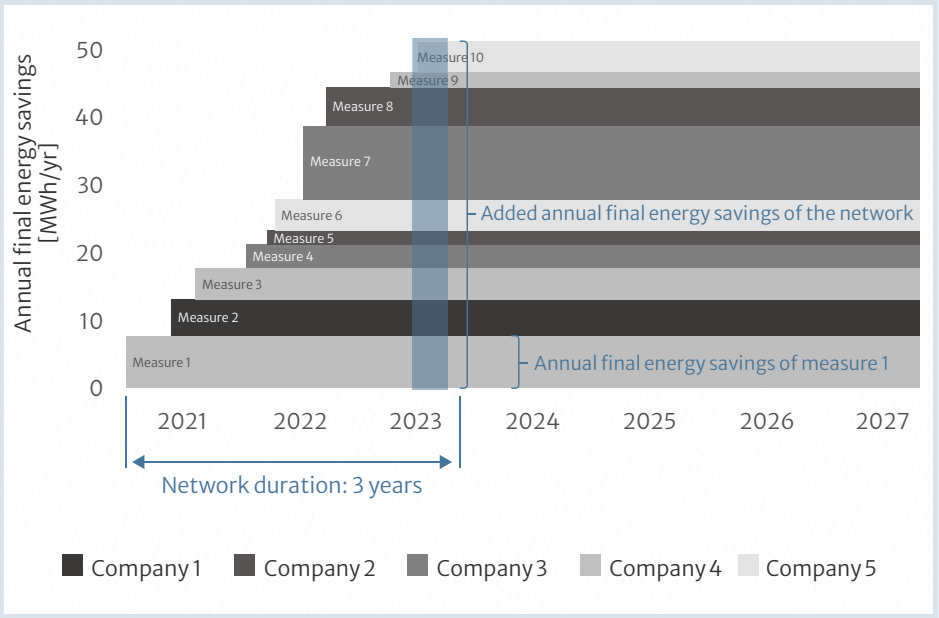
1. **Determine company-specific savings potential**
2. **Determine energy efficiency measures**
3. **Participants each formulate a company-specific savings target**
4. **All participants formulate a common network target**

The IEEKN-compliant definition of the network target is shown graphically in Figure 12. This shows an example network that starts on 1 January 2021 and ends on 31 December 2023. Its five participating companies plan to implement a total of 10 measures over the three-year duration. To calculate the annual savings, the expected effects of all of the network's planned measures are added together. The exact date of implementation is irrelevant for the calculation of the network target, provided it falls within the official network term.[18]

[18] adelphi und Fraunhofer ISI 2024: Regelungen und Anleitung zum Monitoring der IEEKN. Source (in German)

Figure 12: Savings metrics in the context of the IEEKN

Illustration by adelphi based on adelphi und Fraunhofer ISI 2024: Regelungen und Anleitung zum Monitoring der IEEKN. Source (in German)



The measures identified in the energy analysis are implemented in the companies over the duration of the network. Typical measures are:[19]

- **Energy efficiency & cross-sectional technologies:**
  - Efficient heat and cooling generation
  - Simple technology and process optimisation
  - Internal waste heat utilisation and heat recovery
  - Digitalisation, control and regulation technology
  - Energy management systems and software solutions
- **Energy transformation**
  - Combined heat and power generation
  - Use of renewable energies
  - Sector coupling through power-to-heat, power-to-gas
  - Demand side management and flexibilisation
  - Energy storage
  - Electromobility
- **Further measures**
  - Introduction of climate protection management
  - Create a climate neutrality concept
  - Analyse and optimise carbon footprint (company, products, processes)
  - Creating sustainability concepts
  - Recording and reduction of resource consumption.

[19] Initiative for Energy Efficiency and Climate Action Networks 2023. Practical guide for energy efficiency and climate action networks. Source (in German)

→ **Network impact**

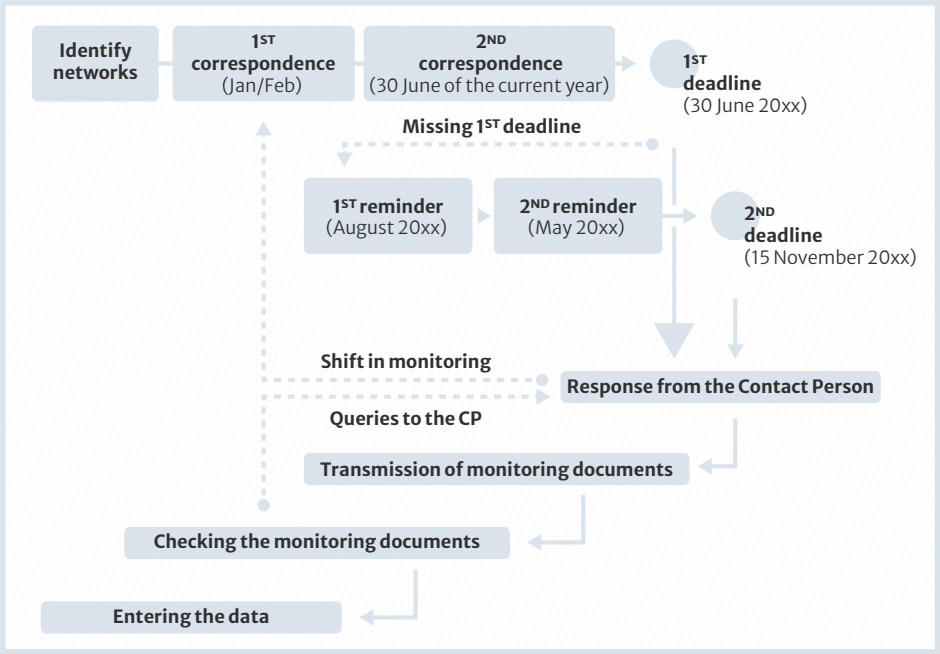
Each company continuously records the success and results of its own measures. Based on the results, a self-evaluation of the network activities takes place at a final network meeting. Interim results and experiences are also part of the network activities and are usually presented and discussed at the network meetings.

Monitoring of the initiative is conducted at the end of each individual network's runtime based on its implemented measures and the resulting energy savings, followed by random sample verification of the accuracy of the submitted information. Undergoing the monitoring is mandatory for all networks participating in the initiative and for the companies involved.

All networks that are in the last calendar year of their duration are part of the monitoring process. They are contacted by the Monitoring Institute in January/February of the year and informed about the monitoring process. A data collection form is provided for submission and must be returned to the Monitoring Institute by 30 June of the same year. The data collection is undertaken by the companies. The form can be processed jointly by the network organiser and/or the moderator and the companies. The data is transmitted in anonymised form and the Monitoring Institute cannot draw any conclusions about individual network companies. If the first deadline cannot be met, it is possible to submit the documents by 15 November of the year. After the documents have been submitted to the Monitoring Institute, they are thoroughly checked. If questions arise, the Monitoring Institute contacts the network again. When all the documents are complete, they are entered into the Monitoring Institute's database. The timeline of the monitoring process is illustrated in the following figure 13.[20]

Figure 13: The timeline of the monitoring process of the IEEKN

Illustration by adelphi based on Barckhausen, Anton et al. 2024: Monitoring der Initiative Energieeffizienz-Netzwerke. Siebter Jahresbericht. Berlin: adelphi



The participants in the sample are randomly selected by the Monitoring Institute at the beginning of the year after the completion of the data collection and evaluation of the network. 10% of the companies that have submitted their data for evaluation in the annual monitoring round are randomly selected for the sample. The information provided by the company on implemented measures, savings and compliance with the minimum criteria is verified as part of the random sample. The network then has until 30 June of the same year to provide the Monitoring Institute with the required information and evidence.[20]

[20] Barckhausen, Anton et al. 2024: Monitoring der Initiative Energieeffizienz-Netzwerke. Siebter Jahresbericht. Berlin: adelphi.

Networks often continue for a further phase after the end of their official cooperation by repeating these three steps.

Key players and their tasks in a network

Different tasks are involved in the initiation and successful implementation of an Energy Efficiency and Climate Action Network. The participating companies can take on these tasks themselves or outsource some or all of them to external experts.

In practice, a network registered with the initiative will typically have the following key players (Figure 14)[21]:

Figure 14: Key players in an EEN

Illustration by adelphi based on Initiative for Energy Efficiency and Climate Action Networks 2023. Source (in German)

- As the central player, the **network operator** is responsible for recruiting participating companies, initiating the establishment of the network and supporting its activities. In addition to network registration, the network operator is also responsible for involving external specialist consultants. The role of network operator can be shared between several players and can be assumed by network participants as well as by associations, chambers, local authorities, external service providers or energy agencies.

- The **moderator** who is the connective tissue in the EEN and responsible for both organisational and content-related activities, such as setting the overall agenda and timeline, organising and moderating the regular meetings, helping with identifying the need for and subsequently finding external expertise, communicating the network's activities and results, and wider networking etc. The moderator can be an employee at one of the participating companies, an external energy consultant or auditor (incl. self-employed), or an employee of the industry association or chamber of commerce to which the EEN belongs, etc.

- The **companies' internal or external energy experts** who carry out the required initial qualified energy consultation. The main task of the energy consultant is to determine the current energy situation and the energy consumption and greenhouse gas reduction

[21] Initiative for Energy Efficiency and Climate Action Networks 2023. Practical guide for energy efficiency and climate action networks. Source (in German)

potential of the participating companies as part of (the potential analysis). After this, the energy consultant makes technical proposals for savings and optimisation measures. The role of energy consultant can be assumed by both external service providers and internal company employees.

- The **participating companies** might be from the same region, the same industry, belong to the same holding company, or might have nothing in common. At the beginning of the network, the participants agree, among other things, on the duration and working structure of the network. On the basis of an individual potential analysis, which is carried out for all participants in the first year, individual goals and measures for all participants are defined. At the end of the network period, the participants use a monitoring process to check whether they have achieved their goals.

Costs of operating a network:
The total cost for companies to participate in an EEN varies and is dependent on the size and energy intensity of the companies, the frequency of meetings and the number of participants. Networks organise an average of four meetings per year for which network moderators invest about 20 working hours per meeting. Additionally, the initial energy review will take around 10 to 12 working days and limited resources are needed for the interim and final assessment of the companies' results. For an EEN with 10 participants and a duration of four years, this would lead to total costs of around €20,000 (depending on local expert rates, of course). These are only external costs, the costs incurred by the company's own staff will be at least on the same scale. Overall costs for a typical participant are around €35,000 to €40,000 for a network that operates for four years.

Voswinkel, F., Durand, A., 2018. Energy Efficiency Networks Initiative (Germany). Case study prepared by Fraunhofer ISI for the EPATEE project, funded by the European Union's Horizon 2020 programme. Source (in English)

Köwener et al 2014. Learning energy efficiency networks for companies – saving potentials, realization and dissemination

These are the classic roles of actors in an Energy Efficiency and Climate Action Network. However, an actor can also take on several of these roles. This can reduce the costs incurred in the network. For example, the network organiser can also provide energy advice or a participant can take on the role of network moderator - provided they have the necessary qualifications.

An EEN officially registered with the initiative must comply with the following minimal requirements[22]:

- Have at least 5 participating companies
- All the participating companies need to carry out a qualified energy consultation acc. to EMAS (Eco-Management and Audit Scheme) or an ISO 50001 energy management system, an energy audit in line with DIN EN 16274-1, or acc. to an equivalent standardized approach
- The EEN has set itself a savings goal
- The participating companies hold regular moderated meetings

Stefan Kesenheimer
Network Moderator, IHK

"The biggest challenge comes not during a network lifetime but before – that is to convince the companies to participate."

[22] adelphi und Fraunhofer ISI 2024: Regelungen und Anleitung zum Monitoring der IEEKN. Source (in German)

Energy Efficiency Networks as a Policy Instrument

The pioneer networks in Germany, as described above, have shown that network activity brings long-term benefits for participating companies. By participating in a network, companies can significantly increase their progress in energy efficiency. By including the Initiative for Energy Efficiency Networks in the National Action Plan on Energy Efficiency (NAPE), the German government is therefore endeavouring to spread the use of this instrument across the country.

Phase 1: Initiative for Energy Efficiency Networks (IEEN)

With the adoption of the National Action Plan on Energy Efficiency (NAPE) in 2014, the German government introduced a comprehensive package of measures and declared energy efficiency to be the second pillar of the energy transition. With an initially assessed potential of 75 PJ primary energy savings or emission reductions of 5 Mt CO_2 -eq. per year by the end of 2020, the Initiative for Energy Efficiency Networks (IEEN) was one of the central measures of the NAPE. Designed as a voluntary instrument relying on the autonomous decision to implement economic energy efficiency measures by the participating companies, the German government and 22 leading organisations of the German private sector jointly agreed on the goal of establishing a total of around 500 Energy Efficiency Networks throughout Germany by the end of 2020.[23]

The IEEN expired on 31 December 2020 and entered its second phase with an expanded range of content, the Initiative for Energy Efficiency and Climate Action Networks.[26]

Phase 2: Initiative for Energy Efficiency and Climate Action Networks (IEEKN)

An ambitious energy efficiency target for 2030 was confirmed with the Climate Protection Programme 2030 and, in particular, with the Efficiency Strategy 2050 adopted in December 2019. The measures required to achieve this were bundled in a new National Action Plan on Energy Efficiency (NAPE 2.0). The agreement on the continuation and further development of the initiative was then signed. The IEEN entered its second phase on 1 January 2021 with an expanded range of content. As part of the Initiative for Energy Efficiency and Climate Action Networks (IEEKN), the plan is to establish 300 to 350 new networks between 2021 and the end of 2025. This could lead to savings of 9 to 11 TWh of final energy or 5 to 6 million tonnes of greenhouse gas emissions.[24]

The content spectrum of the networks was expanded to include the topics of climate protection and sustainability. However, the focus remains on increasing energy efficiency. From 2021, networks can also report a GHG savings target (t/a CO_2 equivalent) in addition to an energy target (MWh/a final energy).

→ **The steering committee**

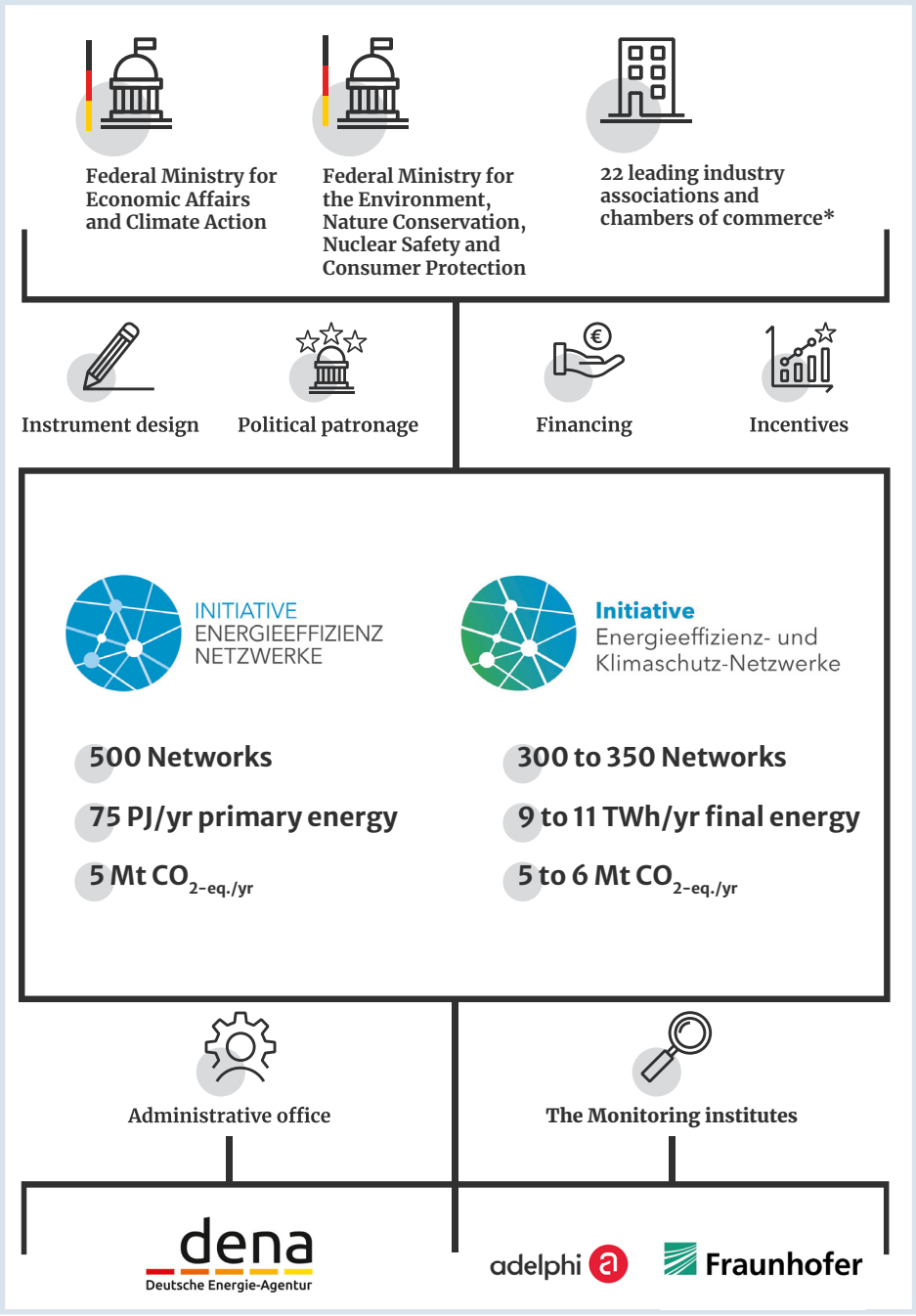
The main actors of the initiative are presented below. Besides the two Federal Ministries – for Economic Affairs and Climate Action, and for Environment, Nature Conservation, Nuclear Safety and Consumer Protection (in both cases, the current names are used) – the current members of the initiative's steering committee *(Steuerungskreis)* represent more than 20 business associations. Operationalisation of the initiative was entrusted to the German Energy Agency (*Deutsche Energie-Agentur* – dena). The steering committee makes all the key decisions with regard to instrument design, operation and monitoring.

[23] Initiative for Energy Efficiency and Climate Action Networks 2014. Source (in German)

[24] Initiative for Energy Efficiency and Climate Action Networks 2020. Source (in German)

Figure 15:
The main actors of the IEEN

Illustration by adelphi



→ The administrative office

dena has been in charge of the central office since December 2015. Its main tasks are[25]:

- To be a central contact point for all stakeholders in the initiative,
- To coordinate and support the communication concerning the initiative (website, newsletter, press releases etc.),
- To represent the initiative at events such as trade fairs, conferences etc. and organize events such as yearly conferences, regional information events, etc.,
- To coordinate stakeholder processes such as working groups and steering committee meetings,
- To manage networks' registration,
- To develop materials for the EENs and the stakeholders around them (guidelines, graphic materials, tools, etc.) and communicate existing materials from others,
- To perform surveys and provide advisory services for the development of the initiative and EENs in general,
- To provide support and advice for the development of the monitoring process.

The Monitoring Institute (MI) →

In order to document the activities of the networks, measure the impacts of the implemented measures – including the information needed for Germany's reporting obligations under the EU's Energy Efficiency Directive – and to derive valuable insights into the policy instrument of EEN, the founding members of the initiative agreed to commission an independent, scientifically-founded monitoring organisation. This was awarded to the consortium of adelphi and Fraunhofer ISI, who are also the authors of this guide.

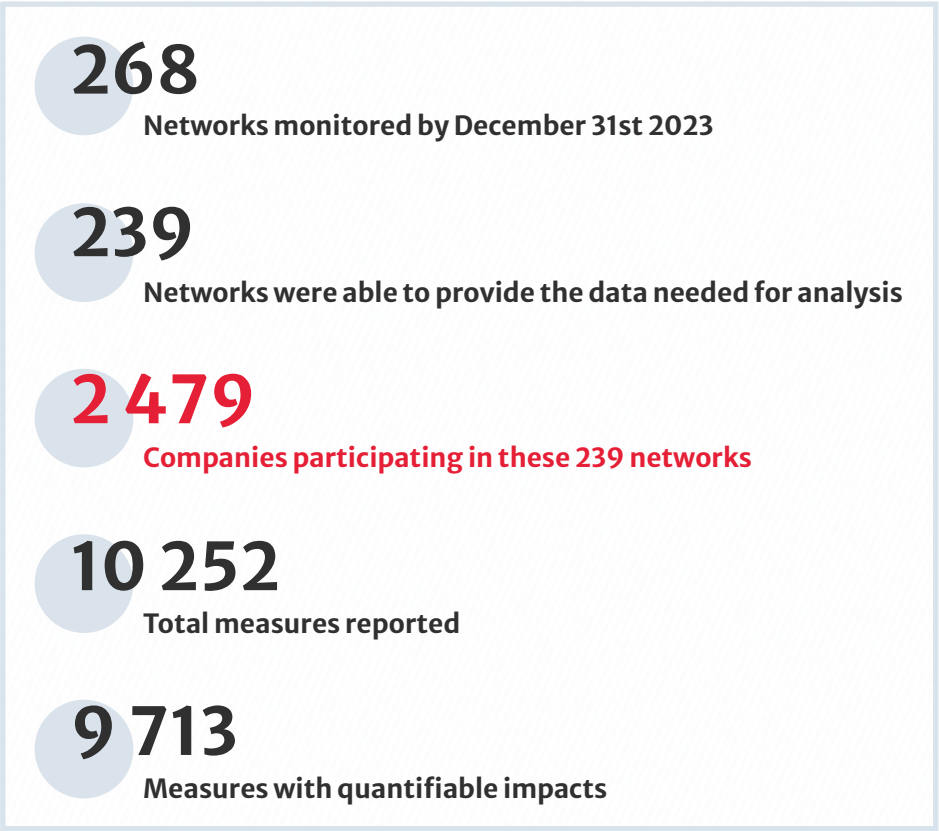
The monitoring of the initiative records the total number of measures implemented within the network and the resulting energy savings at the end of each network's term - and evaluates them on a random sample basis.

[25] Quezada, Akamitl et al. 2021: Energy Efficiency Networks in Germany. Source (in English)

Impacts, Success Factors and Good Practices

Impacts from the German Initiative

Figure 16: Impacts



As part of the 7 IEEN[26] monitoring rounds carried out between 2017 and 2023, a total of 277 networks were asked to submit documents. Monitoring was completed for 268 of these by the deadline. Regular monitoring could be carried out for 239 of these networks by collecting and analysing the data. The 2 479 companies participating in the 239 analysed networks reported a total of 10 525 implemented measures to increase energy efficiency. In 9 713 of these, the energy savings were quantifiable; the remaining measures were primarily organisational, such as training and information campaigns.[27]

These 9 713 quantifiable energy-saving measures resulted in total annual savings of 7 432 GWh of final energy, 9 350 GWh of primary energy (only the non-renewable share is considered) and 2 686 kt CO_2. The 239 networks analysed achieved 91% of their average network target of 34.15 GWh/yr., as reported as part of the monitoring process.[27]

As part of the monitoring process, the actual implementation of the reported measures was also checked by randomly sampling 10% of the companies. Of a total of 737 reviewed measures, 683 were implemented in full and one was partly implemented. This results in a sample correction factor of 0.927, which was then used to correct the overall results of the initiative listed in the paragraph above.[27]

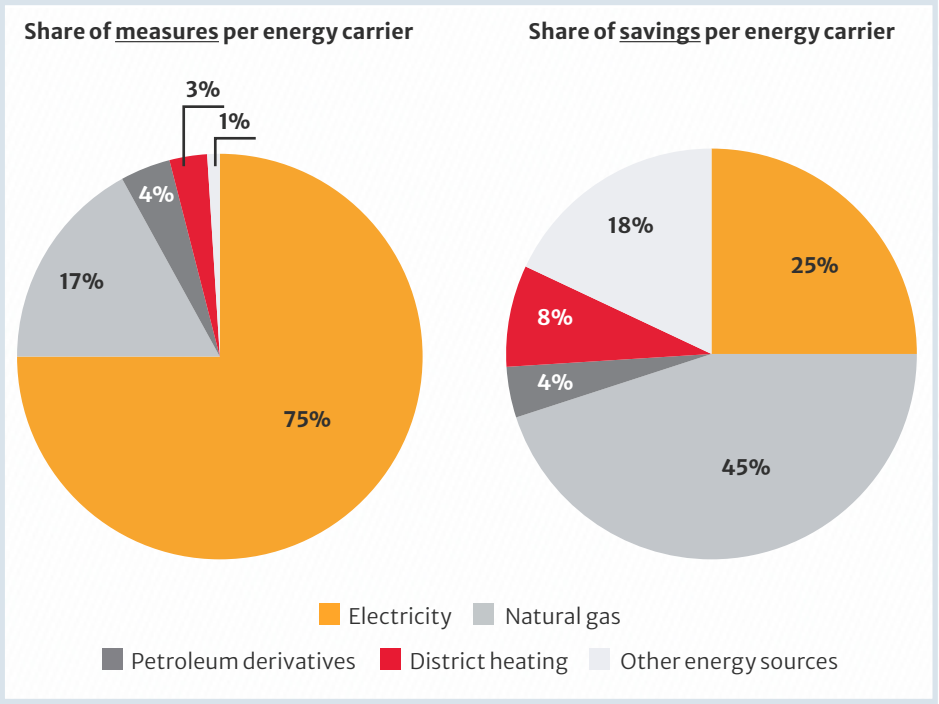
Further results of the monitoring are shown in Figure 17 and Figure 18.

[26] There are currently no results available for IEEKN

[27] Barckhausen, Anton et al. 2024: Monitoring der Initiative Energieeffizienz-Netzwerke. Siebter Jahresbericht. Berlin: adelphi

Figure 17 & 18: Share of measures per energy carrier and share of final energy savings per energy carrier

Barckhausen, Anton et al. 2024: Monitoring der Initiative Energieeffizienz-Netzwerke. Siebter Jahresbericht. Berlin: adelphi



At 75%, the large majority of measures are related to electricity as an energy source (Figure 17; left). Almost all measures in the areas of lighting, compressed air, cooling, motors/drives and information and communication technologies led to electricity savings. 17% of all measures led to energy savings in natural gas. 4% of the reported measures related to petroleum derivatives and 3% to district heating. 1% of the measures related to other energy sources.

The energy carriers for which the majority of measures were implemented are not the same as those with the highest savings. Figure 18 (right) shows that the highest savings (45%) were achieved with the energy source of natural gas, followed by electricity with 25%. 18% of the savings were attributable to other energy sources. 8% of the savings related to district heating and 3% to petroleum derivatives.

The Monitoring Institute *"EEN approach proves to be a good catalyst for the uptake of energy management systems as well as energy effciency measures"*

Figure 19:
Share of saving and share of quantity per measure categories

Illustration by adelphi

Barckhausen, Anton et al. 2024: Monitoring der Initiative Energieeffizienz-Netzwerke. Siebter Jahresbericht. Berlin: adelphi

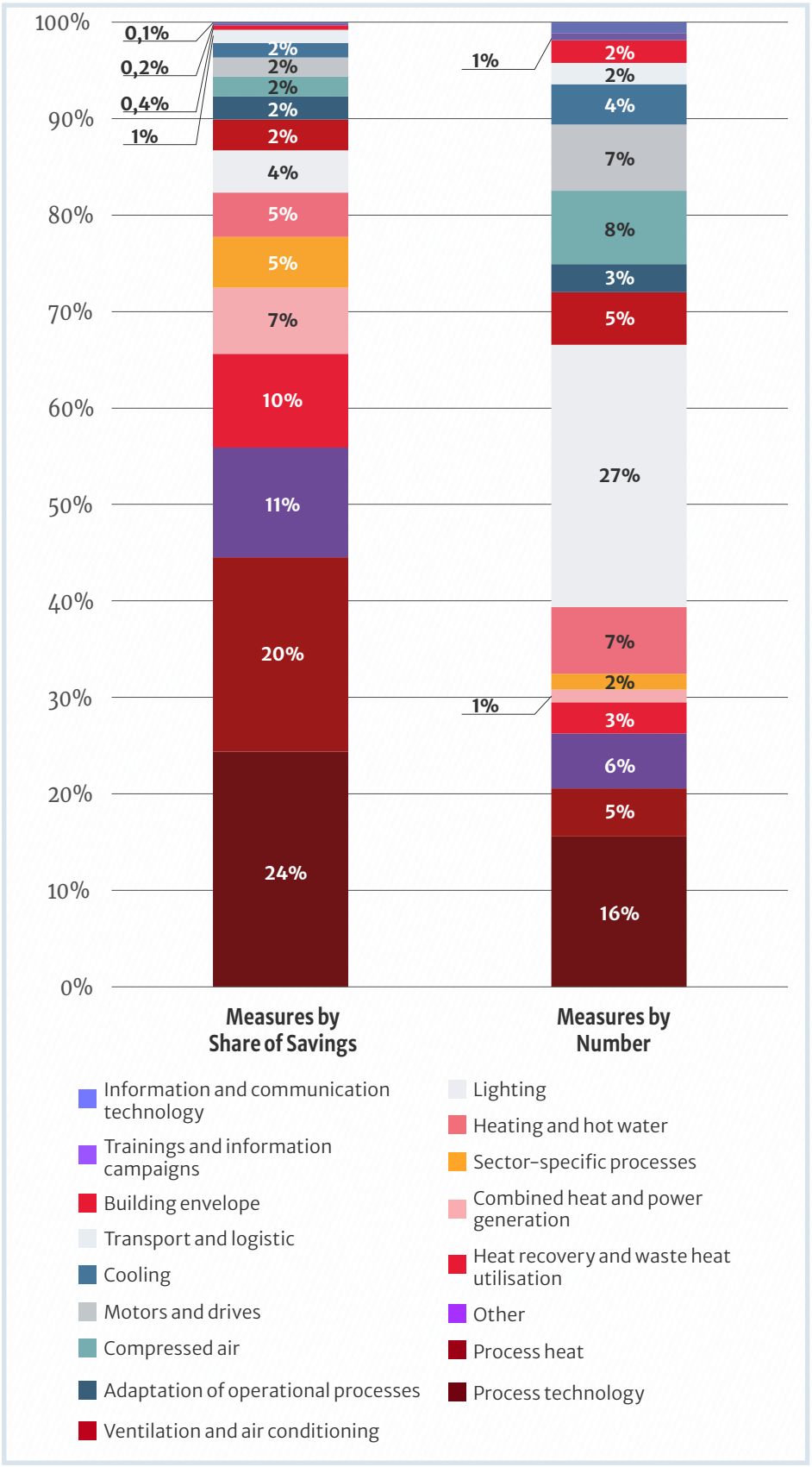
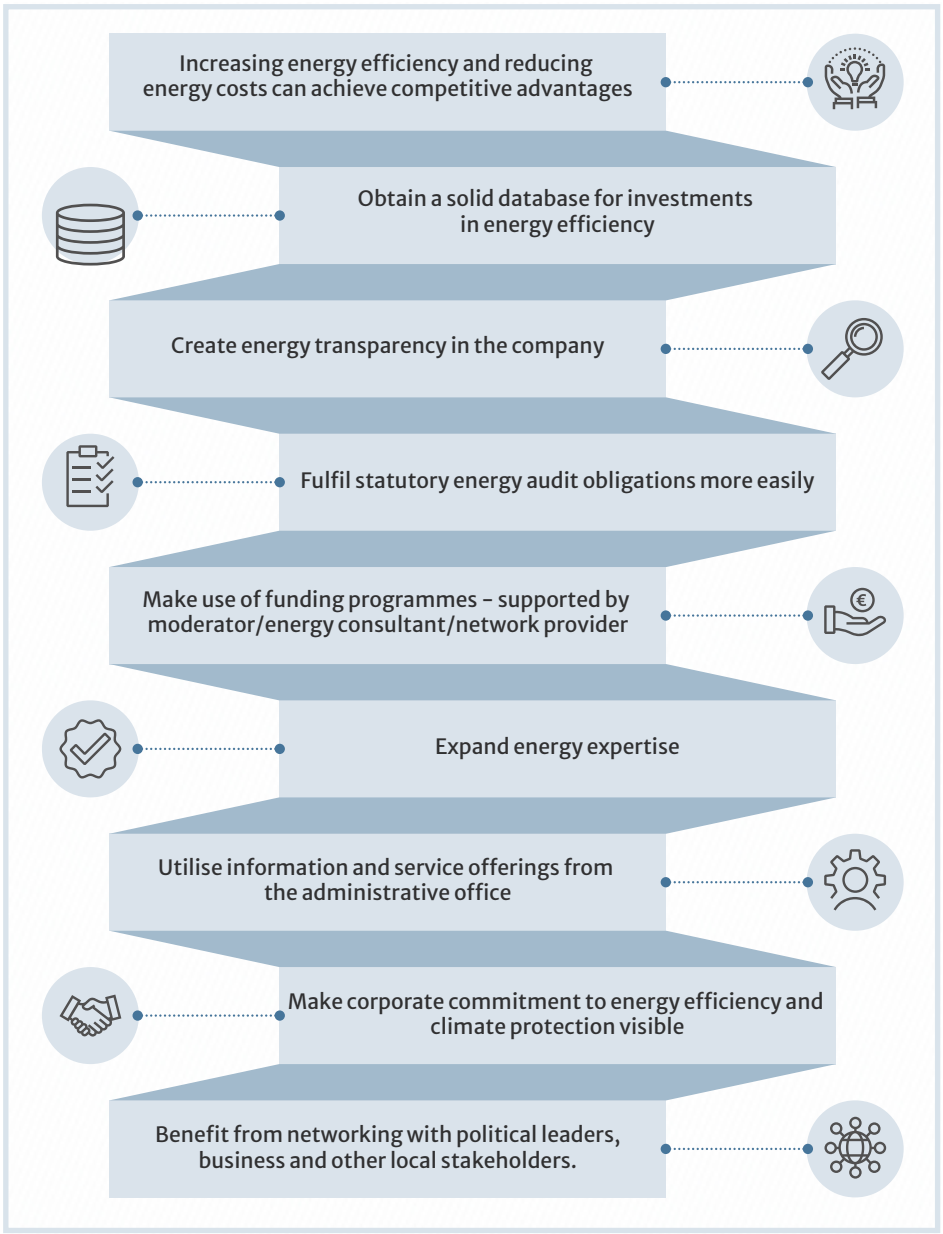


Figure 19 shows the share of savings and quantity by measure categories. This figure illustrates that the measures implemented most frequently do not result in the highest savings. Measures in the area of process technology (totalling 1 811 GWh per year) make the largest absolute contribution to savings, followed by process heat (1 498 GWh per year), other measures (847 GWh per year), heat recovery (721 GWh per year), combined heat and power generation (510 GWh per year), sector-specific processes (392 GWh per year), heating (340 GWh per year) and lighting (326 GWh per year). This shows that heat-related measures in particular achieve major savings. Lighting is still a significant efficiency technology due to the high number of measures (27%), even though it only achieves 4% of the savings.

In addition to increasing their energy efficiency, reducing their greenhouse gas emissions and increasing their energy productivity, there are other **advantages of EEN for companies** (figure 20).

Figure 20: Advantages of EEN for companies

Illustration by adelphi Initiative for Energy Efficiency and Climate Action Networks 2024. Source (in German)



Challenges and Success Factors from the German Experience

The fact that favourable framework conditions have been created at the three levels of **design**, **implementation** and **evaluation** has contributed to the success of the IEEN as a policy tool in Germany. These framework conditions are necessary in order to encourage enterprises to get involved in an Energy Efficiency Network (EEN) and to deploy the approach on a large scale. However, in order to achieve a large impact, one of the main recommendations is to **adapt the network concept to the respective local context**.

This guide identifies success factors in five areas: **overall success factors** and specific **success factors for policy makers, network operators, companies** and **potential monitoring institutions**.

Overall success factors

Progressive scale:
Introducing the EEN concept via a pilot phase first enables gradual scaling up to a recognised, legislatively anchored scheme.

Commitment agreements:
Contracts between the federal government and major industrial associations and organisations confirm the EEN targets and establish accountabilities to run networks.

Transfer approach:
Transferring the EEN through industry associations is an important lever.

Skilled administration:
Protecting the integrity of certification by setting up a dedicated coordinating office responsible for registering the EEN, managing the website and disseminating activities, e.g. by organising events, is crucial.

Awareness-raising:
Initiating networks requires strong promotion of the scheme's benefits to potential participants, coordinators and other stakeholders.

Information base:
Providing support material on a comprehensive website (e.g. FAQs, webinars, guidelines with practical information, contract templates etc.) as well as an interactive network map with relevant players and contact information empowers a quick start.

Training:
Qualified moderators and energy auditors are needed in the implementation and operation phase.

Policy programmes fostering widespread implementation of EENs are rather rare in the world. Nevertheless, two main factors supporting large-scale rollout can be observed: **voluntary agreements and incentives** (or a combination of both). The German example demonstrates that, despite the lack of financial rewards, companies can still be incentivised to participate in networks and implement energy efficiency measures. Until April 2023, the German scheme featured no main financial incentive, but of course companies were able to access the existing German subsidies supporting energy efficiency activities. As of May 2023, a 10% bonus is awarded to IEEN companies for the implementation of so-called "transformation concepts" under the German funding programme "Energy and Resource Efficiency in the Economy". There is some sporadic support for participating companies at federal state level, e.g. funding of modernisation costs or the costs for external consultants or the evaluation of measures. A more engaged approach can be seen in Switzerland or China, where participation in an EEN has clear additional benefits for the companies or at least exempts them from taxes or other disadvantages. Accompanying monitoring can provide valuable insights for **policy makers** and their decision-making.

Design Success factors for policy makers:

Regulatory framework:
A strong national policy framework, such as a high-level national target and a voluntary agreement as in Germany, is essential to establish networks at a large scale.

Partnership approach:
Government and major industrial associations and organisations collaborate under a joint initiative.

Clearly defined minimum requirements:
Government establishes minimum requirements for each network, including minimum network size, frequency of exchange and obligation to participate in monitoring, with compliance being monitored by the coordinating office.

Tailored support measures:
Support activities for networks such as training and/or subsidising moderators and external experts to facilitate knowledge building and exchange between different networks can help to improve the impact of the EEN.

Ecosystem:
For EENs to reach their full potential, the government needs to create an ecosystem of certified energy auditors and tailored multi-measure funding programmes.

Continuous monitoring:
By building an audit database, an independent Monitoring Institute collects accurate self-reported data on energy efficiency implementation and measures the contribution to the government's climate targets.

The bottleneck of the EEN approach is the **recruitment phase**. Many participants are hesitant to sign a contract for EEN services lasting 2 to 4 years (e.g. network moderation). For the initiator and/or network operator, it can be very resource-intensive to convince participants to join an EEN. In Germany, it takes three to five working days to persuade a company to join a network. Good practice examples and strong promotion of the scheme's benefits to participants and coordinators help to build support for the concept.

Experience shows: The stronger the national framework is, the easier the acquisition of new participants becomes:

Switzerland: exemption of the CO_2 surcharge on fossil fuels for companies involved in a network

China: companies in the three implementation regions had strong incentives to participate in an EEN

Germany: voluntary agreement

Companies interested in becoming part of a network often struggle with concerns about data sharing, efforts (employee time and up-front costs) and the effort required to complete the monitoring documents. This is particularly the case in networks that are strongly characterised by small and medium-sized enterprises that lack the necessary resources and capability. The monitoring process in Germany has therefore been designed in such a way that the companies need as few resources as possible.

The German IEEN has successfully targeted industry. Among other reasons, this is partly due to the flexibility in how firms conduct exchanges. "Competition" is neither a major obstacle nor a major advantage for the IEEN companies. Competitors may be part of the same network. Companies decide for themselves what information they share with the other participants. An exchange about energy efficiency does not necessarily mean revealing internal process-specific details.

Implementation Success factors for engaging companies:

Strong national framework:
Political significance facilitates the recruitment of new participants.

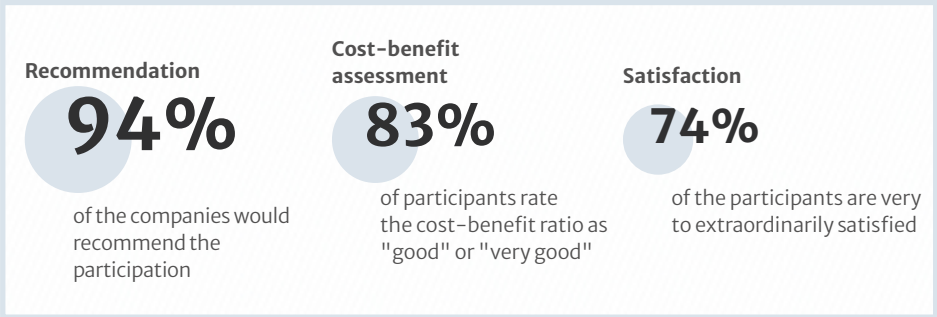
Intensive promotion:
Initiating networks requires strong promotion of the scheme's benefits to potential participants, mainly the good performance of the EEN in terms of energy savings and the high satisfaction rate of former participants.

Data protection:
Ensuring anonymous data collection to address privacy concerns and communicating that firms have full control over the information shared to encourage maximum participation.

Transparency:
Transparency about the efforts required to allocate staff or provide data for the monitoring process, e.g. provide information on how information create a positive cost-benefit ratio (especially for SMEs).

Figure 21:
The German EEN Initiative has proven highly successfull

Initiative for Energy Efficiency Networks: More successful together. Source (in German)



From the **company's perspective**, it is important to know what helps to correctly plan measures, estimate the related savings, successfully implement them and thus complete the monitoring. Missing resources or expertise, longer absences or changing key staff can be particularly challenging. Recently, the covid-19 pandemic with its multiple impacts on businesses has not made the process easier. However, over time, the German networks seem to have found ways to continue their activities and the implementation of measures.

Implementation Success factors for participating companies:

Commitment:
Conviction with regard to the topic of energy efficiency itself - both on the side of the participating companies and on the side of the moderator.

Providing resources:
Provision of the necessary time and dedicated financial and material resources by the companies and moderators and, if necessary, planning of redundancies.

Utilisation of support offers:
Intensive exchange with the coordinating office and Monitoring Institute to get familiar with the processes and, if necessary, support from qualified external energy consultants.

Qualified energy audit and potential analysis:
Makes it easier to set an appropriate savings target and ensures that the measures can be implemented as planned.

Monitoring a voluntary scheme like the one in Germany is a particular challenge. There is hardly any leverage with which the **Monitoring Institute** can motivate companies to participate in the monitoring process. While monitoring measures the overall effect of the initiative, the added value of participating in the monitoring process is often unclear for the individual companies. In particular, when it comes to a detailed verification of the implemented measures, significant efforts have to be made to stimulate their active contribution. The Monitoring Institute's tasks also include critically examining the eligibility of measures and borderline cases. Due to the diversity of the networks, however, the increased need for personal counselling with networks in the case of individual queries on creditable measures, delays, etc. should not be underestimated in terms of the capacities required. From the perspective of a potential Monitoring Institute, several success factors for minimising reporting burdens can be identified.

Early-stage support for German EEN
A new benefit for EEN in the IEEKN is support from the Monitoring Institute right from the outset. This means that the Monitoring Institute is available as a contact partner at an early stage and offers free advice, for example, on setting savings targets that comply with the monitoring requirements.

Evaluation Success factors for the monitoring process:

Monitoring guideline:
Documented regulations and instructions for monitoring with practical instructions for the participants and a detailed explanation of the methodology.

Simplified data acquisition:
Development of a standardised data collection procedure for quality assurance with easy-to-use excel reporting templates (with obligatory and optional metrics).

Early announcement & on-going support:
Explaining details of the monitoring process and sending the necessary monitoring forms at an early stage plus on-going contact with networks to clarify questions.

Reasonable implementation times:
The collection of monitoring documents at an advanced stage of the network activities has proven to be a good way of better evaluating the results and recording as many implemented energy efficiency measures as possible.

Verification:
Firms' reported data is verified in a two-step verification process between network coordinators and the independent Monitoring Institute.

Concession:
The flexible handling of deadlines meets the challenges of the complex real-world environment in which EENs operate (e.g. the EEN can request a postponement of monitoring to the next round if necessary).

Success Stories

Energy efficiency networks are a success story delivering measurable benefits for the participating companies. The ambassadors of the network initiative are committed to ensuring that even more companies seize this opportunity. They personally support the network idea and actively promote energy efficiency networks in internal association and public communication.[29]

One example of a success story in Germany is the Kiel Region Energy Efficiency Network. The Kiel Region Energy Efficiency Network was founded in 2015 in order to jointly implement the energy audits required by law for many companies. By pooling the tasks, the participants were able to carry out the audits at significantly lower costs and with less effort than if they had acted individually. The options to improve energy efficiency identified in the audits were recognised as an opportunity for further corporate development. The second round of the network has been running since January 2019. The network meetings focus on sharing experiences about the companies' energy efficiency activities. Examples of the topics covered so far include water pumping, frequency control and the replacement of pumps. The network also supports participants in applying for funding or developing energy efficiency services. One focus is on energy-efficient water supply. To this end, the participants visited a modern waterworks belonging to a municipal utility. By optimising pipeline routes, replacing pumps and renewing the pump control system, the energy demand can be reduced by 38 percent in future. The small municipal utility will save over 740 megawatt hours over the next ten years. This corresponds to a saving of around 400 tonnes of CO_2. A second focus is on urban district concepts for heat supply. For example, one participating company feeds the waste heat generated during production into a local heating network. A neighbouring company (also from the same network) uses this waste heat. The local heating network began operating in autumn 2019 and can supply additional consumers. The company uses the waste heat to save around 350 megawatt hours of gas and therefore around 70 tonnes of CO_2 per year. The overall energy savings target of all participants in the first network round was 862 megawatt hours by the end of 2018, for which they implemented around 40 measures in just over three years. The monitoring shows that the companies have significantly exceeded their target.[30]

Another very successful network is the REGINEE Bonn/Rhein-Sieg network, which was founded in April 2016. Eleven companies joined together with the aim of increasing their own energy efficiency. The originally planned network goal was achieved before the end of the four-year programme. But above all, the exchange of experience in the cross-industry network led to a very high level of satisfaction among the participants. In addition to traditional efficiency topics, such as heat recovery, in-house generation and electromobility, practical issues such as the legal framework, taxes and levies or energy management in accordance with DIN EN ISO 50001 were also discussed. REGINEE Bonn/Rhein-Sieg has implemented a total of 73 energy efficiency measures. This generates an annual final energy saving of 6,400 megawatt hours and an annual reduction in CO_2 emissions of almost 3,300 tonnes. In addition, 500,000 Euros in annual energy cost savings have been achieved.[30]

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Events Manager/REGINEE, VEA

"From the participating companies' point of view, the great added value of the networks is clearly the exchange with "like-minded people" who all have to overcome the same challenges in the energy sector."

In addition to the numerous German examples, there are many other successful network stories worldwide. For example, the first EENs in China were operated between 2005 and 2010 by the German consulting firm Arqum, focusing on energy efficiency and environmental protection. After this initial experience, the German Agency for International Cooperation (GIZ) and the State Grid Corporation of China (SGCC) decided to scale up the EEN activities between 2010 and 2013. With the support of GIZ, SGCC launched 576 networks with more than 6,000 industrial companies. A concrete example of EEN from China is the industrial park in the Taicang region, which was founded in 2021. The operation of the network was supported by the China International Engineering and Consulting Company (CIECC). The German Energy Agency (dena) has been following the activities of the network as an advisor. The network has a total of 10 participants. Most of them are production sites of German companies in China. The companies are currently completing their potential

[29] Initiative for Energy Efficiency and Climate Action Networks 2020. Source (in German)

[30] Quezada, Akamitl et al. 2023: Recommendations for the development of Energy Efficiency Networks in China. Source in (English)

analysis in the form of energy audits and defining measures to reduce their energy consumption and greenhouse gas emissions. Some companies have already started implementing measures.[30]

A second example of energy Efficiency Networks can be found in Nigeria. In 2016 the Nigerian Energy Support Programme supported the establishment of the first Energy Efficiency Network in Nigeria in collaboration with the Federal Ministry of Industry, Trade and Investment (FMITI), Manufacturers Association of Nigeria (MAN) and Nigerian Association of Chamber of Commerce Industry Mines and Agriculture (NACCIMA). The five participating companies jointly realised annual energy savings of around 280 million Naira. Based on the interest of several companies to participate in an EEN by early 2020, additional EENs have been established to address the energy challenges being faced by manufacturing industries in Nigeria. The participating companies are supported in the implementation of energy audit, training on clean energy topics and cross-cutting technologies, site visits to facilities of manufacturing companies in the same network, workshops to facilitate exchange of information and experiences among companies and the monitoring and reporting of energy savings and emissions reduction targets.[31]

[31] GIZ 2021. Share knowledge on Energy Efficiency. Source (in English)

Outlook and Transferability

Energy Efficiency Networks play an important role in Germany in achieving its energy efficiency and climate action targets. As a tool that is not based on regulation, but implemented on a voluntary basis by companies, this instrument is a good way to motivate companies to implement energy efficiency measures and share their experiences.

Germany's approach is an exemplary model of how to establish a large number of networks on a voluntary basis as part of a national energy and climate strategy. To introduce an IEEN approach, policy makers may therefore first need to **set a high-level legislative target** to achieve a certain number of networks, as was the case in Germany. At the same time, business associations (including industrial associations) should be given sufficient responsibility to facilitate the establishment of energy efficiency networks.

In addition, there is the need for **official recognition of EENs**. Companies will feel more incentivised to participate if networks are proposed and acknowledged by official authorities, e. g. as part of official regulations or action plans. Furthermore, companies can be motivated by concrete **state incentives for EEN participation**, e. g. tax reductions or exemptions from legal obligations. The incentives can be supported by local and national authorities and developed at national and/or regional level.

Transferring the IEEN approach through industry associations can leverage existing umbrella agreements. Such industry-level agreements could be expanded to cover not only energy consumption and CO_2 targets, but also to be a mandate for creating networks between members, requirements for each industry association to appoint network operators and participate in the scheme's annual monitoring.

Previous experiences show that it can be difficult for other countries to simply transfer an EEN model like the one existing in Germany. Therefore, it might be useful to develop **alternative models adapted to local conditions and considering local cultural aspects**.

To develop such a concept, it is first necessary to carry out a detailed evaluation of existing similar instruments or models. An important part of the evaluation is to draw up a stakeholder map to get an idea of the potential roles and contributions of different actors. This evaluation, which should consider quantitative and qualitative aspects, can be carried out by applying methods such as surveys and interviews. Second, experiences with EENs in other countries should be considered as well.

The central office of the German networks' initiative (hosted by dena) acts as a national and neutral entity for the EENs in Germany. This entity was established right at the beginning of the initiative and was therefore able to help with shaping the framework and supporting the different stakeholders in the establishment of the first networks. The **creation of a similar entity** is recommended to implement and coordinate the IEEN approach.

A key element of network development is the moderator. Network moderators require a special set of both communication and technical skills. Typically, there will be a lack of suitable moderators able to support EENs adequately. A dedicated **training programme can be developed** to address this issue. This programme would train local consultants, who could both initiate and accompany the first networks and later be responsible for training other local consultants and moderators.

To get the IEEN approach recognised by companies, the **development and dissemination of best-practice examples** certainly help companies to better understand the approach and its benefits and help motivate them to join a network. Collecting and preparing examples and developing an information and motivation campaign would be initial steps.
In order to estimate the savings achieved in the scope of an IEEN approach, data collection and verification is an essential part of such an instrument. Germany's approach to data collection is a good example, as it is well documented and can be transferred to other countries. Given that concerns about data protection can be a significant barrier to companies

joining an EEN, it is important to communicate that firms have full control over the information they share with other firms to encourage maximum participation.

With a view to the future and since the EEN instrument is still being developed and has not yet reached its full potential, it would be worth fostering the exchange of experiences with this approach around the globe. This would feed the knowledge base of how it has been implemented in different countries, how many EENs exist, how many participating companies are involved and, of course, the impacts in terms of energy savings and costs.

Some corresponding initiatives exist at national level, like the EEN Working Group in Germany (Arbeitsgemeinschaft der Energieeffizienz-Netzwerke Deutschland – AGEEN), but there is nothing comparable at international level, although IPEEC has made major efforts to disseminate knowledge about the EENs within the G20 and to put the instrument on the agenda. At an international level, major players, such as UNIDO and GIZ, could help to spread information about the approach. They could develop the corresponding guidelines and programmes to increase the exchange of experiences at an international level.

In addition, the EEN is an ideal instrument to promote energy efficiency and climate protection for companies and municipalities in the context of development aid programmes: it is a new approach, participants are from the private sector, costs can be easily calculated, timing and risks are controllable (e.g. compared to projects focusing on regulation), there is a tangible impact (real energy savings and CO_2 reductions achieved) and it has reputational benefits for all stakeholders involved in the implementing country.

To further improve the promotion of the EEN concept, closer international cooperation between governments, industry organisations and associations of cities is required. There is a need for better tracking and monitoring of EEN activities at an international level and better communication about the concept to demonstrate its benefits. Germany could play a key role in promoting EENs worldwide due to its many years of experience and successful implementation of this instrument.

List of Abbreviations

EDL-G	Energy Services Act
EED	Energy Efficiency Directive
EEG	Renewable Energy Source Act
EEN	Energy Efficiency Networks
EnEfG	Energy Efficiency Act
EU	European Union
GDP	Gross domestic product
GHG	Greenhouse gas
GWh	Gigawatt hour
IEEN	Initiative for Energy Efficiency Networks
IEEKN	Initiative for Energy Efficiency and Climate Action Networks
IEKP	Integrated Climate and Energy Programme
KSG	Federal Climate Change Act
LEEN	Learning Energy Efficiency Networks
NAPE	National Action Plan for Energy Efficiency
SME	Small and medium-sized enterprises
TWh	Terawatt hour

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