ENERGY IN TIME

SIMULATION-BASED CONTROL FOR ENERGY EFFICIENCY BUILDING OPERATION AND MAINTENANCE

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PROJECT DESCRIPTION
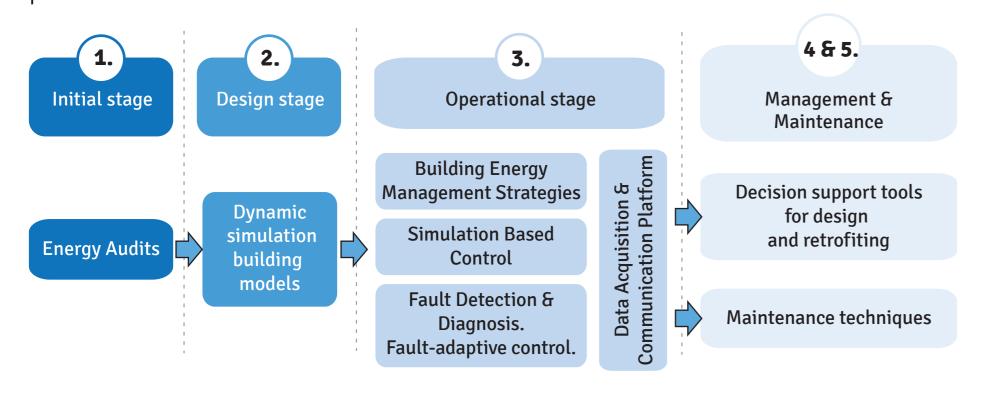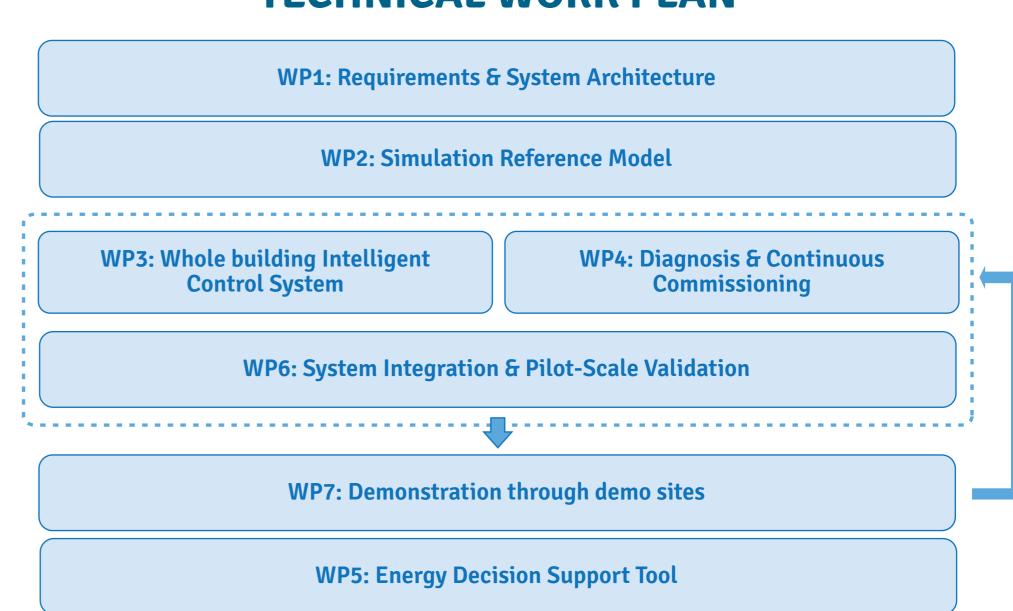
EiT developed a Smart Energy Simulation Based Control method to reduce the energy consumption in the operational stage of existing non-residential buildings. The Consortium created new techniques based on the prediction of indoor comfort conditions and user behavior performance to improve Lifetime and Efficiency of Energy Equipment and Installations through continuous commissioning and predictive maintenance with the possibility to centralize the remote control of different buildings in a single automated process.

1. Initial stage
2. Design stage
3. Operational stage
4 & 5. Management & Maintenance

Energy Audits → Dynamic simulation building models → Building Energy Management Strategies / Simulation Based Control / Fault Detection & Diagnosis. Fault-adaptive control. → Data Acquisition & Communication Platform → Decision support tools for design and retrofiting / Maintenance techniques

TECHNICAL WORK PLAN

WP1: Requirements & System Architecture

WP2: Simulation Reference Model

WP3: Whole building Intelligent Control System

WP4: Diagnosis & Continuous Commissioning

WP6: System Integration & Pilot-Scale Validation

WP7: Demonstration through demo sites

WP5: Energy Decision Support Tool

DEMO SITES & INTERMEDIATE RESULTS

Energy IN TIME is being tested and validated at four non-residential demo sites located in different geographical area with diverse climatic conditions with different characteristics, such as building use, properties and age.

Airport - FARO (PORTUGAL)
· Area: 41.000 m2
· Built: 1965/1989/2001
· Open spaces, 6 million of passengers

Offices and Test Labs - BUCAREST (ROMANIA)
· Area: 17.384 m2;
· Built: 1982
· Closed and distributed spaces, constant flow of people, scheduled occupancy

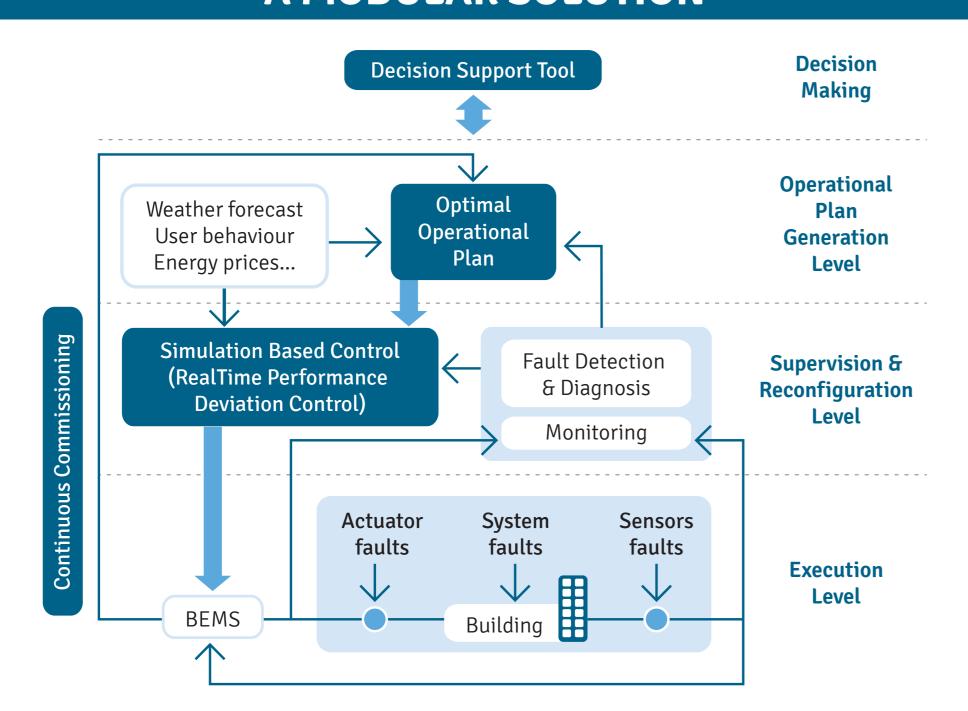**Commercial and Office Building - HELSINKI (FINLAND)**
· Area: 38.190 m2; Built: 1999
· Open and distributed spaces, 1.400 people working daily, scheduled occupancy

Hotel - LEVI-LAPLAND (FINLAND)
· Area: 42.500 m2
· Built: 2010
· Distributed spaces, seasonal occupation 170 guest rooms

A MODULAR SOLUTION

Decision Support Tool — **Decision Making**

Weather forecast / User behaviour / Energy prices... → Optimal Operational Plan — **Operational Plan Generation Level**

Simulation Based Control (RealTime Performance Deviation Control) / Fault Detection & Diagnosis / Monitoring — **Supervision & Reconfiguration Level**

Continuous Commissioning

Actuator faults / System faults / Sensors faults — **Execution Level**

BEMS / Building

REAL APPLICATIONS

• Verify the function of the existing systems in real buildings
• Detect possible ways to improve developed systems
• Find direct energy and maintenance cost savings
• Improve indoor climate in spaces to ensure energy and economic strategies
• Implement proactive maintenance procedures

IMPLEMENTED TECHNOLOGIES

• Automatic operational plan generator
• Building HVAC Fault Detection & Diagnostics
• Fault-adaptive control for VAV damper stuck in a multizone building
• Decision support method for building mid-long term analysis
• Data mining for building operations improvement

EXPECTED IMPACT Energy efficiency tangible optimization in buildings

Energy IN TIME goes beyond existing building control techniques and presents an innovative solution for building control and management contributing to building operation energy and maintenance costs with savings of up to 20% over traditional energy consumption.

The 'W² goals' of the EiT solution: (1) **W**hen? **>** ensure energy consumption IN TIME, only **when** really needed; (2) **W**hat? **>** consume only **what** is really needed.