

# A SHIFT OF PARADIGM

## FOR CONSTRUCTION INQUIRIES

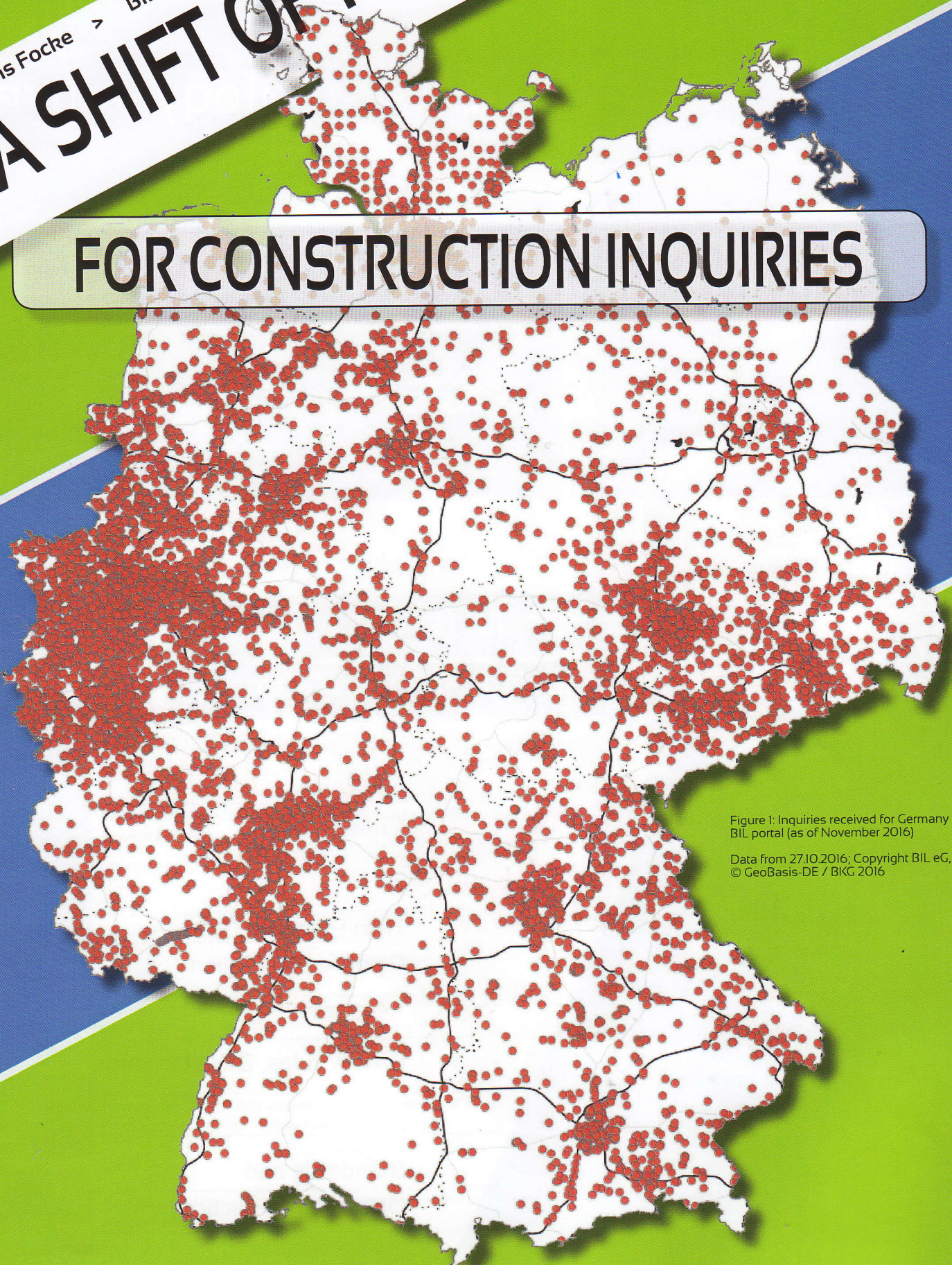


Figure 1: Inquiries received for Germany via the BIL portal (as of November 2016)

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## ABSTRACT

In macroeconomic terms, the cost of compensating damage to pipeline/cables and cables caused by construction work amounts to an estimated €2 billion per annum.

Much of this damage is due to a lack of information on the location of pipeline/cables during the site investigation phase prior to the commencement of construction. Indeed, both building contractors and pipeline/cable/cable operators seeking to obtain such information will often find that identifying pipeline/cable/cable routes and their operators is far from easy.

An all-digital process available online can go a long way to simplify such inquiries, contributing to the safety of all the players involved. The following report describes the current situation and requirements, and provides a proposal based on recent operative experience in this field.

## SITUATIONAL CONTEXT

Digital business processes are on the increase in all industrial sectors. In general, the aim is to boost efficiency, eliminate redundancies and achieve a closer interlinkage of sensor technology and machine control with dedicated technical business processes. In general, commercial business processes are highly standardized and already largely automated without requiring adjustment to specific customer profiles. Widely accepted for private as well as commercial monetary transactions, online banking is a good example of this.

In the context of "Industry 4.0", the focus is on connected manufacturing which can be improved by using suitable sensor technologies and evaluation of measured data in order to optimize production cycles.

In the energy sector, the introduction of Industry 4.0 processes has not yet progressed quite so far. This is partly due to the fact that the focus is not so much on production schemes and that the human interface plays a dominant role in monitoring processes. Germany's digital association BITKOM demands for "digital ecosystems" to be developed in order to promote the digitalization of the German national economy.

***"The cost of compensating damage to pipelines caused by construction work amounts to an estimated €2 billion per annum. Much of this damage is due to a lack of information on the location of these assets."***

Jens Focke

To implement digitalization, Big Data analysis and automation in the context of Industry 4.0, the following requirements must be met:

1. The business process must be digitizable and comply with a standardized process comprising input and output data that lends itself to automatic processing.
2. The immanent transaction must generate a benefit that can be increased by automated processes which can be digitally supported.
3. The underlying logic of the business process ideally uses intranet - or possibly even internet - services for data storage and data provision/system deployment.

## STATUS QUO OF PIPELINE/CABLE INQUIRIES

Most of the business processes of pipeline/cable operators in all domains nowadays serve to monitor critical infrastructures, for instance monitoring underground pipeline/cable networks. As statistically proven, there is a risk of pipeline/cables being damaged by excavators or at least of increased interference with pipeline/cable corridors. All these activities are undertaken without full knowledge of underground pipeline/cable locations. In the context of civil engineering, more than 100,000 instances of structural damage occur within a calendar year, which according to actuarial assessments amount to €500 million in damages paid. Much of this damage could be prevented by setting up a fully functional inquiry process. Providing information on the location of pipeline/cables and construction supervision are business processes that are crucial to safety and form part of a pipeline/cable operator's core competencies. In this context, safety is the overarching topic involving the following aspects:

- Pipeline/cable infrastructure safety to protect and keep pipeline/cables intact and prevent injury to persons or damage to resources
- Reliability of the inquiry process in which
  - the inquiry constitutes a legally secure claim to correct and full information and its exchange between the party pursuing the construction activities and the supervising operator(s)
  - an inquiry process that is transparent in case of damage and an ensuing lawsuit
- Data security in the context of data provision and archiving, also preventing the improper use of data

The afore mentioned aspects are explained in detail below as they contribute to safety in different ways. The requirement of generating a benefit (as listed under 2. above) can thus be met by means of a digitally supported business process.



When investigating a potential construction site, the party pursuing the construction activities is obligated to obtain information on the location of pipeline/cables if it wants to avoid liability for negligence in case of damage. Presumably, the party in question will even be aware of this, but it appears that in a rural area where pipeline/cable corridors are not clearly marked, the magnitude of not meeting this obligation is perceived as comparable to knowingly exceeding a speed limit while driving a car. The likelihood of damage occurring is perceived as low and readily accepted.

This would seem to be the only explanation as to why interference with pipeline/cable networks occurs time and again, without having inquired about their location.

This is essentially the reason why pipeline operators regularly incur substantial expenses to carry out site inspections, both on the ground and by helicopter.

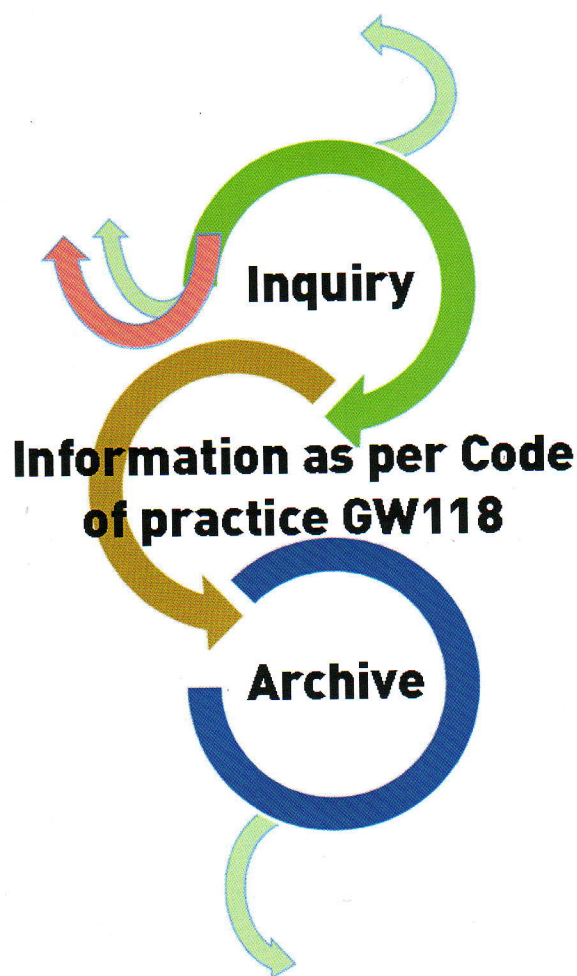


Figure 2: Pipeline/cable inquiry process illustrating the leeway in terms of inquiry and archiving. It can be seen, that only the process to be implemented on the operator side has been standardized by the rules and regulations (code of practice GW118)

According to pipeline/cable operators, the number of inquiries on pipeline/cable locations has doubled since 2010, probably owing to the increase in building activities. While according to section 254 BGB [German Civil Code], pipeline/cable operators are required by law to respond to any inquiries received, there is no general legal duty to inquire.

On the inquiry side, this leads to a situation that is nothing short of absurd: The inquiry process involves time-consuming research in order to identify the pipeline/cable operators in charge of a certain area. Bigger companies have organized this task more or less efficiently while smaller companies tend to place inquiries via mailing lists that are often not exhaustive.

The information to be obtained and exchanged between inquirer and pipeline/cable operator is not subject to any standards and requirements, and thus varies greatly in terms of the content and details communicated. A meaningful communication, however, requires current knowledge of the situation inquired about. The emergence of new operators and new pipeline/cable routes in biogas, solar and cable grids, etc. does not make this any easier. Also, established operators may have changed names due to regulations, resulting in the formation of new corporate units and contacts.

In the interest of customer orientation, many energy utilities now provide a telephone number or email address to contact for pipeline/cable inquiries on their website. In some cases, construction information is requested, and very rarely a geographical description of the site. Download services are provided to known inquiring companies only upon prior registration. For municipal utilities, this is a feasible and secure solution. However, it means the inquirer has to know about this option. In big German cities, underground cables serve up to 40 services and operators, i.e. much more than just the conventional gas, water, power and district heating lines provided by the municipal utilities as commonly known.

In this confusing situation, inquirers often choose to proceed as follows:

- Place several inquiries on the various portals provided by pipeline/cable operators
  - Set up a mailing list to contact operators known to them
  - Send emails randomly to a list of recipients that is too exhaustive
- or
- Outsource the inquiry process to a local company specialized in this field
  - Use commercial services to obtain information on the local companies potentially in charge, and forward the inquiry if necessary



Based on the number of incidents caused by third-party interference in pipeline/cable networks, one must conclude that, as a third option, some consciously take the risk of not inquiring.

For the reasons outlined above, inquirers may feel that they are anyway unlikely to obtain exhaustive and reliable information on the location of pipeline/cables in the area. Accordingly, the unrecorded number of construction projects carried out without prior inquiry and involving an unknown risk potential can therefore be assumed to be significant.

### NEED FOR ACTION

Regarding interference with pipeline/cable routes, operators of the critical chemical, gas and oil pipeline infrastructures relate the following experiences:

- Incidents still occur on a daily basis, even though excavators should be well aware of the risk potential.
- Excavator damage to steel pipes results in corrosion which can be detected at some later stage in the course of regular in-line inspections, by which time it is impossible to determine who caused it, so operators are left to bear the rehabilitation costs.
- When it comes to planning and constructing new pipeline/cables, operators, too, require information on the underground facilities present in the area. Addressing municipalities in order to find out who is responsible in such matters will often disclose only those operators running pipeline in public space. Mostly, however, new cable routes and existing pipeline/cables are not located in public ground.
- Pipeline operators receive a large number of inquiries that are irrelevant in that they do not fall within their competence and domain of responsibility. This is due to the fact that many inquirers tend to include too many random recipients in their mailing lists.

Due to the complexity of the situation, inquirers need to

- automatically reach all operators without first having to identify who is in charge.
- submit a complete and fully specified inquiry, i.e. detailing all the information required.
- receive a timely response.
- archive the replies received from a multitude of operators in a structured way.
- receive status updates on the processing of their inquiry from the operator.



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## PIPELINE/CABLE INFRASTRUCTURE SAFETY

To ensure safety during planning and construction projects, full knowledge of the local pipeline/cable infrastructure is needed. Operators also need to receive a full description of the measures planned, including those that may have a critical impact on safety. Local operators need to be in a position to assess to what degree they may be affected depending on the criticality of the measures planned. Naturally, the effect of local asphalt road works will be less critical than the erection of a solar power plant close to a gas pipeline/cable. Also, time and again, unknown underground cable routes are damaged, which mainly affects the connected data users.

With the new legislation in the energy sector and the development of new power utilities and an evolving private market of cable and communication companies, obtaining full information on local pipeline/cable locations has become increasingly difficult, if not downright impossible.

### PROCESS SAFETY

The pipeline/cable inquiry process consists of a query and a reply which correspond to the input and output data of a business process. The centralized provision, transfer and archiving of data is in the common interest of inquirers and operators. In many cases, inquirers will receive information from more than just one operator. Both inquiries and replies must specify all relevant details, and the multitude of replies coming from the operators affected must be accessible for later reference.

As part of a legal transaction, this information must be managed digitally in a uniform infrastructure, ideally in a hosted application providing the same information to both parties via the internet. Also, both parties rightly demand traceability and status updates on the process steps throughout the work flow.

### DATA SECURITY

Data security is of utmost importance, as underlined by the current legislation on personal data. Furthermore, according to the current special laws e.g. the current legislation of the Federal Office for Information Security (BSI), infrastructures critical to security – which include power supply lines – must be protected.

The European INSPIRE directive 2007/2/EC on the disclosure of public planning data also affects power utilities, standing in stark contrast to their need for data privacy. Apart from the importance of protecting their infrastructures, pipeline operators also assert the need to protect their data. They wish to disclose this detailed data

only upon request, rather than making it available online where they would lose control over its use. Therefore, providing data only upon request also contributes to data privacy and security on the whole.

In the context of digitalization, "safety" no longer means just protection from damage, but also security in the sense of protection against threats. To take maximum effect in macroeconomic terms, this process, which varies from company to company, must meet the following requirements:

- A centralized inquiry and archive platform rather than an individual question-and-answer-based infrastructure that does not cover all operators.
- Disclosure of information in line with requirements. To determine local operators for planning purposes, detailed information on pipeline/cable locations often is not required.
- Data must not be disclosed and used randomly. Operators are liable for their infrastructure and therefore must know whom they are disclosing information to, what it will be used for and when. The currentness of data, information value and field of use are security-relevant.

In a centralized inquiry system, a multitude of construction projects will be stored. Data security must be guaranteed by using a suitable data center. The risk of information being spied out can be detected by big data analysis methods. For instance, systematic queries can be detected both geographically and when a certain party places inquiries repeatedly within a short time.

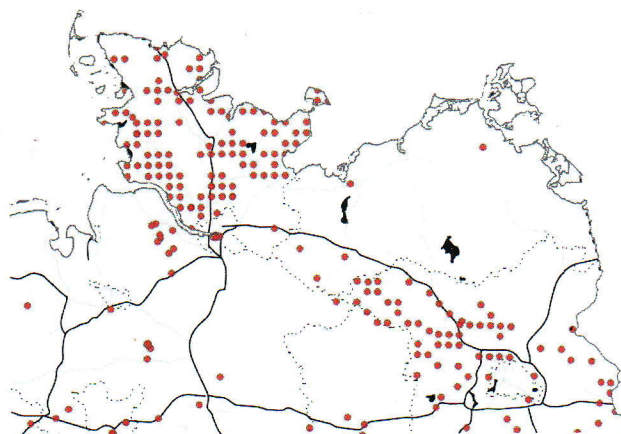


Figure 3: Systematic geographic inquiry pattern in the context of site investigations through dynamic probing. Data from 27.10.2016; Copyright BIL eG, Karten © GeoBasis-DE / BKG 2016



## PROPOSED SOLUTION AND OPERATIVE EXPERIENCE

A centralized inquiry portal with a high level of user acceptance is the only solution. As a single point of entry, it has to meet the requirements outlined above. It must be noted that this should be considered an approach still under development rather than a destination already reached.

With 1 million construction sites in Germany each year and figures rising, the construction industry is in need of information on pipeline/cable and cable routes both underground and aboveground. A simplified inquiry process can contribute to safety and effectiveness.

One year after going live, the BIL portal has recorded an annual number of over 800 inquiries per week. Pipeline/cable operators and inquirers from the construction sector rate this as a success. However, there is still a lot of potential to be tapped by getting even more operators involved, which will lead to an increase in inquiries from construction enterprises in the region as well as from operators.

In this regard, the microeconomic benefit that certainly exists is almost secondary, as the primary achievement is the increased safety in civil engineering that averts macroeconomic damage. BIL's cooperative form of organization is without alternative because it makes clear that there is no intention to generate profits and requires it to observe absolute transparency in the way it presents itself on the market.

See Figure 1 for Inquiries received for Germany via the BIL portal.

## SAFETY AS AN OPPORTUNITY

Generating a benefit in terms of safety is a goal worth striving for in the interest of operators, regardless of whether stipulated by law or not.

Those who leave the introduction of necessary protective procedures and expedient safety measures to the legislator will run the risk of losing control over their core business.

The goal therefore must be a centralized and harmonized pipeline/cable information process consisting of the inquiry, the information provided and the archiving of both. A simplified process that benefits the inquirer will be generally beneficial and enhance safety in many respects. Conversely, when operators choose to realize a silo approach, this entails risks that inquirers alone can hardly mitigate.

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The intention of the approach proposed by BIL is to increase safety so as to generate a tangible benefit for all players involved, including insurance companies and claimants in case of damage. The approach is always assessed against the state of the art. An ideal scenario must not only be prescribed as a goal to strive for, but should also be taken as an invitation to get involved in a joint approach.

A joint approach mitigates risks and thus contributes to safety. An all-digital business process is transparent and quick. With solid arguments on its side, this is what BIL strives to achieve with its Germany-wide construction inquiry system.

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