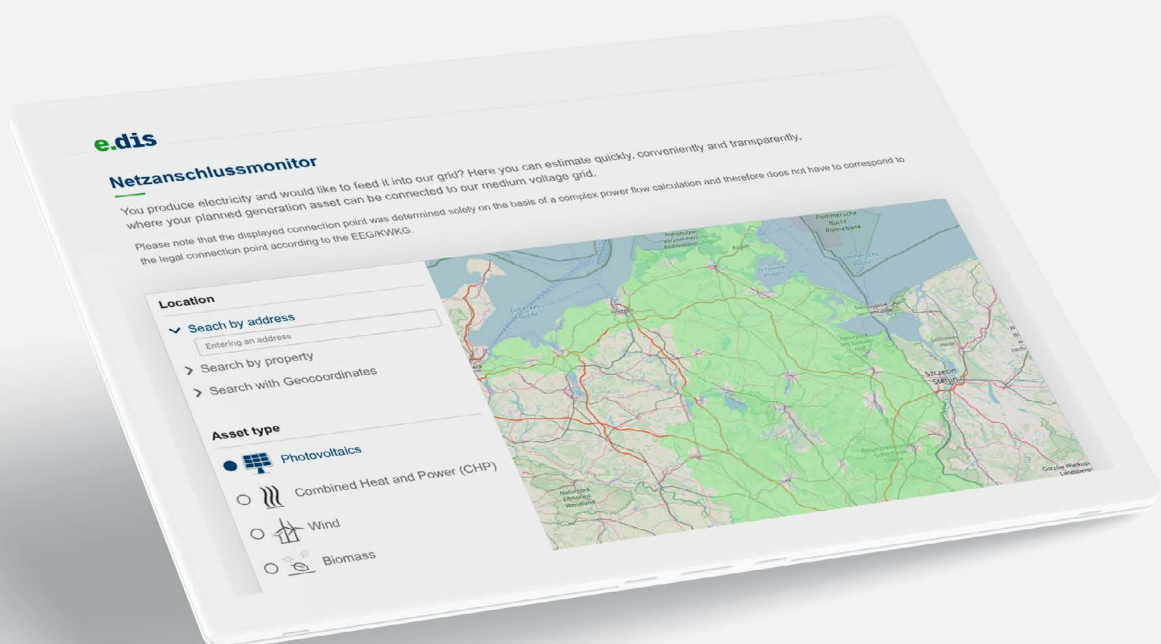


Digitalized and automated interconnection process with the help of the **Intelligent Grid Platform** at E.DIS in Germany



envelio.com



Customer Portrait

E.DIS Netz GmbH is one of the largest distribution grid operators in Germany and operates the power grid in the federal states of Brandenburg and MecklenburgVorpommern covering an area of 13,900 square miles. In addition, a gas pipeline grid of approximately 3,773 miles in length covers an area of 2,672 square miles.

Every year more renewable generators are connected to the E.DIS grid. In 2018, around 2,500 renewable interconnection applications were answered. The trend is increasing by approximately 25 % per year.

E.DIS Germany

e-dis.de



Executive Summary

envelio's Intelligent Grid Platform digitizes and automates technical grid planning and grid operation processes in order to integrate renewable energies and new consumers (e.g. charging points for electric vehicles) into the energy grids faster and more cost-efficiently.

In the course of its grid digitization journey, E.DIS Netz GmbH uses the Intelligent Grid Platform to digitize and automate the process for interconnections of distributed energy resources. The project focuses both on accelerating the internal evaluation processes with full process support and integration, and on providing an external online portal where potential customers can independently obtain an initial assessment of the possible grid connection points for their proposed generators.

Project Structure

Basis

Development of customized interfaces to the relevant data systems

Processing and preparation of the data including identification of data errors and gaps

Provision of a fully computable digital grid model

Permanent synchronization with the source systems for automated integration of data changes

Subproject 1: Internal process handling

Largely automated handling of the interconnection process, specifically the detailed technical evaluation of connection requests for new distributed energy resources

Subproject 2: External online grid connection portal (Netzanschlussmonitor)

Integration of a fully automated interconnection portal into the E.DIS website for direct self-assessment of the possibility of a grid connection

Background and Motivation

In a single calendar year, E.DIS Netz GmbH receives several thousand grid connection requests for new distributed energy resources. One reason for this is the great economic conditions of the E.DIS Netz GmbH area for the use of renewable energy such as photovoltaic and wind energy plants. Another is that developers of these renewable energy assets submit up to 100 different requests for a single planned plant in order to identify the most favourable grid connection point. The savvy developer knows that they can save significant costs by reducing the connection distance by even a few hundred meters.

As a legal requirement, German grid operators must respond to requests from developers within eight weeks and provide them with reliable information on a technically plausible and economically favorable grid connection point.



Original Structures and Processes

Previously, E.DIS relied on a manual process for the technical impact analysis of these new projects, making it both time-consuming and costly. The reason was that many isolated individual IT systems and data silos were used in the overall process. Most of them were not connected via automated interfaces resulting in many time-consuming manual intermediate tasks. As a result, the process was divided into the following individual steps:

Receipt of the interconnection application via an online form

Examination by the E.DIS Grid Economic Department of the completeness of the documents and information that have been provided

Entering the request into the SAP system "EBC" (E.ON Business Connector)

Regular export of all collected query data in an Excel table

Localization and search for a suitable grid area by grid engineers using the GIS

Manual grid preparation: comparison and updating of data

Data transfer to the DigSilent PowerFactory grid calculation software

Calculations on grid connection capacity, load capacities, and if necessary, grid expansion possibilities was performed

The results of this analysis was manually combined into a document and provided as feedback to the developer/customer

With this previous process, analysis of a single request could take many days and up to a few weeks depending on complexity of the analysis and current workload. Under these conditions it became increasingly difficult for E.DIS Netz GmbH to meet the prescribed deadlines for all of the inbound requests given its existing staffing levels. Potential customers often waited several weeks for feedback on their application. In view of the increasing number of connection requests, both current and anticipated in the future, there was a need to re-engineer the previous process utilizing new software systems.

Background and Motivation

The number of new DER interconnection requests in Brazil is steadily increasing. Especially new solar plants are planned to be built on regular basis resulting in several thousand interconnection requests per region. The existing local grid infrastructure can in many cases only handle a limited number of additional interconnections creating the need for grid upgrades and expansion measures.

Consequently, the processes associated with both impact studies for new connections and the planning of grid reinforcement measures to enable more DER connections become mass processes for ENEL that require a high level of efficiency. Automation is a key enabler in such an environment to avoid a constant overload of valuable grid engineering resources that are needed for more strategic grid analyses and planning tasks.

At the same time, ENEL aims for a positioning as a digital leader among grid operators which also comprises a quick and easy grid customer interaction – also for new DER interconnections.

Project Objectives

Reduction of the engineering workload and time needed for interconnection studies

Acceleration of the end customer interaction with DER developers

Quality improvement of the interconnection process when handling large volumes of requests

Efficient handling of grid expansion measures associated with DER interconnections

Improved and fast overview of additional DER integration potentials with a detailed hosting capacity map for internal use



Project Goals

Reduction of the number of non-binding inquiries

Accelerated processing of binding interconnection requests

Reduction of internal resources for data preparation and technical simulation

Cost reductions through avoidance of staff level increases

Quality improvement of planning data

Increase of the overall customer service level including faster response time



Solution Requirements

The above-mentioned objectives determined the following requirements for the two subprojects:

Subproject 1: Automation of internal evaluation process

Automated transfer of the relevant data from the existing E.DIS IT systems

Automated identification and evaluation of possible grid connection points for the new project

Capability of developing and evaluating grid expansion variants

Legally compliant archiving of all completed processes

Reservation management for confirmed but not yet completed projects

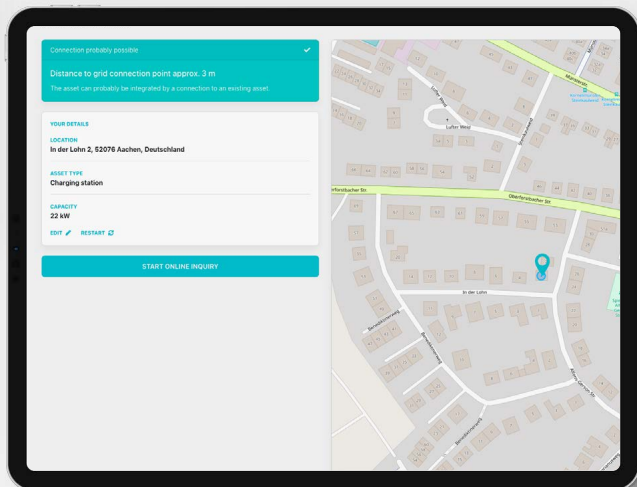
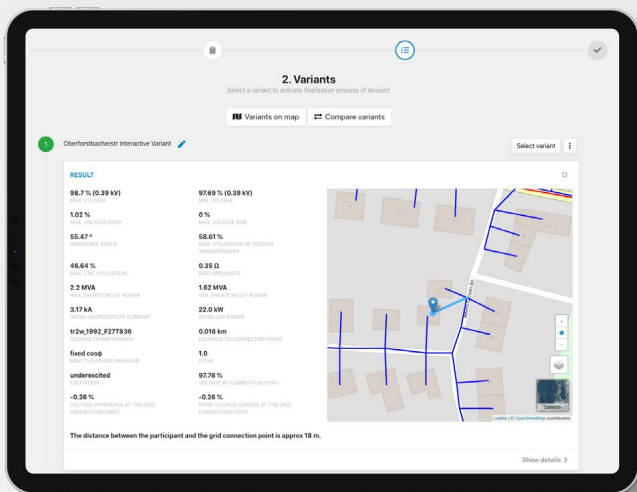
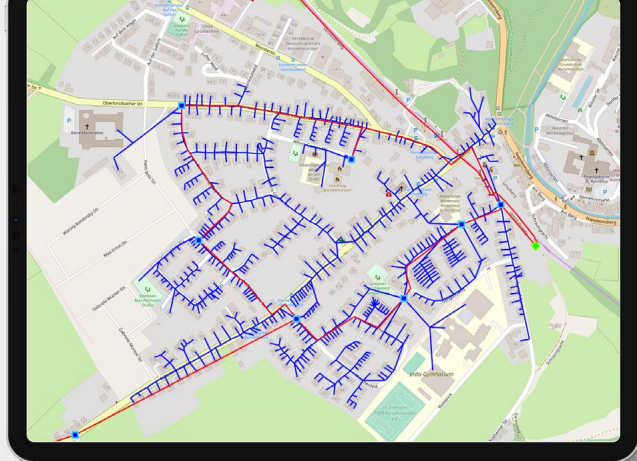
Subproject 2: External online grid connection portal

Digital customer self-service to provide information on grid connection points automatically

Integration into the existing E.DIS website

Automatic evaluation of the distance between requested DER location and grid connection point

Fast response time



Intelligent Grid Platform

Intelligent Grid Platform: Basis for the Digitized Interconnection Process

The Intelligent Grid Platform (IGP) is a software assistance system with which technical processes in grid planning and grid operation management can be digitized and automated. The required functionalities in the project were covered by a combination of different IGP applications:

Grid Transparency

Providing computable and electrotechnically validated grid models by linking previously isolated data systems and using machine learning algorithms to identify and correct data errors automatically.

Connection Request

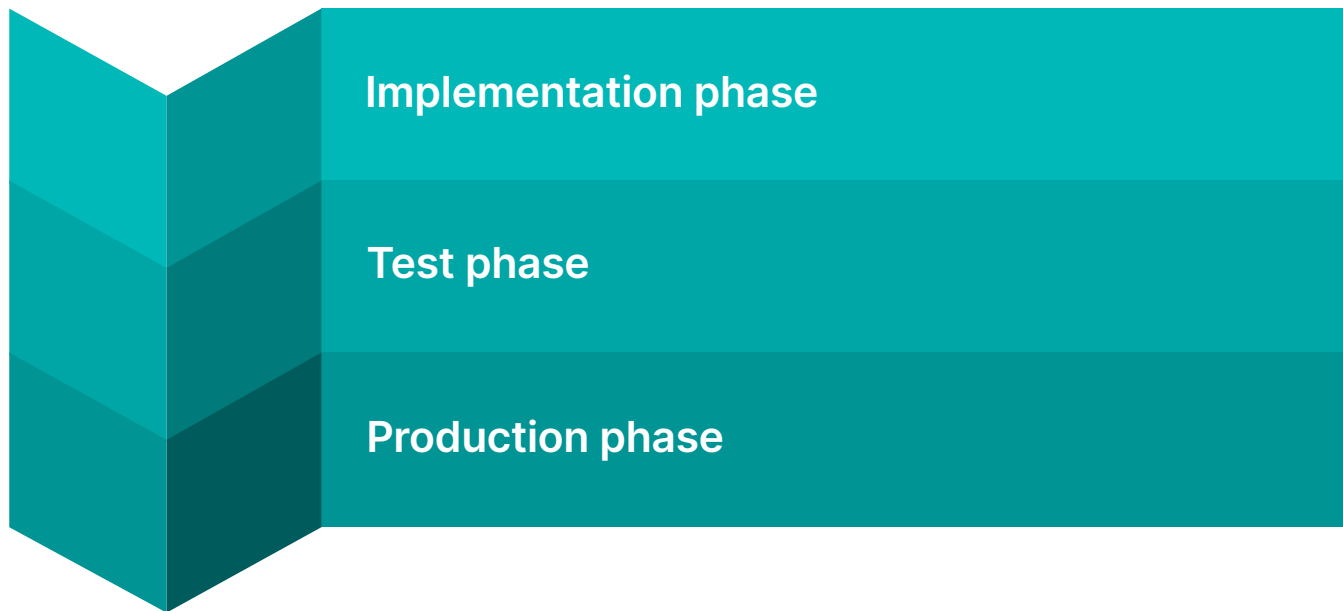
Automatic creation and evaluation of connection requests for new generators (e.g. wind turbines, solar panels, CHP) and loads (e.g. heat pumps, EV charging points).

Online Connection Check

Customizable customer portal integrated into the grid operator website for fully automated customer feedback on non-binding connection requests.

The overall project with E.DIS Netz GmbH was divided into three phases.

Project Phases



Implementation Phase

During the Implementation Phase, the interfaces to the relevant E.DIS internal data systems were developed. Furthermore the Online Connection Check was customized to the internal requirements of E.DIS. In order to be able to react quickly and dynamically to changes in requirements, the agile SCRUM principle was used during the implementation phase at both project management and development level.

Following a conceptual design phase, tailor-made interfaces were developed to connect E.DIS internal data systems to the IGP in order to ensure automated, continuous data transfer of all relevant grid and process data.

Implemented Interfaces:

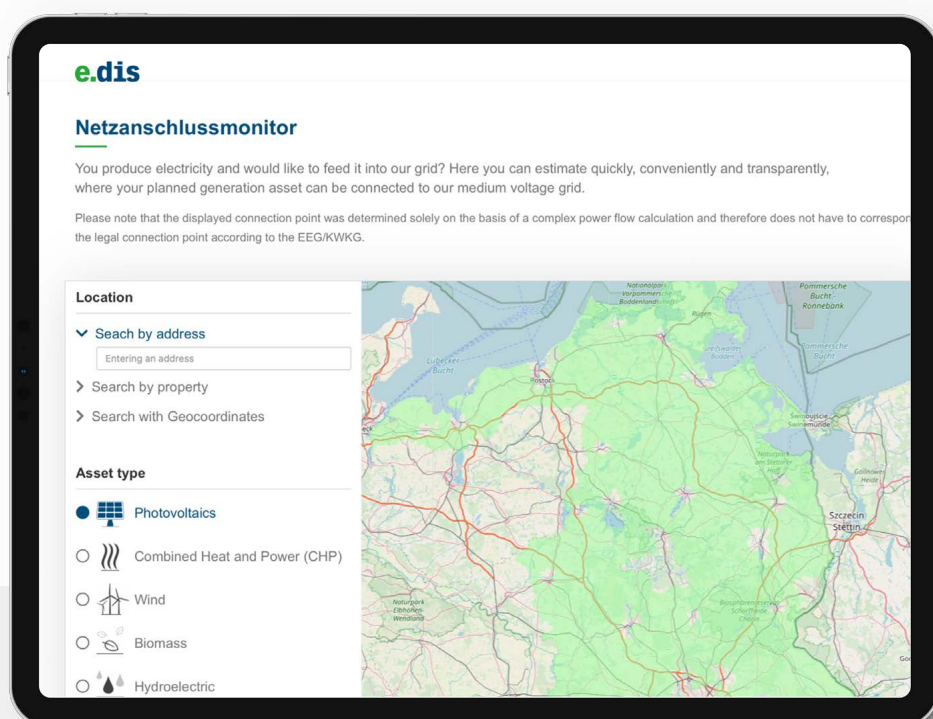
GIS & SAP PM: Grid model (weekly update)

PowerFactory: List of reserved generators (update on event)

EBC: Connection requests (daily update)

Implementation Phase

With the help of these interfaces, all relevant data can be automatically transferred to the Intelligent Grid Platform. The various source systems are permanently monitored, and all changes are automatically detected, corrected and integrated to the IGP. The IGP's innovative data management approach ensures that the underlying digital grid model is always up to date for all applications. Since high data quality is a prerequisite for the successful digitalization of planning and operating processes, the data is also continuously checked for consistency and validity using the IGP Data Inspector application. The resulting grid model with all technical parameters, information on the supply task and the list of reserved generators is the basis for all downstream processes in the Intelligent Grid Platform.



In addition to interface development and grid data preparation, the Online Connection Check application was customized to the internal requirements of E.DIS Netz GmbH during the Implementation Phase. This included in particular the customization of the layout to the corporate design of E.DIS as well as the configuration of the calculation logic (e.g. limit values, considered investigation cases).

Test Phase

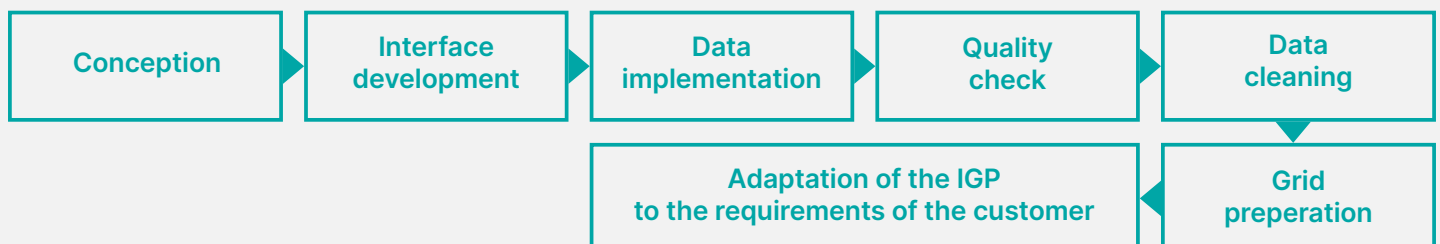
At the beginning of the Test Phase, all E.DIS users were first intensively trained in the use of the Intelligent Grid Platform, so that a detailed evaluation of all functionalities was possible. The introductory workshops were followed by a benchmarking analysis: Previously completed connection requests in the old process were automatically assessed and analyzed by new digital process with the IGP. The success criteria of matching results in 90% of the cases was surpassed by the new IGP based process.

A further objective of the test phase was to continuously improve the grid model in the Intelligent Grid Platform. With the help of the Data Inspector application, data implausibilities could be easily identified and sorted according to different categories. This enabled a targeted elimination of the problems in the source systems, a byproduct of which is improved data quality for other E.DIS systems which may be using that same data. At the end of the test phase, almost the entire medium-voltage grid of E.DIS with substations and 20,000 MS/NS stations was available in the Intelligent Grid Platform, validated and ready for calculation.



Implementation & Testphase

Scrum



Production phase

Scrum



Production Phase

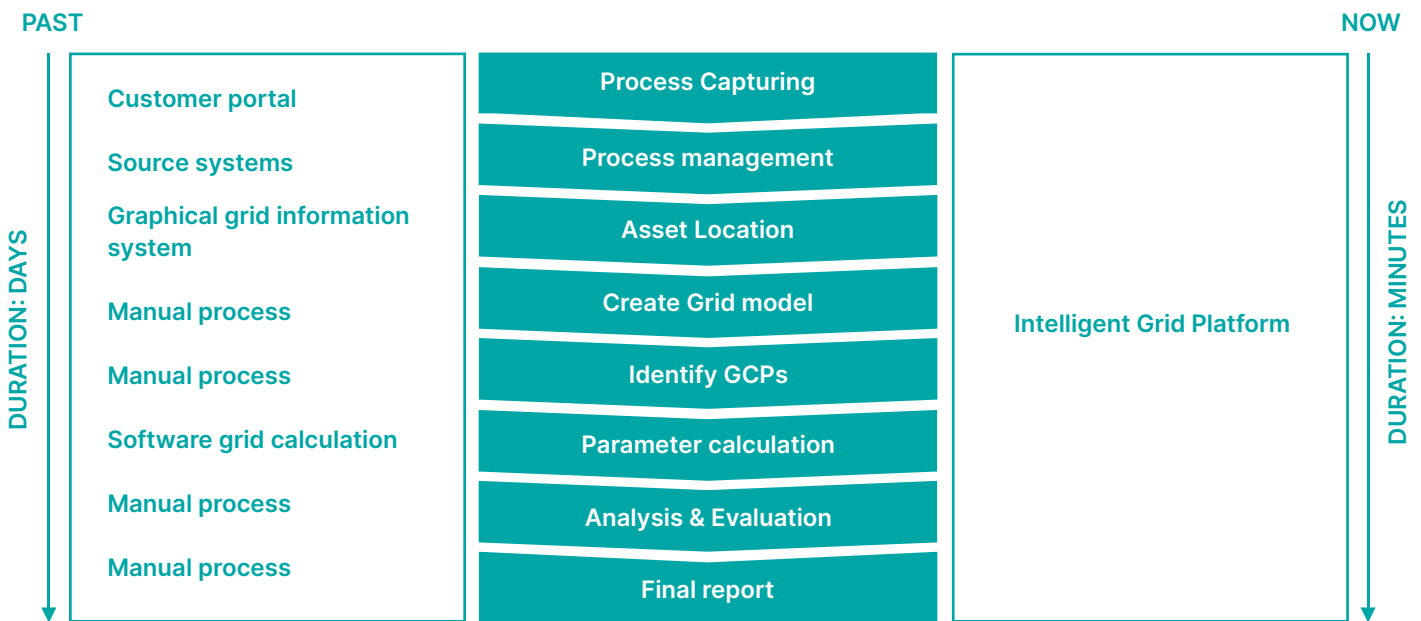
Following the Test Phase, the Online Connection Check initially went live in June 2019 as the “Netzanschlussmonitor“ under the domain <https://netzanschlussmonitor.e-dis.de>. This enabled the first central goal: Reduction of interconnection requests which have to be processed by grid planners.

In the Production Phase, all functionalities of the Intelligent Grid Platform are constantly being further developed as a result of direct customer feedback. In regular sprint cycles, the new functionalities are implemented by envelio’s development team and then installed in the productive environment.



Project Result and Benefits

With the Intelligent Grid Platform, E.DIS Netz GmbH was able to automate isolated and error-prone manual processes, such as the creation of the grid model, the identification of grid connection points, and creating of final reports. The end result was a significant reduction in person-hours spent on these tasks and measurably faster response times for their end customers.



This results in the following benefits for E.DIS Netz GmbH and for its end customers:

E.DIS

Reduction of application to be handled by grid planners by 20%

Acceleration of the processing of the online interconnection process

Reduction of internal resources for data preparation for technical simulations

Reduction of manual work

End customer

Improved service - the online connection check was used multiple thousand times during the first months

Faster response to interconnection applications

Automatic evaluation instantly via the web portal

Decrease of non-binding customer inquiries

Conclusion

Through the use of the Intelligent Grid Platform, E.DIS Netz GmbH is able to process more interconnection applications accurately and efficiently. Thanks to this digital re-engineering, renewable energy plants are connected to the grid faster thus accelerating the energy transition.

Next steps

By the end of 2020, the IGP will be used to extend the digital grid models at E.DIS Netz GmbH to also include the low voltage grids. The optimization of the data quality is an ongoing and progressive process. Currently, E.DIS is correcting the errors in the original systems and envelio is improving the data shippers in parallel. The data shippers work as the glue between customer systems and the IGP, making it possible to transfer files and metrics easily and reliably.

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