

**Science Centre  
North Rhine-Westphalia**

Institute of Work  
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Studies

**Wuppertal Institute for  
Climate, Environment and  
Energy**

# **Practical experiences with internal and external energy performance contracting in the public sector in Germany**

## **EPC, PRIME and PICO: The importance of contract design**

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**IEA/Danskenergi Seminar**

**„Registration and validation of energy saving activities -  
Practical experiences and cost-effective solutions“**

**19 April 2006, Copenhagen**

# Mission: Application-oriented Sustainability Research

- The Wuppertal Institute explores and develops **models, strategies and instruments** to support a **sustainable development** at local, national and international levels.
- Sustainability research at the Wuppertal Institute focuses on **ecology and its relation to economy and society**.
- Our research analyses and initiates **technological and social innovations** that **decouple economic growth from nature use and wealth**.



# The science company „Wuppertal Institut“



- President: Prof. Dr. Peter Hennicke
- Setting up: 1991 conducted by Prof. Dr. Ernst Ulrich von Weizsäcker
- Legal form: Ltd., Non-Profit-Organisation;  
Member of the Science Centre of North Rhine-Westphalia
- Ownership: State of North Rhine-Westphalia
- Staff: more than 150 members from all disciplines
- Projects: 80 - 100 projects per year
- Budget 2004:



■ 19 April 2006

■ Wolfgang Irrek - IEA/Danskenergi Seminar, Copenhagen

2.9 m. Euro basic funds from the

**Wuppertal Institute**

# Overview

- **Energy efficiency potentials** in the public sector
- Experience with **energy performance contracting (EPC)** in the public sector in Germany
- How to involve citizens in EPC:  
**PRIME - Private Investment Move Ecopower**
- There's room for in-house solutions:  
**PICO - Public Internal Performance Commitment / Public Internal Performance Contracting**
- EPC, PRIME and PICO -  
The example of the **City of Freiburg**
- **„Success contracting“** - The importance of contract design and enforcement

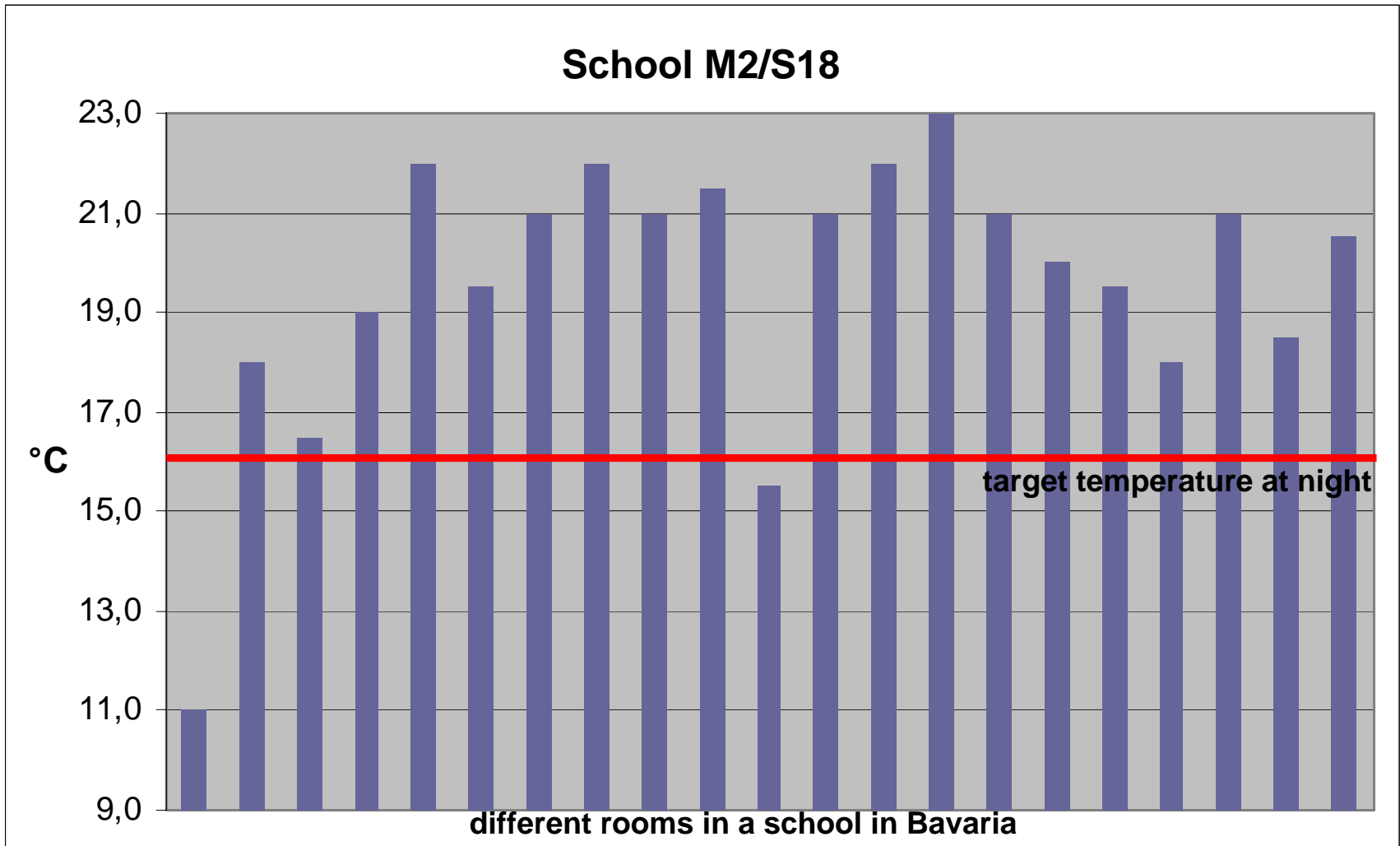
# Energy efficiency potentials in the public sector

- **Total final energy demand of public sector in EU-25:**
  - about one third of tertiary/commercial sector demand
  - 6 - 8% of total final energy demand (not including transport)
  - i. e. about 182 - 239 TWh<sub>el</sub>/year and 371 - 488 TWh<sub>th</sub>/year (based on RELIEF and PROST studies 2003/2004)
  - i.e. about **26 - 35 billion Euro energy costs / year**
- **Energy cost reduction potential in public sector in EU-25: 7.7 - 10.0 billion Euro/year in total by the year 2020 (compared to BAU scenario)**
- ... of which **a large part** could be **realised via external or internal energy performance contracting**

# Energy Performance Contracting (EPC)

- Typical characteristics of public investment financing: split between operating and investment budgets, lack of personnel capacities, lack of finance, etc.  
-> **barriers to energy efficiency**
- **Energy efficiency services** like Energy Performance Contracting often provide a solution, but ...
- ... **Energy Performance Contracting is not always successful:**
  - Insufficient contracts
  - Suboptimal energy efficiency solutions
  - Cherry-picking
  - Transaction costs

# Typical bad practice example in Germany: even the temperature reduction at night does not work



Source: Margit Fluch, 2005

# The PRIME idea

- **Private Investment Move Ecopower**
- **Participatory approach** for profitable investment by private citizens and other local stakeholders in a profitable package of energy efficiency, renewable energy and cogeneration measures
- Focus on **integrated RUE & RES investments in public buildings**
- **Examples in German schools** (accompanied by educational measures in the schools):
  - Staudinger Comprehensive School, Freiburg, started in 1998/99 (Dieter Seifried, ECO-Watt GmbH)
  - 4 Solar & Save projects in schools in North Rhine-Westphalia since 2000 (Kurt Berlo, Solar & Spar GmbH / Wuppertal Institute; „100,000 Watts Solar Initiative for Schools in North Rhine-Westphalia - Energy School 2000+“)
- Running: **European pilot project „PRIME“** within the IEE programme, co-ordinated by Climate Alliance

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# Advantages of the PRIME approach

- Investors receive a reasonable payment of interest (about 5 percent)
- School and community save on renovation and running costs
- Teachers and students experience practical climate protection
- Less maintenance work for caretakers
- Local tradesmen receive word orders
- Thousands of tons of carbon dioxide emissions per year are prevented



Aggertal High School, Enger



New energy-efficient

New CHP plant

# The PRIME contract - M&V of savings

- **Baseline:**

Average energy and water consumption of the respective building in the last two or three years before the refurbishment

- **Remuneration for first five years:**

Difference between baseline and consumption in accounting year, multiplied by current energy and water prices (if current prices are lower than average value in base years, remuneration will be calculated on the average base year prices)

- **Remuneration for following years, e.g. year 6 to 20:**

Minimum amount is average value of remuneration in years 3 to 5; additional remuneration for any savings exceeding the average savings of years 3 to 5



# The PRIME contract - distribution of profits

**If energy and water savings equal planned savings as laid out in the prospect of success**, shareholders will receive on average about 5% return on their investment. In any case, the school will receive a minimum amount of 1,000 Euro/year.

**Typical profit sharing agreement for any additional savings exceeding the values as defined in the prospect of success:**

- Municipality: 25%
- School: 25%
- ESCO: 25%
- Private citizens with financial participation in the project: 25%



# Transaction costs of a typical PRIME project (from the perspective of the ESCO)

- **Planning costs:** about 20% of investment costs
- **Initiating the PRIME project, contract negotiations with the municipality, communication:** 15,000 - 30,000 Euro
- **Monitoring, billing, tax administration, communication during implementation of measures:** 2 - 3 % of investment costs
- **Technical operation during contract duration:** depending on the sharing of responsibilities agreed on in the contract (service level agreement)
- **Monitoring, billing, tax administration during operation:** about 5,000 Euro/year
- **Services for private shareholders** (regular information, inquiries, change of addresses): between 3,000 and 5,000 Euro/year



# The PICO idea

## ■ The dream:

A „perpetual motion“ finance mechanism for public authorities by which, once triggered, energy efficiency savings fund new investments in an upward virtuous cycle even in times of tight budgets

## ■ The idea:

Public Internal Performance Commitments (PICO) as a way to continuously manage and finance energy efficiency measures in public administrations consisting of 3 elements:

- **Specific commitment or target** describing the level of future energy efficiency investments or savings
- A way of **(seed) funding** the continuous implementation of energy efficiency measures: revolving fund or budget line, etc.
- Capable **energy management unit**



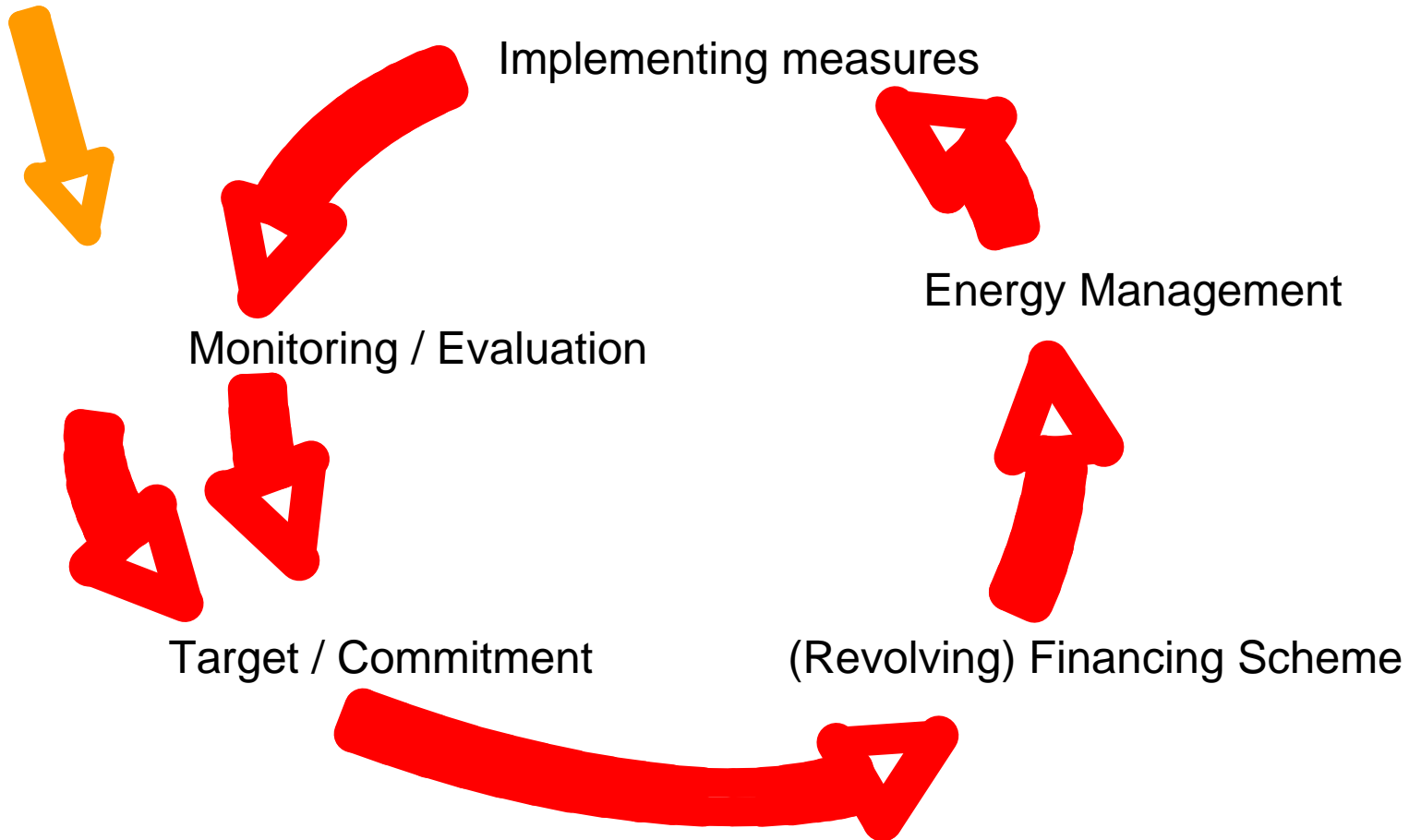
# Results from 7 PICOLight case studies

- **Often a long way** from idea to implementation, even if part of the public administration is really committed to PICO
- **PICO solutions differ** very much from case to case -> adaption of the principal scheme to specific situation of the public administration and its public procurement and buildings investment routines needed
- Important, but still difficult: finding a way to **continuously** finance and manage energy efficiency measures
- PICO can particularly help **smaller or very specific energy efficiency investments** not implemented by ESCOs because of **transaction costs**, and it **reduces cherry-picking**

Package 2		
initial installation costs	after	
initial installation costs (only additional costs compared to the reference case)		
• material (Euro)	82.809	
• labour (Euro)	70	
• design (Euro)	7.875	
• transaction (Euro)	2.100	
• total (Euro)	92.854	
annualised additional installation costs		
• installation costs/year (Euro/a)	7.714	
running costs	before	after
lifetime running cost (real terms)		
• energy (Euro)	199.038	89.381
• power (Euro)	67.101	34.094
• transaction (Euro)	0	1.470
• maintenance (Euro)	107.149	103.178
• total (Euro)	373.288	228.124
• annualised running cost savings/year (Euro/a)		11.818
cost-effectiveness of the investment	without design and transaction costs	including design and transaction
simple payback (a)	6,9	7,9
benefit/ cost ratio	1,8	1,5
net present value (Euro)	63.755	52.310
internal rate of return %	12%	9%

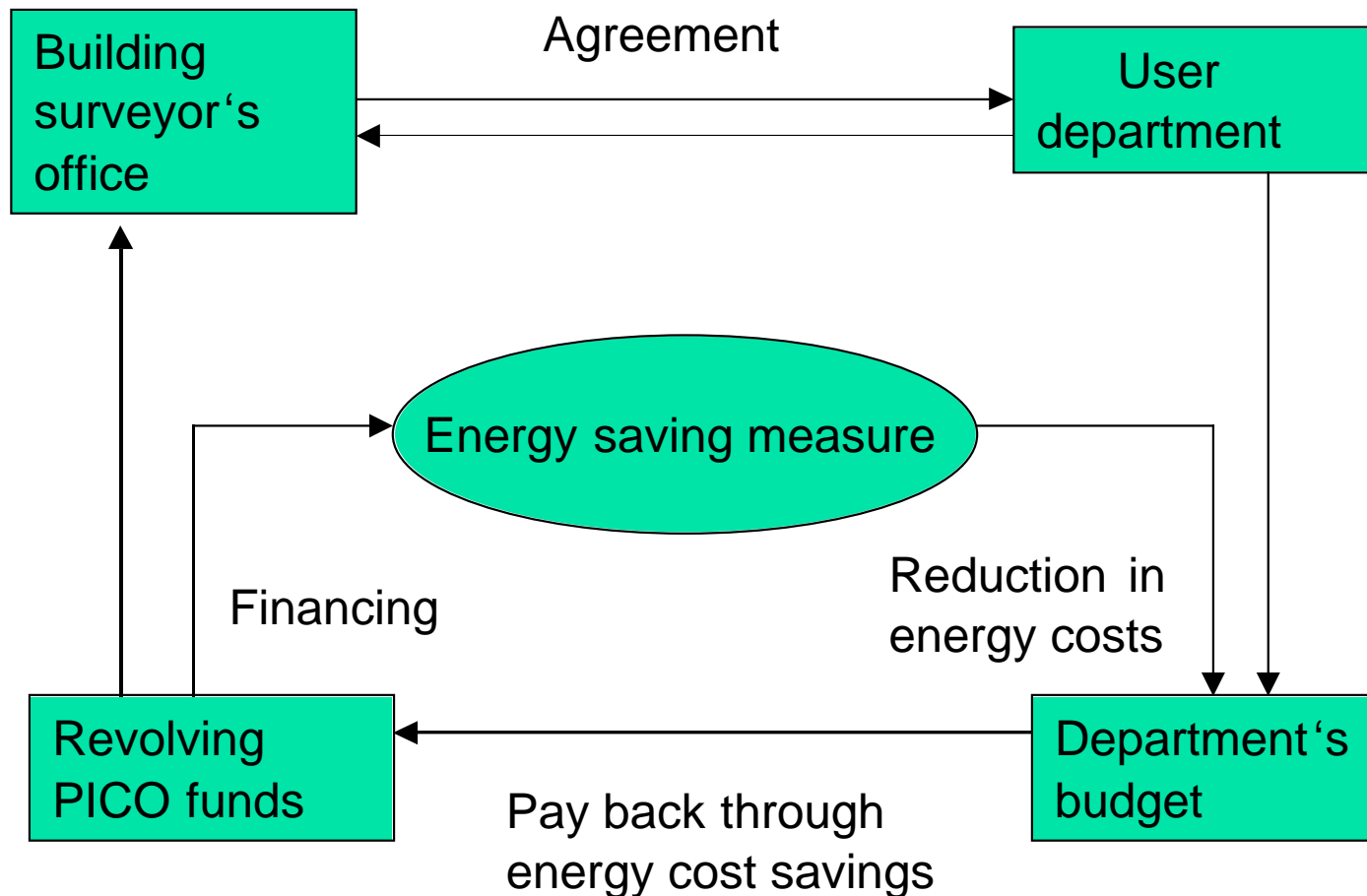
# The PICO loop

*External stimulus / support*



# Public Internal Performance Contracting

A special kind of PICO scheme: in-house contracting („Public Internal Performance Contracting“), e.g. in the City of Freiburg i.Br./Germany





# M&V in a Public Internal Performance Contracting

1. Initial estimate of energy saving measures  
(Internal requirement in Freiburg: average payback period over all PICO measures shall not exceed 5 years)
  2. More detailed ex-ante estimate of energy savings
  3. Agreement on a **simple flat rate** for the energy savings based on this ex-ante estimate (conservative estimate; price base: energy prices in first year)
  4. User department regularly pays the flat rate to the PICO department
- *No further M&V procedures; no further transaction costs; no change over the lifetime of the project*
- *In case of conflicts, e.g. after conditions of usage have changed during first 5 years: both parties try to achieve a mutual agreement which leads to the best result for the municipality as a whole*

# Rule of thumb for decision between external EPC and internal PICO in the City of Freiburg i.Br.

- Buildings with energy costs **> 75,000 Euro/year:**  
**Energy Performance Contracting** with external contractor
- Buildings with energy costs **50,000 < x < 75,000 Euro/year:**  
**EPC with pooling** of buildings in tender considered
- Buildings with energy costs **< 50,000 Euro/year: PICO (Public Internal Performance Contracting)**



# EPC in the City of Freiburg i.Br. - 1<sup>st</sup> pool

- **3 building pools for EPC planned**
- **1<sup>st</sup> pool:**
  - 6 buildings
  - Baseline: 827,000 Euro/year energy costs (average of three base years)
  - about 90 measures
  - 2.6 Mio. Euro investment
  - 12 years contract duration
  - 270,000 Euro/year guaranteed savings (32.6 %)
  - 10% share of City of Freiburg in energy cost savings



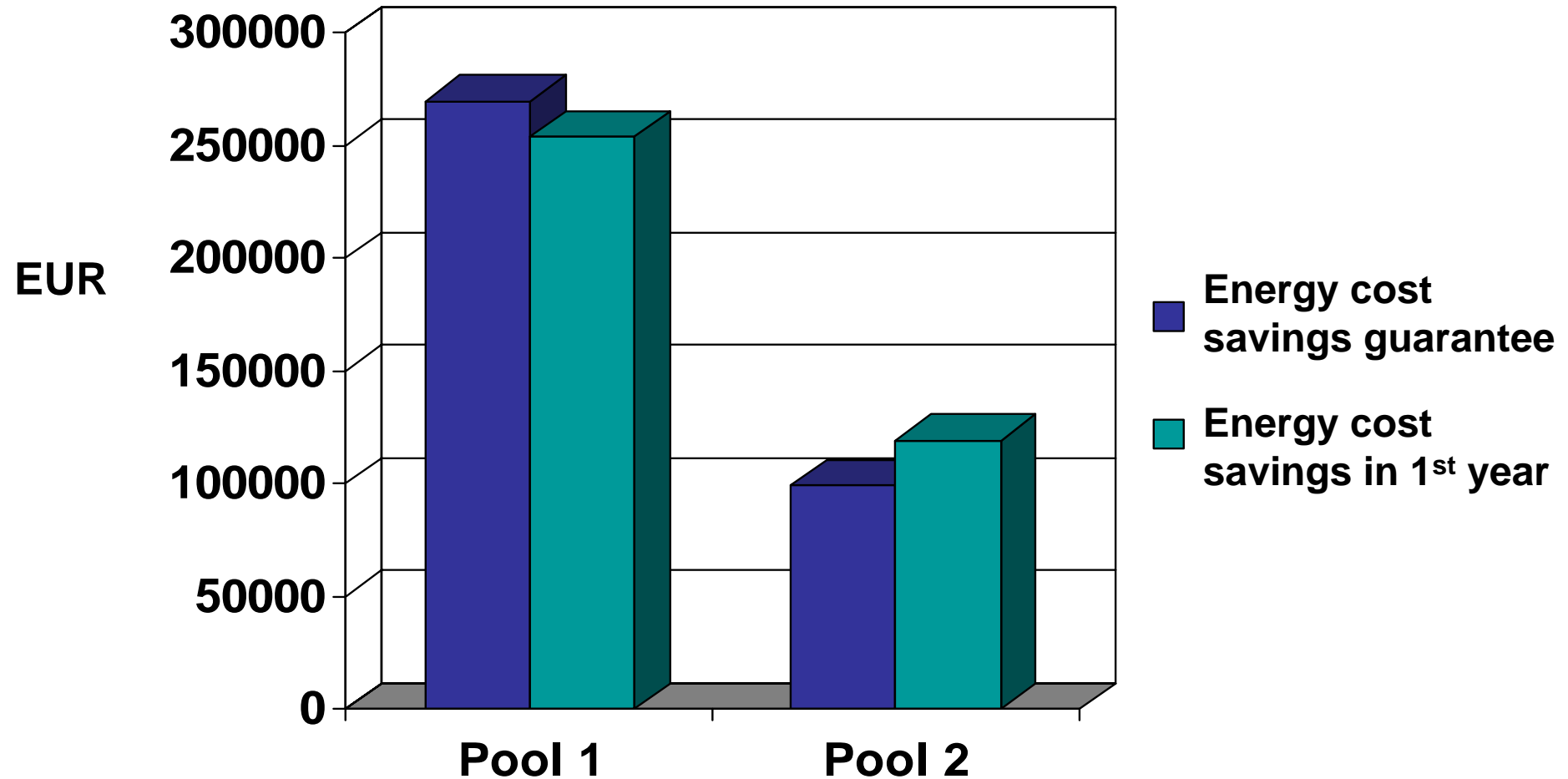
# EPC in the City of Freiburg i.Br. - 2<sup>nd</sup> pool

## ■ 2<sup>nd</sup> pool:

- start of implementation on 1 Nov 2004
- 550,000 Euro/year energy costs (baseline)
- about 50 measures
- 1.2 Mio. Euro investment
- 13 years contract duration
- 90,000 Euro/year guaranteed savings (16.4 %);
- 10% share of City of Freiburg in energy cost savings;



# EPC in the City of Freiburg i.Br.



# PICO in the City of Freiburg i.Br.

- PICO scheme applied: **Public Internal Performance Contracting**
- **Results 2004/2005** (PICO scheme started on 1 Jan 2004):
  - about 50 single measures which were implemented quickly and without big planning effort
  - 180,000 Euro sum of investment
  - 40,000 Euro/year energy cost savings



# PRIME in the City of Freiburg i.Br.

- One project in **Staudinger Comprehensive School** (1,200 students)
- (Difficult) Start of PRIME project: **1998/1999**
- ESCO: **ECO-Watt GmbH** (Dieter Seifried, Ö-quadrat)
- Energy and water costs in **baseline**: 250,000 Euro
- **Investment**: 250,000 Euro, of which 200,000 Euro were collected from private investors (minimum of 500 / 2,500 Euro per share)
- Energy and water cost **savings**: 65,000 Euro (**23.2%**)
- **Contract duration**: 8 years
- **Interest rate** for private investors: 3 - 6 %
- **School** receives 2,500 - 10,000 Euro/year
- **Savings for the municipality** after expiry of contractual term: 400,000 - 600,000 Euro



# Conclusions

- **Don't lose opportunities** by suboptimal energy performance contracting. Time and tide wait for no man/woman.
  - **Contract design including simple measurement and verification procedures is important:**
    - Ensuring **comfort level**
    - Ensuring **cost savings**
  - PRIME and PICO as interesting **complements** to EPC
- ⇒ **Is public administration capable to do this efficiently and effectively?**



# Recommendations: Preconditions for EPC, PRIME and PICO

- **Cost accounting** based on individual metering by department or building and simple measurement and verification procedures
- **Energy management unit**, technical expertise  
(small public administrations: co-operative solution)
- **Political will** to provide seed money and to start energy efficiency improvements / investment culture
- **Compatibility to national regulations**
- **Supporting policy mix needed!**



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