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Energy Efficiency Networks in Germany

The Sino-German Energy Partnership





Imprint

The report "Energy Efficiency Networks in Germany" provides an introduction to the German Energy Efficiency Networks Initiative and discusses experiences and best-practices from the operation of such networks in Germany. The report is published in the framework of the Sino-German Cooperation Field on Energy Efficiency Networks. The Cooperation Field, as part of the Sino-German Energy Partnership between the German Federal Ministry for Economic Affairs and Energy (BMWi) and the National Development and Reform Commission of the People's Republic of China (NDRC), is jointly implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH and the China International Engineering Consulting Cooperation (CIECC). The Cooperation Field supports the formation and operation of the Sino-German Energy Efficiency and Climate Networks in Taicang that shall serve as a showcase for the establishment of further Energy Efficiency Networks across China. As a German federal enterprise, GIZ supports the German government in the achievement of its goals in international cooperation for sustainable development.

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Acronyms

dena	German Energy Agency
EEN	Energy Efficiency Network
EMAS	Environmental Management and Audit Scheme
EMS	Energy Management System
LEEN	Learning EEN
IEEN	Initiative Energy Efficiency Networks
IEECN	Initiative Energy Efficiency and Climate Protection Networks
GHG	Greenhouse Gas
НО	Head Office
SME	Small and Medium Size Enterprises

Executive Summary

Energy Efficiency Networks in Germany

Today, Energy Efficiency Networks (EENs) are an effective way to improve energy efficiency in companies and municipalities in Germany. The "German Initiative for Energy Efficiency Networks" has been supporting the creation of EENs of companies since the end of 2014 and it is one of the most successful instruments of the German National Action Plan on Energy Efficiency (NAPE). Over 310 EENs, with about 10 participating companies each, have been started since the beginning of the initiative.

An EEN is more than just exchanging experiences; it is about reaching goals and achieving savings together. According to the first results of the official evaluation of the German Networks Initiative, the 132 registered EENs were saving on average 30 GWh final energy per year. Each network participant implemented on average 4 energy efficiency measures, which, in total, have already lead to savings of about 18 PJ (0,6 million t of coal equivalent) primary energy and 1,45 million tones CO2-equivalent. But much more savings are expected since many EENs have not finished their work yet and the creation of new EENs continues.

The benefits of participating in an EEN goes further than saving energy, emissions and costs: It helps companies make their company's commitment on energy efficiency and environmental protection visible, increase the capacity building of their employees, improve companies' energy management, get in touch with other companies and important players and much more. Surveys conducted by the initiative show that companies evaluate the cost-benefit ratio as good or very good and they would recommend network participation to other companies.

This document provides general information about the aproach for Energy Efficiency Networks (EEN) in Germany and the German Networks' Initiative including some examples of EENs.

1. The Approach for Energy Efficiency Networks (EEN) in Germany

Today, there are different approaches of companies' networks all around the world. These approaches can differ in their design, activities and proposed achievements. In order to better understand the content of the entire document this chapter describes the general approach for Energy Efficiency Networks (EEN) as applied in Germany.

Definition of EEN

An Energy Efficiency Network (EEN) is a voluntary, systematic, goal-oriented and non-bureaucratic exchange of experiences and ideas between its participants.

All around the world there are networks of organizations exchanging experiences. However, what makes the EEN-approach so special and different from other approaches?

An EEN goes further than just an exchange; it is about taking action, achieving results and reaching goals together. About one year after the beginning of the network activities, the participants define

Roles in an EEN

Within each EEN, there are four different roles to be filled. The network operator, the moderator, the energy consultant and the participating companies.

The network operator acquires network participants, proposes the moderator and the energy consultant to network participants, administrates the network (contracts etc.) and is in charge of public relations. The role of a network operator is commonly taken by industry associations, chambers, municipalities or service providers like energy consultants, but it can be taken by an organization of any kind. For example, some energy suppliers create networks with their clients to develop energy efficiency measures that benefit both, the companies and the energy suppling system. an energy-saving goal for the entire network. This goal is based on the concrete energy saving goals of each participant, which, in turn, are based on the results of individual energy audits or similar procedures to define energy efficiency measures within each company. The addition of individual goals determines a common goal for the network.

For a successful exchange and to obtain best results, the network activities are supported by experts (operators, moderators and energy consultants) during the entire running time (usually 2-4 years) of the network. This helps to ensure the quality and effectivity of results.

The moderator is in charge of planning, organizing and moderating the network meetings. He or she plays an essential role since, among other tasks, he or she ensures the exchange in between all participants without sharing confidential information. The moderator can be a person from an organization of any kind and is generally proposed by the network operator to the network participants. In Germany, there is no official specific certification for EEN-moderators. However, some market actors propose some trainings for moderators and deliver their own certificates. At the end of the day, it is up to the network operator and participants to decide, if the moderator meets the expected qualifications or not. The energy consultant provides technical advice to network participants and helps to identify energy-efficiency measures via, for example, energy audits. If required, the energy consultant can also help network participants to implement selected measures. As well as the moderator, the energy consultant is generally proposed by the network operator to the network participants, who decide whether he meets the expectations or not. The role of the energy consultant is generally taken by an external service provider. However, it is possible that an internal employee from one participant fills the role, as long as the person meets the requirements. This decision may occur in case of large companies with certified technical staff for energy auditing or with an energy management qualification. In contrast, choosing an external consultant may have the advantage of getting a different point of view. In Germany, there is an official list of qualified energy consultants supported by the federal government and administrated by dena, which can be consulted in search of a suitable energy consultant.

Finally, there are **the network participants**. They are the organizations exchanging experiences, identifying and implementing energy efficiency measures, defining energy saving goals and discussing results. Network participants may be organizations of any kind. However, in Germany, they are mostly companies and municipalities.

As a remark, an organization may play different parallel roles within an EEN. For example, a network operator may also be the moderator or even the energy consultant as long as the institution meets the requirements and the participants agree with the dual role.



Network Types

In Germany, EENs are classified in four types:

- **Regional Networks** of "neighbor" companies, geographically close to each other
- Sector-Internal Networks of companies of same economic/industry sector
- Company-Internal Networks of different company-sites
- Small-Company Networks of companies with 80 000 Euro or less energy-cost per year

Network Meetings

According to network statistics, the average number of network meetings per year is four. They usually take place in a site of one of the participants. Typical topics of a meeting are regulations, funding programs around energy efficiency, presentations of external experts on new technologies, guided tours in the host company to show implemented measures, discussions of achieved results and the exchange of experiences. The following table shows an agenda-example of a typical network meeting:

09:00	Welcome speech - Plant Manager of "ModelCompany"
09:15	Novelties around energy policy, changes in laws and guidelines, etc. - Mr Modelman, Energy Consultant
09:45	Presentation: Experience of Co. Model- Company with company lighting mod- ernization - Energy-Manager, Co. ModelCompany
10:15	Coffee break
10:45	Presentation on Smart Technologies and Energy Management - Guest Expert Ms. Modelwoman, Mod- el-Institute for Energy Management
12:30	Lunch break
13:30	Guided tour of ModelCompany, exam- ples of energy efficiency measures
15:00	Organizational matters (next dates, top- ics, hosts, etc.)
15:30	End of meeting

Contractual Relations and Financing

In Germany, the participation at an EEN is voluntary. Today, there is an open market around EENs. Thus, there are no official rules on how networks should organize themselves contractually and financially. This flexibility has the advantage of allowing network actors to decide individually on the best way of working together.

The first pilot EENs in Germany were directly financed by programs of the German "Federal Ministry of the Environment, Nature Conservation and Nuclear Safety". The direct financial support for EENs of companies was ended in 2014 with the beginning of the German Networks' initiative. Today, only EENs whose participants are solely municipalities still receive direct financial support from the Federal Ministry of the Environment. EENs of companies receive support by the federal government only indirectly; i.e. in form of information, supporting materials, communication etc. and primarily from the Federal Ministry for Economic Affairs and Energy (see Chapter 2). This decision was partly based on the relatively low cost of network participation. Experience shows that the total cost for companies for participation in an EEN varies between one and five thousand Euro per year. The magnitude of this participation cost is very low compared to the magnitude of the amount of money that companies invest in energy efficiency measures (in many cases over 100 000 Euro) and compared to the magnitude of the energy-cost-savings expected after the implementation of those measures (in many cases over 100 000 Euro per year).

A survey conducted in 2016 among 53 EENs participating companies shows that 73 % of companies are exceptionally or very satisfied with their network and 94 % of companies would recommend network participation to other companies. Consequently, a large majority of the companies (83%) evaluated the cost-benefit ratio of network participation as good or very good. This last point has been confirmed in a later survey in the context of the monitoring of the German Network's initiative (see Chapter 2), where 87 % of over 1 000 companies evaluated the cost-benefit ratio as good or very good. The results of the first pilot EENs in Germany showed that participating companies were significantly more effective at increasing their energy efficiency compared to the industry average, reducing their GHG emissions by an average of 1 000 tons of GHG, and increasing their energy productivity twice as fast as the industry average.

Today, some local governments in Germany provide financial support to regional EENs, mostly for the acquisition of network participants, which in the majority of cases needs about four working days of investment per participant. Some programs are focused on SMEs. Moreover, some industrial and economic associations and chambers financially support networks in different ways, for example by taking charge of the costs of the moderator or even moderating and organizing the networks themselves. In some cases, EEN participation is included in the membership fee that companies are paying to the associations. Nevertheless, most networks are financed by their own means.



Benefits

Participation in an EEN enables companies to plan and efficiently implement economic investments in energy efficiency on a solid data basis. The joint exchange of experience simplifies implementation measures, thus lowering energy consumption, reducing energy costs and creating competitive advantages. At the same time, companies can position themselves in an important sociopolitical context and demonstrate commitment to climate protection as well as technical innovations.

Participants of EENs:

- implement energy efficiency measures guided by experts and reduce energy costs
- can use network activities to prepare energy audits
- can use network activities to implement an Energy Management System (EMS) or to improve an existing one
- obtain faster results than companies not participating in EENs
- make their company's commitment on energy efficiency visible
- increase capacity building of employees
- increase transparency with own energy consumption and costs
- and more.

EENs and Energy Management

There are many possible synergies between network activities and energy management.

Anyone who operates an energy or environmental management system can participate in an energy efficiency network with relatively little additional effort. Conversely, networking effectively supports the implementation and continues improvement of the management system. Thus, participation in an energy efficiency network can be seen as a measure to demonstrate continuous improvement in energy performance. Many large companies have already made the decision to introduce an Energy Management System (EMS) in accordance with DIN EN 50 001 or an Environmental Management System (for example according to ISO 14 000 or to the European Eco-Management and Audit Scheme EMAS). For these companies it is easier to participate in an EEN. Numerous elements of the mentioned management systems have similarities to EEN-activities. For those companies interested in implementing an energy or environmental management system, EEN-participations is an ideal way to start with it and learn from other companies already having such systems.

The table in attachment 1 summarizes some of the synergies between EENs and EMSs.



2. The German Networks' Initiative

This chapter aims to present the German Initiative for Energy Efficiency Networks as an effective political instrument (policy) to increase energy efficiency in companies.

The German Networks' Initiative

With the adoption of the National Action Plan on Energy Efficiency (NAPE) in 2014, the German government put together a comprehensive package of measures and declared energy efficiency to be one of the hree mainstays of the energy transition: energy efficiency, renewable energy and sector coupling.

Because of the successes of the pilot networks, by the end of 2014, the Energy Efficiency Network Initiative (IEEN) started as voluntary agreement between the German government and 22 industrial and economic associations, to support the creation and realization of EENs until the end of 2020. Due to the success of this first period of the initiative, the German government and its partners decided to start a second period of initiative from the beginning of 2021 to the end of 2025, this time as "Initiative Energy Efficiency and Climate Protection Networks (IEECN)" to extend the initiative's topics to climate protection. For practical reasons "Energy Efficiency and Climate Protection Networks" will still be called EENs in this document.

The initiative has been playing the role of a superordinate national and neutral entity for EENs in Germany and is one of the most important and successful instruments of the NAPE. A main feature of the Initiative as a political instrument (policy) is the fact that it is based on voluntary participation at all levels, from the German government and the industrial and economic associations, in charge of implementing the initiative, to the companies participating at the networks. This makes this instrument particularly interesting and innovative since it has a different base compared to classic instruments such as financial programs, regulations, taxes etc.

First pilot EENs in Germany

The EEN approach was first developed in Switzerland in the late 1980s and was adopted in Germany in 2002. The Swiss experience was very successful, particularly after 2008 when the voluntary engagement of companies was motivated by the fact, that committed companies were excepted from the CO2 surcharge on fossil fuels, if they agreed on an individual efficiency target and a yearly monitoring. In 2018, the surcharge amounted to 82 Euro per ton CO2, compared to 10 Euro per ton in the implementation year 2008. In Germany, a pilot project called "30 Learning Energy Efficiency Networks (LEEN)" between 2008 and 2014, with focus on large companies, confirmed the benefits of the EEN-approach. Between 2012 and 2017, two additional projects for pilot networks called "Mari:e" (with focus on SMEs) and "LEEN 100 Plus" delivered positive results as well. The pilot projects were financed by the German Federal Ministry of the Environment, Nature Conservation and Nuclear Safety. The goals of the first period of the initiative was to support the creaton of 500 EENs. In this way, yearly savings of up to 75 PJ (2,6 million t of coal equivalent) of primary energy and 5 million t of GHG emissions were planned to be reached (per year, after the implementation of all EENs). The goals of the second period are to create 300 to 350 new networks to achieve total yearly savings of 9 to 11 terawatt hours (1,4 million t of coal equivalent) of final energy and 5 to 6 million tons of GHG emissions. With these objectives, the initiative brings an essential contribution to achieve the climate and energy policy goals of the Federal Republic of Germany.

Since December 2015, dena is in charge of the central office of the Initiative. Its main tasks within this role are:

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

and more.

Minimum Criteria for EEN

For registration at the IEEN, EENs have to fulfil following minimum criteria:

- least 2 years running time
- have at least 5 participating companies or company sites and at least 3 of them in Germany
- be supported by qualified moderators and internal or external energy consultants,
- define a common final energy saving goal (at the latest one year after foundation). As an option, EENs can also define a GHG saving goal (since 2021)
- participate at the monitoring process of the intiative.

In Germany, a market around EENs is developing and many service providers are adapting their business models to include EENs, for example, some energy consultants are grounding EENs and extending their services to propose not only the technical consultancy, but the network moderation and operation as well. Today, there are various EEN models in Germany, some of them are based on a running time of 4 years with a focus on SMEs, others have a running time of 2 years and are a mixture of SMEs and large companies, etc. As long as the models meat the above-mentioned minimum criteria of the initiative, network actors are free to choose their favored construct.





Achieved Results

A total of 286 EENs were registered and active in the first phase of the German initiative (2014 - 2020) and 24 EENs have been initiated since the beginning of the current (second) phase (state 06.09.2021). More than 2 300 companies have participated or are still participating in these EENs.

In order to evaluate the effects of the initiative, an annual monitoring is carried out since 2018. The aim is to quantify the measures implemented by the EENs and the achievements gained. More precisely, the monitoring is used to assess the total energy and GHG emission savings resulting from the initiative.

The monitoring is carried out by the so-called "monitoring institute" on an anonymous basis. To assure results' credibility, the monitoring institute is an independent entity from the initiative. Today, it is composed of a consortium of a research institute and a consulting company. The monitoring process is supposed to be as simple as possible for the companies, which means it is not a complicated and detailed evaluation of the companies or EENs itself but an evaluating of the initiative as a political instrument (policy).

The current monitoring process follows two main steps. The first step consists in collecting energy saving data of those EENs, which have ended their running time or are close to end it. In this step, the network operator or moderator summarizes the implemented energy efficiency measures and achieved energy savings for the EEN and communicates anonymized results to the monitoring institute.

The second step is verifying the results shared by the EENs. This means the monitoring institute examines the energy savings communicated by the EEN by sample testing. The testing is carried out randomly. This means 10 % of the companies are randomly selected by the monitoring institute for the verification.

The chosen companies are asked to deliver proof (such as invoices, protocols of measurements, etc.) of the implemented energy efficiency measures and respective achieved energy savings.

The communication between the monitoring institute and the companies mostly takes place via email or telephone, and, in most cases, with the support of economic associations as intermediaries. There are no site visits included.

To date, 132 EENs (1 384 companies) have been monitored for the initiative. The average saving goal of these EENs was 30 GWh final energy per year. A total of 6 207 energy efficiency measures have been implemented by the monitored EENs (in average 4 measures per company). The measures lead to savings of about 18 PJ (0,6 million t of coal equivalent) primary energy and 1,45 million tones CO2-equivalent.

Most common implemented measures have been lighting (28%), process technic (15%), compressed air (7%), heating (7%), motors (7%) and others (6%). 52% of measures were related to replacement of existing equipment and 31% to process optimization. 76% of measures were related to electricity and 16% to natural gas.

Until 2019, evaluated EENs exceeded their initial saving goals of 105 % on average, meaning the companies have achieved more than initially expected. Unfortunately, the average goal attainments fall to 94% in 2020. First enquiries on possible reasons for this lead to difficulties due to the corona pandemic, among other reasons.

From the 286 EENs of the first phase of the initiative, 154 have not participated in the monitoring yet, most of them because they are still active and running. The monitoring process for the EENs of the second phase (2021 - 2025) is currently under development. It will be based on the process of the first period and extended to the new topics and goals.

3. Examples of EENs in Germany and China

Somme examples of succesfull EENs are ilustrated in this chapter. The examples show, among other things, how different EENs can be. "Each EEN has its own story".

Mobility network of guild companies and women entrepreneurs from Essen city

Туре	Small-Company Network
Industry, Sector	mixed
Duration	1st round from March 2016 to Feb- ruary 2018. 2nd round from March 2018 to February 2021 (still to be monitored/ evaluated)
Nr. of com- panies	9, all SMEs (craftmen's companies)
Nr. of implement- ed energy effciency measures	65
Target and degree of achievement	First round: goal of 13 MWh/year, exceeded by 85%, Second round: goal of 15 MWh/year, results yet to be monitored/ evalu- ated
Description	The craft-companies, participating at this EEN are all leaded by women entrepreneurs. For them, the initial motivation for creating a network was the increasing energy prices. They also wanted to make their businesses competitive for the future while contributing to climate protection. In their first EEN-round, the companies implemented energy efficiency measues such as mod- ernization of lighting, windows and doors and lighting and heating con- trol via App. After the very success- fully first round, in March 2018 they started a second round, this time with a focus on mobility.

Energy Efficiency Network in Kiel

Туре	Regional network
Industry, Sector	mixed
Duration	1st round from October 2015 to December 2018. 2nd round from January 2019 to December 2022 (still runnig)
Nr. of com- panies	11, mostly power suppliers and pub- lic utilities
Nr. of implement- ed energy effciency measures	40 in the first round, 50 planed for the second round
Target and degree of achievement	First round : goal of 862 MWh, exceeded by 10%, Second round: goal of 830 MWh/ year
Description	The EEN was initially created to implement energy audits together. Thanks to this, the participants were able to carry out the audits at sig- nificantly lower costs and with less effort than if they had acted individ- ually. The network worked on topics like water pumping, frequency control and the renewal of pumps. Moreover, the service providers sup- porting the EEN (network operator, moderator and energy consultant) supported the participants in ap- plying for funding or in developing energy efficiency services.

Energy Efficiency Network Chemistry Location Bitterfeld-Wolfen

Туре	Sector-Internal Network	
Industry, Sector	Chemical industry	
Duration	1st round from June 2016 to May 2019. 2nd round from June 2019 to May 2022 (still runnig)	
Nr. of com- panies	10 chemical companies	
Nr. of implement- ed energy effciency measures	18 in the first round, most of them related to process technic	
Target and degree of achievement	First round : 4 680 MWh/year energy saving achieved	
Description	Bitterfeld-Wolfen is a location for chemical companies with a long tradition: the first companies from this sector settled there by the end of the 19th century. A total of eight chemical companies from Bitter- feld-Wolfen took part in the first phase of the network, and two more were added in the second round. The sector focus has been a great advantage for the participants, as all of them deal with similar issues. In its second round, the network will work among other things on the improvement of the companies ´ en- ergy management systems.	

Sino-German Energy Efficiency and Climate Networks in Taicang

Туре	Regional Networks
Industry, Sector	mixed
Duration	2021-2023
Nr. of compa- nies	10 companies
Nr. of imple- mented ener- gy effciency measures	Implementation ongoing
Target and degree of achievement	 Reduce CO2 emissions of energy-in- tensive enterprises by 5% to 15%. Increase the share of renewable energies in the energy-intensive enterprises to a total of 20% of total energy consumption.
Description	As agreed by NDRC and BMWi during the 6th Sino-German Working Group meeting on energy efficiency, China and Germany will enhance their cooperation on promoting energy efficiency network in China by introducing German best practices. The EEN aims to promote the exchange on energy saving and carbon emission reduction among enterprises by intro- ducing the management and organiza- tion model of German EEN, and to sup- port the establishment and operation of EEN in Taicang Hightech Industry Zone (THIDZ) and summarize the results and experiences as replicable references to showcase that EEN can be an innovative energy service instrument for energy saving in China.
	agencies respectively. The German EEN consultancy company Arqum will mod- erate the Sino-German Energy Efficiency and Climate Network in Taicang and provide technical advices while the Ger- man Energy Agency (dena) will provide further technical support

Attachment: Synergies between EMS and EENs

Requirements ISO 50001 (EMS)	Synergies with EENs
 Top-Management Appoint a management representative Ensure the setting of objectives Evaluate results 	 The management representative can be the employee designated as a participant in the network The definition of an energy savings target is part of the network's work Monitoring of the results in the network
 General (energy planning) Conduct and document an energy planning process 	• Developing plan for energy-efficiency measures in the network
Energy reviewDevelop, record, and maintain an energy review	• The potential analysis conducted in the network can be part of the energy review
 Energy baseline Establish an energy baseline using the initial energy review information 	• The potential analysis conducted in the network can help to develop an energy baseline (and vice versa, if an EMS already exist)
 Energy performance indicators (EnPI) Define EnPIs for monitoring and measure of energy performance 	• An exchange on the definition of EnPIs can be part of the activities of a network
 Energy objectives, targets and management action plans Establish, implement and maintain documented energy objectives 	 The definition and monitoring of energy savings targets is part of the network's work
 Competence, training and awareness Ensure that employees with tasks related to significant energy-use are competent based on appropriate education, training, skills or experi- ence 	 Training courses and presentations of experts can be part of network's activities Network participants share knowledge and expe- rience with each other
 Documentation requirements Establish, implement and maintain information on core elements of the EMS and their interac- tion 	 As part of network's activities, energy efficiency measures (action plan) and their implementation and monitoring as well as savings targets and eventually further information are documented
 Control of documents Documents as required by ISO 50001 shall be controlled 	 The network activities help to review the docu- mentation
 Operational control and design Define and plan operations and maintenance activities related to energy use Consider energy performance improvement while designing facilities, equipment, systems and processes with relevance on energy use 	 As part of network's activities, energy efficiency measures related to maintenance or the im- provement of facilities, processes etc. can be defined Network participants can exchange experienc- es regarding operational control and design as requested by EMS and even develop solutions together

Requirements ISO 50001 (EMS)	Synergies with EENs	
 Monitoring, measurement and analysis Ensure that the key characteristics of operations that determine energy performance are monitored, measured and analyzed 	 Network participants can exchange experiences regarding monitoring, measurement and analy- sis of operations as requested by EMS and even develop solutions together 	
 Compliance evaluation with legal and other requirements Evaluate compliance with legal and other requirements related to energy use 	 Presentations of experts on legal and other requirements can part of network's activities Network participants can benefit from the experience of other participants regarding legal and other requirements 	
 Internal audit of the EMS Internal audits must be conducted in planned intervals 	 Network participants can exchange experiences on audits of the EMS (or audits in general) and even define a common auditor 	



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