1. INTRODUCTION

PROJECT SUMMARY
Year of construction: 1964
Past energy renovations: partially changed windows in the wing of the fiscal office in 2006

SPECIAL FEATURES
Main topics in the renovation:
* improved functionality
* additional surface area
* challenging energy efficiency
* sustainability targets

Innovative features:
* special façade
* innovative HVAC (ventilation system, bivalent heat pump)
* lighting concept

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Administration building Bruck/Mur – District Court and Fiscal Office

IEA SHC Task 47
Renovation of Non-Residential Buildings towards Sustainable Standards
2. CONTEXT AND BACKGROUND

BACKGROUND
- Building in T-form
- 3 floors (wing district court), 5 floors (wing fiscal office)
- Mixture of public users: district court, fiscal office, governmental verification office
- Different ministries pay the rent

OBJECTIVES OF THE RENOVATION
- Improved functionality
- Additional surface area for district court
- Clear separation of district court from the rest of the administration building
- Challenging energy efficiency and sustainability targets

SUMMARY OF THE RENOVATION
Innovative technologies:
- Prefabricated metal cladding panels with solar ‘honeycombs’ for passive solar exploitation
- Ventilation with highly efficient heat recovery in the wing of the district court;
- Bivalent heat pump with a deep drilling system for cooling and part of heating;
- Lighting by presence and daylight dependent controlled floor lamps.

Integrated Energy Design approach including accompanying LCCA throughout the whole process

Percentage reduction in primary energy consumption: about 60% (but also higher comfort levels)
3. DECISION MAKING PROCESSES

- 2004 Ministry of Justice needs more space for the district court
- 2007–2008 Study on the renovation and extension of the district court
- 2009 Decision to realize a pilot project of the whole building including all three public stakeholders (district court, Ministry of Finance and BEV)
- 2009 Start of research project within ‘Building of Tomorrow’: Decision to realize this building as a demonstration project
- From standard renovation level to high performance renovation standard of the project BIGMODERN
- International architectural competition in two steps:
  1) Call for Application, Description of the capabilities of the office (11 applicants)
  2) Architectural Competition with 5 remaining studios
- Definition of precise energy efficiency and sustainability targets for the winning architect
- Analysis of life-cycle costs in order to find cost-optimal solutions

Timeline for the decision making process

- Idea was born
  2004
- First brief project description completed
  05.2008
- Contract with general planner
  08.2009
- Detailed project description completed
  12.2009
- Tendering process started
  01.2010
- Start renovation
  05.05.2011
- Renovation completed
  25.09.2012
- Evaluation among occupants
  2013 - 2014

Entrance of the district court: outside (being closed, see above) and hall inside (below)
4. BUILDING ENVELOPE

**Roof construction:**  U-value: 0,112 W/m².K  
Materials (Interior to exterior):
- Thermoplastic roofing membrane: 4 mm  
- Rock wool insulation: 320 mm  
- Moisture barrier: 0,4 mm  
- Ferroconcrete: 200 mm  
Total: 524 mm

**Wall construction:**  U-value: 0,155 W/m².K  
Materials (Interior to exterior):
- Chalk-cement plastering: 20 mm  
- Concrete brick: 205 mm  
- Chalk-cement plastering: 20 mm  
- Rock wool insulation: 200 mm  
- Air space (solar comb façade): 4 mm  
- Glass (solar comb façade): 5 mm  
Total: 454 mm

**Windows:**  U-value: Ø 1,20 W/m².K  
Materials (Interior to exterior):
- Frame: aluminum  
- Window: 2 layers of glass  
- Sun-blinds in between the glass layers

**Summary of U-values [W/m²K]**

<table>
<thead>
<tr>
<th></th>
<th>Before</th>
<th>After</th>
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<tbody>
<tr>
<td>Roof/attic</td>
<td>1,05</td>
<td>0,112</td>
</tr>
<tr>
<td>Floor/slab</td>
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<tr>
<td>Walls</td>
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<td>Ceilings</td>
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<td>0,188</td>
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<tr>
<td>Windows</td>
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<td>Ø 1,20</td>
</tr>
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5. BUILDING SERVICES SYSTEM

OVERALL DESIGN STRATEGY
Two different types of renovation for the different wings

LIGHTING SYSTEM
.Floor lamp, daylight and attendance control

HEATING SYSTEM
- Before: Gas boiler
- After: District heating based on biomass

COOLING SYSTEM
- Before: no cooling system
- After: heat pump with deep drillings for court rooms; passive cooling for administration rooms

VENTILATION
- Before: no ventilation
- After: Semi-central ventilation unit with heat recovery for every floor

HOT WATER PRODUCTION
- Before: central gas boiler
- After: decentralized electric boilers

RENEWABLE ENERGY SYSTEMS
- Before: no renewables
- After: 140 m² photovoltaic modules on the roof; heating based on renewables (district heating)

- Concept sun blinds and daylight

- Concept PV panels: 140 m² on the roof

- Concept lighting system: Floor lighting with daylight and attendance control
6. ENERGY PERFORMANCE

REDUCTION HEATING DEMAND
The heating demand of the building could be reduced by 85% from 153 kWh/m²a to about 24 kWh/m²a. Due to the different refurbishment measures taken, the energy certificates have been drawn up separately for each wing (district court and fiscal office).

REDUCTION PRIMARY ENERGY DEMAND
Even though comfort and convenience in use could be increased significantly – and therefore additional energy flows for ventilation and cooling occurred – the primary energy demand could be reduced by approximately 65%.

REDUCTION CO₂
Due to the reduction of the energy demand and the replacement of the heating system by biomass district heating, CO₂-emissions could be reduced by approximately 75%.

SYNOPSIS
The building was expanded by 853 m². In addition, a cooling system for the court rooms as well as a ventilation of the district court were installed. Despite this extension and the significant increase of comfort levels, a considerable reduction of energy demand could be achieved.

CLARIFICATION: the energy calculations and given energy numbers will be according to the national standards which might vary between countries, i.e. numbers are not always comparable.
7. ENVIRONMENTAL PERFORMANCE

- The building has received the Total-Quality-Building (TQB) certificate, which is the sustainability certificate of the Austrian Sustainable Building Council (ÖGNB – www.oegnb.net)
- The certificate is different for the two building wings
- Wing of district court: 911 points of max. 1,000 points
- Wing of fiscal office: 741 points of max. 1,000 points
- The sustainability performance according to TQB is among the front-runners of refurbishment projects in Austria
- In addition, the building (district court) holds the climate protection certificate “klima:aktiv Gold”
8 MORE INFORMATION

USER FRIENDLY DESIGN
Light colors and glassed areas are used in the interior of the building and make it user-friendly for the working staff as well as for clients.

OUTDOOR DESIGN
The public space in front of the building has been equipped with seating accommodations and green spaces.