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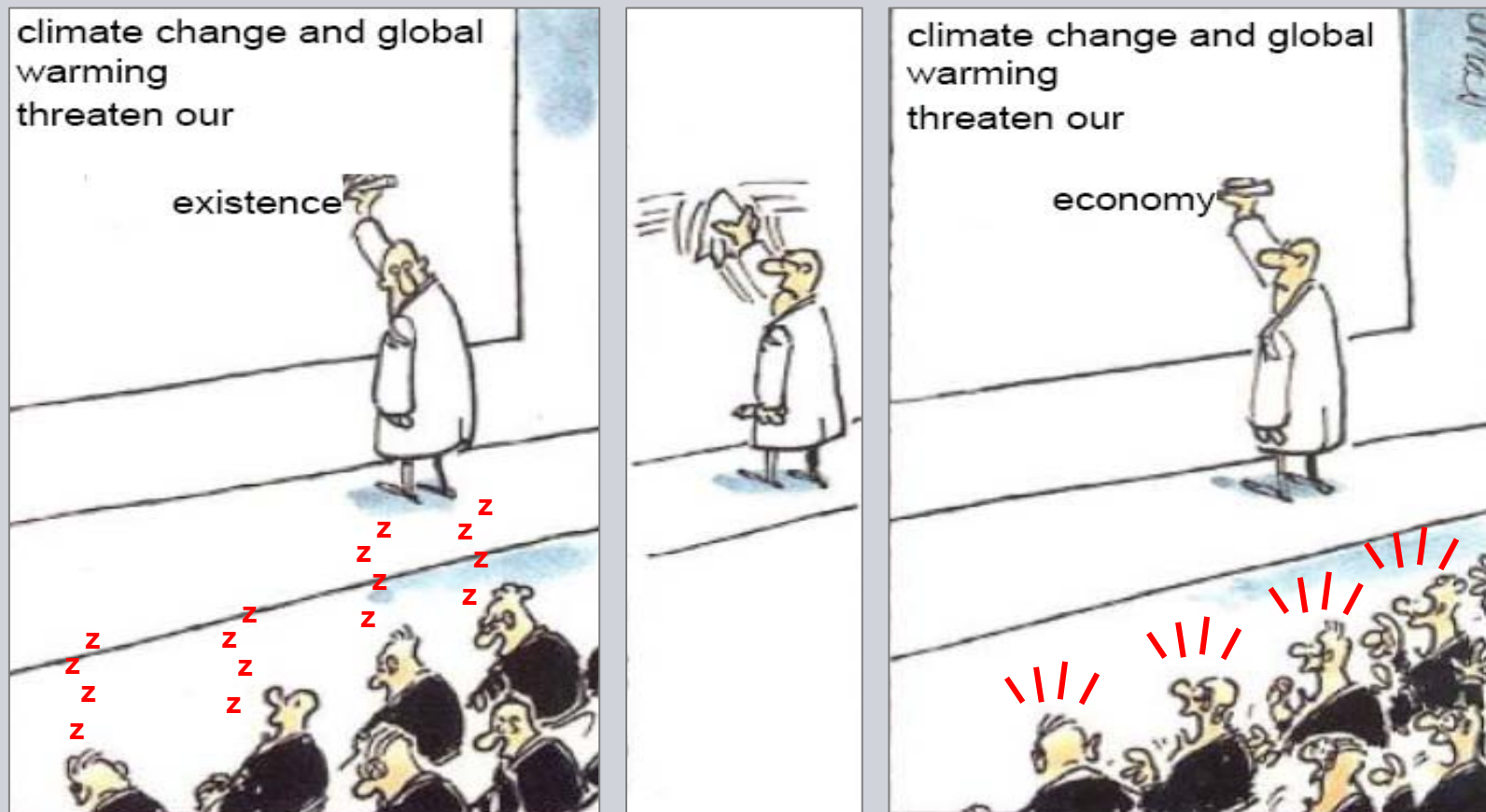
ESCO Framework for Public / Federal Buildings

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Siemens Building Technologies
Energy & Environmental Solutions
ICEBO
20th October 2008, Berlin**

Climate Change and Global Warming

Not a new topic, but now with the right attention !

No environmental awareness without economic interests



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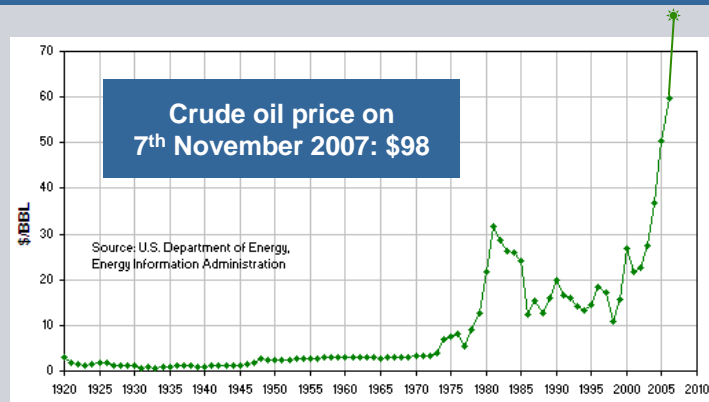
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What are Current Market Drivers ?

Energy is at the top of any agenda

- Demand for energy continues to grow
- 40 percent of the world's energy is consumed in buildings
- Megatrend - Urbanization: 50%+ population now in urban centers
- Energy is a growing topic on corporate agendas

Rising energy and CO₂ emission costs

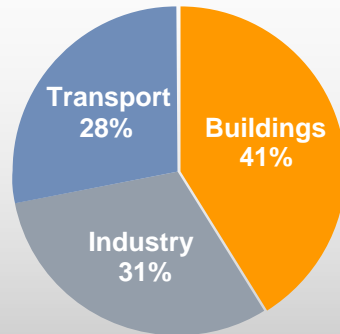


Public awareness on climate changes

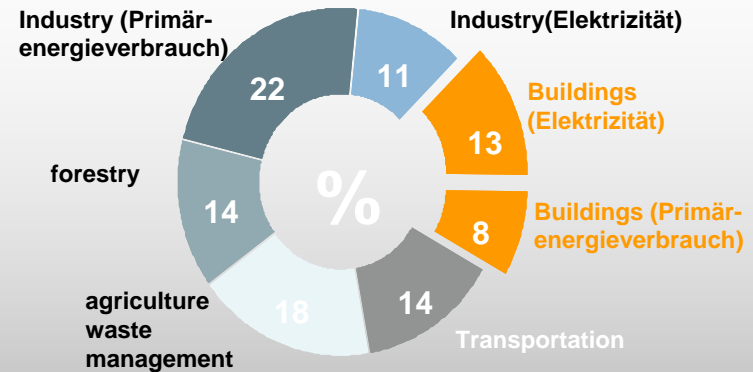


What we know about buildings...

40% of the world energy demand*



Produces global 21% of the green house gases***



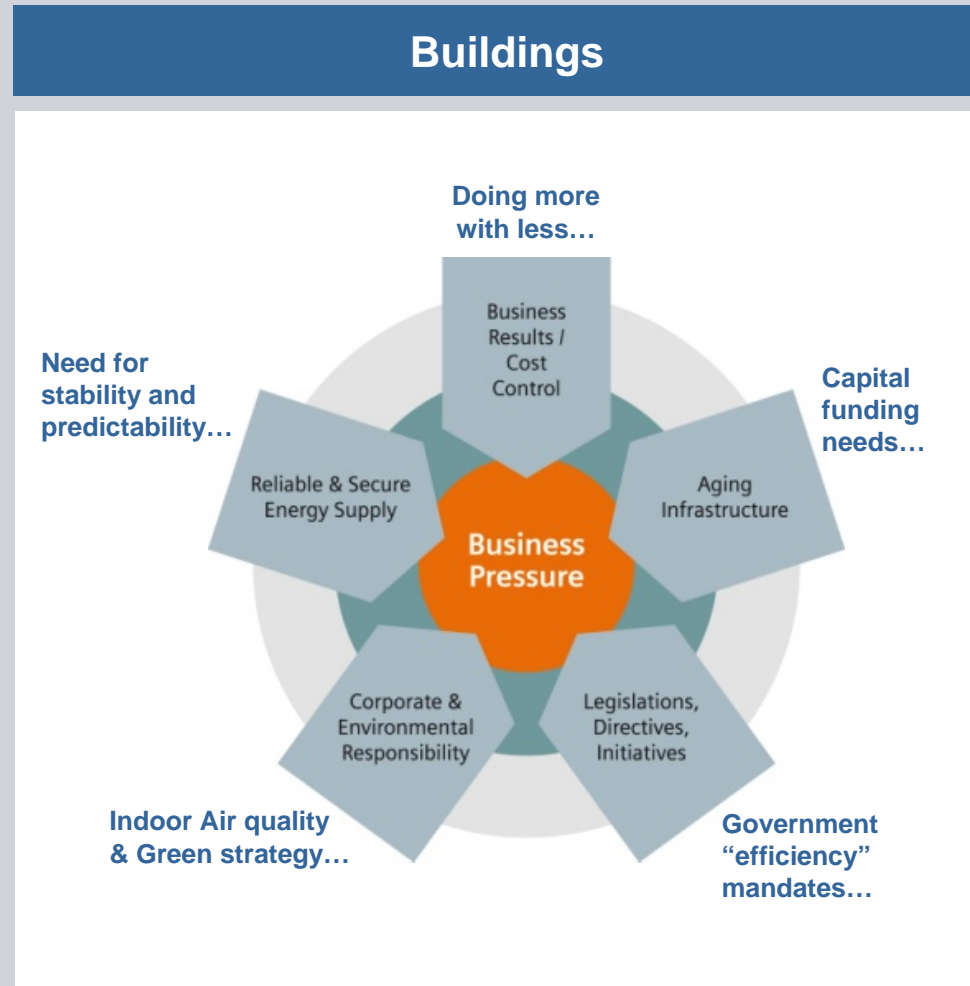
40% of the building life-cycle-costs are energy costs**



*International Energy Association, auf weltweiter Basis, im Jahr 2002 / ** Dena Congress, Berlin, 2008 / *** „Global Mapping of Greenhouse Gas Abatement Opportunities up to 2030“, Building Sector deep dive, June 2007, Vattenfall AB, basiert auf Information von IEA, 2002, % der weltweiten Treibhausgasemissionen; Total 40 Gt CO2e



Challenges for Building Owners




SBT BAU/EE

Potential & Perspective Results of public studies

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zukunft haus
Energie sparen. Wert gewinnen.



Potenziale: Steigerung der Energieeffizienz in Nichtwohngebäuden.

- Lebenszykluskosten eines Gebäudes:
20% Investitionskosten und 80% Betriebskosten
(davon **50 % Energiekosten**, Tendenz steigend)
- in Dienstleistungsgebäuden (Büro- und Verwaltungsgebäude, Geschäftsobjekte, Schulen, etc.) sind wirtschaftliche Energieeinsparpotenziale in Höhe von 30 – 40 % vorhanden,
- ein beträchtlicher Anteil der Dienstleistungsgebäude und der energietechnischen Anlagen in diesen Gebäuden ist sanierungsbedürftig,
- das wirtschaftlich optimale Maßnahmenpaket bei der Durchführung von Instandsetzungsmaßnahmen führt zumeist zu sehr hohen Einsparungen

Example: Germany

- **80% of the Building-Life-Cycle-Costs are driven by operating expense (thereof min. 50% Energy)**
- **30-40% of the energy costs in commercial buildings are seen as potential that can be exploited in an economic way - today**
- **EU-Studies point out, that this potential can be exploited by ESCOs with up-to-date technology.**

Potential & Perspective Results of Public Studies

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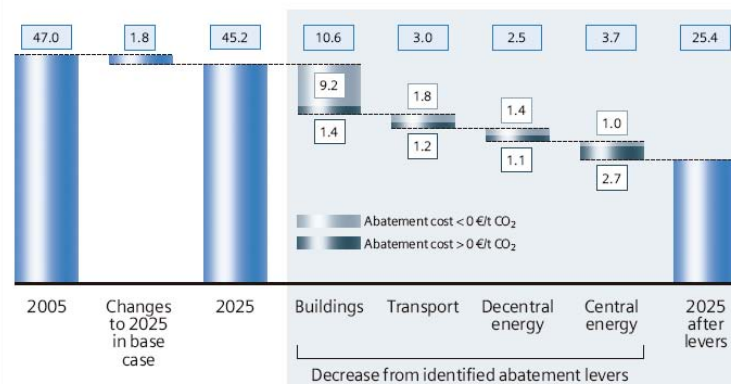
Buildings – Composition of CO₂ emissions in London

Mt CO₂ (2005)

	Residential	Commercial/public	Industrial	Share of total
Heating	9.3	5.5	0.8	45%
Hot water/catering	3.6	2.5	0.7	20%
Lighting	0.9	3.6	1.1	16%
Appliances/IT	3.2	0.6	0.1	11%
Cooling	0.2	0.8	0.2	3%
Other	0	1.6	0.2	5%
Total	17.2	14.6	3.1	34.9 Mt total emissions

Example: London Study

Summary of greenhouse gas abatement – London

Mt CO₂

- Energy savings measures in buildings could account for more than half of London's overall emissions reduction potential, cutting emissions by 10.6 Mt, or nearly one-third, by 2025
- Almost 90% of this carbon abatement potential is based on technological levers that will payback their initial investment through energy savings
- Installing energy-efficient lighting is the single most cost-effective measure identified for buildings, cutting 0.4 Mt of emissions while providing savings of €270 per tonne of CO₂ abated
- Businesses have a wide array of carbon-cutting options at their disposal, ranging from more efficient equipment to optimized building automation.

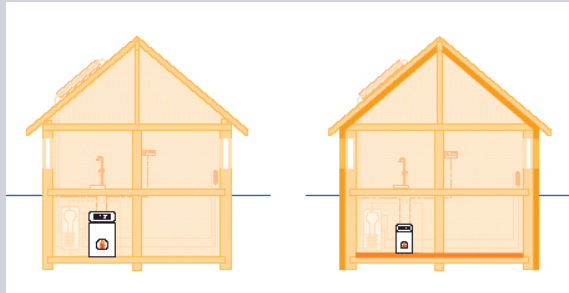
What are the main levers to exploit the tremendous potential ?

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1. Right Approach
2. Advanced Technology
3. Appropriate Business Models
4. Available Financing
5. Favorable Legislations
6. Professionals

1. Right Approach: Sustainability requires right sequence and holistic approach

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<< Right Sequence & Holistic Approach >>>

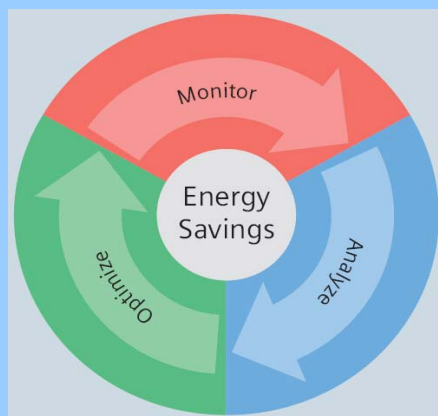


- Building Envelope
- Energy Supply
- Energy Distribution
- Heating
- Cooling
- Ventilation
- Indoor Air-Quality
- Lighting
- Water
- Building automation
- User behavior
- Operator qualification
- Energy Management
- Maintenance

30-40% Energy savings can be achieved on a sustained basis

1. Right Approach: Energy-Management an ongoing and evolving process

- No Transparency > No Overview & Control > No Improvement... !
- Sustainable Efficiency is an ongoing process.
- it's not the target to maximize Savings > **Maximize the Efficiency !**

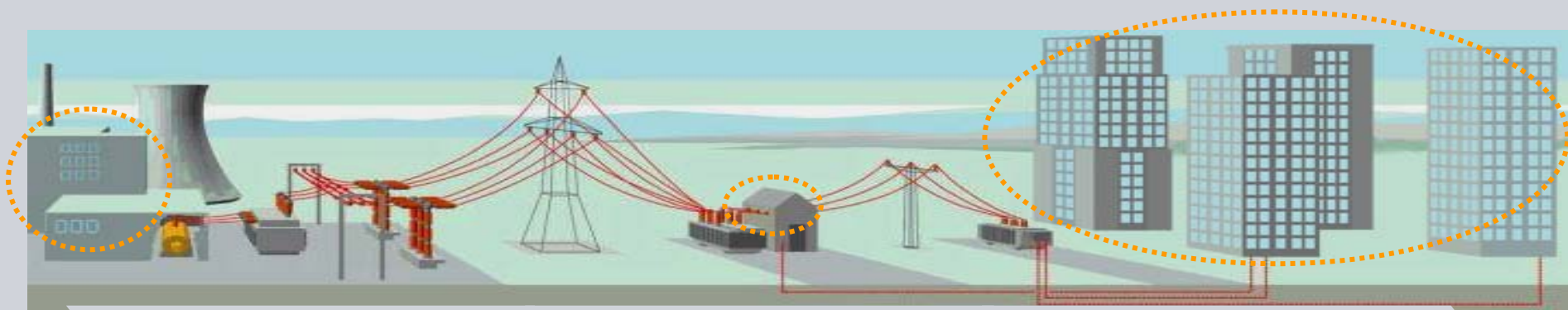


You normally know the energy consumption of your car.

What about your building ?

... and compared to others - are you good enough ?

2. Advanced Technology: Integrated Solutions for the Energy Efficiency Value Chain



Energy supply

Core and auxiliary processes

Buildings

1 Optimized energy supply SIEMENS

Optimized energy supply – short description

	<p>Key features</p> <ul style="list-style-type: none"> Enhanced efficiency of components – optimally adapted to processes (COP, O&M) Optimized selection of plant equipment etc. Increased fuel conversion efficiency CO₂ emissions reduced accordingly complying with energy efficiency Increased availability of plants
	<p>Environmental value</p> <ul style="list-style-type: none"> Increasing energy efficiency Lowering fuel consumption & Lowering CO₂ emissions
	<p>Customer value</p> <ul style="list-style-type: none"> Cost reduction Increased energy availability/reliability of power supply Independence from external energy suppliers

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2 Drives (Energy Optimization Drives) SIEMENS

"Drives (Energy Optimization Drives)" – example

Industrially and environmentally-friendly alternative to conventional hot metal production

SIPAPER Reject Power

Waste Heat Recovery for Cement Plants: Generation of electrical energy from industrial waste heat

	<p>Key features</p> <ul style="list-style-type: none"> Economical generation of power, starting at temperatures as low as 100° C based on innovative heat exchanger R&D project for development of appropriate heat exchanger started in Oct. 2006
	<p>Environmental value</p> <ul style="list-style-type: none"> Increasing Energy Costs Increasing pressure to reduce greenhouse gases
	<p>Customer value</p> <ul style="list-style-type: none"> Reduction of energy costs by generating supplemental electrical power with no additional fuel Permanent CO₂ reduction Less exposure to rising energy prices

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3 Energy efficient buildings SIEMENS

Energy efficient buildings – short description

	<p>Key features</p> <ul style="list-style-type: none"> Optimized life cycle solutions Customer economy secured by saving guarantee Energy consumption optimization by measures in HVAC, lighting and water consumption Intelligent Building Automation & Management System
	<p>Environmental value</p> <ul style="list-style-type: none"> Increasing energy efficiency Lowering fuel consumption and CO₂ emissions Sustainability of construction & emissions reduction by controlling & monitoring
	<p>Customer value</p> <ul style="list-style-type: none"> Considerable reduction of energy costs Modernized plants with better energy efficiency and lower operating costs Transparency of energy consumption and information base for analysis and further energy saving measures

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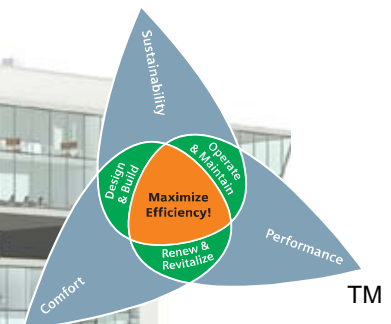
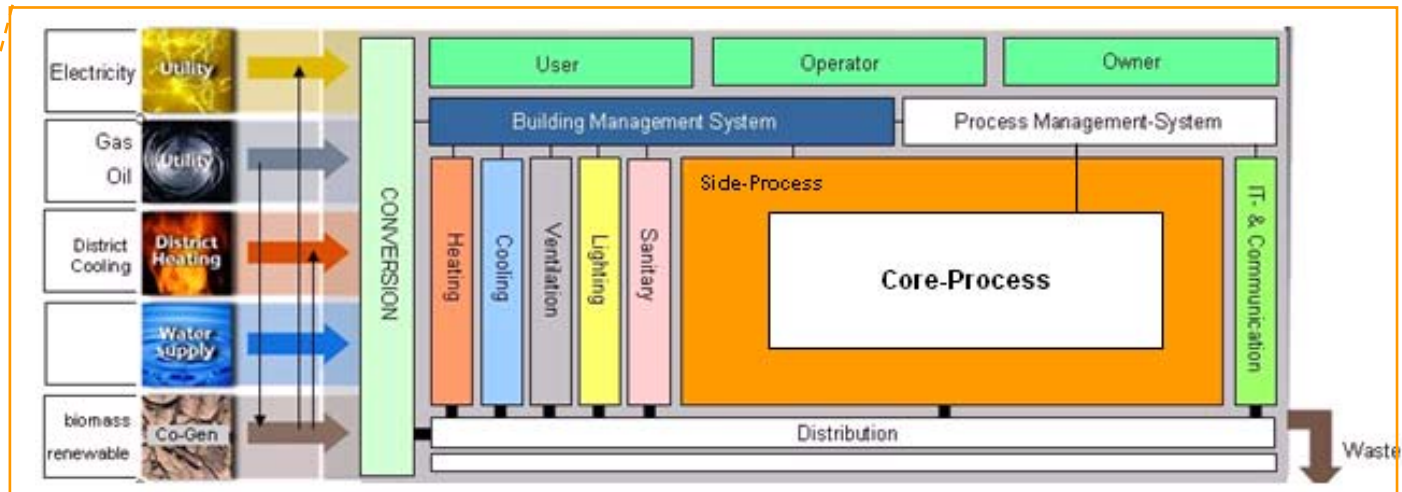
BT BAU Improves the energy efficiency in buildings

2. Advanced Technology: Total Building Solution – The Efficiency Enabler

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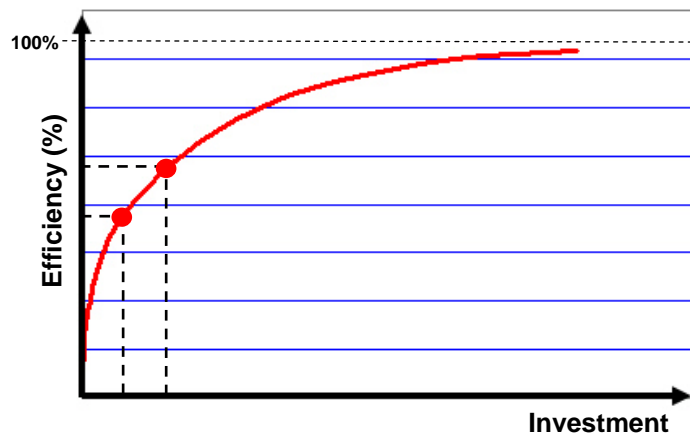
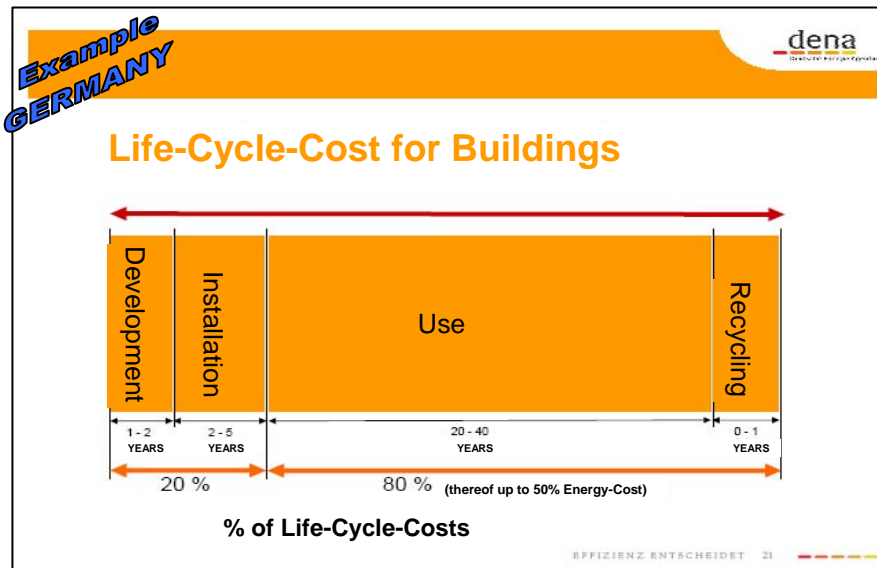
Scope of BMS:

- Secure & smooth Operation
- Efficient Operation
- Event Management
- Remote Connectivity
- Monitoring
- Reporting
- Benchmarking
- Data Storage



3. Appropriate Business Models: Sustainable solutions versus short-term results

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- Today energy-efficiency is mainly seen as product feature.
- Main priority in the up-to-date procurement is best price for the investment – GC-Model.
- User-investor Dilemma -Distinct responsibility for operations and investment.
- No standard procedures for Life-Cycle-Calculation available.

How do you purchase your Energy-Efficiency today ?

3. Appropriate Business Models: Performance Contracting

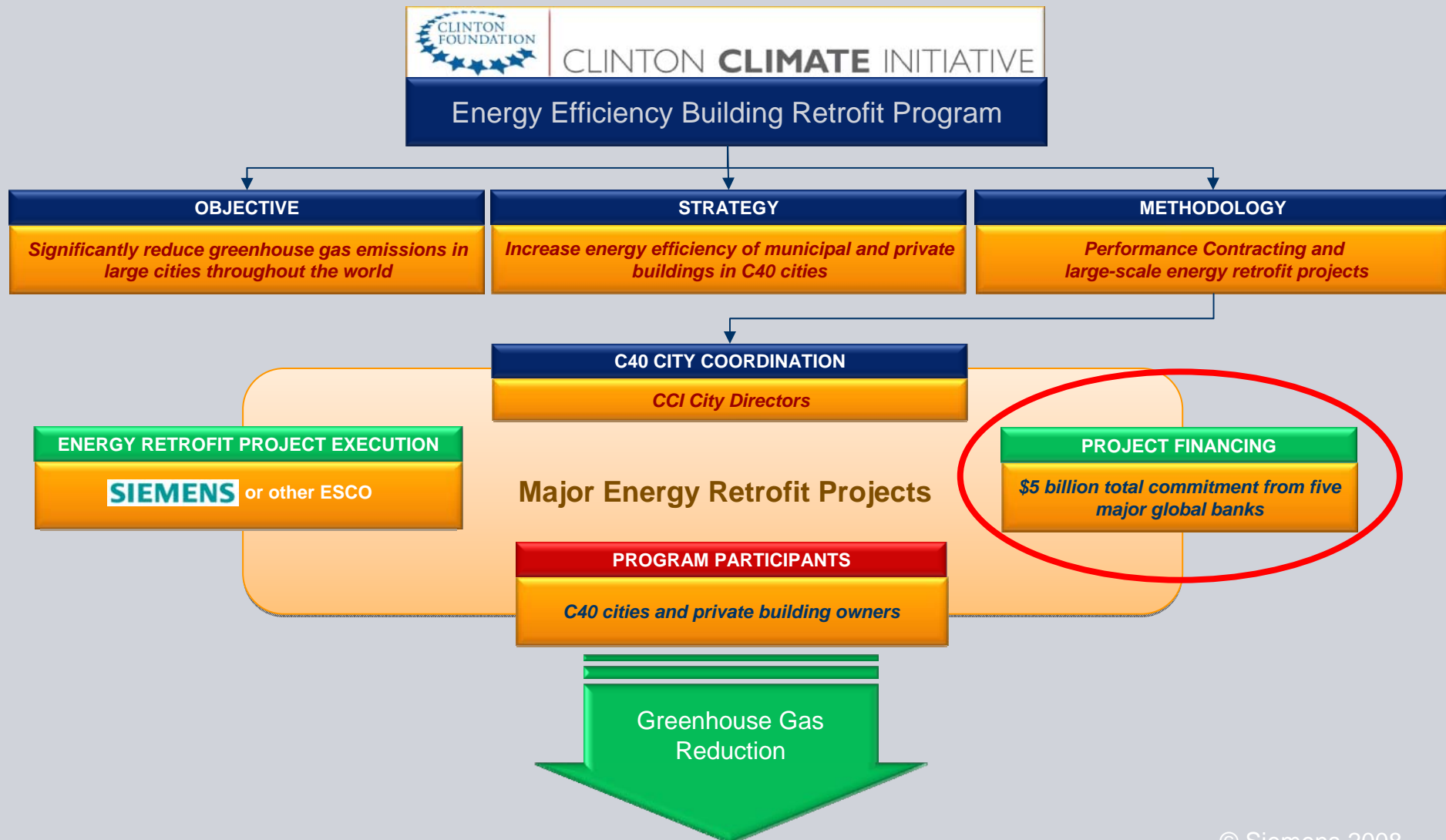
Characteristics

- Specially tailored to customer's requests
- Guarantee promise ensures success
- Innovative technical solutions
- Optional financing of the investment possible
- Integration of user motivation and operators qualification
- Integration of mandatory measures
- Standardized procedure (EUROCONTRACT)
- Energy-price changes are neutralized in the baseline

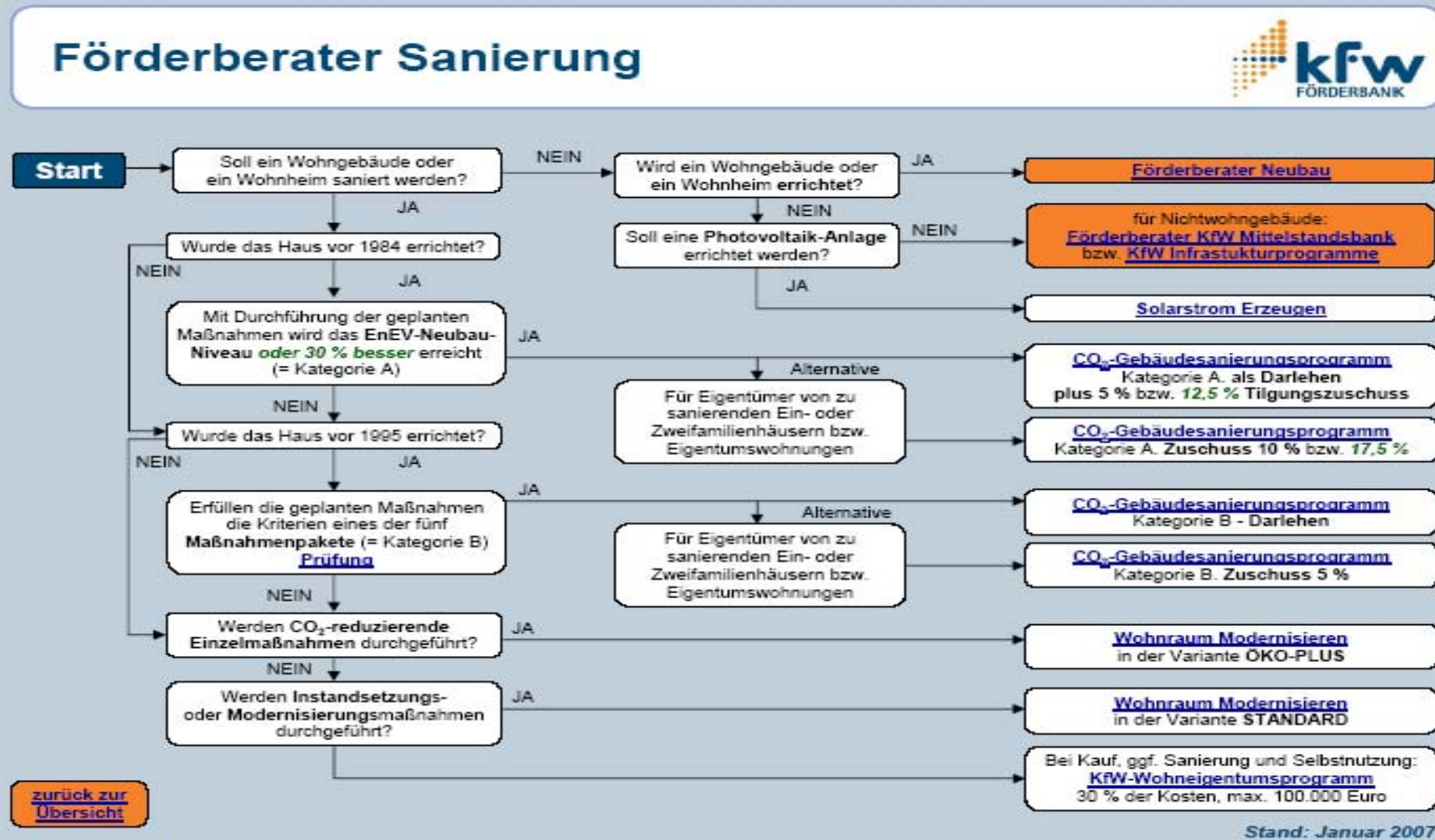




4. Available Financing: Global Example (CCI)



4. Available Financing: European Example Germany (KfW)



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Building Technologies

5. Favorable Legislation: Example Europe

- **Directive 2002/91:
EPBD - ENERGY
PERFORMANCE OF
BUILDINGS DIRECTIVE**

- **Directive 2006/32:
EEUES ENERGY END-
USE EFFICIENCY AND
ENERGY SERVICES
DIRECTIVE**

- **EU'S / NATIONAL
ENERGY EFFICIENCY
ACTION PLAN**

- Promoting the improvement of the energy performance of buildings via:
 - Framework for performance calculation
 - Minimum performance requirements for buildings
 - Energy certification of buildings
 - Inspection of installations (heating & cooling)

- National action plans to achieve 1% p.a. savings
- Public sector to have an exemplary role
- Member States to provide guidelines
- ESPC as an public procurement measure
- Model contracts for financial instruments

- Implementing the EEUES Directive
- Financing energy efficiency



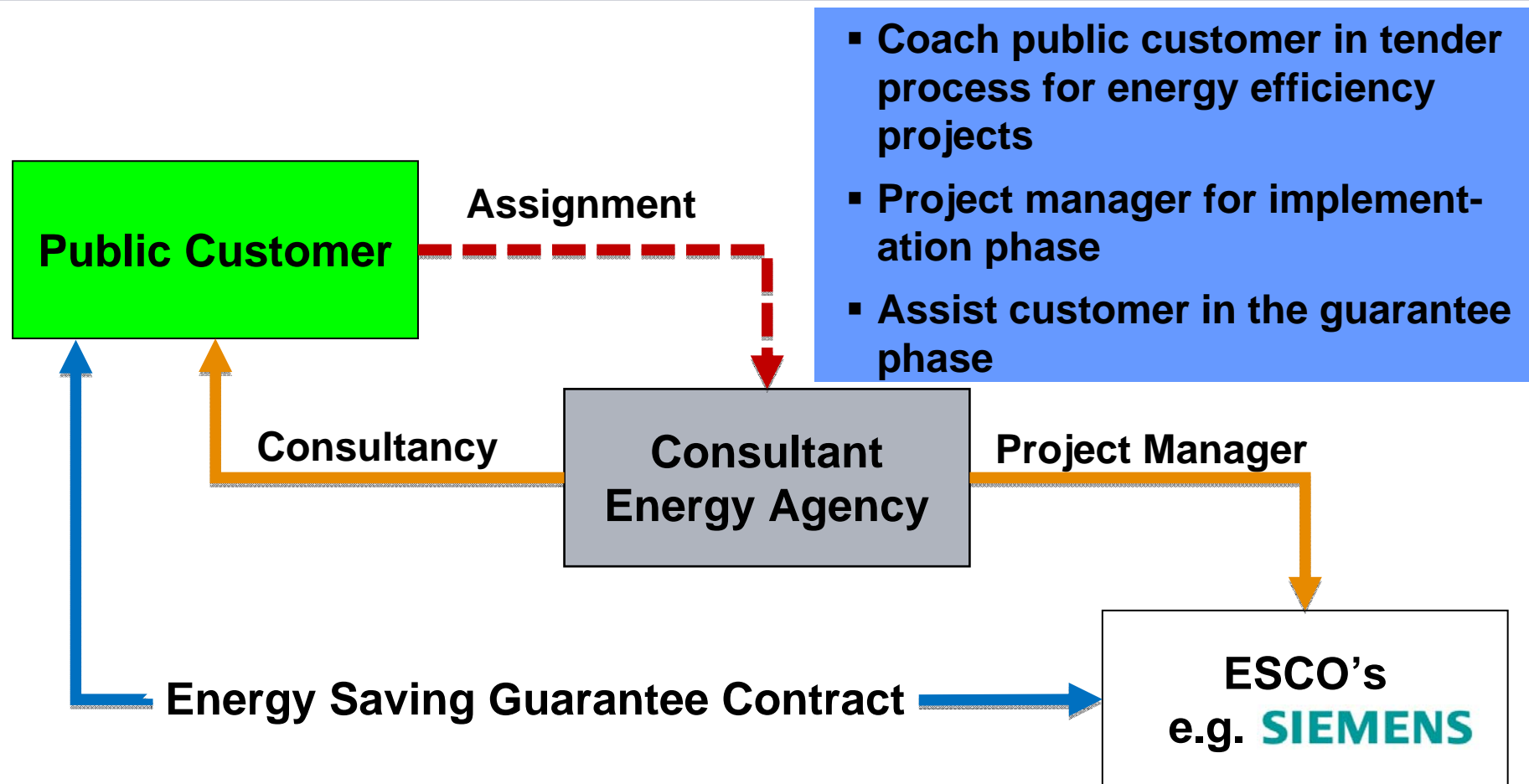
6. Professionals: What is an ESCO ?

ESCO = Energy Service Company

- **Develop, design, and finance energy efficiency projects**
- **Install and maintain the energy efficient equipment involved**
- **Measure, monitor, and verify the project's energy savings**
- **Assume the risk that the project will save the amount of energy guaranteed**



6. Professionals: What is an Energy Consultant ?



6. Professionals: It's all about People !

- **Often lack of information and awareness**
- **Shortage of energy professionals (Sales, Consulting, Engineering, Services, Remote)**
- **Too few universities offering curriculum in energy engineering**
- **ESCO's are looking for substantial increase of capacity**

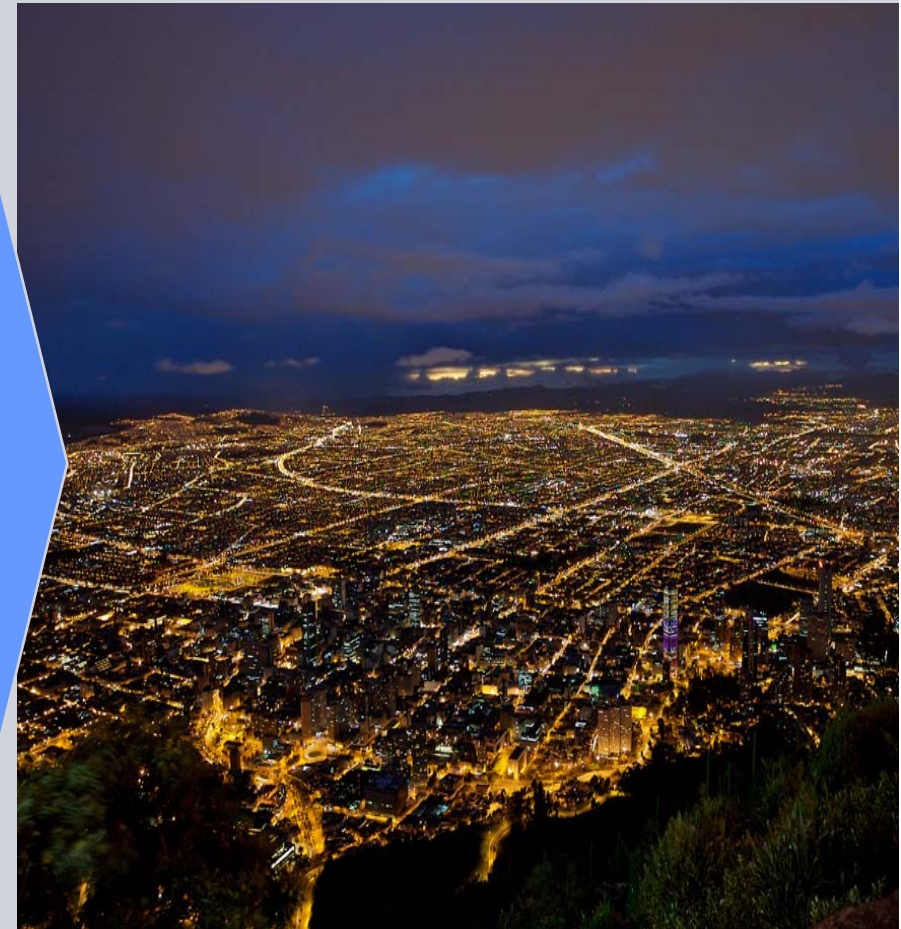


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The necessary framework for ESCO-Business

To make it happen

- **Establish and engage ESCO-Industry: Change procurement behavior - Procure Efficiency instead of Products or Solutions**
- **Build up Energy Professionals (Education, Consultants)**
- **Use available financing and implement special tax incentives**
- **Use available advanced technology to explore the existing potential**
- **Look for sustainable solutions instead of low hanging fruits**
- **Establish a favorable legislative (e.g. Europe – Building Certificates)**



Success Story – City of Berlin, Germany

The Energy Saving Partnership (ESP)

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Solution

- Energy management system
- Heat generation / distribution
- Air-conditioning & ventilation
- Water technology
- Control, monitoring, maintenance
- Education

Basic Data

- Prior energy costs: 17.2 m € / year
- 164 buildings such as schools, kindergartens, day-care centers, gyms, indoor swimming pools, the JVA Tegel correctional facility, Technical University of Berlin, and Berlin University of the Arts (EU Green Building partner)

Customer Benefits

- Guaranteed total savings: 5.3 m € / a
- Immediate budgetary savings for Berlin: 1.14 m € / a
- Contract duration: 9 to 12 years
- Initial investment: 28.5 m €

Energy Performance Contracting Success Story – Clinics Bremerhaven-Reinkenheide



Solution

- Energy management system
- Heat generation / distribution
- Air-conditioning & ventilation
- Water technology
- Control, monitoring, maintenance
- Education

Basic Data

- Prior energy costs 2004:
€2.0 million / year (Baseline)
- 680 beds
- Less modernization during last 20 years

Customer Benefits

- Guaranteed total savings:
€0.52 million / year
- Contract duration: 9 to 12 years
- CO2 emission reduction: 45%
- Initial investment: €5.2 million
- Higher plant availability
- Secured financing



Energy efficiency for buildings made by Siemens

BAU winner of the 2006 and 2007 European Energy Service Award



Achievements

- 1'500+ energy projects since 1994
- 7'500+ buildings updated with latest energy saving technologies
- 1"5 EUR total saving reached for customers
- 700'000 tones CO₂ reduction per year (= 230'000 cars driven 20'000 Km per year)

BAU is a lead participant in sustainability Initiatives



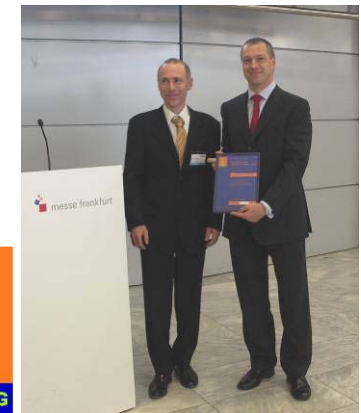
Partnership with Clinton Climate Initiative resulted in projects with City of **Houston** and **Allegheny College**, PA USA

1st LEED Platinum Project
Completed in USA - The Tahoe Center for Environmental Sciences at Sierra Nevada College



Greenbuilding Award 2008

EU commission commended Building Technologies for outstanding achievements in support of its GreenBuilding Program



* Activities include: Contact with CCI's City Director to introduce how energy efficiency project works, contact with the city's staff responsible for buildings and working with them and the CCI Directors to begin the RFQ/RFP process. In some cities, we are in RFQ process to get qualified as one of the ESCOs to bid on projects

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Thank you for your attention !

How green is your building ?
Maximize Efficiency! - Our answer for your infrastructure

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