

# Digital Transformation of Electricity Grids

# envelio develops a software platform for distribution system operators based on innovative algorithms



## Company profile

Founded in April 2017 as spin-off from RWTH Aachen University

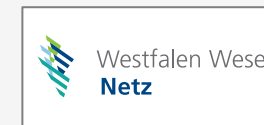
Basis for IGP: 5 PhDs in grid planning and operation

36 employees (as of 10.05.2019)

Financing round with High-Tech Gründerfonds (D) and Demeter (F)



## Our customers



# The Challenge

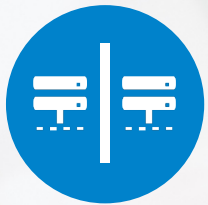
# Distribution grids are the key for a successful energy transition

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Millions of distributed generators and new consumers have to be integrated into the grid

# Workflows and IT-systems at distribution grid operators are not ready for this challenge

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Isolated and inconsistent data silos



Time consuming manual processes



No integration of smart grid technologies

# The Future

# DSO 2.0: The Digital Distribution System Operator

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Full transparency with digital grid models across all voltage levels



Automation of grid planning and operation processes



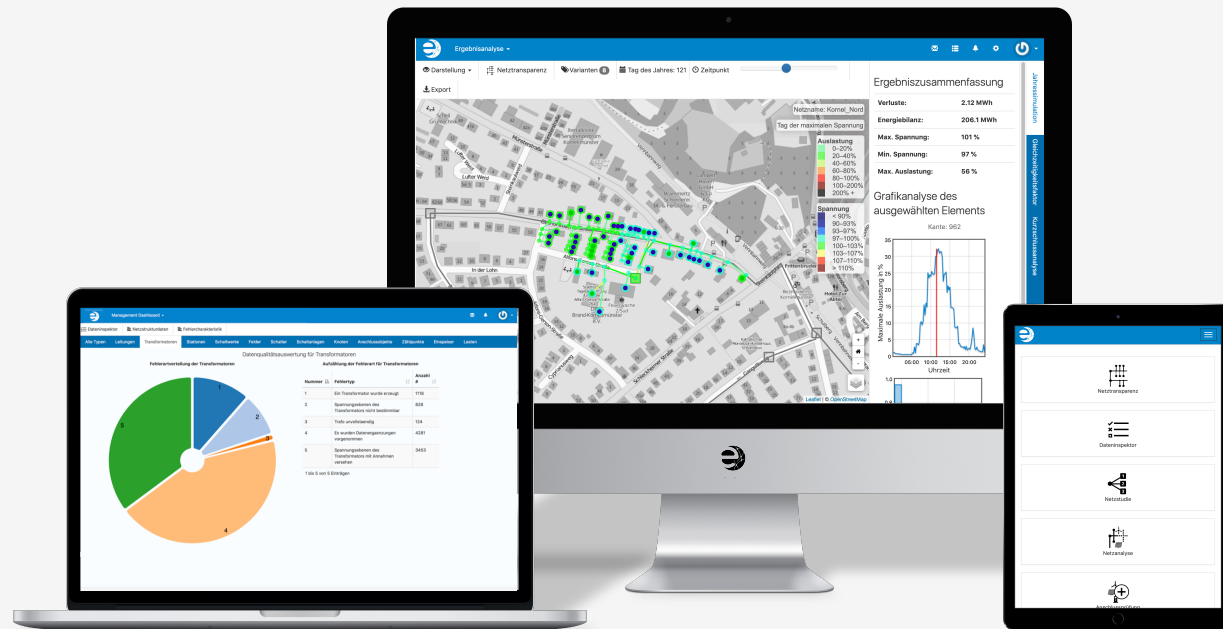
Complete integration of Smart Grid Technologies

# Our Solution



# The Intelligent Grid Platform

Digitization and Automation of  
Grid Planning and Operation Processes



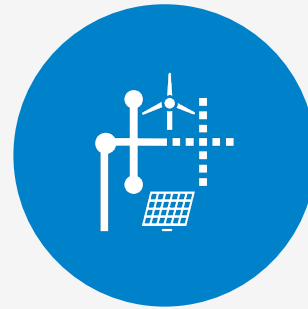
# The Intelligent Grid Platform (IGP) is a modular, flexible & digital DSO assistance system



## IGP DataQuality

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Provide consistency and transparency for grid data by connecting and cleaning isolated data sources with machine learning algorithms



## IGP Planning

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Automate and accelerate essential processes and workflows of grid planners



## IGP Operation

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Support system managers with real-time information about current and future grid states

# Dedicated applications for a wide range of use cases



## IGP Data Quality

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Grid Data Inspector



Grid Transparency



Measurement Data Analysis



## IGP Planning

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Connection Request



Grid Study



Grid Analysis



Grid Planning



Measurement Placement



## IGP Operation

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Online Monitoring



Grid Forecast



Congestion Management

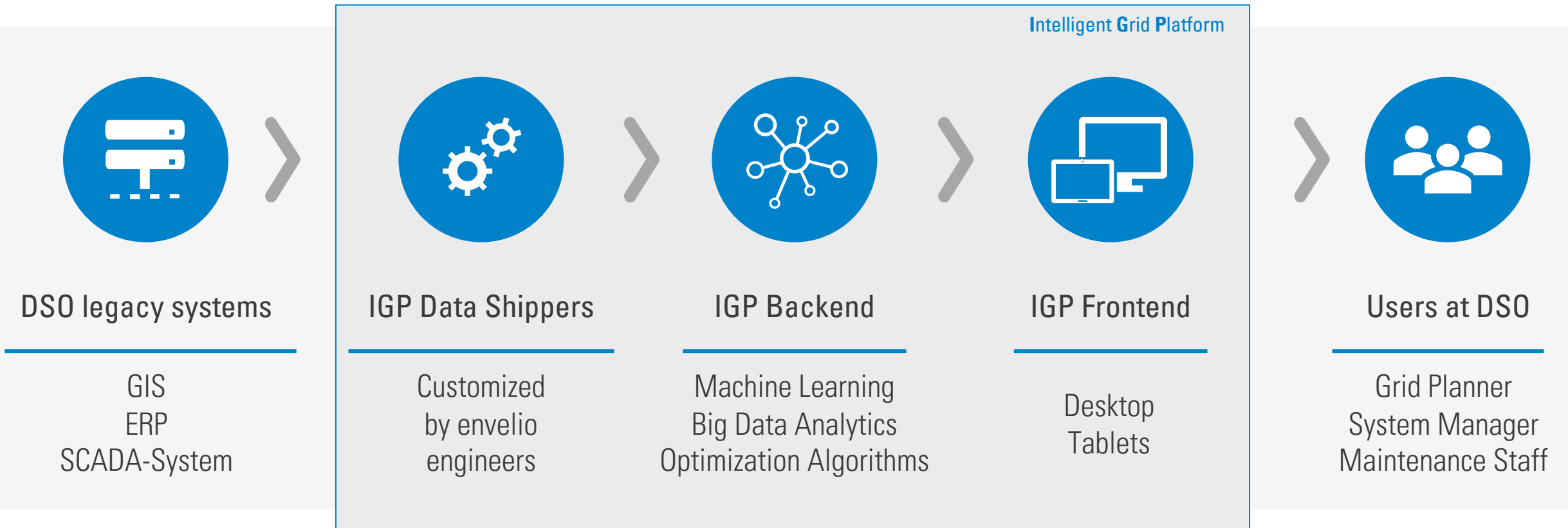


Switching Planning



GLDPM

# The Intelligent Grid Platform is embedded seamlessly into existing DSO structures



# Reference Projects

# Digiplan: Automation of connection requests for new distributed energy resources for e.dis



## Challenge

- Evaluation of new connection requests for DER require significant effort by grid planners
- Too many new connection requests to answer them in time with current staff

## Main Apps

Grid Data Inspector,  
Connection Request

## Grid Area

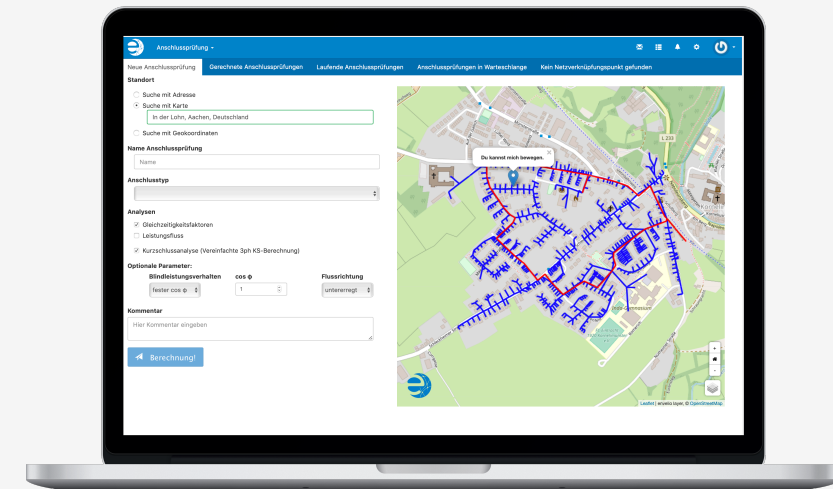
220 Primary Substations,  
26.000 MV/LV Substations

## envelio Solution

- Automatically evaluate new connection requests for DER with dedicated IGP application
- Implement a customer self service for connection requests on e.dis website

## Customer Value

- Reduce internal resources required for data preparation and technical simulations
- Improve response times and service level for customers



# Research project Quirinus: Grid forecast and congestion management for grid oriented VPPs



## Challenge

- Locally concentrated Virtual Power Plants (VPP) can cause bottlenecks in distribution grids
- Grid constraints should be considered in VPP scheduling and real-time operation

|           |  |
|-----------|--|
| Main Apps | Online Monitoring,<br>Grid Forecast            |
| Grid Area | 7 Primary Substations,<br>50 MV/LV Substations |

## envelio Solution

- Establish IGP interfaces to SCADA system via IEC 60870-5-104
- Develop IGP applications for state estimation, grid forecast and congestion management

## Customer Value

- Derive grid traffic light status based on day-ahead and intraday forecast
- Automatically provide recommendations for the operative congestion management



# Create and evaluate scenarios for future supply tasks for Iberdrola



## Challenge

- Integration of DER, EV and smart grid technologies will alter traditional planning procedures
- Creation of predefined and static future scenarios is no longer valid for grid planning

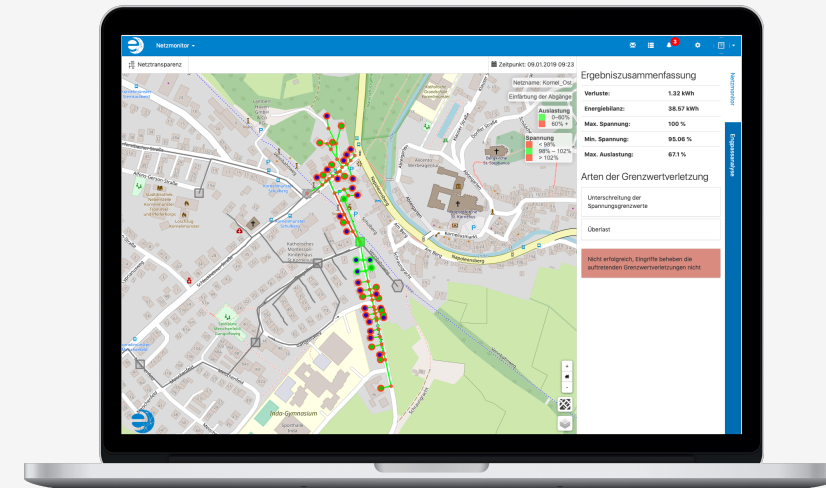
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| Main Apps | Grid Data Inspector,<br>Grid Study                   |
| Grid Area | 180 Primary Substations,<br>20.000 MV/LV Substations |

## envelio Solution

- Generate a series of future scenarios for EV and PV penetration based on historical data
- Analyse & evaluate impact of future scenarios on the grid with dedicated IGP applications

## Customer Value

- Create and evaluate future scenarios tailored to the own grid area
- Be prepared for changing supply tasks and the integration of smart grid technology





# Research project ELBE: Flexible load management of charging points for electric vehicles

## Challenge

- Increasing penetration of EV charging points can cause bottlenecks in the distribution grid
- Due to limited resources and lacking acceptance grid expansion should be avoided

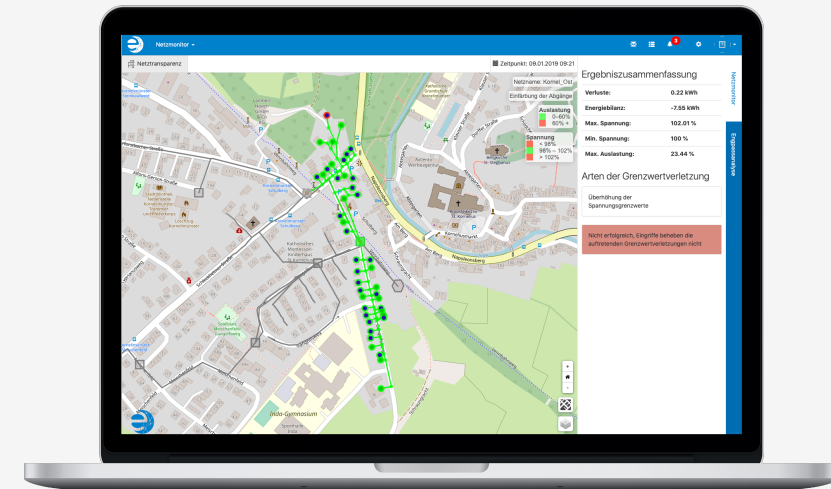
|           |  |
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| Main Apps | Online Monitoring,<br>Congestion Management        |
| Grid Area | 15 Primary Substations,<br>2.100 MV/LV Substations |

## envelio Solution

- Connect the IGP to measurement points in the field and to the Emobility Backend of SNH
- Determine grid state in real-time and give recommendations for load management

## Customer Value

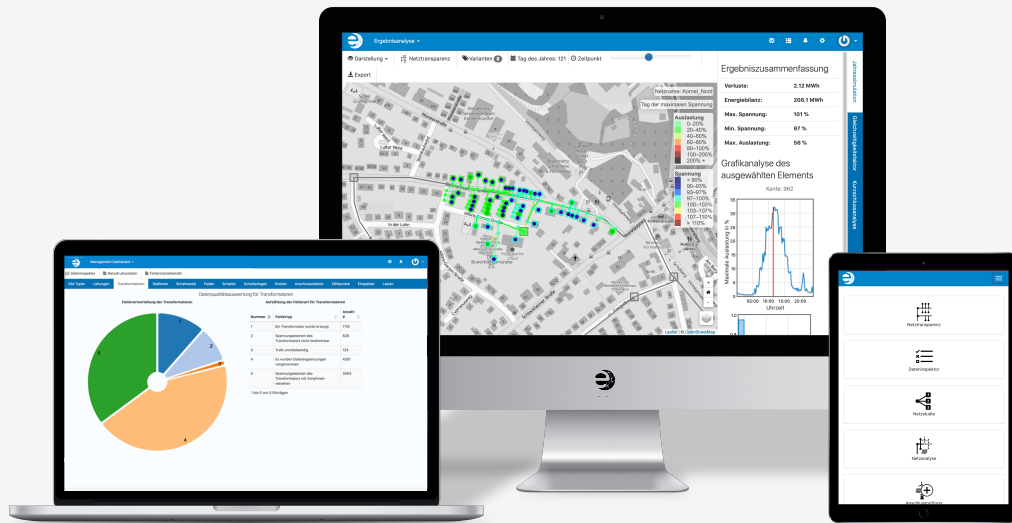
- Prevent grid expansion by intelligent load management of EV charging points
- Enable extensive roll-out and grid integration of charging infrastructure





## Digital Electricity Grids for the Energy Transition

For questions and further information please contact us:



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