guarantEE
Building Energy Services in Europe

Market Report on the German EPC Market

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2. Framework conditions

2.1. Relevant national legislation and regulation

The main German policy targets on energy savings are defined in the “Energy Concept of the Federal Government” (2010). It states the German energy and CO_2 reduction targets up to 2050 and also describes the long-term strategy for the future energy supply. Greenhouse gas emissions have to be reduced by 40 % by 2020 and by 80-95 % by 2050 compared to the level of 1990. The share of renewable energy in gross final consumption of energy has to be 18 % by 2020. By 2050, the German government strives for a share 60 % of renewable energies (BMWi & BMU, 2010).

In the building sector, the target for 2050 is to have a building stock which is almost climate-neutral.

Since 2011, Germany has been implementing an integrated strategy for an “energy turnaround” (Energiewende) which includes the phasing out of nuclear energy by 2024. A large set of laws and regulations have been adopted to provide the adequate political support to the national energy strategies and targets. To reach the ambitious energy and climate targets, the refurbishment of existing buildings has been identified as a main focus area. The most relevant pieces of legislation and support schemes are provided in the following chapter.

Legislation / regulation	Effect on energy services / EPC
The EU Energy Efficiency Directive (2012) is being implemented in Germany mainly through the National Action Plan on Energy Efficiency (NAPE). The NAPE defines cross-sectoral energy efficiency measures for the building sector, establishing energy efficiency as an investment and business model and increasing individual responsibility for energy efficiency (see also table support schemes).	+
Another part of the EED implementation is the National Energy Efficiency Action Plan NEEAP (June 2014)	0
The EED obligation for large enterprises to perform regular energy audits was implemented in April 2015 by the Federal Government with a bill to amend the Energy Services Act (EDL-G).	0 (+)

Legislation / regulation	Effect on energy services / EPC
The amendment of the Combined Heat and Power Act in 2016 (Kraft-Wärme-Kopplungsgesetz, KWKG) incentivises the building of low-emission energy generation systems.	+
The Energy Savings Act (Energieeinspargesetz, short: EnEG): is the legal implementation of the EBPD and is the legal basis for the Energy Saving Ordinance 2013 (Energieeinsparverordnung, short: EnEV) which regulates amongst others the building code for new buildings and the refurbishment standards for existing buildings.	0
The Renewable Energy Sources Act (Erneuerbare-Energien-Gesetz, short: EEG) defines feed-in tariffs for renewable electricity	+
Renewable Energies Heat Act (Erneuerbare Energien-Wärmegesetz, short: EEWärmeG): Obligation to use renewable energy sources for heat supply in new buildings, and in case of refurbishment also in buildings of the public sector	0
The Municipalities Codes of the German Federal States aim to ensure balanced budgets to help in fulfilling the criteria of the Maastricht Treaty. The municipal supervisory authorities ensure that local authorities adhere to this target by diligently controlling their public debt levels.	-

2.2. Relevant public support schemes

There are several public support schemes for energy efficiency related measures, mostly administered by either the Federal Office of Economics and Export Controls (BAFA) or Germany's large development bank KfW (see also chapter 2.2).

Normally it is the building owner who has to apply for the related grants or soft loans. At the same time, the technical planning is in the hands of the ESCO in EPC projects, so that applying for funding in these schemes is difficult, sometimes even impossible in the context of an EPC.

In recent years, the funding conditions of several programmes have been improved in a way that now also ESCOs can submit applications within an EPC project. The following programmes are generally open to ESCOs:

Funding / support scheme	Open to client and/or ESCO	Effect on energy services / EPC
Measure defined in NAPE: Support for project developers in energy performance contracting (started 2015)	Client	+
Measure defined in NAPE: Guarantee programme by guarantor banks for investments in EPC projects (see below)	SME ESCOs	0 (+)
Grants and soft loans administered by the Federal Office of Economics and Export Controls (BAFA) • renewable energy sources in the heating market (Marktanreizprogramm, short: MAP) • highly efficient cross-sectional technologies • highly efficient cogeneration and cooling systems • introduction of energy management systems	 Client & ESCO Client & ESCO Client & ESCO SME Clients	+
Favourable credit costs for refurbishment investments from the state owned bank KfW (several sub-schemes for different building types)	Client & ESCO	0
SME Energy Consulting (“Energieberatung Mittelstand”) by KfW: grants of up to 80 % of energy auditing costs for SMEs	Client	0
Incentive Programme Energy Efficiency (2016) (Anreizprogramm Energieeffizienz): Funding of new heating systems and ventilation systems in building modernisation	Client & ESCO	0 (+)

The German Federal Government, together with the 16 regional guarantor banks, is presently setting up a guarantee programme for investments in EPC projects which is explicitly tailored to SME ESCOs. As the usual EPC project size in Germany is rather big (> EUR 200,000 baseline), SMEs are presently involved mostly as subcontractors in EPC measures, but hardly as ESCOs.

The new programme aims to establish a market for smaller EPC projects with simplified contract models aiming at technology-specific projects (e.g. lighting EPC) which are

expected to be offered also by SME ESCOs. The bank guarantees through the guarantor banks will address the expected financing challenges which SMEs face, especially if they enter this new market which is presently also not very well known to most of the banks. The programme is expected to start in 2016.

2.3. Available financing options for energy services

A list of all possible financing options is attached in annex A.

The majority of EPC projects in Germany are shared savings projects in which the ESCO finances the investments. For doing so, the instrument of forfeiting (see annex for explanation) is the preferred financing practice of the ESCOs and is usually also accepted by the clients (though there are exceptions).

In recent years, there has been a growing number of EPC projects in which the client took over (parts of) the financing of the investments (guaranteed savings approach), thus reducing or taking away completely the ESCO's financing obligations. This is being done especially in situations in which the client is interested in including deep renovation measures in an EPC project. As the payback period of deep renovation measures is usually higher than the duration of an EPC project, a construction subsidy from the client is usually the only way to achieve this goal.

2.4. Development of energy prices in Germany

Energy prices and price relations strongly influence the attractiveness of energy efficiency investments and the economic viability of energy services.

European energy prices (based on Eurostat) have been published in the 2016 “Energy Data” publication of the German Federal Ministry for Economic Affairs and Energy. The following graphs illustrate the price development for gas (industry and households), electricity (industry and households) and light heating oil (index year 2005).

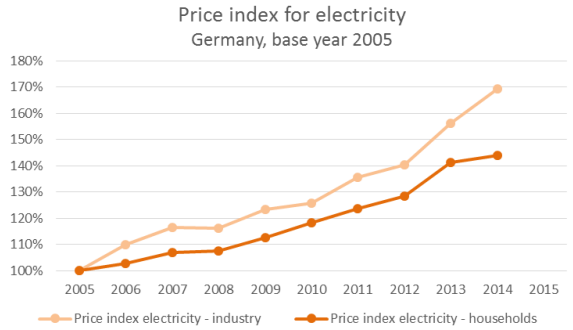


Figure 1: Development of electricity prices in Germany

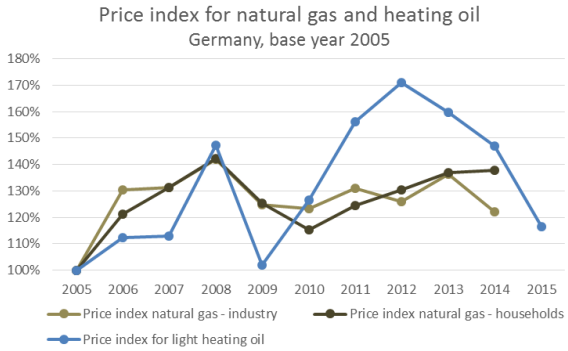


Figure 2: Development of natural gas and heating oil prices in Germany

It can be stated that:

- Prices for **electricity** increased steadily since 2005: approx. 70 % in industry and 44 % for households.
- While the price per kWh household electricity is roughly twice the price of electricity for industry, the price increase for industry was higher in recent years.
- As the natural gas prices are linked to the oil price, the gas price development is much more fluctuating with decreasing prices since 2013.

Graphs illustrating not only the price indexes but also the absolute prices for gas, oil and electricity as well as the detailed figures are attached in annex B.

2.5. Critical assessment

National legislation and regulation

European legislation (especially EED, RED and EBPD) and the German "Energiewende" (energy turnaround) can be considered key impulses for defining the extensive legislative framework and funding environment for energy efficiency, renewable energies and energy services in Germany.

Even though German legislation is very supportive of energy efficiency and renewables, the legal framework is only supportive to a limited extent of energy services such as EPC. The German practice of public procurement is fragmented due to the German federal system. What is lacking is a legally binding national procurement guideline clarifying procedures. Presently, modernisation strategies are mainly organised on the regional level, resulting in huge differences in the application of EPC between the 16 Federal States.

A major bottleneck for EPC on the regulatory level is the very restrictive approval practice of EPC in local authorities by the supervisory authorities, which control public

debt levels. Especially for indebted communities, for which EPC could be explicitly interesting, the approval for EPC projects is very hard to obtain in several Federal States. Unfortunately, this restrictive practice is also supported by the Eurostat Guidance Note (2015) on the European level, impeding the development of EPC markets in many countries.

Public support schemes

A large variety of public support schemes for energy efficiency (grants and soft loans) improves the financing options for EPC projects, although applying for these funds is sometimes difficult in EPC projects. But generally these programmes are supportive also of energy services.

At the same time, the funding levels are not high enough to bring the payback period of especially deep refurbishment measures anywhere close to 10-14 years which is the normal duration of EPC projects in the public sector. Therefore some EPC clients who want to include deep renovation in their EPC projects provide an investment subsidy to the project.

Financing

The predominantly large ESCOs operating on the German EPC markets usually do not face serious financing problems. As both EPC clients and banks know and usually accept the instrument of forfeiting, this is the most common financing structure of EPC in Germany.

For the emerging market of smaller, technology-specific EPC projects, the new guarantee programme through the guarantor banks will address expected financing challenges for smaller ESCOs.

Energy prices

The drop in international oil and natural gas prices since 2013 – combined with the anticipation of moderate prices in the future – clearly reduces the economic pressure on building owners to invest in energy efficiency or modernise the building stock with energy services such as energy performance contracting.

Traditionally approx. 80 % of the energy costs in German EPC projects are related to room heating. Consequently, the low natural gas prices since 2013 disproportionally negatively affected the economics of EPC projects in Germany. This effect contributes to the decrease of EPC projects since 2013.

Public debt levels

The budgetary situation among public authorities has improved significantly during recent years, impeding the inclination to outsource building modernisation to private ESCOs. Furthermore, the interest levels in Germany are on a historic low, allowing building owners cheap access to finance energy efficiency investments themselves. Both effects contribute to the decline in public EPC projects in recent years.

So while the legislative framework and the capacities for EPC are well-established in Germany, the recent years clearly show the high relevance of the general market environment, especially energy prices, interest and public debt levels.

3. Key actors

3.1. Description of key actors

ESCOs

Some 500 to 550 companies are supplying energy services (especially energy supply contracting) in Germany today. These include energy companies, ESCO companies, engineering companies and other suppliers (EC DC JRC, 2014). However, for less than 30 % of the companies, revenues from energy supply contracting and/or energy performance contracting amount to more than 30 % of their total turnover, for about 60 % of the companies the ESC/EPC revenues equate less than 5 % of their total turnover (Seefeldt et al. 2013).

Looking at energy performance contracting (EPC), approx. 10-15 mostly large companies (often subsidiaries of multinationals or large utilities) dominate the market.

Manufacturers of building technology such as Siemens and Schneider Electric are experiencing success shifting to service business models in Germany.

The following ESCOs (selection, in alphabetical order) offer EPC in Germany:

- Cofely Deutschland GmbH
- Bilfinger
- Caverion
- Dalkia Energie Service GmbH
- EnBW Sales & Solutions GmbH
- Evonik New Energies GmbH
- German Contracting
- GETEC AG
- Honeywell Building Solutions GmbH
- MVV Energiedienstleistungen GmbH
- RWE
- Sauter FM GmbH
- Siemens AG, Industry Sector, Building Technologies Division
- SPIE Energy Solutions GmbH
- Vattenfall Europe Sales GmbH
- WISAG Energiemanagement GmbH & Co. KG
- YIT Germany GmbH

Due to the traditionally large project sizes in Germany, SMEs are normally not able to win EPC tenders. However, there are now ambitious efforts supported by the Federal Government to open up the EPC markets for SMEs in the future with simplified contracting models and a guarantee programme through guarantor banks for SMEs offering EPC.

Several industry associations represent ESCOs in Germany and address ESCO issues:

- VfW – Verband für Wärmelieferung: Association for heat supply
- ESCO Forum: Working team within the ZVEI (Zentralverband Elektrotechnik- und Elektroindustrie), the German Electrical and Electronic Manufacturers' Association
- VDMA – Verband deutscher Maschinen- und Anlagenbau: German Engineering Federation
- AGFW – Der Energieeffizienzverband für Wärme, Kälte und KWK: Energy Efficiency Association for Heating, Cooling and Co-generation
- DENEFF – Deutsche Unternehmensinitiative Energieeffizienz: The German Business Initiative for Energy Efficiency

EPC clients

The customer groups for energy services including EPC projects can generally be classified into five main customer groups.

	EPC	ESC	Others*
Municipalities, public buildings	+++	+	++
Hospitals, medical facilities	+++	++	+
Industry	+	++	+++
Commerce, Trade, Services	+	+++	++
Social housing companies	-	+++	++
Shares of the total contracting market	~15 %	~80 %	~5 %

Table 1: Customer groups for EPC (Source: BEA 2007); *others: operation contracting etc.

Public sector

The EPC focus is mainly on public buildings, which can be explained by suitable conditions in public buildings regarding continuous energy use and possibilities for central energy management installations. There is also the fact that market development

has been pushed considerably by energy agencies and comparable institutions that are in close connection to public administrations. Limited investment budgets and the reformatory efforts of the public administration are driving an additional necessity for advanced private energy services by private companies, though this effect has weakened since the situation of public budgets has been improving in recent years.

For the implementation of EPC, a minimum energy cost baseline in Germany of approximately EUR 200,000 is required. Small buildings are in general not well suited for EPC. However, they can be part of a building pool together with larger buildings, because the economic feasibility of small energy efficiency measures often improves in combination with the modernisation of larger facilities.

A research study for the Federal Environmental Agency on existing EPC projects showed that around 75 % of EPC projects have been implemented in the public sector. There are around 200,000 public buildings in Germany. Most of these buildings are office buildings for administration, school buildings and sports facilities. A good overview regarding the energy consumption in public buildings in Germany is given in the study by the German Energy Agency (see table below):

	Number of buildings	Energy consumption in GWh	Energy costs in EUR million
Total potential	186,200	58,200	3,580
Federal buildings	4,200	9,700	580
Buildings of the States (Länder)	6,400	11,400	750
Buildings of municipalities	175,600	37,100	2,250

Table 2: Public buildings and their energy consumption in Germany in 2005 (dena 2007)

Private sector (Industry, Commercial, Housing)

Private EPC clients are mostly clients from the retail and office sectors which comprise retail outlets such as shops, supermarkets, shopping malls, other leisure facilities, and commercial office buildings.

Buildings of the **commercial and trade sector** are comparable to large residential buildings. The units are rented by different clients with the impact, that user changes might appear very often. The technical saving potentials are huge. At the same time, EPC is normally not applied in rented commercial buildings due to the split incentives dilemma.

The **industry sector** is completely different from other sectors. It is characterised by different production processes and equipment, resulting in varying demand on usable energy supply. Besides heat and electricity, which are covered in the classic EPC model, other transformed energies, e.g. steam, cooling, process heat or compressed air play an important role and offer many possibilities for implementing energy efficiency measures.

Some ESCOs satisfy this demand by combining energy supply contracting with additional saving elements, which are implemented as full services. Nevertheless, information on the use of EPC-related products in the industry sector is typically not published. In general, industrial companies try to achieve a reduction of the contract duration by providing own financial resources to the EPC projects.

The general legal framework for realisation of EPC in **residential buildings** is currently not very supportive. Following the German Law, the ESCO needs agreement by each tenant to implement measures. To reach the minimum size to implement EPC economically, the number of necessary agreements is high. Due to this structural problem it appears that no EPC projects have been implemented yet, even though there is a huge energy saving potential.

EPC facilitators

Project facilitators (agencies, consultants) are very important in Germany. Especially public clients regularly take advantage of the services of EPC facilitators to support them in navigating through project initiation and management. They help especially municipalities in conducting public procurement for ESCO services (e.g. project development, assistance in the tendering procedure and other project management tasks) (Busch, 2013; EC DC JRC, 2014).

Some regional energy agencies are the most experienced facilitators for EPC in Germany:

- Berliner Energieagentur GmbH (BEA), Berlin
- Klimaschutz- und Energieagentur Baden-Württemberg GmbH (KEA), Karlsruhe
- Energieagentur Nordrhein-Westfalen
- BEKS Energieeffizienz GmbH

The energy agencies mentioned are organised in the Federal Association of Energy and Climate Protection Agencies in Germany (eaD).

3.2. Critical assessment

Germany remains the most important ESCO market in Europe. There is, however, some movement in the markets, both on the demand and the supply side:

The public sector remains an important client group for EPC with continued large potentials for projects. The general suitability of public buildings is generally high due to stable usage patterns, openness to a long contract duration (> 10 years) and extensive experience with EPC in the German market.

At the same time, the share of EPC projects in the private sector is growing, with a strong focus on hospitals/healthcare, but also significant shares in the services sector and in industry The residential sector is seen very difficult for EPC, to date there are no documented EPC pilot projects in this sector.

4. Market volume

Figures on the size of the German EPC market are available from several sources.

Company profiles on important ESCOs in Germany show EPC revenues of several companies, representing most of the ESCOs which are known to be active in EPC:

ESCO	Turnover with EPC (2014)
Siemens	EUR 39 million
Cofely	EUR 17.53 million
EnBW	EUR 10 million
Bilfinger	EUR 5.80 million
Caverion	EUR 3.45 million
RWE	EUR 3.44 million
German Contracting	EUR 0.33 million
Sum	EUR **79.55 million**

Table 3: ESCOs in Germany (Source: https://www.facility-manager.de/)

While some EPC providers active on the German markets are missing in the list above (e.g. WISAG, SPIE), the companies named represent the largest share of the German EPC market.

4.1. Number of EPC projects

	2006 - 2007	2008 - 2009	2010 - 2011	2012 - 2013	2014 - 2015
Number of EPC projects with public clients in your country*	22	23	20	19	12
Number of EPC projects with private clients in your country:	No sector-specific figures published for EPC				

Table 4: Number of projects (Source: tenders published on http://ted.europa.eu)

While in 2007 the largest share of the German EPC market was seen in the public sector, this seems to have changed in the last 8-10 years. A 2015 survey in the context of the Transparense project, in which German ESCOs participated, resulted in the following figures, translating into a total of approx. 70 new projects (2014).

Number of projects initiated

How many EPC projects has your organisation initiated / become involved with in the last 12 months?

	None	1-5	6-10	11-20	20+
TOTAL		**29** % (2)	**29** % (2)	**43** % (3)	
Germany		29 % (2)	29 % (2)	43 % (3)	

Source: www.transparense.eu/database/

4.2. Size of EPC projects

With the Berlin Energy Saving Partnership which is the largest regional EPC scheme in Germany (27 projects since 1996), the key parameters (average) of these mostly public sector projects were:

Key parameters	
Average baseline / project	EUR 1,800,000 €/a
Average guaranteed savings	26 %
Average investment / project	EUR 2,035,000
Average ESCO turnover over duration	EUR 4,275,000
Average contract duration	12 years

Table 5: Key parameters of Berlin Energy Saving Partnerships (Source: BEA)

No systematic evaluations of EPC projects in the private sector are available. Contract durations in private sector EPC projects will normally be in the range of 3-6 years.

4.3. Other important energy services

In Germany, the predominant ESCO business model is **energy supply contracting** (ESC) with approx. 75 % of all ESCO projects. Only approx. 20% of the market is covered with EPC. The rest of the projects involve financing only, or they are based on operation contracting and other less complex solutions.

The number of providers of energy supply contracting (ESC) and/or energy performance contracting (EPC) today is put at 500-550, which includes energy companies, ESCO companies, engineering companies and other suppliers (Seefeldt et al. 2013).

4.4. Critical assessment

Compared to other countries, customer attitude towards energy services is highly favourable and the market is forecast to deliver solid growth. At the same time, the number of tendered EPC projects in the public sector suffered a slight decline during recent years, indicating a certain shift from previously predominantly public clients to a larger share of private clients today (own evaluations based on http://ted.europa.eu).

The market volume of energy services in Germany is seen at between EUR 3.5 – 5.0 billion/a. The share of EPC in this market is estimated at 8 % of the total income generated (Seefeldt et al. 2013).

A 2015 survey among ESCOs (Transparense project) showed slight growth rates of maximum 5 % for the German EPC market.

The market potential for energy services (EPC and ESC) is being calculated at EUR 20 – 30 billion/a, referring to the total revenue from energy services, including energy costs (EC JRC 2012).

5. Market assessment of EPC sectors

Expert feedback collected from market stakeholders combined with own experiences is shown in the following SWOT analysis regarding EPC in the various building sectors:

5.1. Public sector

STRENGTHS

- Good suitability of public buildings for EPC
- Project bundling/large projects are possible and common
- Guaranteed energy cost savings
- Financing through ESCO
- Numerous successful pilot projects
- Well-tested EPC standards available

WEAKNESSES

- Weak demand due to low energy prices (natural gas), interest rates and public debt levels
- Market saturation in some regions
- High transaction costs due to public procurement rules
- Difficult for small projects (e.g. in smaller towns with only a few public buildings)
- Number of ESCOs bidding for public projects is rather small

OPPORTUNITIES

- Modernisation backlog, extensive refurbishment needs
- Chance of combining EPC with deep renovation (EPC plus)
- Openness for long commitment periods
- Still large potential in most regions
- Exemplary role of public sector
- Public CO_2 reduction targets (nationally, regionally, locally)

THREATS

- Restrictive EPC approval in indebted communities of some Federal States (cf. Eurostat guidance note)
- Strongly depending on political support / supportive stakeholders within administration
- Tendency to reduce outsourcing and to build up own technical capacities in some administrations

5.2. Private sector: Industry

STRENGTHS

- High cost-consciousness in industry
- Openness to outsourcing in industry

WEAKNESSES

- Normally only a short project duration is being accepted
- EE measures in production processes require highly specialised ESCOs (small supply market)

OPPORTUNITIES

- ESCOs/manufacturers/utilities can use their strong ties to industry
- Possibility to develop/offer integrated energy services
- Process heat utilisation offers opportunities for CHP application

THREATS

- “Closed' market, hardly public tenders

5.3. Private sector: Tertiary sector

5.4. Private sector: Residential buildings

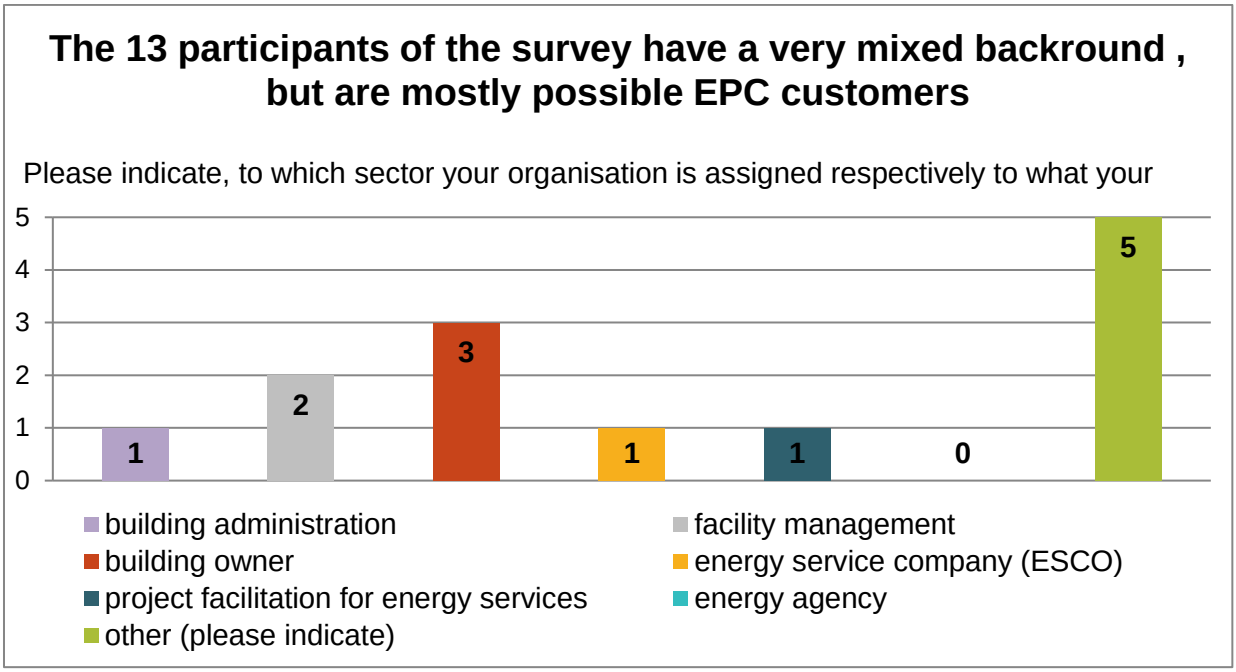
6. Stakeholder Survey

To identify the potential of an EPC roll-out and the needs of possible EPC market stakeholders in the use of EPC or related energy services, an online survey has been performed. Target groups have been on the one hand public and private building owners (also associations) as possible customers, and on the other hand partly also experienced ESCOs and EPC facilitators.

The survey addressed issues concerning the modernisation of buildings and aimed to enquire to what extent the split incentives dilemma and flexibility issues are relevant in the decision making of the building owners.

The following graphs show the most important results of the German stakeholder survey. 13 participants in total filled in the questionnaire.

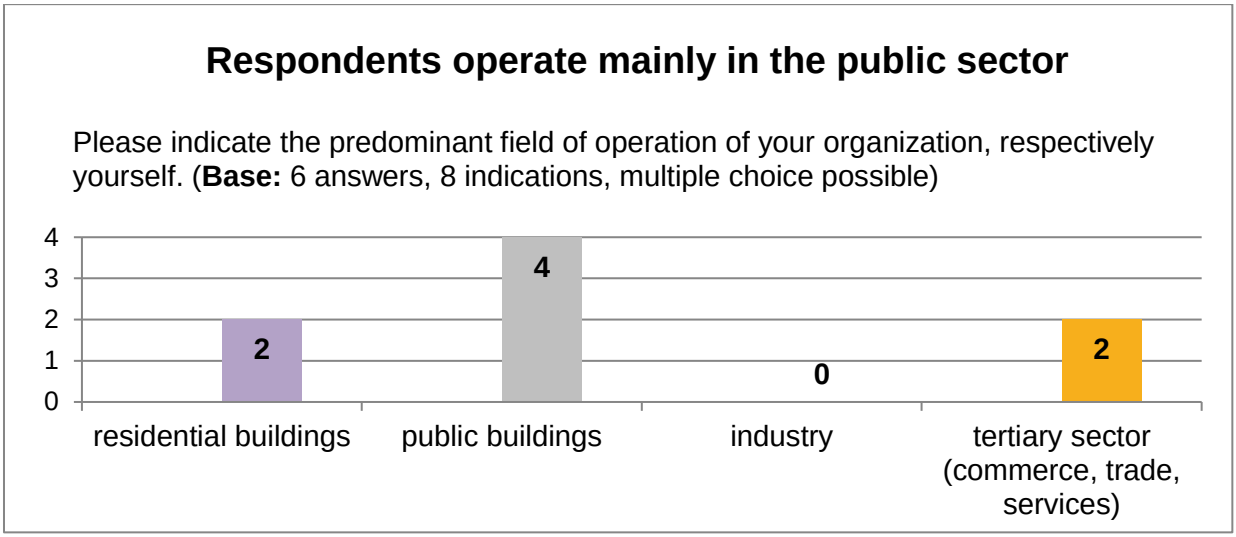
6.1. Basis of survey



Stakeholder recipients summarized under the heading “other” are

- A local business association for industry and commerce
- A national business association of SMEs
- A national public authority
- A contractor and energy service provider

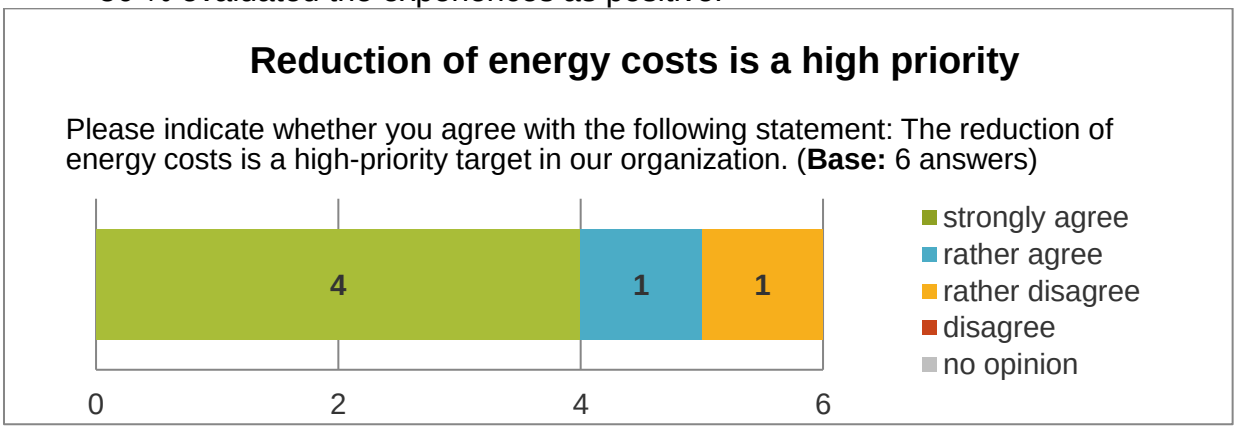
- An insurance company

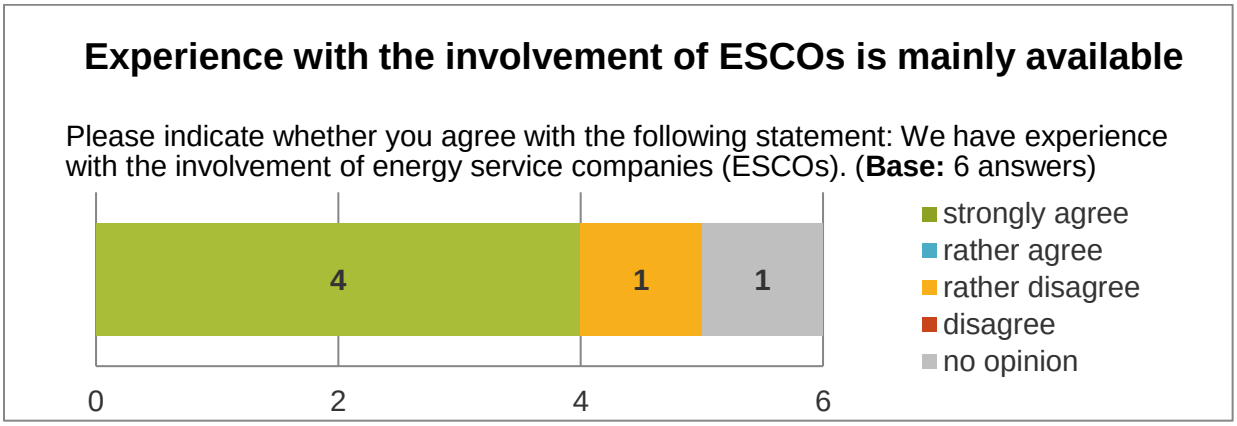


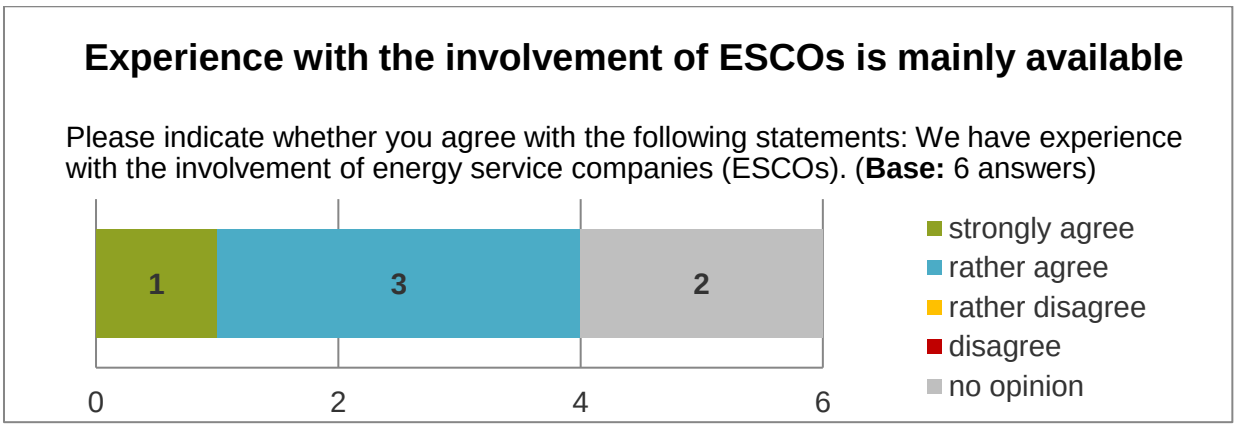
6.2. Experiences with EPC

The respondents have been asked to indicate how much they agree with certain statements on EPC.

- 5 out of 6 respondents indicate that the reduction of energy cost has high priority in their organization
- 4 out of 6 respondents have already experiences with energy service providers; 50 % evaluated the experiences as positive.



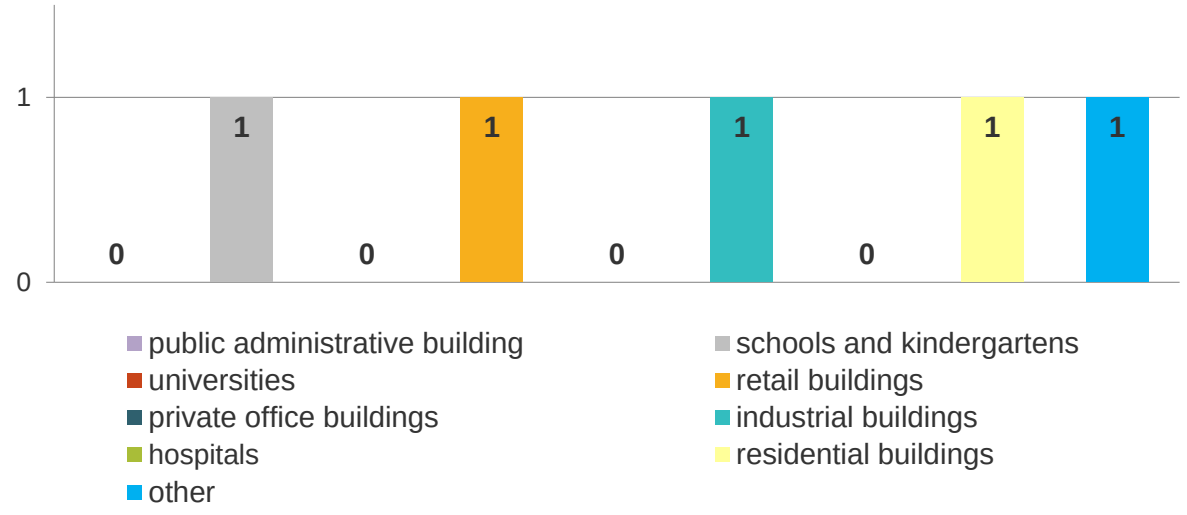




There have been only two survey participants who already implemented or accompanied EPC projects by themselves. Their EPC activities take place in the public as well as the private sector (public administrative buildings, retail buildings, residential and industrial buildings, others).

EPC experience exists in public and private sector

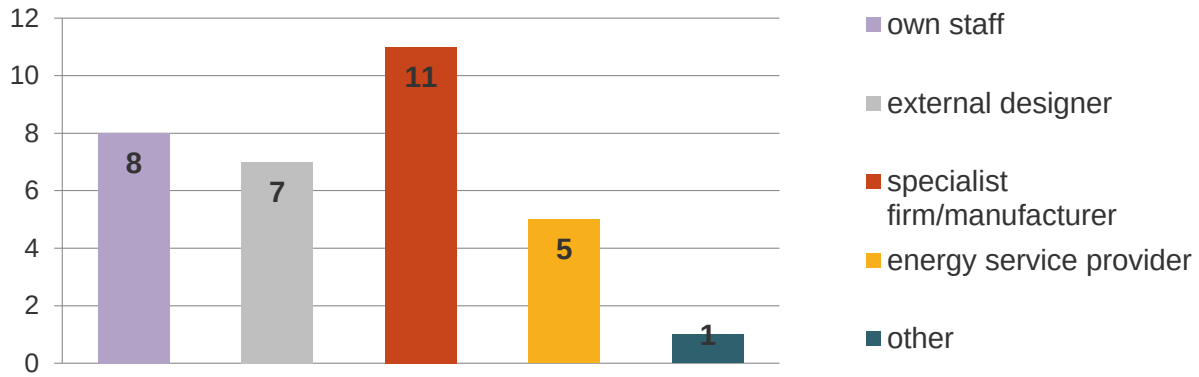
Question: For which kinds of buildings has your organisation already implemented or accompanied EPC-projects? (**Base:** 2 answers, 5 indications, multiple choice possible)



The following two graphs show that it is quite common to implement energetic modernization measures with own staff, but that it's more likely to employ the services of external companies such as specialist firms, manufacturers, external designers and energy service providers. In contrast, the ensuing maintenance and operation of facilities is accomplished predominantly with the help of in-house-staff. This might lead to risks on the side of the building owner that can be addressed/solved through EPC.

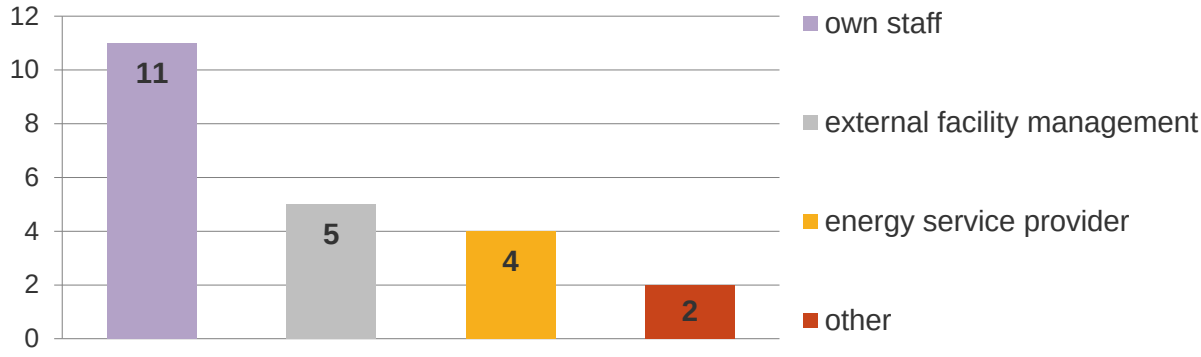
Implementation of measures is accomplished predominantly externally

Question: With whom do you normally implement the diverse phases of an energetic modernization? (**Base:** 13 answers, multiple choice possible)



After implementation of measures, operation of facilities is accomplished predominantly internally

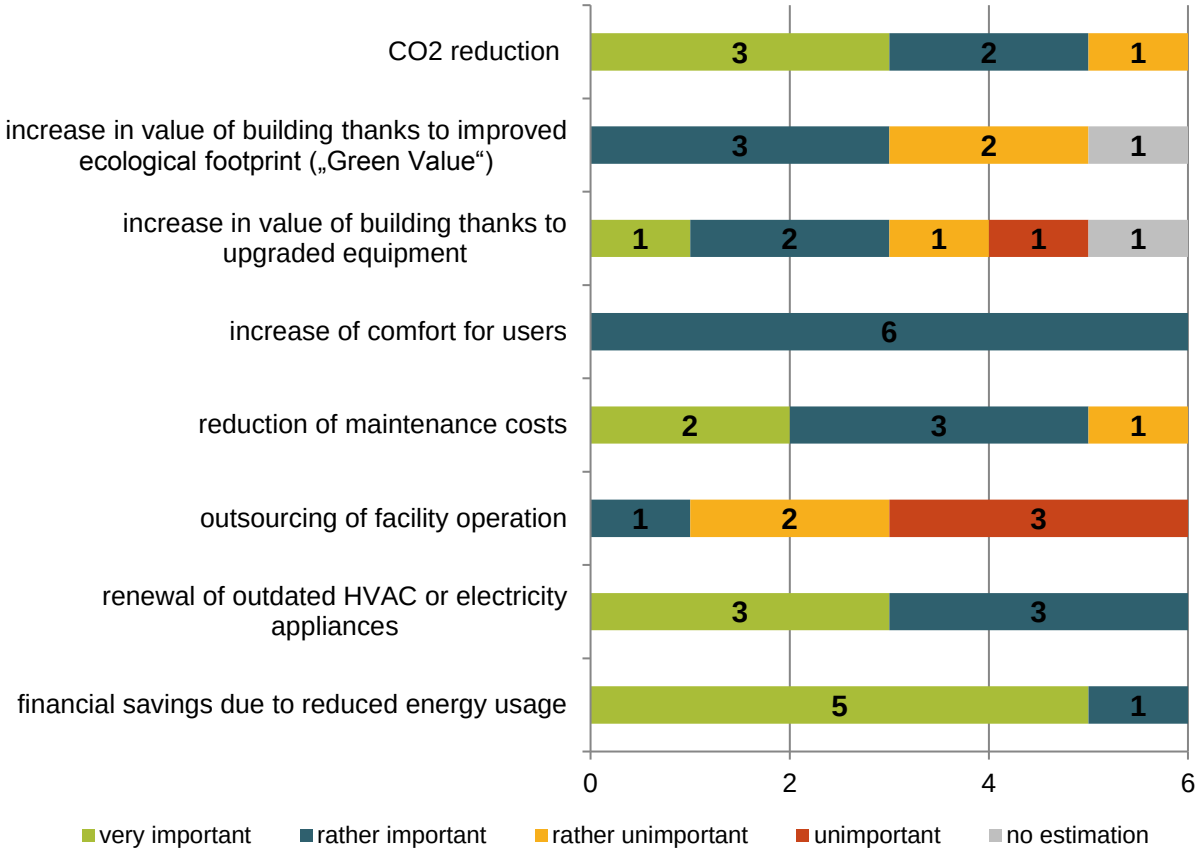
Question: Who does normally the operation of facilities after the implementation of an energetic modernization. (**Base:** 13 answers, multiple choice possible)



The most important reasons for energetic modernisation are financial savings, renewal of facility operation and, surprisingly, also CO_2 reduction. On the contrary, the outsourcing of facility operation or the increase of building value are hardly driving forces for modernization measures.

Financial savings, renewal of facility operation and CO2 reduction are most important reasons for modernization

Question: There are several reasons for an energy efficient refurbishment. How do you evaluate the importance of the following aspects? (**Base:** 6 answers)

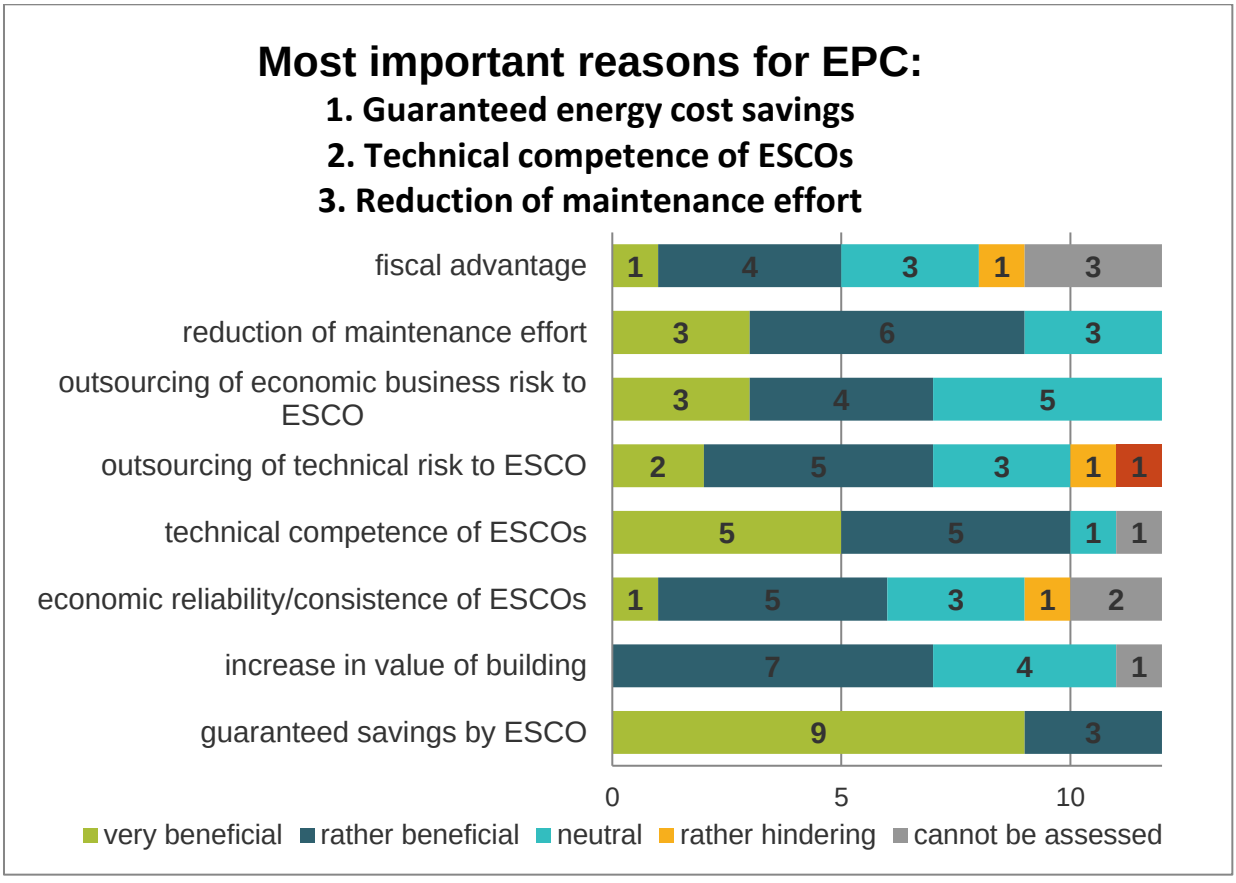


Those respondents who indicated previously that they have already experience with EPC had been asked to evaluate economic, contractual and other aspects regarding their influence for the implementation of EPC projects.

Most important **economic aspects** for EPC are the guaranteed energy cost savings and the technical competence of ESCOs. Much less determinative are the reduction of maintenance effort and the outsourcing of economic business risk to the ESCO. Other economic aspects, listed in the graph below, play a rather secondary role.

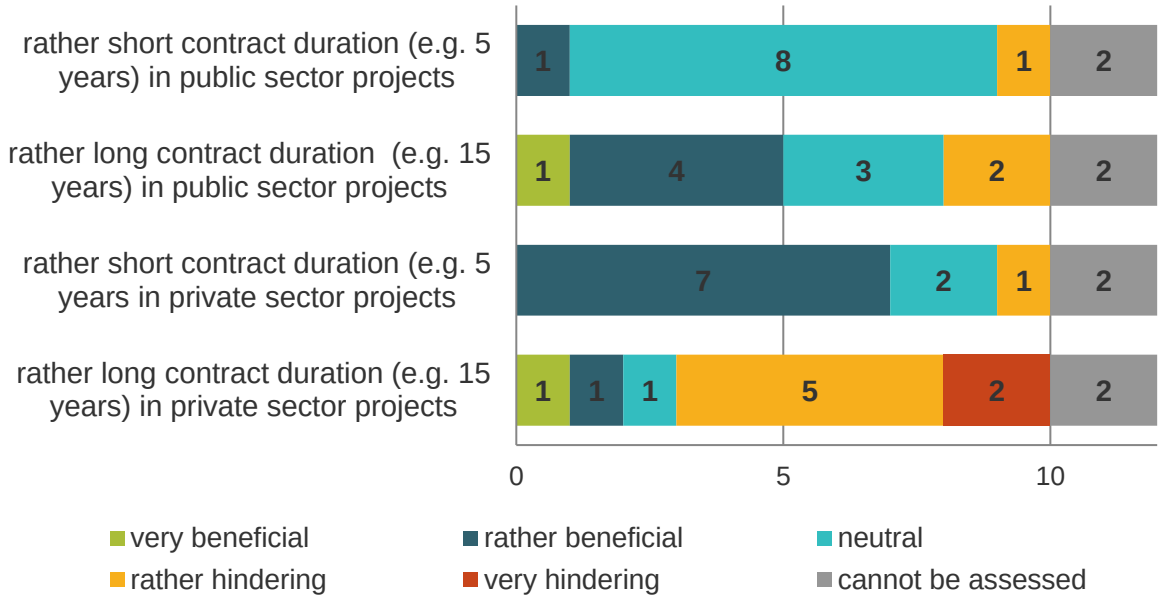
When it comes to **contractual aspects**, there is a strong position for short contract duration in the private sector, but indifferent opinions regarding rather short or long contract durations in the public sector.

Among the **other aspects**, almost all named aspects are rated exclusively as beneficiary and not hindering (if the aspect was assessed). The level of achievable CO_2 reduction is rated as most beneficial for the implementation of EPC projects, followed by the user acceptance of EPC.



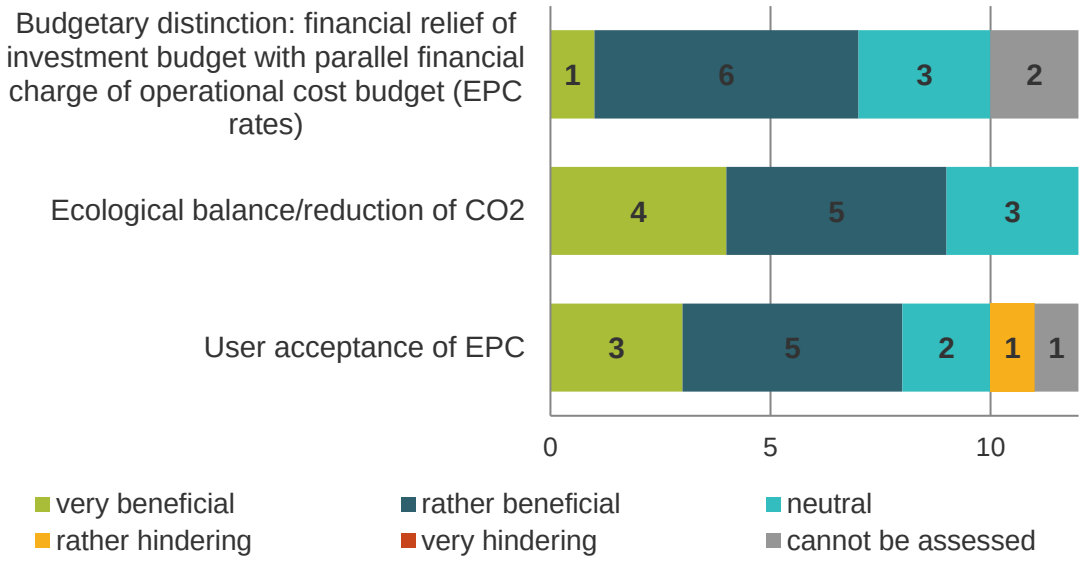
Strong position for a short contract duration in the private sector, only slight preference for a rather long contract duration in the public sector

Contractual aspects
Question: Please evaluate the subsequent aspects for the implementation of EPC projects. (**Base:** 12 answers)



The reduction of CO_2 is an essential aspect for the implementation of EPC projects, closely followed by the user acceptance for EPC

Other aspects
Question: Please evaluate the subsequent aspects for the implementation of EPC projects. (**Base:** 12 answers)

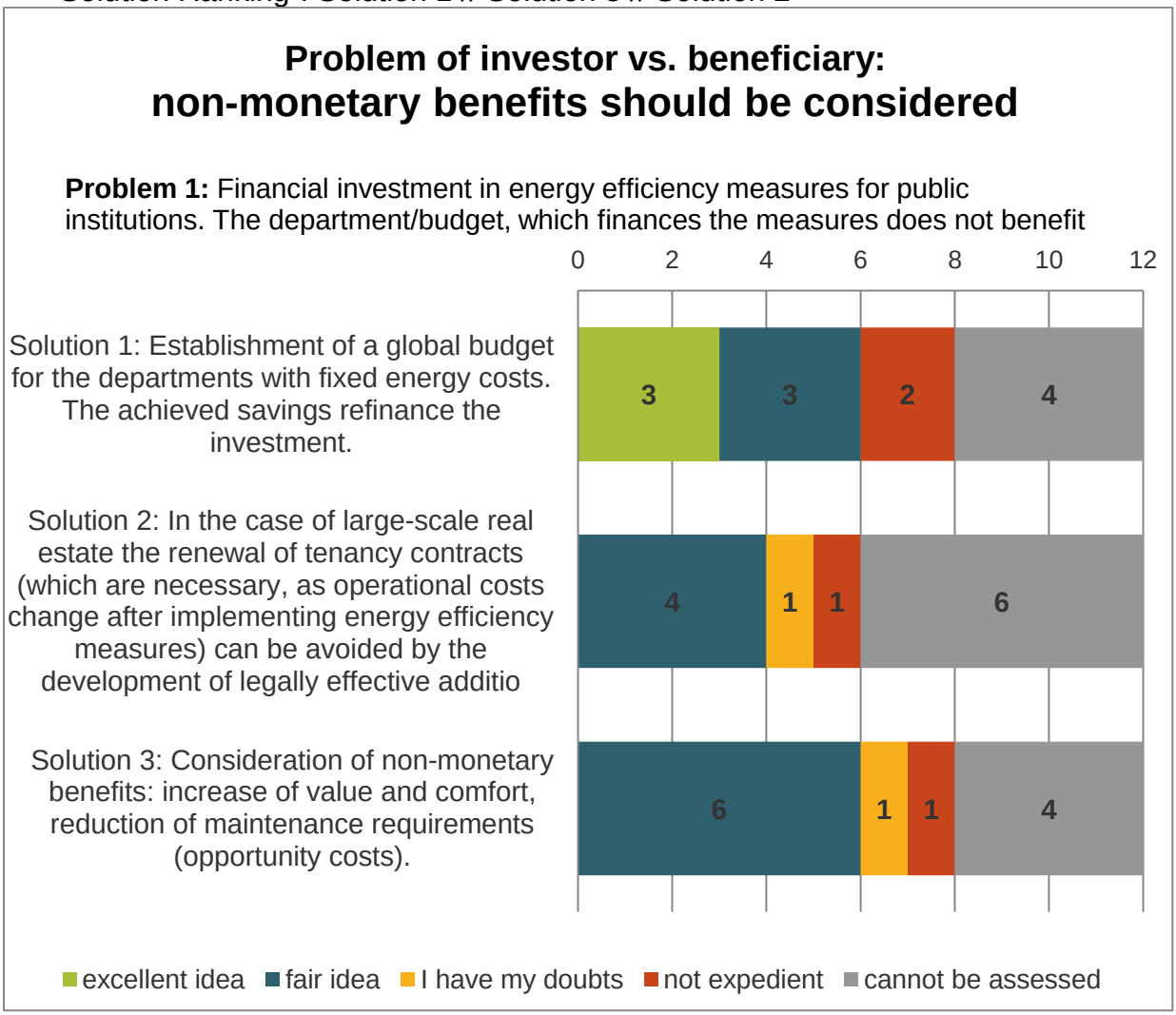


6.3. Problems and potential solutions

The development of EPC projects is facing specific challenges depending on the customer group. Those problems and potential solutions were presented in the survey and assessed by the respondents.

Problem 1: Financial investment in energy efficiency measures for public institutions: The department/budget, which finances the measures does not benefit from the measures.

- Best rated solution: Solution 1 → Establishment of a global budget for the departments with fixed energy costs. The achieved savings refinance the investment.
- "Solution Ranking": Solution 1 // Solution 3 // Solution 2

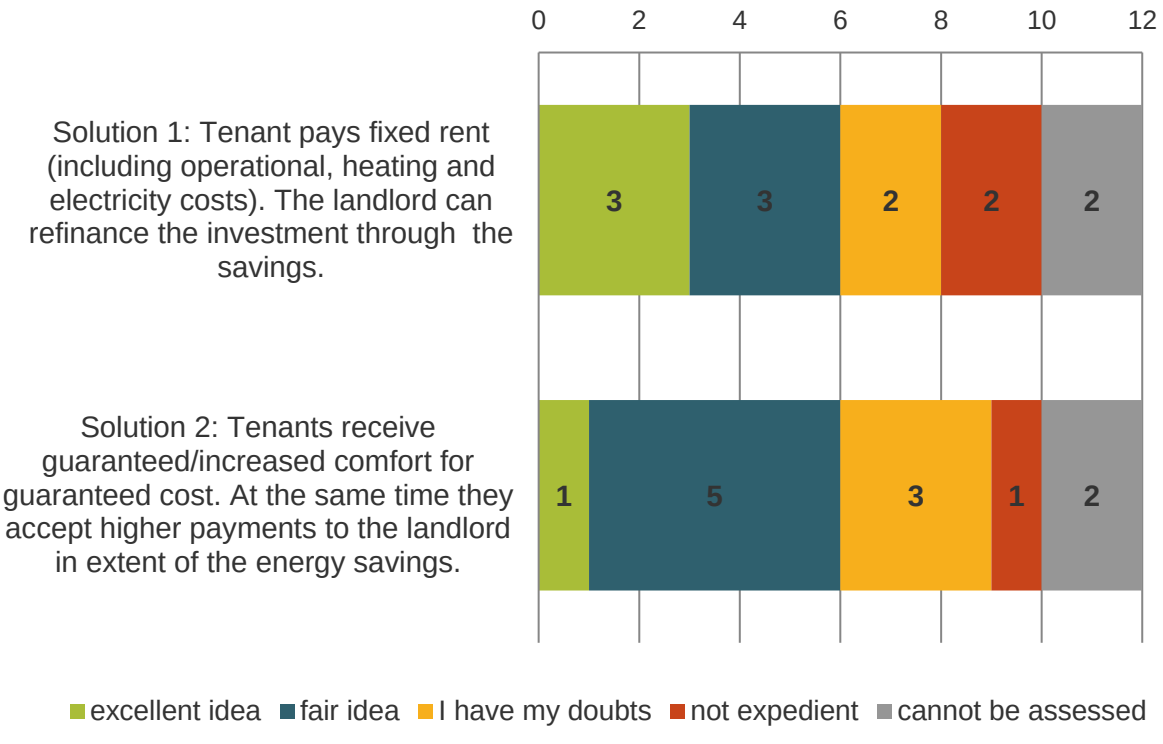


Problem 2: Tenancy in commercial properties: The landlord invests in energy efficiency measures but cannot refinance those by reduced energy cost, as only the tenant benefits from energy cost savings.

There is only a small lead for solution 1 among the respondents.

**Problem of financing efficiency measures in rented commercial properties:
two different approaches have been evaluated as fair ideas**

Problem 2: Tenancy in commercial properties: The landlord invests in energy efficiency measures but cannot refinance those by reduced energy cost, as only the tenant benefits from energy cost savings. (**Base:** 12 answers)

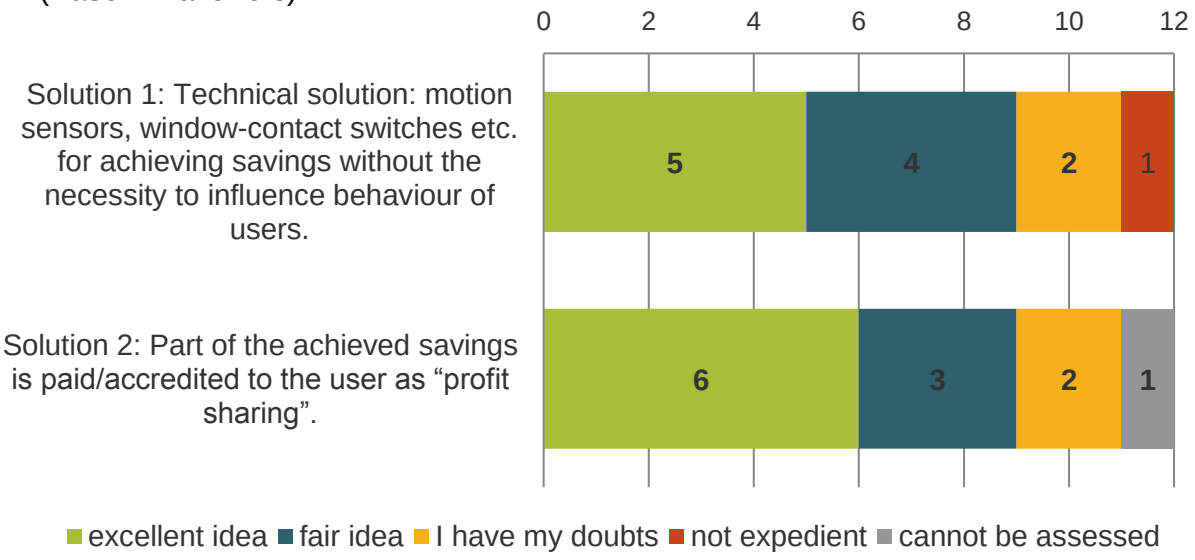


Problem 3: The behaviour of users in buildings influences the energy demand drastically. However, the change of behaviour of the user can turn out to be difficult.

Both presented solutions meet the respondents' approval even though solution 2 is accepted more.

Problem of efficiency measures and behaviour of users in rented properties: profit sharing as incentive for energy friendly behaviour or technical solutions?

Problem 3: The behaviour of users in buildings influences the energy demand drastically. However, the change of behaviour of the user can turn out to be difficult. (**Base:** 12 answers)



Annex A: EPC financing options

On-Balance sheet (Debt Financing)

Situation in which investors lend a certain amount of money on credit in exchange for repayment plus interest. The most common EE financial product is a loan directly to the client (owner of the premises) or to the ESCO – this is known as third-party financing (TPF).

On-Balance sheet (Equity Financing)

Situation in which investors lend a given amount of money in exchange for a stake in a project. The most common example of equity financing is private equity. With respect to energy efficiency businesses, equity investment can take the form of an ESCO issuing additional shares in the company's common ownership.

On-Balance sheet (Mezzanine Financing)

Mezzanine financing is a hybrid form of financing that combines debt and equity financing. In most cases, debt will be ranked as a preferred equity share. Mezzanine debt financing is thus riskier than traditional debt-financing but also more rewarding; it is associated with a higher yield.

Off-Balance sheet (Project Financing)

Project financing (PF), in contrast to balance sheet financing (loans, debt and equity), bases its collateral on a project's cash flow expectations, not on individuals' or institutions' creditworthiness. It is off-balance sheet financing. A typical PF is divided into debt and equity financing.

Forfeiting (also referred to as factoring)

Involves the long-term sale of (future) receivables, i.e. the bank wires the costs (of the equipment, hardware) to the ESCO at the time of completion of the project set-up, when the equipment has been installed. The EPC client is obliged to complete the periodic fixed payments to the bank based on an agreement directly between the bank and the client.

Off-Balance sheet (Leasing)

Leasing is the energy market's common way of dealing with initial cost barriers. It is a way of obtaining the right to use an asset. Finance leasing can be used for EE equipment, even when the equipment lacks collateral value. Leasing is the most common form of equipment manufacturers' vendor financing, which is often applied in the case of CHP equipment. Leasing is often done as part of a SPV.

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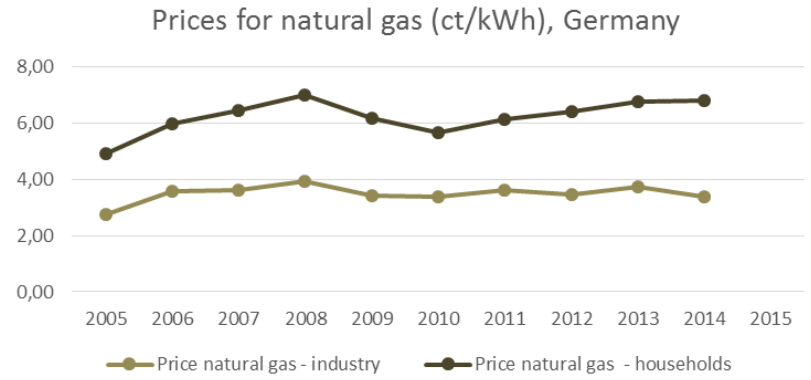
Building Energy Services in Europe

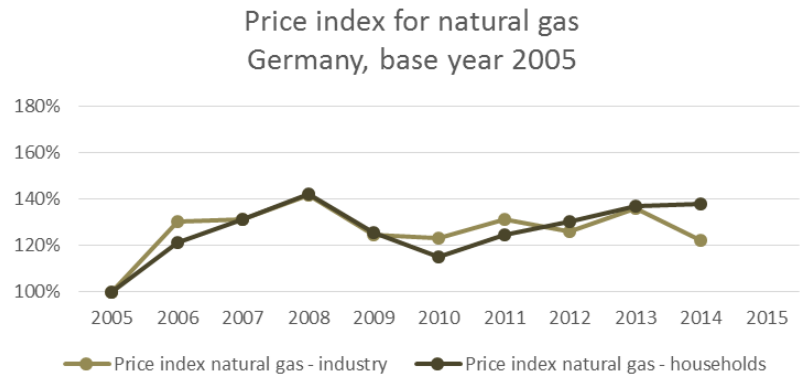
Annex B: Development of energy prices in Germany

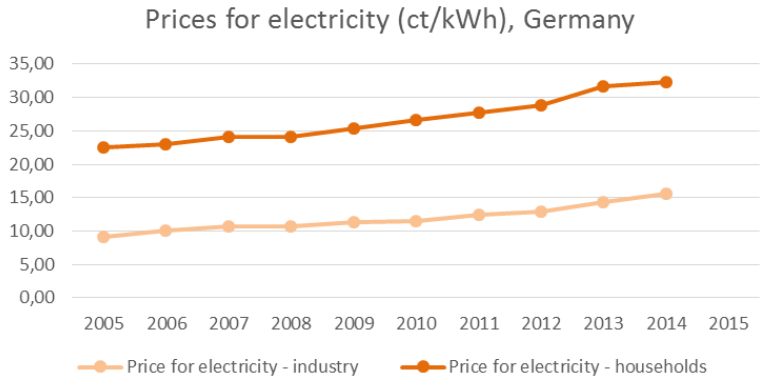
		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015 [5]
Price natural gas - industry[1]	€-ct/kWh	2,76	3,59	3,62	3,92	3,44	3,40	3,62	3,47	3,76	**3,37**	
Price index natural gas - industry	-	100,0	130,4	131,1	142,0	124,7	123,3	131,1	125,8	136,2	122,0	
Price natural gas - households[2]	€-ct/kWh	4,93	5,98	6,47	7,02	6,19	5,68	6,14	6,43	6,75	**6,80**	
Price index natural gas - households	-	100,0	121,3	131,2	142,3	125,5	115,2	124,5	130,3	136,9	137,8	
Price for electricity - industry[3]	€-ct/kWh	9,18	10,08	10,69	10,66	11,33	11,55	12,46	12,87	14,35	**15,53**	
Price index electricity - industry	-	100,0	109,9	116,5	116,1	123,5	125,9	135,7	140,3	156,3	169,3	
Price for electricity - households[4]	€-ct/kWh	22,45	23,05	24,02	24,14	25,31	26,59	27,76	28,86	31,73	**32,29**	
Price index electricity - households	-	100,0	102,7	107,0	107,6	112,8	118,4	123,7	128,6	141,3	143,9	
Price for light heating oil	€ / 1000 l	548,94	616,53	619,87	807,71	560,22	694,49	857,66	938,73	876,74	**806,98**	639,25
Price index for light heating oil	-	100,0	112,3	112,9	147,1	102,1	126,5	156,2	171,0	159,7	147,0	116,5

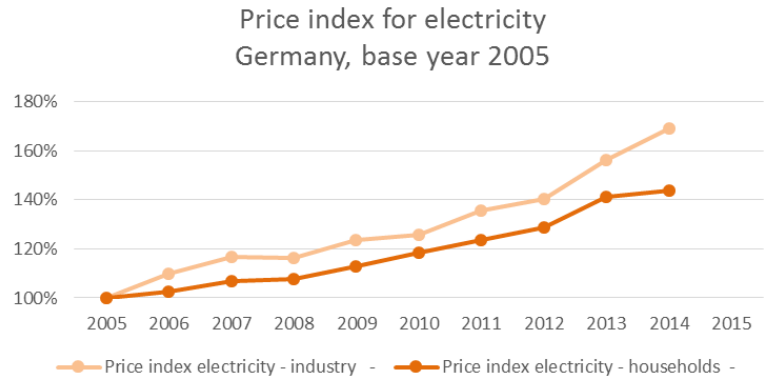
[1] Database 2005 - 2007: Consumers with about 116 Mio. kWh (≈417.600 GJ), 330 d/a of use, 8.000 h/a of use. From 2008 on: All consumers with a consumption of 100.000
[2] Database 2005 - 2007: Annual consumption of households: around 23.000 kWh (prices inclusive all taxes). From 2008 on: All consumers with a consumption of 20 to
[3] Database 2005 - 2007: Consumers with about 2 Mio. kWh; maximum power consumption: 500 kW; annual use: 4,000 h/a. From 2008 on: All consumers with a
[4] Database 2005 - 2007: Annual consumption of households: around 1,200 kWh. From 2008 on: All consumers with a consumption of 1,000 to 2,500 kWh/a. Price
[5] Preliminary

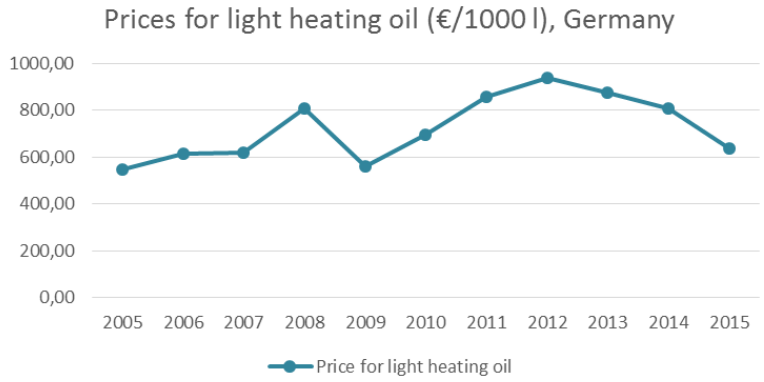
Resource: BMWi, 2016: Energiedaten: Gesamtausgabe
(Energy statistics see URL: http://bmwi.de/DE/Themen/Energie/Energiedaten-und-analysen/Energiedaten/gesamtausgabe,did=476134.html

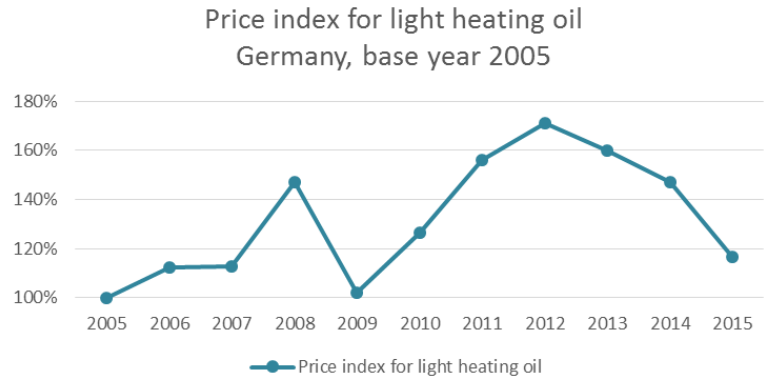





Prices for electricity (ct/kWh), Germany
35,00
30,00
25,00
20,00
15,00
10,00
5,00
0,00
2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015
Price for electricity - industry
Price for electricity - households


Price index for electricity
Germany, base year 2005
180%
160%
140%
120%
100%
2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015
Price index electricity - industry
Price index electricity - households


Prices for light heating oil (€/1000 l), Germany
1000,00
800,00
600,00
400,00
200,00
0,00
2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015
Price for light heating oil


Price index for light heating oil
Germany, base year 2005
180%
160%
140%
120%
100%
2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015
Price index for light heating oil

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