Energy Management
Energy Savings Performance Contracting for the school complex Riedlingen

Project Presentation

Darmstadt, September 9th, 2013
Dipl.-Ing. Michael Pietzner
Agenda

Company Presentation
Energy Savings Performance Contracting
The Project
Measurement and Verification: results to date
Company Presentation

WISAG

Industry Service
Facility Service
Aviation Service
Company Presentation

WISAG Industry Service

Industry Service

- Maintenance
- Technical Cleaning
- Facility Management Industry
- Construction Electrical Systems
- Construction HVAC
- Logistics for Production
- Production Support
- Construction of Industrial Systems

Facility Service

Aviation Service
Our Scope of Work

- Energy Consulting, Energy Concepts
- Turnkey Projects (Project Development, Consulting Implementation of Energy Savings Measures incl. Financing, if required)
- Guaranteed Savings
- Independent and web based Building Management System
- Development and Implementation of Measurement Concepts plus web based Energy Management System
- Monitoring and Controlling Services
- Implementation of Energy Management Systems in accordance with DIN EN ISO 50001
Our Company

References government customers

- Landkreis Neu-Ulm
- Freiburg im Breisgau
- Landkreis Nürnberger Land
- Baden-Württemberg
- Hansestadt Lübeck
- Freistaat Thüringen Justizvollzug
- Edingen-Neckarhausen
- Klinik St. Georg
- Wehrbereichsverwaltung West
- Weissenburg Gunzenhausen
- Park-Klinik Weisensee

☑ Optimization of approx. 250 buildings
☑ Contract volume approx. 50 Mio. €
☑ Investment in savings measures: approx. 30 Mio. €
☑ Guaranteed savings: approx. 5 Mio. € per year
Our Company

References commercial customers
Energy Savings Performance Contracting
Guaranteed Energy Savings

- Investment in technical systems to improve energy consumption and reduce energy costs
- (re-)financing through guaranteed savings
  - Implementation of savings measures with defined ROI
  - Savings Guarantee for the customer

Our Services:
- Consulting, Financing and Project implementation (Turnkey Project)
- Maintenance
- Measurement and Verification (Monitoring & Controlling), further Optimization of Energy Consumption
Energy Savings Performance Contracting
Contractual Framework

Monitoring & Controlling
- Continuous Monitoring of Energy Consumption
- Further Optimization

Energy Supplier
- Electricity
- Natural Gas
- Water / Waste Water

Performance Contract
- Savings guarantee

Implementation of Savings Measures
- Design & Project Management,
- Financing
- Construction
- Start-Up
- Maintenance

Customer
Energy Savings Performance Contracting
Financing the investment with guaranteed savings

Energy Cost

- Energy Cost Savings for Customer
- Payment WISAG Energiemanagement (based upon fixed energy Prices)

Contract Duration (Years)

- Development Energy Cost without Contracting
- Development Energy Cost with Contracting
- Guarantee Phase
- Contract Signature
- Preparation Phase (Design and Implementation)
- End of Contract
- Operational use of systems

Wisag
Energy Savings Performance Contracting

Process of project development

- **Project Qualification**
  - Energy Cost
  - Operational Cost
  - Building and System Data
  - November 2009: Start of public tender process

- **Tender Process Preliminary Study**
  - On-site data collection
  - Engineering (preliminary)
  - May 2010: Signature Performance Contract (Phase 1)

- **In Depth Study**
  - On-site data collection
  - First design Engineering (final)
  - October 2010: Signature Performance Contract (Phase II)

- **Implementation Phase**
  - Final design
  - Implementation Start-Up
  - Typically 8 – 11 months

- **Guarantee Phase**
  - Savings Guarantee Monitoring & Controlling, Optimization Maintenance
  - 6 years
  - October 2011: Start of Guarantee Phase
The Project: 2 Schools, each with a gym
The Project
Area Map

Kreisgymnasium
Realschule
The Project

The Buildings

Kreisgymnasium

Realschule
The Project

On-site Visit: existing technical systems Kreisgymnasium
The Project

On-site Visit: existing technical systems Kreisgymnasium
The Project

On-site Visit: existing technical systems Realschule
Energy Cost Baseline

- **Electricity**: 26,695 €
- **Oil**: 57,000 €
- **Water/Waste Water**: 4,665 €
The Project

The Contract

- Signature of contract: October 29th, 2010
- Guarantee Phase: 6 years
- Baseline of energy cost: 183,080 €/a (2008)
- Invest in technical systems: 1,462,520 €
- Guaranteed savings: 138,937 €/a
- Total value of contract: 1,744,919 €
- Start of guarantee phase: October 1st, 2011
- \( \text{CO}_2 \)-Savings: 600 to/a
## The Project
### Technical Measures Kreisgymnasium

<table>
<thead>
<tr>
<th>Heating Technology (1)</th>
<th>Heating Technology (2)</th>
<th>Electrical Systems</th>
<th>Lighting</th>
<th>Building Automation System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continue use of existing oil-fired boiler in central heating plant</td>
<td>Renewal of heating distribution system in central heating plant</td>
<td>Renewal main electrical distribution system and electric panel for central heating plant and heating distribution system</td>
<td>Renewal of 860 lighting panels in all kind of rooms</td>
<td>New DDC-controls for central heating plants</td>
</tr>
<tr>
<td>New building for central heating plant with woodchip storage</td>
<td>Implementation of district heating system with Realschule (465 m)</td>
<td>New Transformer (400 kVA) for future supply of both buildings with electricity</td>
<td></td>
<td>Connect all DDC-controls (new and existing) to web based Building Management System (BMS)</td>
</tr>
<tr>
<td>Gas fired CHP System (50 kWel, 88 kWth) with water storage tank (6 m³)</td>
<td>Connection of heating distribution system of Sporthalle to main supply system</td>
<td>New power cable to connect new transformer Station with Realschule (380 m)</td>
<td></td>
<td>Implementation of new meters</td>
</tr>
<tr>
<td>Woodchip boiler (500 kW) with electrical filter</td>
<td>Installation of Meter for Cogen electricity production</td>
<td></td>
<td></td>
<td>Connect all meters to Energy Management System</td>
</tr>
<tr>
<td>Renewal of required equipment for central heating plant operation</td>
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**Wisag**
## The Project

### Technical Measures Geschwister-Scholl-Realschule

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</thead>
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<tr>
<td>Dismantling of existing oil-fired boiler</td>
<td>Renewal main electrical distribution system and electric panel for heating distribution system</td>
<td>Renewal of 460 lighting panels in all kind of rooms</td>
<td>New DDC-controls for central heating plants</td>
</tr>
<tr>
<td>Connect heating distribution system to district heating system</td>
<td>Shut-down of existing transformer station</td>
<td>Connect all DDC-controls (new and existing) to web based Building Management System (BMS)</td>
<td></td>
</tr>
<tr>
<td>Renewal of required equipment for central heating plant operation</td>
<td>Connect main electrical distribution system to power cable from new transformer station at Kreisgymnasium</td>
<td>Implementation of new meters</td>
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<td>Connect all meters to Energy Management System</td>
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The Project

Design Phase: Area Layout Plan

- Woodchip storage (below surface)
- Woodchip supply route
- Woodchip boiler in new central heating plant
- Kreisgymnasium
- Distinct heating system (460 m)
- Central heating plant in new central heating plant
- Realschule
The Project

Design Phase: new building for central heating plant
The Project

Design Phase: new building for central heating plant (2)
The Project

Design Phase: layout new building
The Project

Design Phase: heating supply and distribution system
The Project

Implementation Phase: new building for central heating plant
The Project

Implementation Phase: Inside the new central heating plant: woodchip boiler
The Project

Implementation Phase: new transformer and district heating system
Measurement and Verification: results to date
Measurement and Verification

Evaluation baseline oil consumption

Witterungsbereinigter Heizölverbrauch in kWh (letzte 12 Monate)

Baseline = 1,075,970 kWh
(2008 mit Nutzungsanpassungen in Höhe von -120,000 kWh)

Sanierung Sporthalle
Sanierung Shed-Fenster Schulgebäude
Sommerferien 2010
Measurement and Verification

Evaluation metered gas consumption (guarantee phase)

Monatlicher Gasverbrauch BHKW bei Vollast-Dauerbetrieb = 122,224 kWh Hs
Measurement and Verification
Evaluation heating production, hdd-corrected (guarantee phase)

Baseline = 1,686,101 kWh
Sollerzeugung = 1,541,135 kWh
Kalkulierte Einsparung = 144,966 kWh
Measurement and Verification

Evaluation heating production (guarantee phase)

- Heizöl-Spitzenkessel alt
- Heizöl-Spitzenkessel neu
- Holzhackschnitzel-Heizkessel
- BHKW

Monatliche Wärmeerzeugung BHKW bei Volllast-Dauerbetrieb = 65.472 kWh
Measurement and Verification

Evaluation heating consumption, hdd-corrected (guarantee phase)
Energy Savings Performance Contracting Riedlingen

Measurement and Verification

Evaluation electricity production cogen (guarantee phase)

Netto-Stromerzeugung BHKW in kWh

Monatliche Stromerzeugung BHKW bei Volllast-Dauerbetrieb = 37,200 kWh

Netto-Stromerzeugung BHKW in kWh

Jan 11  Apr 11  Okt 11  Jan 12  Apr 12  Jul 12  Okt 12  Jan 13  Apr 13  Jul 13  Okt 13  Jan 14  Apr 14  Jul 14  Okt 14  Jan 15  Apr 15  Jul 15  Okt 15
Measurement and Verification

Evaluation electrical efficiency cogen (guarantee phase)

Elektrischer Nenn-Wirkungsgrad BHKW = 30.4\%
Measurement and Verification

Evaluation thermal efficiency cogen (guarantee phase)

Thermischer Nenn-Wirkungsgrad BHKW = 53,6%
Measurement and Verification

Evaluation electricity consumption (guarantee phase)
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