



Empowering decisions of tomorrow

**/Energy**

# Optimization in the Energy Sector

Solutions from KISTERS and Challenges for the Future

 **KISTERS**



## /Agenda

- 1. About KISTERS**
- 2. Optimization in Energy**
- 3. KISTERS Solutions**
- 4. Future Challenges**
- 5. Conclusion**



# Experts in environmental solutions and IT.

Founded in  
**1963**

Worldwide nearly  
**30 offices**

Revenue  
**€ 80m**

Employees  
**700**



**Pioneering**  
Technologies

**Customer**  
focused

**Sustainable**  
at heart

**Empowering**  
decisions of tomorrow

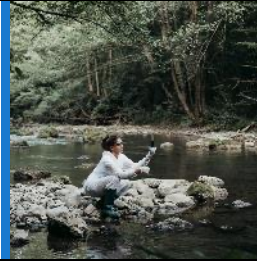
**/Our areas of expertise**

# What we do.

**Energy  
& Renewables**



**Water, Weather  
& Environment**



**Occupational Safety  
& Compliance**



**Environmental  
Consulting**



**2D / 3D  
Printers & Scanners**



**3D Visualisation**



# KISTERS BU Energy: Strategy and Solution Areas

Solution Areas – along market roles



# Optimization, Forecast and Flexibility Management

## • BelVis ResOpt

- Grafical Modelling Suite
- MIP Optimization
- Multi Commodity
- Short Term – Long Term
- ~40 Customers



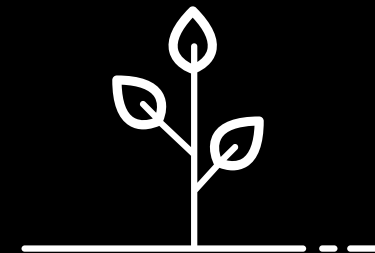
## • BelVis+ Forecast

- Generic Master Data Mangement
- Multi Method Forecasting
- Cloud and Web based
- ~200 Customers



## • BelVis+ FlexManager

- Flexibilities and Groups
- SCADA Interface
- Switch Control
- Algorithmic Load Management (Grid)
- ~10 Customers





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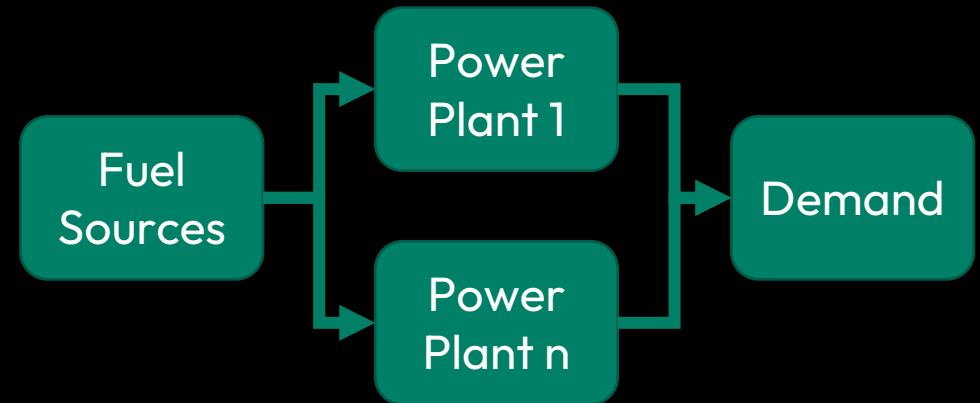




## When it all started (~199x)

- Requirements
  - Small number of power plants
  - No markets
  - Predictable demand
  - Multi commodity
  - Objective: fulfill demand at minimal cost
  - Plan day(s) ahead
  - Unit commitment and economic dispatch

- Solutions
  - Mixed Integer Programming
  - State of the art solvers
  - Forecast solutions for demand
  - Grafical modelling for power portfolios

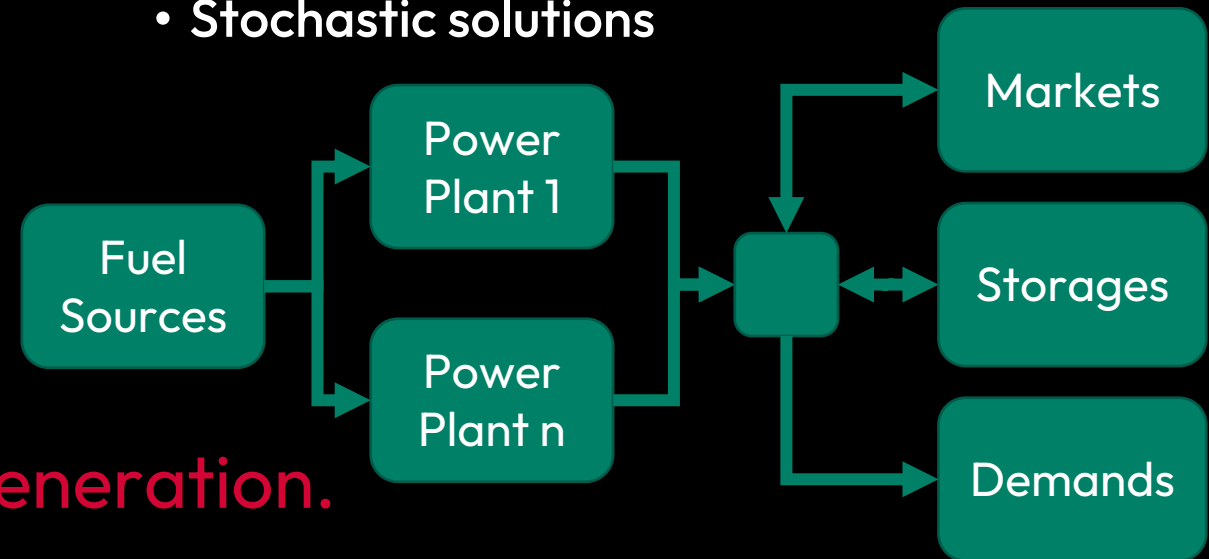


Forecast demand and plan generation.

# How it evolved

- Additional Requirements
  - District heating (water, steam)
  - CO<sub>2</sub>-prices
  - Power markets (DA, ID, Future)
  - Reserve power markets
  - Intra day optimization
  - Mid term optimization
  - Long term optimization
  - Uncertainties

- Solutions
  - Forecast for new demands, prices
  - Time aggregation
  - Scenario calculations
  - Stochastic solutions



Forecast demand/prices and plan generation.

## /Agenda

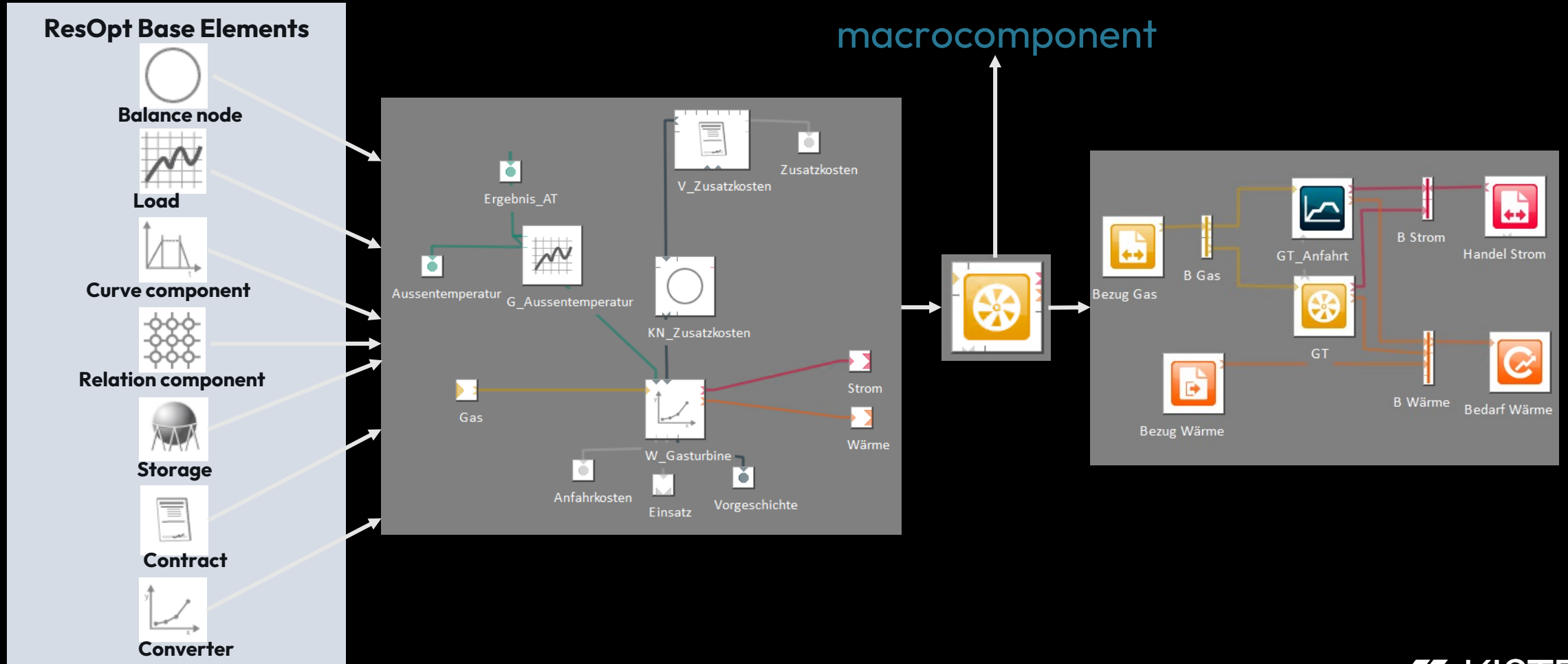
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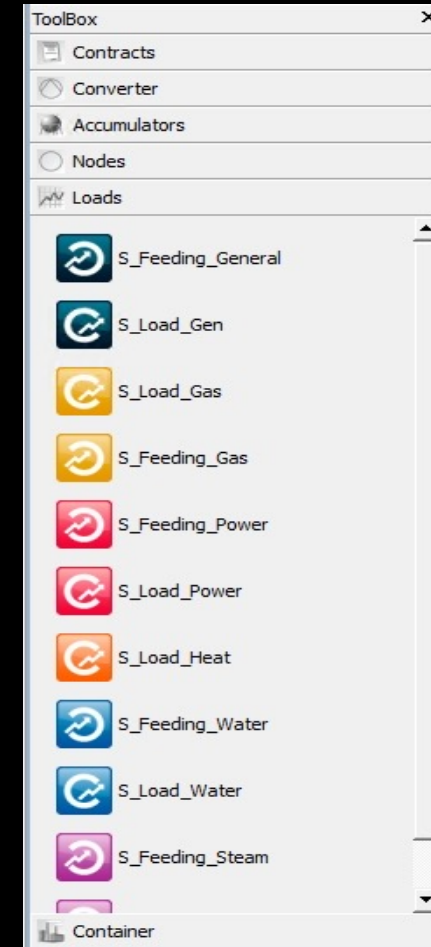
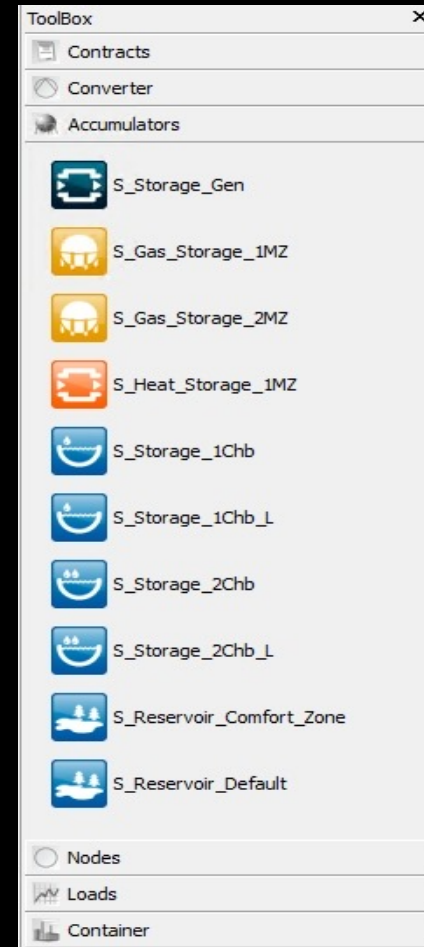
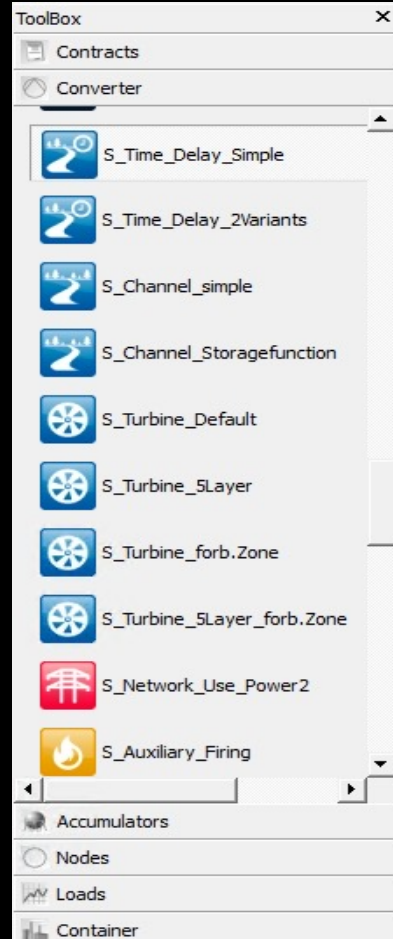
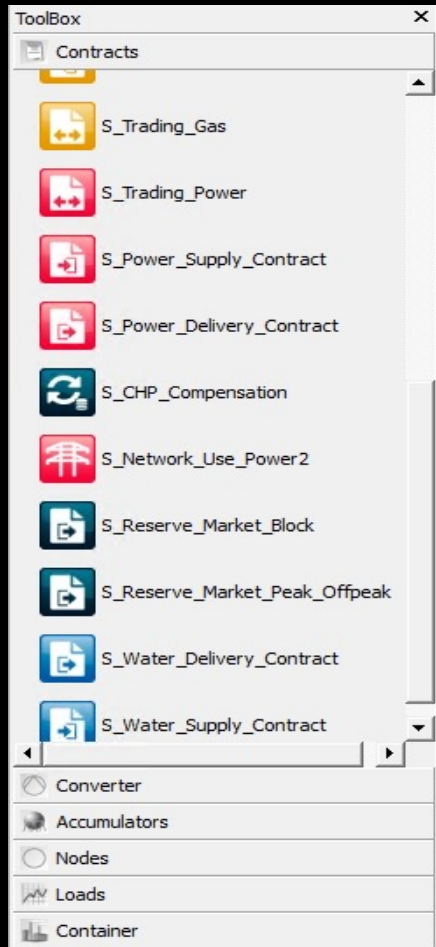
# BelVis ResOpt - the optimization toolbox

ResOpt consists of 7 basic elements - with their combination any problem can be modeled

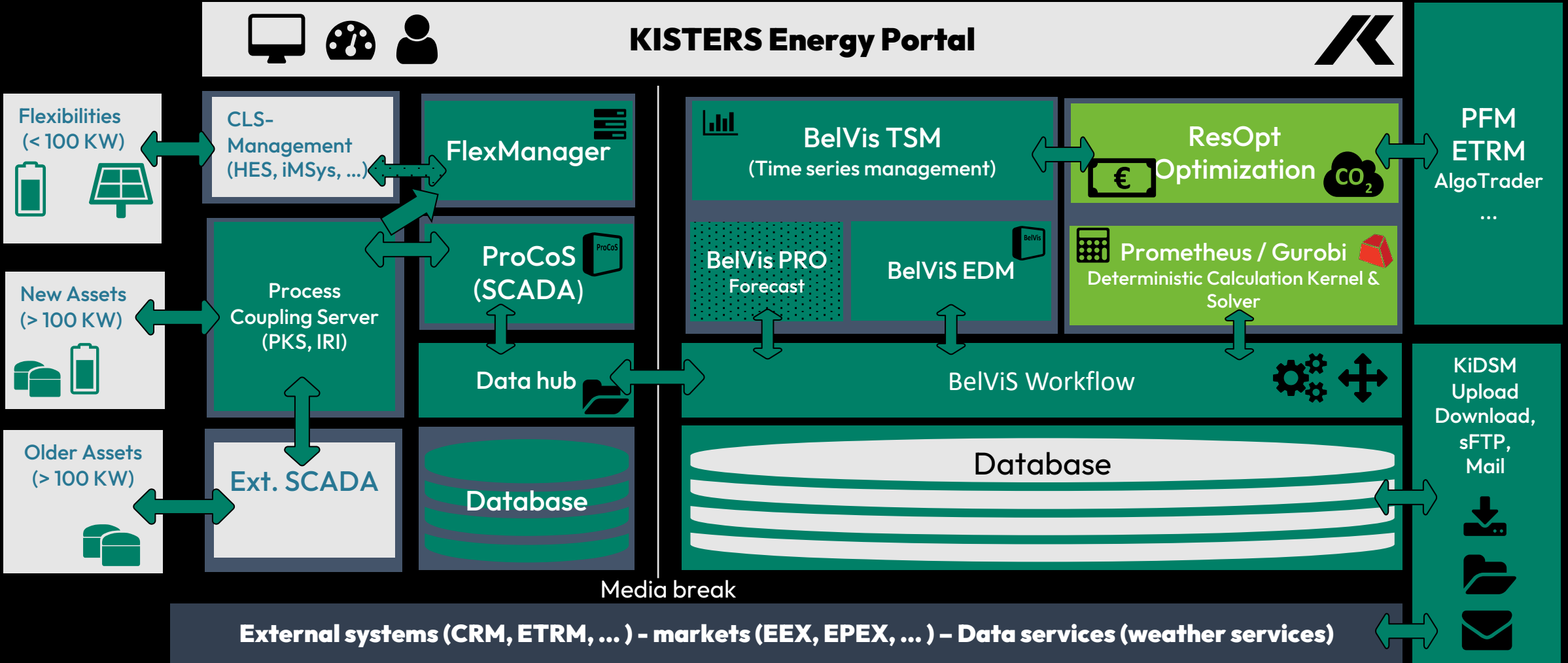


# Comprehensive toolbox for modelling all use cases

more than 120 standard components with detailed documentation



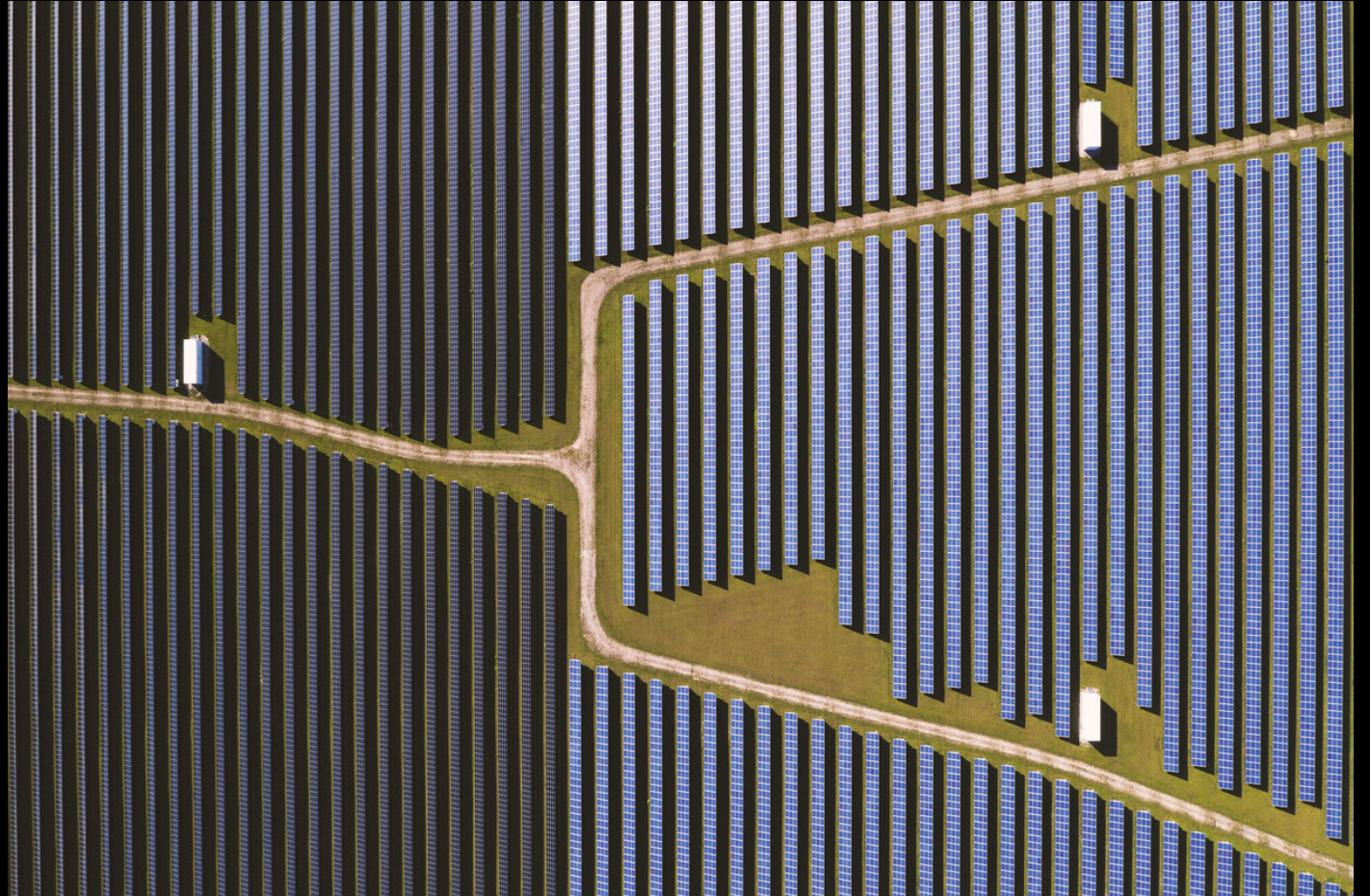
# System architecture of a VPPM solution





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# What is about to come?

- **New Requirements**

- # of generators is exploding
- # of controllable assets is exploding
- # of decision variables is exploding
- Mandatory changes in heat sector upcoming (D)
- Physics cannot be ignored any more
- Market rules will change

- **Possible Solutions**

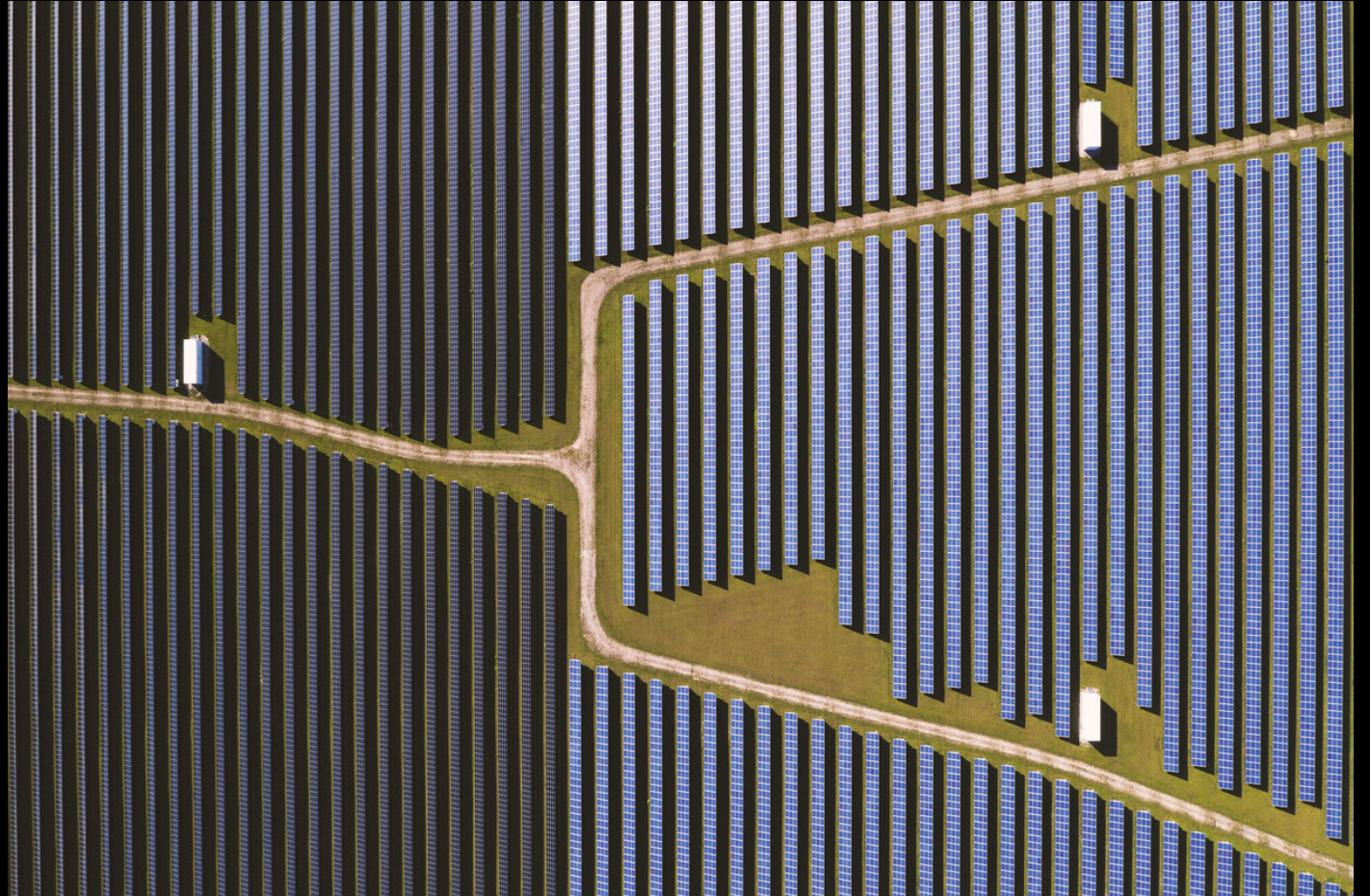
- Local MIP optimization
- Centralized global optimization
- Dynamic models needed
- Fast adoption to changes → intelligent architecture
- Non linear models required?

**Forecast generation and plan demand.**



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# Conclusion

- KISTERS has a long history in optimization in energy
- Major changes challenge the energy sector
  - Decentralization of generation
  - Electrification of mobility
  - Electrification of heat
  - Dynamization of portfolios
  - Possible changes in market rules
  - New requirements from grid operators
- Future solutions will be/have...
  - Cloud based, generic, flexible, fast, decentralized, easy to use
  - High security level
  - Low onboarding investment





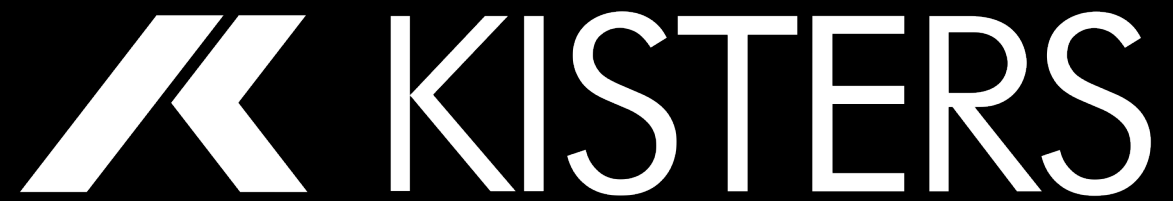
# Thank you

An aerial photograph of a wind farm situated on rolling hills. The wind turbines are white and are scattered across the landscape. The scene is captured during sunset or sunrise, with a warm, golden light illuminating the hills and the sky. A large, dark, triangular graphic element is overlaid on the right side of the image, pointing towards the top right corner.

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