



Quality management for building performance

## Quality Management for Building Performance – QUANTUM tools in German demo buildings

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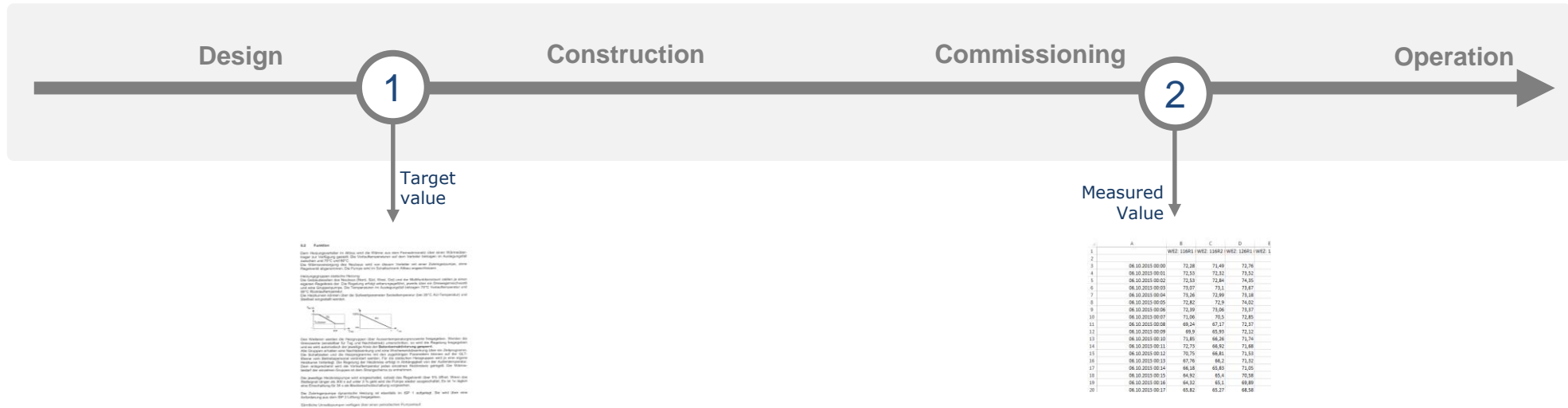
Technische Universität Braunschweig



# Demonstration Buildings

Name	Forumsgebäude (Offices)	Integrated Centre of Systems Biology	Pharmaceutical Engineering	External Building (Heidelberg)	External Building (Muenster)
					
Type of building	Office building	Office / Laboratory	Office / Laboratory	Office / Laboratory	Office building
Gross floor area	11,225 m <sup>2</sup>	4,330 m <sup>2</sup>	3270 m <sup>2</sup>	nA	nA
Implemented tools	PTB, NG9, CM	PTB	PTB	PTB	PTB
Testes facilities	AHU, Heating Circuits	AHU	Chiller, Cooling Circuits	Heating Circuits, AHU, District Heating, Compression Chiller	Heating /Cooling Circuits, AHU, Compression Chiller
Design Documents	+	++	+	0	0

## — Active Functional Specification

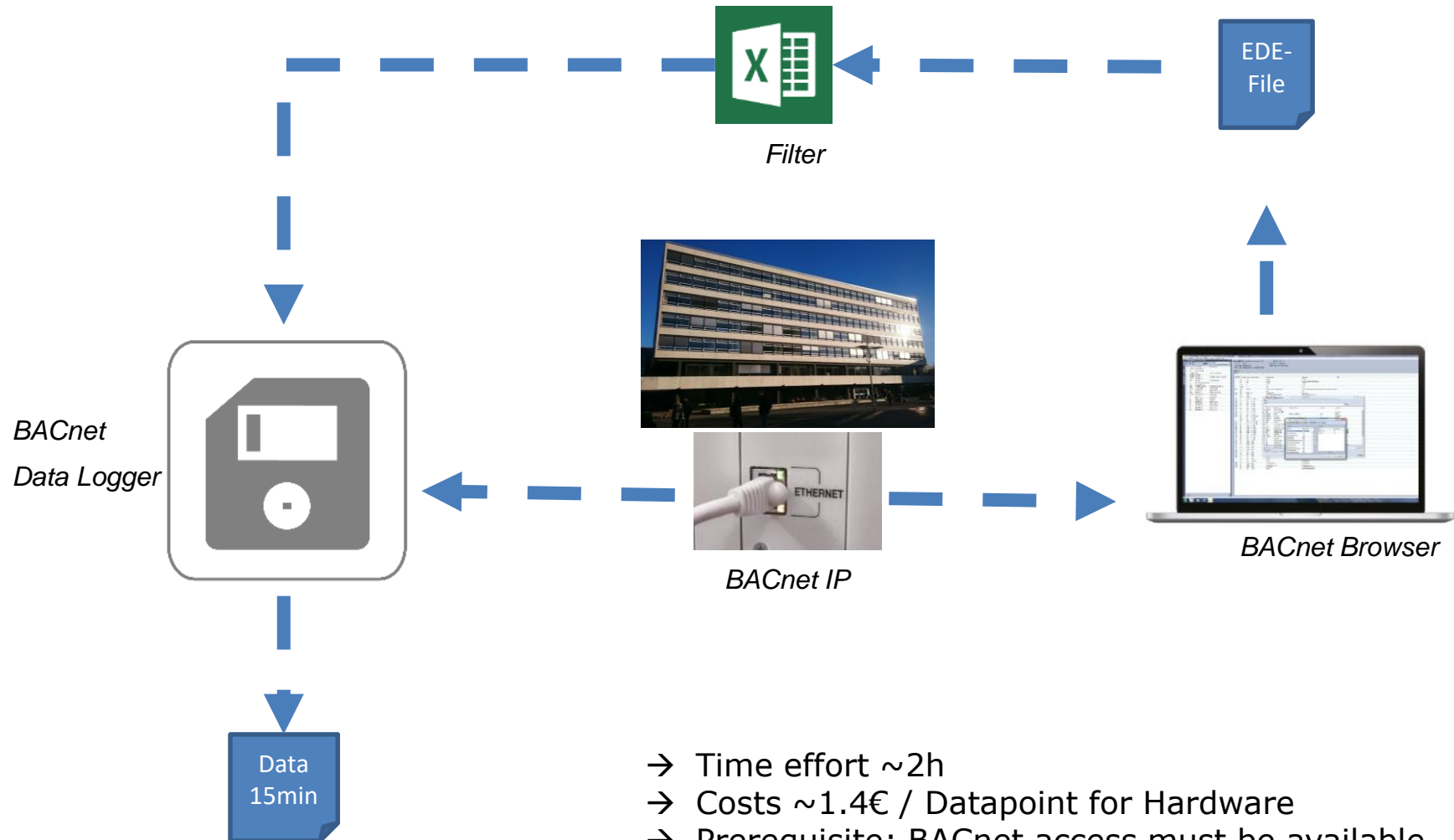


## Implement active functional specifications

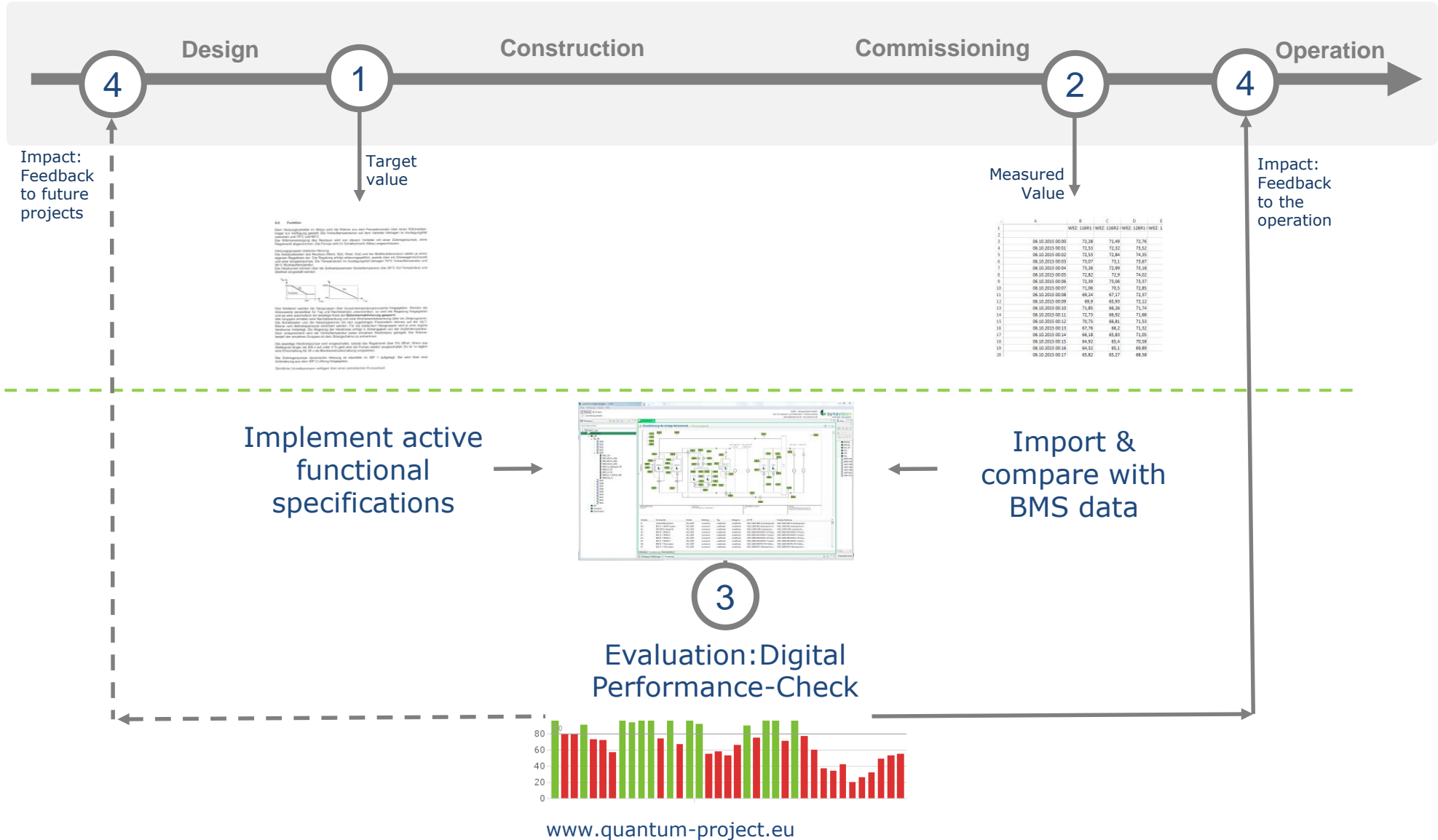


Import & compare with BMS data

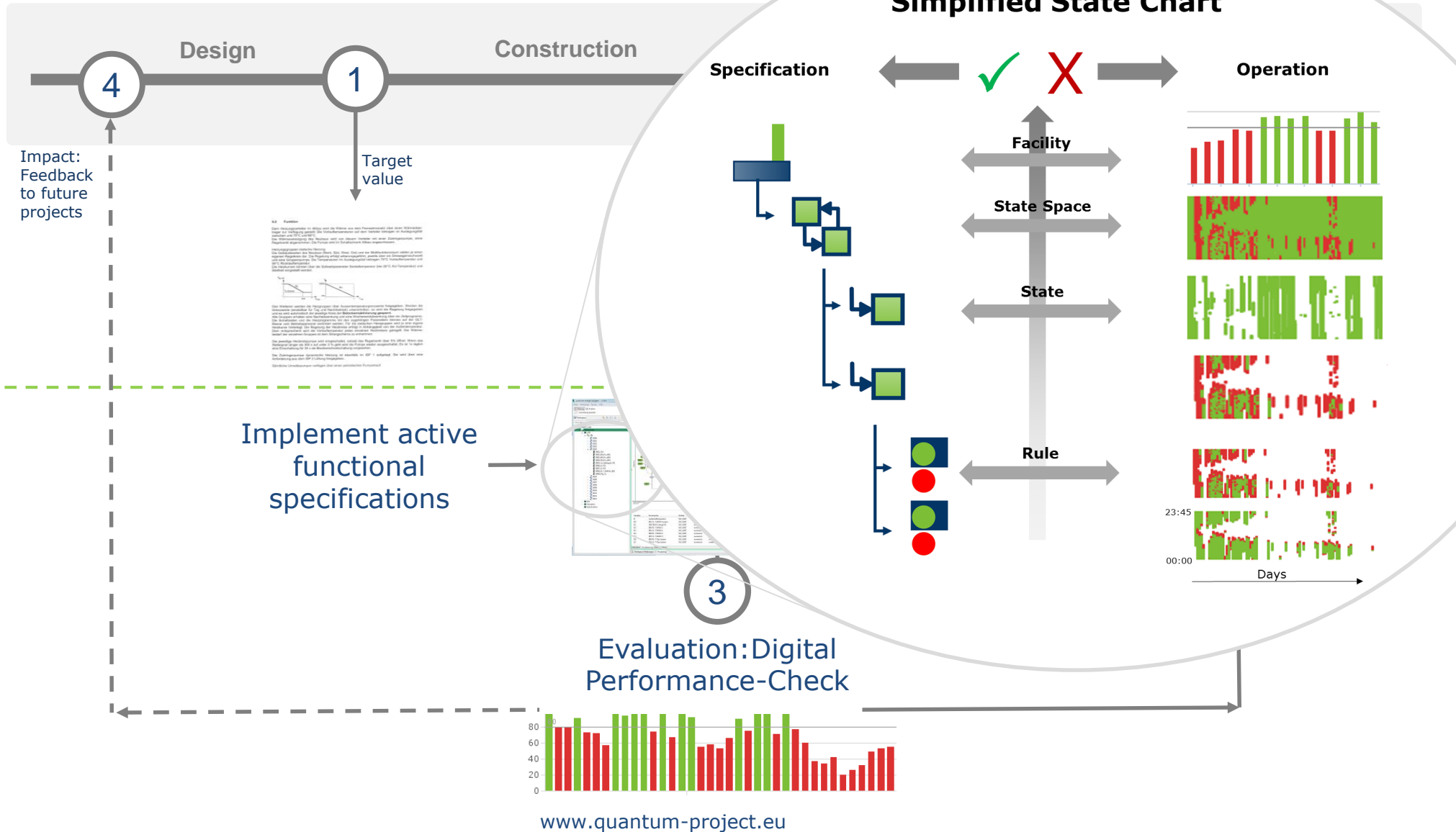
## Data Access



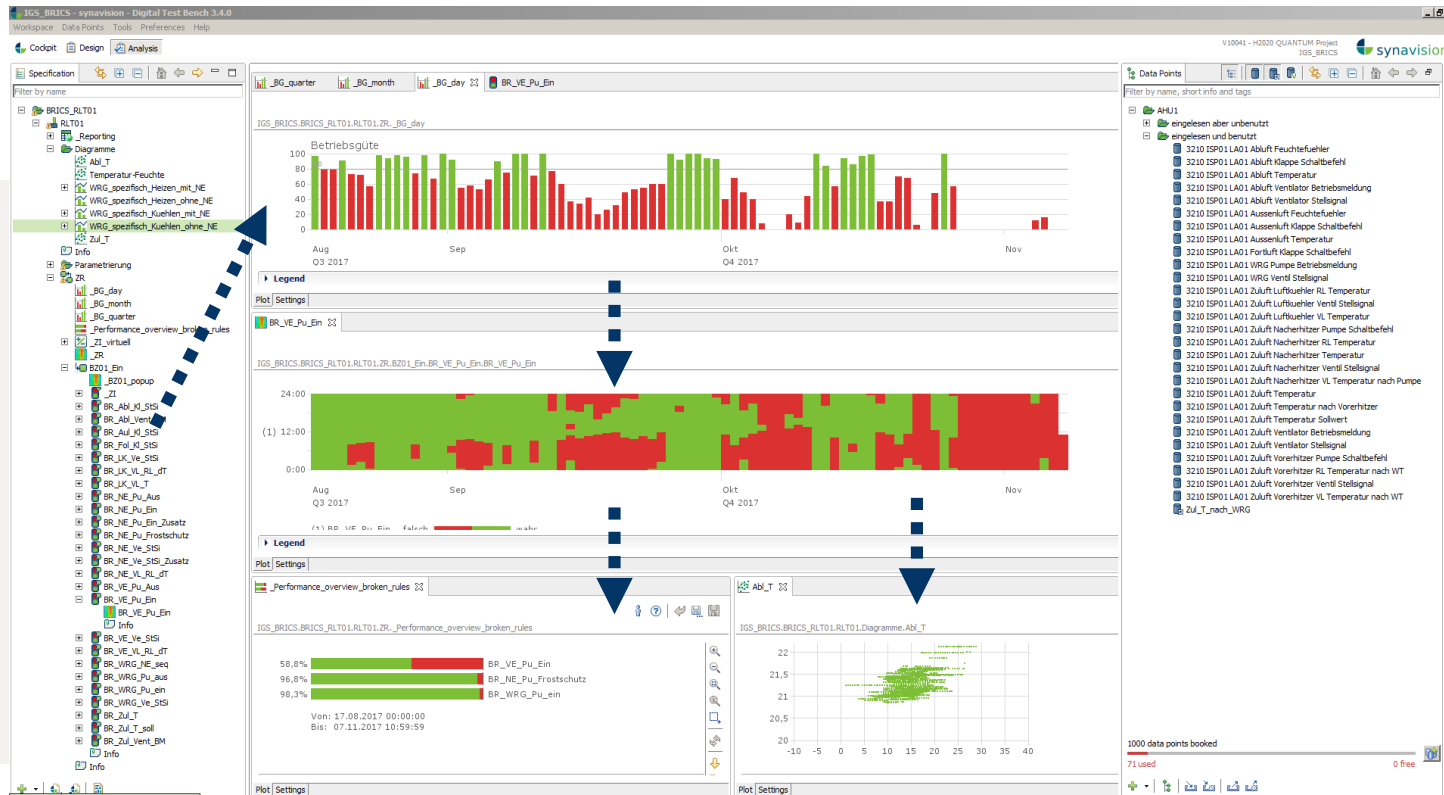
# Active Functional Specification



## — Active Functional Specification



# Performance Evaluation



- Standardized testing and individual technical analysis  
=> Pre-heater pump not controlled = permanently on



## — Performance issues identified



- **False set-points**
  - Supply air temperature set-point
  - Too high or low set-points for supply temperatures of the heating and cooling- coil
- **Schedules for the operation time adapted**
- **Missing balance between energy production and demand**
  - Heating or cooling circuits are operated permanently
  - Pump is running even if there is no heating or cooling demand
  - High of on/off cycles affecting the life span and controllability
- **Faulty control sequence between heating, cooling-coil, heat recovery and free-cooling**
  - Synchronous heating and cooling
  - Missing night- setback
- **And more ...**



## — Savings potentials



- 5 buildings
- 19 systems (AHU, HC, CC, DH, Chiller)
- 43 faults
- Energy Savings = 10.300 €/a
- Cost = 15.000 €
  - 200 working hours á 75 €
- RoI = 1,5 a
- Average Duration of Implementation: < 3 month