DSM Spotlight

The Newsletter of the International Energy Agency Demand-Side Management Programme June 2010

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NOTE FROM THE CHAIRMAN

Energy Efficiency: Time For A New Approach

It is time to be more specific on the narrative for energy efficiency. We have lived with two ways of motivating people to be energy efficient for more than 35 years. Both of them made sense once, but their best-before-date has passed. They repel more than they attract and, worse, they lead to negative thoughts.

The first narrative was created in a time of dire necessity. Born out of the first oil crisis, it was about conservation and sacrifice. OECD countries faced oil shortages and there was a collective understanding that we had to give up a bit of our comfort for some time. It was a time of warfare.

The second narrative, which is still the dominant one, is that of efficiency. Most often communicated with slogans such as 'win-win' or 'do more with less', this is far more correct than the first one, not least because it indicates that we are still misusing resources.

It is quite puzzling to see supply curves for energy efficiency with negative costs. Are people really content with spoiling resources? Or do they not believe in perfect markets and the gospel of general equilibrium?

The undeniable facts are that we still have a huge untapped potential for energy efficiency, and that we need to exploit it fast. According to the IEA's latest analysis, more than half of greenhouse gas mitigation has to come from end-use efficiency. Energy efficiency, even if widely deployed, might not be enough. We may have to think about energy sufficiency. This calls for a new way of 'marketing' the message. It is time to shift the narrative.

The next narrative must be about comfort, modernity, coolness, values – terms that will communicate energy efficiency not through necessity or rationality but by describing the way things should be for a sustainable society. The fact that a similar shift is taking place in the business landscape is of great help.

Technology allows us to provide energy services in more sophisticated ways. For example, advanced ICT provides control at our fingertips; better design can make energy-saving equipment more functional and beautiful at the same time; supply solutions in miniature scale are available for photovoltaic or wind installations on roofs and in gardens.

Energy efficiency can be delivered by businesses that are far removed from the old centralised utilities, which traditionally tend to put technology first. These new businesses are rather service providers putting customer service first. They will market their products accordingly.

Energy efficiency should be desirable, comfortable and natural. It should be delivered on people's doorstep by someone they recognise and like. Energy efficiency should be built into the installations as well as into the perception of a good and decent living. It is time for this third narrative to take off.

This was first published on ENDS Europe, www.endseurope.com.

Hans Nilsson
IEA DSM Chairman

case study

French Riviera DSM Program
France

This is the fifth article in a series highlighting the case studies of DSM Task XV, Network Driven DSM. This Task demonstrated that DSM can be successfully used to support electricity networks in two main ways 1) by relieving constraints on distribution and/ or transmission networks at lower costs than building 'poles and wires' solutions, and 2) by providing services for electricity network system operators, achieving peak load reductions with various response times for network operational support.

Introduction

After 20 years of attempting to gain public approval and legal permission to upgrade the high voltage transmission lines in the Provence-Alpes-Côte d'Azur region of France, the decision was made to implement the Eco-Energy Plan. At the time this was the largest DSM project in the European Union and possibly the world. It had three main objectives:

- To increase the efficiency of electricity usage and to create a critical mass of scientific and technological competence in relation to electricity DSM.
- To modify the electricity-using behaviour of consumers, and building owners and managers.
- To contribute to the development of local renewable energies and to establish a solid basis for future energy choices.

Figure 1. High Voltage Transmission Lines in the Eastern Part of the Provence-Alpes-Côte d'Azur Region of France

The Eco-Energy Plan

The Plan was launched in March 2003. Initially six priority areas were identified:

- communication and information
- new building construction
- efficient lighting and domestic electrical appliances
- large consumers and distributed generation
- demonstration projects by the Eco-Energy Plan institutional partners
- public housing

In 2004, two priority areas were added on existing buildings and tourism. The forecasted impacts and costs of the DSM measures to be implemented through this plan are shown in Figure 2. Eco-Energy Plan.

	Impact on Winter Peak (MW)	Impact on Summer Peak MW)	Impact on Consumption (GWh)	Public Funding (M €)
Communication and information campaigns				2.9
Increasing awareness and training of engineering departments and installers				3.6
Demonstration energy management projects in state and local authorities, EDF and ADEME	26	5.5	52.5	4.6
Specific measures for new residential and commercial buildings	1.2	0.1	2.5	7.6
Large-scale dissemination of CFLs in social sector	2.3	0.5	6	2
Promotion of efficient lighting in commercial sector	24	12	72	1.8
Promotion of CFLs and energy efficient white goods	57	8	115	3.6
Energy efficient retrofitting in residential and commercial sectors	41	11.5	125	9.1
Energy Efficient retrofitting in tourism sector	3	2.3	9	2.6
Domestic hot water		15	5	3.3
Wood heating	8		7	2.1
Specific measures for large industrial and commercial consumers	16.5	11		2.3
Cogeneration, biogas, hydro installations	45	23		3
Photovoltaic installations	0	0.3		0.9
Evaluation				3
TOTAL	224	89.2	394	52.4

Figure 2. Forecasted Impacts and Costs of Identified DSM Measures

Program Implementation

Communication and Information

An annual public information campaign was launched that included paid advertisements in newspapers, and on radio and television; information booklets and posters; quarterly newsletter; telephone information centre; website; energy audit software for residential dwellings; and displays in shopping centres and fairs (see Figure 3).

Targeted educational materials on energy saving also were produced for use by school children, including information on how to carry out energy saving projects at home. These projects were intended to influence entire families to save energy not just the children.

New Building Construction

Targeted information materials on energy efficient lighting were developed for engineering and building design firms that included software to assist in the design of energy efficient communities and

Figure 3. Eco-Energy Plan Information Stall at a Shopping Centre

promotional materials to help building designers convince their customers to invest in energy efficient buildings.

Efficient Lighting and Domestic Electrical Appliances

Negotiations with lamp manufacturers enabled energy efficient lamps to be sold at a 20% discounted price in the Alpes-Maritime region. The Eco-Energy Plan also made available loans to cover the cost of energy efficient lighting installations. Loans of between EUR 2,000 and EUR 16,000 were available at interest rates of 2.5% over three years or 3.5% over five years.

Large Consumers and Distributed Generation

A working group on cogeneration was established and a technical/economic study was completed to identify the potential for the development of small cogeneration installations (200-300 kW) in the region. This study investigated simplifying procedures for connection to the low voltage network and examined tariff options for purchases of electricity generated by cogeneration plants.

A study of the potential for increased hydro-electricity generation in the region also was completed. This study investigated increasing the capacity of existing hydropower stations and installing new power stations on irrigation canals, drinking water supply infrastructure and rivers.

ADEME, the French environment and energy management agency, and the regional government financed the installation of 40 grid-connected photovoltaic modules in the region.

Demonstration Projects

A database of about 100 public sector buildings in the region was established, including colleges, hospitals and offices owned by the national, regional and local governments, Electricité de France (EDF), Gas de France and ADEME. An initial analysis of the database identified that some facility managers were interested in carrying out energy efficiency and DSM demonstration projects. Consequently, an initial program of feasibility studies was launched. The regional government, EDF and ADEME financed 80% of the cost of feasibility studies in hospitals. In addition, 12 colleges in the Alpes-Maritimes voluntarily agreed to undertake DSM feasibility studies.

In late 2004, EDF carried out energy audits of its highest energy-using buildings in the region. The first implementation of energy saving measures aimed to save 7% of electricity usage (600 MWh) per annum. EDF also carried out an internal awareness campaign about energy saving for its staff. This initiative aimed to change the behavior of EDF staff in administrative buildings without implementing costly technical measures. At the completion of this program, EDF prepared a kit about energy saving measures that was available to private sector companies and local communities.

In March 2003, the Eco-Energy Plan partners brought together 29 local communities in the Alpes-Maritimes region to encourage them to undertake effective DSM measures. The first stage of this program required the communities to take a simple action in one of three areas of their own operations: the investigation of opportunities for interruptibility, the installation of energy efficient lighting in one or more of their facilities, or the management of street lighting. In the second stage, the communities could undertake basic measures directed to residents in their areas.

Public Housing

The Eco-Energy Plan worked with managers of public housing to improve the energy efficiency of their properties to reduce the energy bills of their tenants. This is particularly important when existing properties are renovated. To assist the property managers, specific DSM measures were developed for public housing, starting with quick energy audits of the properties to identify major DSM options.

Existing Buildings

The Eco-Energy Plan developed a book of technical solutions applicable to the Mediterranean area that assist the design of buildings adapted to the local climatic conditions and which make use of local renewable energies.

To develop the energy services industry in the Alpes-Maritimes region, a database was constructed to identify a range of products and services that enable energy savings in residential and commercial buildings. The database was available on the Internet and it was possible to purchase the products online. Prior to the development of the database, there were few energy service companies (ESCOs) in the Alpes-Maritimes region. Following the implementation of the database, several new ESCOs were established.

Tourism

In January 2004, the engineering and design firm Fludia was commissioned to assist the hotel sector to better understand and control their consumption of electricity. Individual hotels were provided with small recording devices to use for a three-week period and then returned to Fludia. The recordings were analysed and individual reports were provided to each hotel detailing the characteristics of the hotel's electricity use and identifying anomalies and opportunities for energy saving. Some hotels also benefited from individual telephone consultations. Energy saving measures applicable across the hotel sector also were identified (e.g., switching off coffee machines when not in use and reducing the use of

continued on page 4

taskXVII

Integration of DSM, Distributed Generation, Renewables and Storage

Trend & IEA DSM Work

The good news is that many countries are implementing energy policies to promote energy efficiency, distributed generation and renewable energy resources. The bad news is that as distributed energy production increases, especially from sources with a variable output such as wind, solar, small hydro and CHP (combined heat and power), there is often no correlation between the production and the local consumption (as illustrated in Figure 1).

Because intermittent types of electricity generation are hard to predict, electricity networks (both local and transmission levels) are turning to integrated distributed energy resource. By combining distributed generation with energy storage and demand response, countries can decrease problems caused by distributed generation and increase the value of intermittent energy in the market.

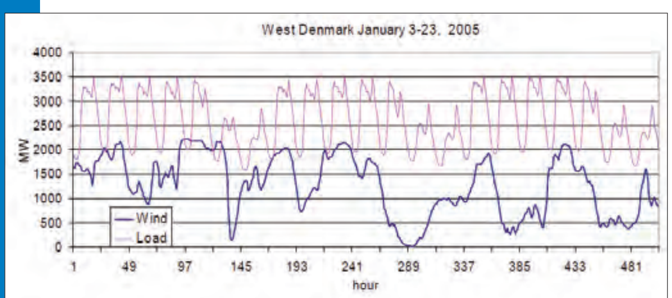


Figure 1. Wind power production (2,400 MW wind power) and load in Western Denmark.

To support this shift to integrated distributed energy resources, participants in IEA DSM Task XVII, Integration of Demand Side Management, Energy Efficiency, Distributed Generation and Renewable Energy Sources, are examining how to optimally integrate and combine demand response and energy efficiency technologies with distributed generation, storage and smart grid technologies, at different network levels (low, medium and high voltage), and how to combine these technologies to support the electricity networks and electricity market.

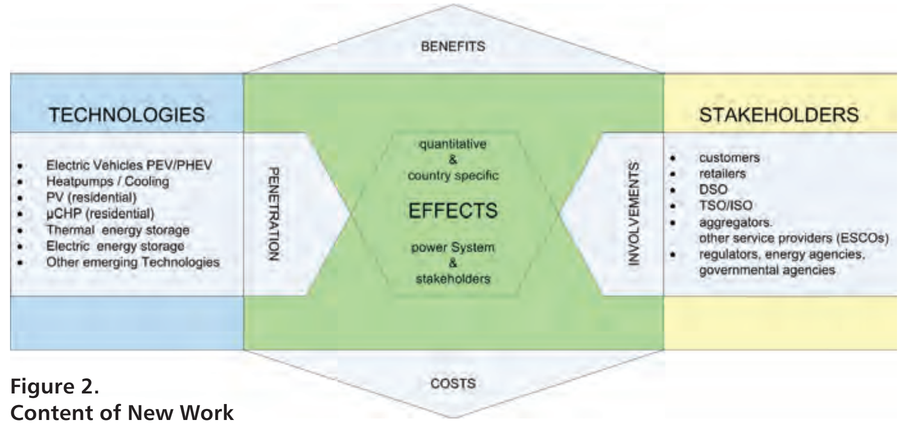


Figure 2.
Content of New Work

Results & New Work

The results of the first phase of work, a scoping study, are synthesized in the report, State-of-the-Art: Integration of Demand Side Management, Distributed Generation, Renewable Energy Sources and Energy Storages, http://www.ieadsm.org/ViewTask.aspx?ID=16&Task=17&Sort=0#ancPublications3.

Participants are now working to assess the effects of emerging distributed energy resource technologies in different stakeholder groups and within the electricity system. The emerging technologies that will be examined are plug-in electric and hybrid electric vehicles, different types of heat pumps for heating and cooling, photovoltaics, micro-CHP, and energy storage (thermal/electricity). Experts also will assess smart metering and emerging ICT (Information and Communication Technologies), and possibly small wind plants. Figure 2 describes the content of this new work.

New participants are welcome. The next Task meeting will be held September 30 – October 1, 2010 in Vienna, Austria.

For more information contact the Operating Agent, Mr. Seppo Kärkkäinen of Finland, Seppo.Karkkainen@elektraflex.com or visit the Task web page, http://www.ieadsm.org/ViewTask.aspx?ID=16&Task=17&Sort=0

Case Study *from page 3*

water-heaters in the middle of the day and when the hotels had low occupancy rates).

This article was contributed by David Crossley of Energy Future Australia Pty. Ltd. For more information on this case study and others, visit Task XV, Network Driven DSM at http://www.ieadsm.org/ViewTask.aspx?ID=17&Task=15&Sort=1.

taskXVI

Comprehensive Refurbishment: Business Models & Good Practice Projects

This article highlights some key results from the DSM Task XVI's publication, Comprehensive Refurbishment of Buildings through Energy Performance Contracting: A Guide for Building Owners and ESCos including Good Practice Examples.

For many building refurbishment projects, improvements in energy efficiency are not the driving force. Non-energy goals and benefits such as efficient use and expansion of space, increased access or ergonomic workplace comfort, external appearance or other ways to increase rental income may be more important to the building owner. Nevertheless, minimum performance standards for thermal refurbishment and guarantees for maximum energy consumption should always be written into the terms of reference for any building refurbishment. Energy Performance Contracting (EPC) models to achieve the comprehensive refurbishment of buildings as described below are a proven means to achieving energy efficiency improvement goals.

Standard EPC-projects realize demand reduction measures that typically comprise building technologies like heating, ventilation, air-conditioning (HVAC), lighting, electrical applications and control systems – known as typical ESCo services. The comprehensive refurbishment (CR) approach to buildings - examining and treating all energy sensitive aspects – includes building construction measures such as building envelope refurbishment, window exchange or passive solar shading measures. DSM Task XVI participants have developed three basic models within the Energy Service (ES) concept extended to achieve the comprehensive refurbishment of buildings. These "Comprehensive Refurbishment Energy Performance Contracting" models (CR-EPC) are:

General Contractor (GC CR-EPC)

In this model, the majority of the CR work and services are not described with detailed specifications. Instead, the building owner provides functional specifications that define the project's technical, financial, organizational, legal and economic performance requirements and the framework conditions for implementation of the measures.

All services, ranging from overall optimization, detailed planning, construction, operation & maintenance and user motivation as well as compliance with the Energy Contracting quality guarantees over the contract term are contracted to a general contractor (GC, which can be one company or a consortium).

General Planner (GP CR-EPC)

In this model, the building owner can specify detailed solutions for the CR-measures (e.g., design of the facade). The building owner commissions a general planner who is responsible for the overall project optimization, detailed planning, specifications, supervision and quality assurance. Typically, the GP tenders building construction measures (e.g., building envelope) on the basis of detailed specifications and the Energy Contracting services are tendered with functional specifications. Hence, building construction and ESCo services are awarded in separate contracts. This model is basically a combination of a standard construction procedure (Independent planner + construction company) combined with the ES concept.

Refurbishment "Light" (CR "Light" EPC)

In this model, individual building construction measures (e.g., top floor ceiling insulation) can be realized with a standard EPC contract. If less than half of the total project cost can be attributed to construction work, the building owner can define detailed specifications for these in the tendering process. An ESCo is awarded an ES contract to oversee overall optimization, detailed planning, and operation & maintenance and to provide all guarantees. The main difference between this model and the GC model is that it covers a smaller extent of the building construction measures. Because only simple building construction measures are involved, we refer to this as "light".

The following are examples of these models at work.

General Contractor Model

Comprehensive Refurbishment and Expansion of a Kindergarten plus a Savings Guarantee - Austria

Building

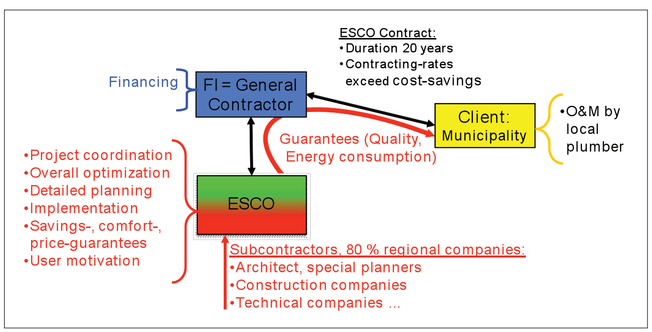
- Kindergarten on the ground level
- 2 dwellings on the upper level
- Year of construction: 1970s
- Total floor area: 992 m^2

General Contractor Model (continued)

Figure 1. Kindergarten before renovation.

Figure 2. Kindergarten façade after the renovation.

Figure 3. Contractual relationships for the project.



Before Refurbishment

- Very high energy consumption: 180 kWh/m² for heating
- No insulation
- Condition of structure according to age of building

Goals

- Comprehensive refurbishment to raise the quality of living and of the building structure and to enlarge the building
- Reduce energy consumption and greenhouse gases
- Achieve the highest quality benchmarks for construction and economic criteria

Measures

- Thermal insulation added to the building envelope and replacement of the windows
- Gas fired central heating and hot-water supply, insulation of heat pipes
- Energy management and control system
- Furnish the entire building for 110,000 Euro
- Total project costs: 900,000 Euro
- ESCO guarantee of a 52% energy savings

Business Model

Public procurement for general contractor:

- Financing, building technologies, construction, savings guarantee, etc. (one-stop-shop)
- 100 % functional specifications

Award criteria to select best bidder:

- Sum of Contracting Rates over contract duration
- Energy savings guarantee
- Meeting of minimum technical standards

Advantages for the Client

- Risk transfer to general contractor – costs, future energy consumption, time schedule
- Sustainability measures that improved the building's living quality and construction
- Comfort guarantees according to legal standards (temperature)
- Reduction of energy consumption: > 70%

Lesson Learned

Adequate procurement process is important à at least 50% functional specifications with minimum standards

For more information contact Wolfgang Weber of EQ Energie & Bau GmbH, wolfgang.weber@eq-energie.at

Figure 4. "Joanneum Research" facility after renovation.

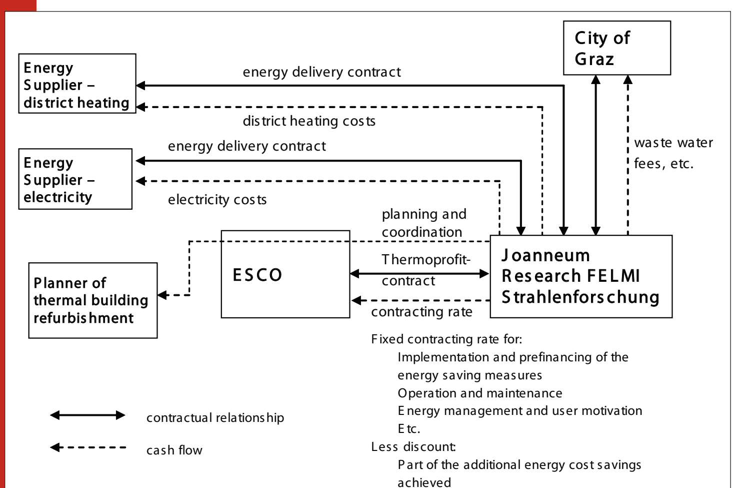


Figure 5. EPC implementation model for the project.

General Planner CR-EPC

Refurbishment of a Research Facility – Austria

Building

- Year of construction: 1962, additions added in 1965 and 1974
- Total floor area: 6.543 m³
- District heating

Before Refurbishment

- High energy costs
- Comprehensive refurbishment necessary for the whole building
- Baseline costs: 123,300 Euro (heating, electricity, fresh and waste water)

Goals

- Guaranteed savings (at least 29% of Baseline costs)
- Reduction of CO_2 emissions and specific energy consumption
- Compliance with comfort standards and refurbishment measures - total optimization of the building envelope, the heating system and other energy technical units

Measures

- Envelope measures: insulation of outer walls, replacement of windows
- HVAC measures: optimization of heating regulation system, installation of thermostat valves, cooling of the laboratory appliances with a closed circulation and a heat exchanger for the room heating, energy controlling system
- Organizational measures: concept for user motivation

Business Model

- A comprehensive EPC model was developed for this pilot project under the quality trademark THERMOPROFIT. The goal was a total optimization of the building, from the envelope and the heating system and other energy technical units (ventilation, electric installations) to the water consumption.
- The ESCO is in charge of the operation, maintenance and technical equipment. The primary part of the investment was financed by the building owner. Additional funding was available from the Kommunalkredit Austria AG.

Advantages for the Client

- Optimization of the building envelope in combination with the heating system and other energy technical units. Heating demand of 37 kWh/m2*a
- Guaranteed savings 35.900 Euro/a or 29% plus a service package
- Guaranteed comfort standards for the building
- Risk transferred to the contractor
- Contractor responsible for maintenance, energy controls, reporting and user motivation

Lessons Learned

- The Guarantee model approach leads to a significant improvement of the quality of the measures in all the refurbishment phases.
- Applicable tender procedures are necessary (partly functional, the refurbishment measures with performance specifications or a defined minimum standard).

This example was reported by Daniel Schinnerl of Graz Energy Agency, schinnerl@grazer-ea.at, please get in contact for more information.

CR-Light Model

Energy Supply Contracting for a Conference Centre and Guest House - Austria

Figure 6. Historic envelope of conference center and inflated cellulose at upper floor ceiling.

Buildings

- Conference centre and hotel
- Year of construction: 16th century, 1960 and 2009
- Three buildings are supplied by a heating network
- Heated area: 4,000 m^2

Before Refurbishment

- Inefficient gas boiler
- No insulation in building envelope due to protection of historic building
- Energy consumption: 185 kWh/m^2/year

Goals

- New boiler
- Outsourcing of energy supply and financing
- Reduction of energy demand and costs and CO_2 emissions through energy efficiency measures

Measures

- Condensing gas boiler and micro CHP for heat and electricity baseload
- Insulation of upper floor ceiling using inflated cellulose (recycled product)
- Energy management and control

Business Model

- Combination of energy efficiency and useful energy supply
- Quality assurance substitutes EPC savings guarantee (see figure)
- Awarding: Combined competition of price and ideas on the bases of a functional service description

Advantages for the Client

- Insulation of the upper ceiling floor in the historic building was a cost effective option.
- ESCo financed CHP at own risk and sold the electricity.
- Co-financing by the building occupant decreased the capital costs.

Lessons Learned

- Building owner must coordinate the interfaces with and control the ESCo, especially when other construction work is going on in parallel to the project.
- Need a dedicated project leader and patience to develop a comprehensive energy efficiency project.

This example was reported by Reinhard Ungerböck of Graz Energy Agency, ungerboeck@grazer-ea.at, please get in contact for more information.

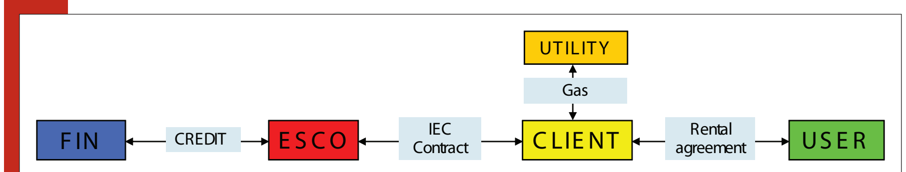


Figure 7. Integrated Energy Contracting implementation model for this project.

Key features of the CR-EPC model

- A CR-EPC-partner plans and realizes energy efficiency measures, including building construction measures, and is responsible for their performance, operation and maintenance throughout the contract term.
- Depending on the implementation model, the contracting partner to implement the measures is either a general contractor (GC), a general planner (GP) or an Energy Service Company (ESCo).
- The ESCo has to guarantee energy cost savings compared to a present state energy cost baseline. Further guarantees and quality assurance instruments can be included, such as thermal comfort conditions, operation & maintenance or emission reduction guarantees.[1]
- Typical EPC contract terms are 10 years. Investments for CR-EPC projects, depending on their magnitude, can be refinanced only partially from future energy cost savings. The building owner has to directly pay part of the investments, e.g. with a building cost allowance. Another option is an extended contract period of 15–25 years. Leasing finance also can be an option and should be considered. After termination of the contract, the entire savings will benefit the client.
- The ESCo's remuneration is the contracting rate and depends on the savings achieved. In case of underperformance, the ESCo must cover the short fall. Additional savings are shared between the partners.

[1] For more details see Bleyl, Jan W; Baumgartner, B; Varga, M 2007,Quality Assurance Instruments for Energy Services have been compiled in a EUROCONTRACT-manual. Graz Energy Agency

This article was contributed by the Task XVI Operating Agent, Jan W. Bleyl-Androschin (bleyl@grazer-ea.at) of Graz Energy Agency. These findings are considered a work in progress due to the limited number of practical experiences collected so far. Feedback and inquires are welcome.

We are trying a new format for the DSM Spotlight newsletter, please let us know if you found this format easier to read online or in print. Comments can be sent to Pamela Murphy, pmurphy@kmgrp.net.

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