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IEA Demand Side Management
Task XVI Competitive Energy Services
(Energy Contracting, ESCO Services)

Final Report Phase 1: 2006 - 2009

J. W. Bleyl-Androschin, D. Schinnerl

Berichte aus Energie- und Umweltforschung

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IEA Demand Side Management
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(Energy Contracting, ESCO Services)

Final Report Phase 1: 2006 - 2009

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Grazer Energieagentur Ges.m.b.H.

mit Unterstützung von KPC

With contributions from Task XVI national experts
(contact details on back cover)

Graz, August 2010

Ein Projektbericht im Rahmen der Programmlinie

IEA FORSCHUNGS KOOPERATION

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Im Auftrag des Bundesministeriums für Verkehr, Innovation und Technologie

Vorbemerkung

Der vorliegende Bericht dokumentiert die Ergebnisse eines Projekts aus dem Programm FORSCHUNGSKOOPERATION INTERNATIONALE ENERGIEAGENTUR. Es wurde vom Bundesministerium für Verkehr, Innovation und Technologie initiiert, um Österreichische Forschungsbeiträge zu den Projekten der Internationalen Energieagentur (IEA) zu finanzieren.

Seit dem Beitritt Österreichs zur IEA im Jahre 1975 beteiligt sich Österreich aktiv mit Forschungsbeiträgen zu verschiedenen Themen in den Bereichen erneuerbare Energieträger, Endverbrauchstechnologien und fossile Energieträger. Für die Österreichische Energieforschung ergeben sich durch die Beteiligung an den Forschungsaktivitäten der IEA viele Vorteile: Viele Entwicklungen können durch internationale Kooperationen effizienter bearbeitet werden, neue Arbeitsbereiche können mit internationaler Unterstützung aufgebaut sowie internationale Entwicklungen rascher und besser wahrgenommen werden.

Dank des überdurchschnittlichen Engagements der beteiligten Forschungseinrichtungen ist Österreich erfolgreich in der IEA verankert. Durch viele IEA Projekte entstanden bereits wertvolle Inputs für europäische und nationale Energieinnovationen und auch in der Marktumsetzung konnten bereits richtungsweisende Ergebnisse erzielt werden.

Ein wichtiges Anliegen des Programms ist es, die Projektergebnisse einer interessierten Fachöffentlichkeit zugänglich zu machen, was durch die Publikationsreiche und die entsprechende Homepage **www.nachhaltigwirtschaften.at** gewährleistet wird.

Dipl. Ing. Michael Paula
Leiter der Abt. Energie- und Umwelttechnologien
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International Energy Agency
IA Demand Side Management (DSM)
Task XVI "Competitive Energy Services"
http://www.ieadsm.org

Austrian Federal Ministry of Transport,
Innovation and Technology,
Bundesministerium für Verkehr,
Innovation und Technologie
http://www.bmvit.gv.at
http://www.energytech.at

Synopsis:

The final report of Task XVI „**Competitive Energy Services** (Energy-Contracting, ESCo services)" - Phase 1 (July 2006 – June 2009) – focuses on the task content and results such as a new Integrated Energy Contracting model, a calculation tool for monetary saving potentials, financing options for ESCo services, comprehensive Refurbishment of Buildings and How Much Can Energy-Contracting Contribute to Energy Efficiency in the Residential Sector.

Der Endbericht von Task XVI „**Competitive Energy Services** (Energy-Contracting, ESCo services)" - Phase 1 (Juli 2006 – Juni 2009) – fokussiert auf Inhalte und Ergebnisse, u.a. ein neues Integriertes Energie Contracting Modell, ein Berechnungswerkzeug für monetäre Einspar-Potentiale, Finanzierungsoptionen für Contracting, umfassende Gebäudesanierung und Energie-Contracting im Wohnungssektor.

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http://www.energytech.at

Belgium
Federal Public Service
Economy, S.M.E.s, Self-Employed and Energy
DG Energy – External relations
http://economie.fgov.be/

Finland
Tekes – the Finnish Funding Agency for
Technology and Innovation
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India
Bureau of Energy Efficiency
Ministry of Power
www.bee-india.nic.in

Japan
Tokyo Electric Power Company
http://www.tepco.co.jp/en/index-e.html

Netherlands
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1 Executive Summary

This is the final task report of Task XVI „Competitive Energy Services (Energy-Contracting, ESCo services)" with a focus on the key results. The Task was carried out in the framework of the research cooperation of the International Energy Agency Demand Side Management implementing agreement (www.ieadsm.org) with experts participating from Austria, Belgium, Finland, India, Japan and the Netherlands.

Introduction

One of the most urgent energy policy and energy economics challenges continues to be the search for suitable "tools" to execute energy conservation potentials. The level of success is far from satisfactory as the continuous increase in final energy consumption reveals. Since the mid of this decade, Energy Services (Energy-Contracting, ESCo services) have climbed high on political agendas and have even reached the headline of energy legislation [2006/32/EC].

The ESCo industry is an expanding business in various parts of the world contributing to the improvement of energy efficiency, control of energy costs and reduction of greenhouse gas and other emissions. At the same time, many end-use market segments are still in a developing stage or have not reached their full potential.

Energy-Contracting (EC) is cited many times as a smart multi-purpose-instrument, which will help to overcome market barriers for Energy Efficiency. While a number of obstacles can be overcome with the EC concept, the realistic potentials, the pros and cons, the limits and added values of ESCo products in comparison to in-house implementation need further elaboration and unbiased discussions amongst stakeholders and (potential) customers.

Goals

In order to contribute to the future market development of Energy-Contracting, the general objectives of Task XVI are to establish an IEA DSM energy services expert platform; to design, document and test innovative ESCo and financing models; to support and follow up country specific national implementation activities and to disseminate results nationally and internationally.

The underlying goal is to increase understanding of Energy-Contracting as a flexile and high potential tool to implement energy efficiency projects and to unbiasedly discuss policy recommendations, advantages and disadvantages, limitations and realistic potentials of outsourcing energy service packages to ESCos in comparison to in-house implementation.

Task XVI (phase 1) brought together Energy-Contracting experts from six countries (Austria, Belgium, Finland, India, Japan, Netherlands), who joined forces to advance energy service markets and competitive ESCo models.

Results

Most existing energy service definitions fall short with regard to important properties of "real" Energy-Contracting projects, such as outsourcing of risks to the ESCo, guarantees for "all inclusive" cost and performance of the measures implemented or optimization according to project cycle cost. The Task's view including a definition of "real" ESCo services is argued in chapter 5.

The Think Tank has worked on a variety of topics which have led to five key publications:

- A new ESCo business model labeled as "Integrated Energy-Contracting" (IEC), which combines energy efficiency and (renewable) energy supply in an integrated product;
- "Calculation Tool for Estimation and Visualization of Monetary Saving Potentials";
- "Financing Options for Energy-Contracting";
- "Comprehensive Refurbishment of Buildings through EPC";
- "How much can Energy-Contracting contribute to Energy Efficiency in the Residential Sector?".

For summaries and conclusions on these topics we refer you to the abstracts of the respective publications in chapter 6 of this report.

In Austria, national implementation activities were designed to execute concrete model projects. Experience from up to now eight projects has proven the feasibility of the IEC model. In addition to competitive energy prices, energy end-use savings of up to 30 % heat, 12 % electricity and 20 % water consumption have been achieved by integrating demand side measures (e.g. controls, hydraulic adjustment, solar, top floor insulation and user behavior) into the ESC scheme. CO_2 reductions are above 90 %, mainly due to switching to a combination geothermal and biomass energy sources. The value of the future cash flow change reaches up to € -250,000 (net savings, including all cost of the EE measures), which could be used to co-finance comprehensive refurbishment of the building shell.

The results of the Task were presented and discussed with stakeholders in altogether 23 conferences and workshops (11 in Austria) and six IEA DSM Task XVI stakeholder workshops were organized.

Conclusions and Outlook

ESCo models offer integrated solutions for the project life cycle, encompassing planning, construction and operation & maintenance. Furthermore Energy-Contracting is an interdisciplinary approach, which takes care of technical, economical, financial, organizational and legal aspects of the implementation process in order to achieve guaranteed performance and results of the efficiency technology deployed. This highly integrated and multidimensional approach opens up solutions, which are not achievable through a standard, disintegrated implementation process, e.g. life cycle cost optimization across investment and operation budgets or integrated planning or performance guarantees over the complete project cycle, all summarized in one ESCo contract.

At the same time this requires well educated stakeholders on the customer and the ESCo side with an understanding and resources of all the disciplines involved. And it requires new organizational routines, in particular on the customer side, e.g. with regard to procurement practices, interdisciplinary co-operations between different departments and project engineers or long-term cross-budgetary financial management. Last but not least: The decision of the building or business owner to tap into energy efficiency resources (either voluntarily or forced by regulations) remains a basic requirement – independent of the implementation model.

Energy-Contracting still is a complex product, which can not be procured or sold easily as it is the case with energy efficiency in general. On the way towards better developed energy service markets work remains to be done. Some general lessons, which we have learned are:

1. Successful market development - in particular for EPC - was demand side driven, meaning ESCo customers defined their needs and goals for energy service packages and put out request for proposals on the market.
2. To foster market development, the role of independent market facilitators as mediators between ESCos and their (potential) clients has proved to be of great value. This role requires more players and deserves better support, also financially!
3. Financing is not necessarily the core business of ESCos. Their core competence usually lies in technical, economic, and organizational matters of an energy service package ESCos should serve as finance vehicle, not necessarily as financiers.
4. Energy-Contracting is a flexible and modular energy service package. This also implies the ESCo customer may define – depending on his or her own resources – what components of the energy service will be outsourced and which components he carries out himself.
5. Energy efficiency improvements are not the driving force for many of the projects but rather a (beneficial) side effect. In other words: Energy efficiency is often not a stand-alone business case. Project developers need to listen better to the needs expressed by the customer side and to build strategic alliances to incorporate energy efficiency goals or minimum performance standards early on in the project development process.
6. High priority should be placed on the development of concrete projects in the end-use sectors of public institutions, tertiary sector, trade and industry as well as housing. It is important to optimize investment decisions according to project (or better life) cycle cost and to ensure the results of the energy efficiency measures on a long-term basis. In this regard, ESCo models inherently have substantial advantages to offer.

Many obstacles root in the scattered nature and small units of end-use energy conservation potentials and must not be attributed to Energy-Contracting models.

This list does not claim to be exhaustive and country specific additions and adaptations to these proposals for National Implementations Activities are suggested, off course.

At its meeting in Vienna in April 2009, the IEA DSM Executive Committee has decided a three year extension of Task XVI, which has started in July 2009. Graz Energy Agency, Austria was confirmed as Operating Agent and has also taken over the Co-Operating Agent agendas. An acceptance of the proposal for the national co-financing of the task-extension is pending. Some of this phase 2-work is already reflected in this report.

On the way to better developed energy service markets and to more competitive energy service products strong efforts on all levels of policy framework, capacity building and concrete market development remain to be done. In case of questions or ideas for further co-operation, your feedback is highly welcome. You can reach the authors at bleyl@grazer-ea.at or schinnerl@grazer-ea.at.

2 Kurzfassung

Dies ist der Endbericht des Task XVI „**Competitive Energy Services** (Energy-Contracting, ESCo Services)" mit dem Schwerpunkt auf die wesentlichen inhaltlichen Ergebnisse. Der Task wurde im Rahmen der Forschungszusammenarbeit der Internationalen Energieagentur im Demand Side Management Implementing Agreements (www.ieadsm.org) durchgeführt, an welchem Contracting-Experten aus Österreich, Belgien, Finnland, Indien, Japan und den Niederlanden beteiligt waren.

Einleitung

Eine der dringendsten Herausforderungen für die Energiepolitik und Energiewirtschaft bleibt die Suche nach geeigneten „Werkzeugen" zur Erschließung von Endenergieeinsparpotenzialen. Der Erfolg ist alles andere als zufrieden stellend, wie die kontinuierliche Zunahme des Energiebedarfs zeigt. Seit Mitte dieses Jahrzehnts werden Energiedienstleistungen als vielversprechender Ansatz auch auf politischer Ebene stärker diskutiert und sind mittlerweile sogar auf der Titelseite der europäischen Energieeffizienzgesetzgebung vertreten [2006/32/EG].

Der Energie-Contracting-Sektor ist ein wachsendes Geschäftsfeld in vielen Teilen der Welt und trägt zur Verbesserung der Energieeffizienz, zur Kontrolle von Energiekosten und zur Verringerung von Treibhausgasemissionen sowie anderen Emissionen bei. Nichts desto trotz befinden sich viele Marktsegmente noch in der Entwicklungsphase und haben ihr volles Potenzial nicht erreicht.

Energie-Contracting (EC) wird oft als intelligentes Mehrzweckinstrument bezeichnet, welches helfen kann, Marktbarrieren für Energieeffizienz zu überwinden. Während einige Hindernisse mit EC-Modellen überwunden werden können, erfordert das Verständnis der realistischen Potenziale, der Vor- und Nachteile, der Grenzen und des Mehrwerts von EC-Produkten im Vergleich zur Eigenregie viele weitere Anstrengungen und unvoreingenommene Diskussionen zwischen allen Interessensgruppen und insbesondere auf Seite der (potenziellen) Kunden.

Ziele

In Task XVI (Phase 1) haben Energie-Contracting-Experten aus sechs Ländern (Belgien, Finnland, Indien, Japan, Niederlande, Österreich) ihre Kräfte gebündelt, um Energiedienstleistungs-Märkte und wettbewerbsfähige EDL-Modelle voranzutreiben.

Um zur künftigen Marktentwicklung des Energie-Contracting beizutragen, bestehen die grundlegenden Ziele des Task XVI im Aufbau einer IEA DSM Energie-Contracting Experten Plattform; in der Entwicklung, Dokumentation und Erprobung innovativer EDL- und Finanzierungsmodelle; in der Unterstützung länderspezifischer nationaler Umsetzungsaktivitäten sowie in der nationalen und internationalen Verbreitung der Ergebnisse.

Im Ergebnis soll das Verständnis für Energie-Contracting als flexibles und leistungsfähiges Werkzeug zur Umsetzung von Energieeinsparprojekten erhöht werden. Und wir wollen zu einer unvoreingenommenen Diskussion von politischen Rahmenbedingungen, Vor- und Nachteilen sowie realistischen Potenzialen der Auslagerung von

Energiediensleistungspaketen an Energiedienstleister (EDL) im Vergleich zur Eigenregie beitragen.

Ergebnisse

Die meisten Definitionen von Energiedienstleistungen greifen zu kurz im Hinblick auf wichtige Merkmale „echter" Energie-Contracting-Pakete wie z.B. die Auslagerung von Risiken an den Contractor, der Garantien für "all inclusive"-Kosten oder Einsparpotenzialen durch die umgesetzten Maßnahmen oder der Optimierung nach den Projektzykluskosten. Die Sichtweise des Tasks einschließlich einer Definition „echter" EDL-Dienstleistungen wird in Kapitel 5 dargelegt.

Task XVI hat eine Reihe von Themen erarbeitet, welche zu fünf Hauptveröffentlichungen geführt haben:

- Ein neues EDL-Geschäftsmodell mit dem Titel „Integriertes Energie-Contracting" (IEC), welches Energieeffizienz und (erneuerbare) Energieversorgung in einem integrierten Produkt kombiniert;
- Ein „Berechnungswerkzeug für die Abschätzung und Visualisierung von monetären Einsparpotenzialen";
- „Finanzierungsoptionen für Energiedienstleistungen";
- „Umfassende Gebäudesanierung durch Einspar-Contracting";
- „Wieviel kann Energie-Contracting zu Energieeffizienz im Wohnungssektor beitragen?".

Für Zusammenfassungen und Schlussfolgerungen zu diesen Themen verweisen wir Sie auf die Abstracts der jeweiligen Veröffentlichungen im Kapitel 6 dieses Berichts.

In Österreich war der Schwerpunkt der nationalen Umsetzungsaktivitäten auf der Entwicklung und Begleitung konkreter Modellprojekte. Erfahrungen von bisher acht Projekten haben die Machbarkeit des Integrierten Energie-Contracting Modells bewiesen. Zusätzlich zu konkurrenzfähigen Energiepreisen wurden Endenergie-Einsparungen von bis zu 30 % Wärme, 12 % Strom und 20 % Wasserverbrauch erreicht, indem Maßnahmen auf der Nachfrageseite (z. B Steuerungen, hydraulische Abgleich, Sonnenenergienutzungen, Dämmung der obersten Geschoßdecke und Änderungen des Benutzerverhaltens) ins Energieliefer-Contracting-Schema (ELC) integriert wurden. Die CO_2-Reduktionen liegen bei über 90 %, vor allem auf Grund der Umstellung auf erneuerbare Energiequellen wie z.B. Geothermie und Biomasse. Der Wert der künftigen Projekt Cash Flows erreicht bis zu € - 250.000 (d.h. Nettoeinsparungen, einschließlich aller Kosten der Energieeffizienzmaßnahmen), welcher für die Ko-Finanzierung einer umfassenden Sanierung der Gebäudehülle genutzt werden könnte.

Die Ergebnisse des Tasks wurden mit Stakeholdern in insgesamt 23 Veranstaltungen (11 davon in Österreich) bei Konferenzen und Workshops diskutiert und es wurden sechs IEA DSM Task XVI Stakeholder Workshops wurden durchgeführt.

Schlussfolgerungen und Ausblick

Energie-Contracting Modelle bieten integrierte Lösungen für den gesamten Projektlebenszyklus und umfassen dabei typischerweise Planung, Errichtung und Betrieb & Instandsetzung. Außerdem ist Energie-Contracting ein interdisziplinärer Ansatz, welcher technische, wirtschaftliche, finanzielle, organisatorische und rechtliche Aspekte des Projektumsetzung berücksichtigt, um garantierte Ergebnisse (wie z.B. Einsparungen oder garantierte Vollkosten) der angewandten Effizienztechnologie zu erzielen. Dieser hoch integrierte und multidimensionale Ansatz eröffnet Lösungsmöglichkeiten, welche mit einem standardmäßigen, nicht integrierten Umsetzung nicht erreicht werden können, z. B. die Optimierung der Lebenszykluskosten über Investitions- und Betriebsbudgets hinweg, eine integrierte Planung über verschiedene Gewerke oder garantierte Ergebnisse über den gesamten Projektzyklus in einem Contracting-Vertrag.

Gleichzeitig erfordern Contracting-Projekte gut ausgebildete Akteure auf Seiten der Kunden und Contractoren mit Verständnis und Ressourcen für alle o.g. Disziplinen. Und es erfordert neue organisatorische Abläufe, vor allem auf Seiten der Kunden, z.B. im Hinblick auf Beschaffung, interdisziplinäre Kooperationen zwischen verschiedenen Abteilungen und Fachingenieuren sowie langfristiges Finanzmanagement über budgetäre Grenzen hinweg. Nicht zuletzt: Die Entscheidung des Gebäude- bzw. Betriebseigentümers Energieeinsparressourcen zu erschließen (entweder freiwillig oder unter dem Druck von politischen Regelungen) bleibt eine Grundvoraussetzung – unabhängig vom Umsetzungsmodell.

Energie-Contracting ist noch immer ein komplexes Produkt, das nicht einfach beschafft bzw. verkauft werden kann (was im Übrigen auf viele Energieeffizienz Produkte zutrifft). Auf dem Weg zu besser entwickelten Energiedienstleistungsmärkten bleibt daher noch vieles zu tun. Einige grundlegende Lessons learned, sind die Folgenden:

1. Erfolgreiche Marktentwicklung – vor allem für Einspar-Contracting – war durch die Nachfrageseite getrieben, das heißt zukünftige Contracting-Kunden definierten ihren Bedarf und ihre Ziele für Energiedienstleistungspakete und brachten Ausschreibungen auf den Markt.
2. Um die Marktentwicklung qualifiziert voranzutreiben, hat sich die Rolle unabhängiger Berater (z.B. Energieagenturen) als Vermittler zwischen Contractoren und ihren (potenziellen) Kunden als ein großer Mehrwert erwiesen. Diese Aufgabe braucht mehr Akteure und verdient es, auch finanziell besser unterstützt zu werden!
3. Finanzierung ist nicht unbedingt das Kerngeschäft von Contracting-Unternehmen. Ihre Kernkompetenz liegt üblicherweise in technischen, wirtschaftlichen und organisatorischen Belangen des Energiedienstleistungspakets. Contractoren können auch als Finanzierungsvehikel und –vermittler dienen, und müssen nicht unbedingt direkte Kapitalgeber sein.
4. Energie-Contracting ist ein flexibles und modulares Energiedienstleistungspaket. Dies bedeutet auch, dass der Contracting-Kunde – je nach den eigenen Ressourcen – definieren kann, welche Komponenten der Energiedienstleistung nach außen vergeben werden und welche er selbst ausführt.

5. Verbesserungen der Energieeffizienz sind bei vielen Projekten nicht die treibende Kraft, sondern eher ein (angenehmer) Nebeneffekt. In anderen Worten: Energieeffizienz ist häufig kein selbstständiges Geschäftsmodell. Projektentwickler müssen den von der Kundenseite ausgedrückten Wünschen besser einzubeziehen lernen und strategische Allianzen bilden, um Energieeffizienzziele bzw. Mindestenergieeinsparstandards neben anderen in einer frühen Phase der Projektentwicklung zu integrieren.
6. Ein besonderes Augenmerk sollte auf die Entwicklung konkreter Projekte bei (potentiellen) Kunden wie öffentlichen Einrichtungen, im tertiären Sektor (Dienstleistungsgebäude), in Gewerbe und Industrie und im Wohnsektor gelegt werden. Es ist wichtig, Investitionsentscheidungen nach den Projektzykluskosten (oder noch besser Lebenszykluskosten) zu optimieren und die Ergebnisse der Energieeffizienzmaßnahmen langfristig sicherzustellen. In dieser Hinsicht haben Contracting-Modelle substantielle Vorteile zu bieten.
7. Grundsätzlich liegen viele Umsetzungshemmnisse in der dezentralen Natur und den kleinteiligen Mengen von Energieeinsparpotenzialen begründet und sollten nicht per se den Energie-Contracting-Modellen zugeschrieben werden.

Diese Liste erhebt keinen Anspruch auf Vollständigkeit und länderspezifische Zusätze und Anpassungen dieser Vorschläge für nationale Umsetzungsaktivitäten sind selbstverständlich notwendig.

Das IEA DSM Executive Kommittee hat bei seinem Treffen in Wien im April 2009 eine dreijährige Verlängerung von Task XVI beschlossen, welche im Juli 2009 begonnen hat. Die Grazer Energieagentur, wurde als Operating Agent bestätigt und hat auch die Agenden des Co-Operating Agent übernommen. Die Bewilligung für die nationale Ko-Finanzierung der Verlängerung des Tasks ist derzeit noch ausständig. Einige der Arbeiten dieser Phase 2 wurden bereits in diesen Bericht aufgenommen.

Auf dem Weg zu besser entwickelten Energiedienstleistungsmärkten und konkurrenzfähigeren Energiedienstleistungsprodukten bleiben noch große Anstrengungen auf allen Ebenen der Politik, des Kompetenzaufbaus und der konkreten Marktentwicklung zu erledigen. Bei Fragen bzw. Ideen im Hinblick auf eine weitere Zusammenarbeit ist Ihr Feedback gerne willkommen. Sie können die Autoren unter bleyl@grazer-ea.at oder schinnerl@grazer-ea.at erreichen.

3 Introduction

This is the final task report of Task XVI „**Competitive Energy Services** (Energy-Contracting, ESCo services)" - Phase 1 (July 2006 – June 2009), subtasks 1-7. The task is carried out in the framework of the International Energy Agency Demand Side Management program. An overview of the IEA and the DSM program can be found in chapter 11.6 or www.ieadsm.org.

This international co-operative project was started on 01. July 2006 and completed on 31. June 2009. The following six countries participated in the task: Austria, Belgium, Finland, India, Japan and Netherlands. Contact information for each country can be found on the back cover of this report.

The success of further increasing energy efficiency in all sectors of consumption plays a vital role in coping with the challenges of our common energy future. Avoiding energy consumption by increasing end-use efficiency is a highly effective way to meet all three key targets of energy policies: Security of supply, affordable costs of energy services and environmental soundness.

Energy Efficiency has finally found its way up on the political agendas over the course of the last few years. Worldwide, concrete saving targets have been declared (like the EU strategy "20-20-20 by 2020" concluded by the EU heads of state at their 2007 summit). The level of success is far from satisfactory though, as the continuous increase in final energy consumption reveals.

But what are the appropriate instruments to bring energy efficiency to the end-user? Now and for the foreseeable future there is an urgent need to conclude and support all suitable political, regulatory and market based instruments for the implementation of Energy Efficiency and Renewables.

Since the mid of this decade, Energy Services (Energy-Contracting, ESCo services) have climbed high on political agendas and have even reached the headline of energy legislation [2006/32/EC]. Energy-Contracting (EC) is cited many times as a smart multi-purpose-instrument, which will help to overcome market barriers for Energy Efficiency. While a number of obstacles can be overcome with the EC concept, the realistic potentials, the pros and cons, the limits and added values of ESCo products in comparison to in-house implementation need further elaboration and unbiased discussions amongst stakeholders and (potential) customers.

Energy-Contracting - also labeled as ESCo or Energy Service (ES) – is a many times proven DSM instrument to implement energy efficiency measures for lighting, heating, ventilation and air-conditioning (HVAC-technologies) or even comprehensive refurbishment of buildings. An Energy Service Company (ESCo) takes over the technical and commercial implementation and operation risks and has to guarantee for its cost and results. ESCo services are also well suited to implement innovative energy technologies and renewable energy systems.

The ESCo industry is an expanding business in various parts of the world contributing to the improvement of energy efficiency, control of energy costs and reduction

of greenhouse gas and other emissions. At the same time, many end-use market segments are still in a developing stage or have not reached their full potential. Nevertheless, Energy-Contracting still is a complex product, which can not be procured or sold easily. As it is the case with energy efficiency in general: Many obstacles root in the scattered nature and small units of end-use energy conservation potentials and must not be attributed to Energy-Contracting models.

In order to contribute to the future market development of "real" energy services, the objectives of Task XVI are:

1. To establish an IEA DSM energy services expert platform
2. To design, elaborate and test innovative Energy-Contracting and financing models and publish them
3. To support and follow up country specific activities to disseminate and implement energy services in the market
4. To position the expert platform as a competence centre for energy services for international and national dissemination and assistance services (e.g. coaching, training courses, publications) and to contribute to an "IEA DSM Centre of Excellence"

The underlying goal is to increase understanding of Energy-Contracting as a flexile and high potential tool to implement energy efficiency projects. And to unbiasedly discuss advantages and disadvantages, limitations and realistic potentials of outsourcing energy service packages to ESCos in comparison to in-house implementation.

This report focuses on the key results of Task XVI. The report is structured as follows: The structure of Task XVI and the methodologies applied are described in Chapter 4. Chapter 5 provides our view of the basic features of "real" Energy-Contracting projects including a definition, the two basic business models and features of "real" energy service (ESCo, Energy-Contracting) projects. The key publications are described in chapter 6, followed by Austrian National Implementation Activities in cooperation with Landesimmobiliengesellschaft Steiermark (state real estate company of Styria) including a good practice example in chapter 7 and conclusions and outlook in chapter 8.

Dissemination activities, organizational and management issues of Task XVI are summarized in the separate final activity report.

The author wishes to thank the IEA participating countries, their respective financiers and the Austrian Federal Ministry of Transport, Innovation and Technology for their financial support within the framework of the IEA research co-operation.

On the way to better developed energy service markets and to more competitive energy service products strong efforts on all levels of policy framework, capacity building and concrete market development remain to be done. In case of questions or ideas for further co-operation, your feedback is highly welcome. You can reach the authors at bleyl@grazer-ea.at or schinnerl@grazer-ea.at.

4 Structure and Methodologies of Task XVI

This work is carried out in the framework of the research cooperation of the International Energy Agency demand side management implementing agreement. It's Task XVI on "**Competitive Energy Services** (Energy Contacting, ESCo Services)" brings together Energy-Contracting experts from currently six countries around the world, who join forces to advance ESCo models and markets [IEA DSM 2009].

To achieve the project goals, the Task XVI Work Plan consists of four main components:

1. IEA DSM energy services expert platform (ES-platform, subtask 3)
2. Innovative and competitive energy services think tank (Think Tank, subtask 4)
3. National implementing activities (NIAs, subtask 5)
4. International dissemination activities (subtask 6)

The following scheme illustrates the general structure and workflow of the task:

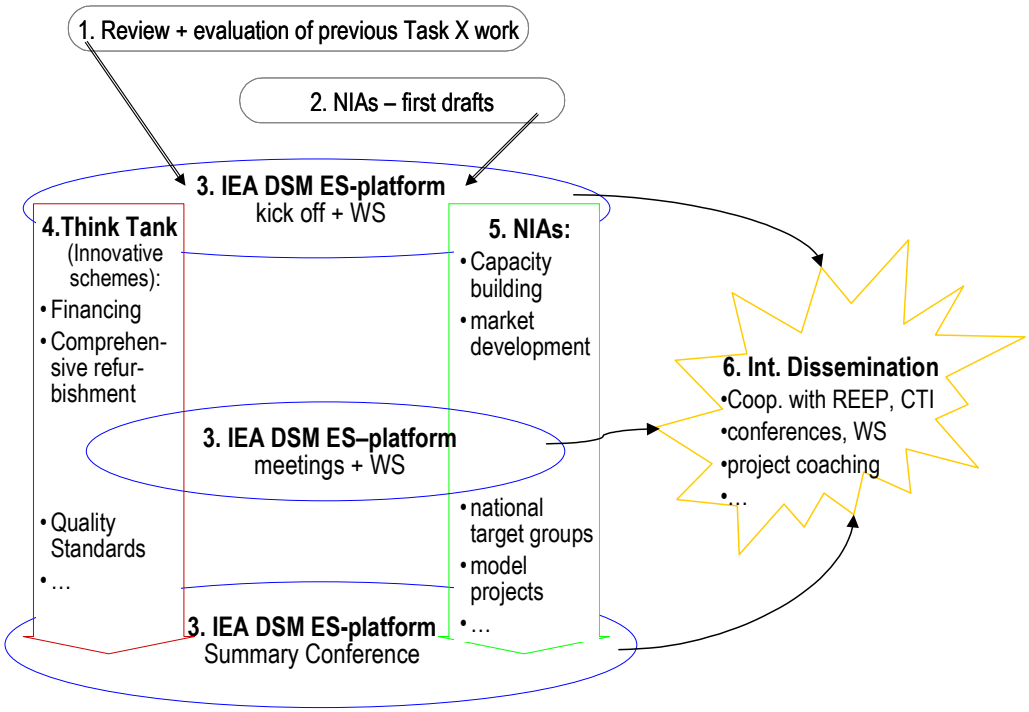

Figure 1 IEA DSM Task XVI: Structure and work packages

In the right pillar, the national implementing activities (NIAs), market development and capacity building activities take place according to the individual needs and resources of the participating country. In the left pillar, the "Think Tank", the experts will follow new developments and elaborate innovative energy service models according to the requirements of the participating countries.

The IEA DSM Energy Services Expert Platform (ES platform) serves as the link between the two pillars, as the communication tool internally and externally and as a

stage for developing services like coaching and training for the outside world (towards a "Centre of Excellence").

A wide variety of methodologies is applied: Modeling of ESCo services, desk and internet research, analyses of implemented projects and expert interviews with stakeholders. In addition, the task cooperates with financial sector institutions as well as ESCo and (potential) client business associations.

Of particular importance to understand and advance ESCo services is an interdisciplinary approach: Besides technical issues, economic, financial, organizational and legal aspects of energy service packages are investigated and accounted for.

The background of the participating experts is a combination of either ESCos representatives (3) or energy agencies (who serve as market facilitators and researchers) (3).

The results of Task XVI are discussed and disseminated in a series of stakeholder workshops, publications and presentations at conferences and workshops.

5 What is Energy-Contracting (ESCo Service)?

5.1 Definition and Concept

We focus on some key features here, assuming that the reader has a basic knowledge of the Energy-Contracting (EC) concept and building energy efficiency.[1] In a narrow sense we define[2] EC as:

> *„Energy-Contracting - also labeled as ESCo or Energy Service - is a comprehensive energy service concept to execute energy efficiency projects in buildings or production facilities according to minimized project cycle cost.*
>
> *An Energy Service Company (ESCo) implements a customized energy service package (consisting of planning, building, operation&maintenance, optimization, fuel purchase, (co-)financing, user behavior …). The ESCo provides guarantees for all inclusive cost and results and takes over commercial and technical implementation and operation risks over the whole project term of typically 10 to 15 years* (after [Bleyl+Schinnerl 2008])

The Energy-Contracting concept shifts the focus away from selling units of final energy (like fuel oil, gas or electricity) towards the desired benefits and services derived from the use of the energy, e.g. the lowest cost of keeping a room warm, air-conditioned or lit.

Energy-Contracting (EC) is not about any particular technology or energy carrier. Instead EC is a flexible and modular "efficiency tool" to execute energy efficiency projects, according to the goals of the facility owner. It is an instrument to minimize life- or project cycle cost[3], including the operation phase of the building. The ESCo acts as coordinator and manager of interfaces towards the customer and has to deliver the commissioned energy service to the customer at "all inclusive" prices as displayed in Figure 2.

ESCo products provide either useful energy (Energy Supply Contracting - ESC) or energy savings (Energy Performance Contracting - EPC) to the end user. And they

[1] For further basics on Energy-Contracting you may refer to e.g. www.grazer-ea.at, www.contracting-portal.at, [SenStad+BE 2002], [dena 2004], [Bleyl+Schinnerl 2008 u. 2008a], [dena 2009], [Eikmeier et.al. 2009] (this list is not exhaustive).

[2] Most existing energy service definitions fall short with regard to important properties of "real" Energy-Contracting projects, such as outsourcing of risks to the ESCo, guarantees for "all inclusive" cost and results of the measures implemented or optimization according to project cycle cost (cf. [2006/32/EC], [Bertholdi et.al. 2007], [CEN/CLC/TF 189], [DIN 8930-5], [GEFMA 540], [UZ 50], [VDMA 24198] - this list is not exhaustive)

[3] Here the sum of investment, operation and maintenance cost over the project term, also labeled as total or life cycle cost. E.g. capital-, consumption- and operation cost according to [VDI 2067] or [ÖNORM M 7140]

achieve environmental benefits due to the associated energy and emission savings as well as non-energetic benefits such as increase in comfort or image gains.

At Energy Supply Contracting efficient supply of useful energy such as heat, steam or compressed air is contracted and measured in Megawatt hours (MWh) delivered. The model usually includes purchasing of fuels and is comparable to district heating or cogeneration supply contracts. The scope of energy efficiency measures is limited to the energy supply side, e.g. the boiler house (cf. chapter 5.2).

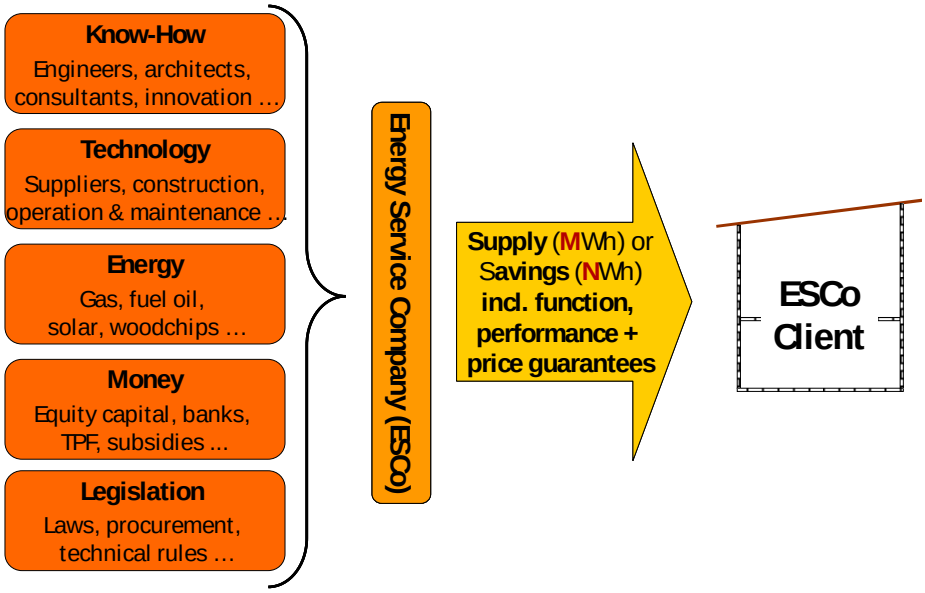

Figure 2 Energy-Contracting: Components of service package and outsourcing of interfaces and guarantees to an ESCo

As for Energy Performance Contracting, the focus is on reducing final energy consumption through demand side energy efficiency measures. The scope is extended to the entire building including measures such as technical building equipment (e.g. HVAC), user behavior or the building envelope insulation as indicated in Figure 3. The business model is based on delivering savings compared to a predefined baseline, also labeled as Negawatt hours (NWh).

5.2 Two Basic Business Models

Two basic business models can be distinguished, cf. Figure 3

1. At **Energy Supply Contracting** (ESC) efficient supply of useful energy such as heat, steam or compressed air is contracted and measured in Megawatt hours (MWh) delivered. The business model usually includes purchasing of fuels and is comparable to district heating or cogeneration supply contracts. The scope of energy end-use efficiency measures is usually limited to the energy supply side of the building or enterprise, e.g. the boiler room. It can also be applied to energy supply from renewable sources, e.g. solar ESC.
2. As for **Energy Performance Contracting** (EPC), the focus is on reducing final energy consumption through demand side energy efficiency measures. The scope is extended to the entire building or enterprise including measures

such as technical building equipment, user behavior or the building envelope insulation as indicated in Figure 3. The business model is based on delivering savings compared to a predefined baseline, also labeled as Negawatt hours (NWh).

Figure 3 illustrates the typical scope of services of the above mentioned Energy-Contracting models.

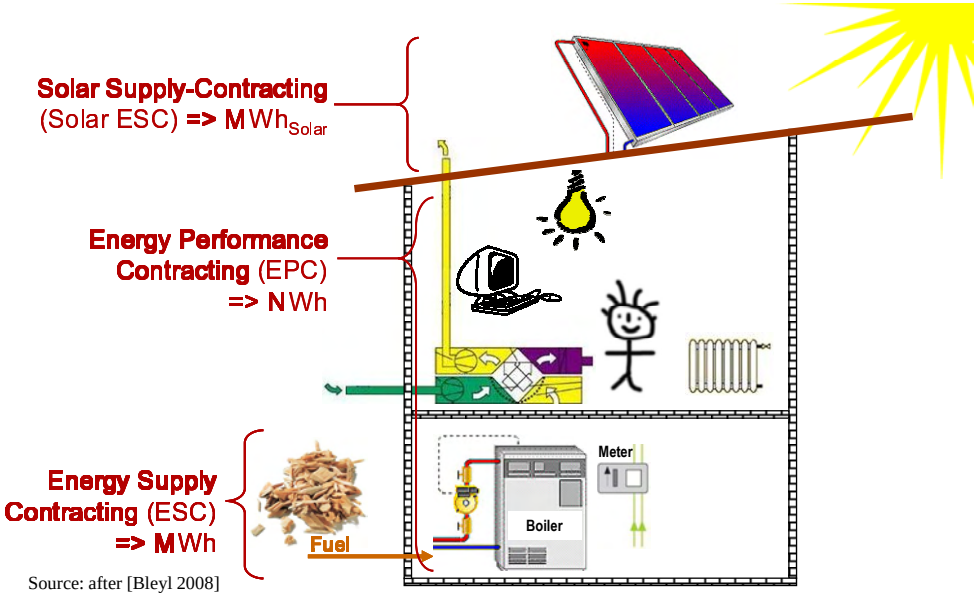

Figure 3 Scope of services of two basic ESCo models

Most ESCo products are based on either one of the above business models.

5.3 Modular Scope of Services

Most energy efficiency projects differ in their contents and general conditions. Therefore, it has proved to be necessary and sensible to adapt the scope of services specifically to the individual project. This also means the building owner can – depending on his own resources – define what components of the energy service will be outsourced and which components he or she carries out in-house (e.g. financing[4] or ongoing on-site maintenance provided by a caretaker).

The necessary components for implementing energy (efficiency) projects are summarized in an energy service package with result guarantees given to the client as displayed in Figure 4.

[4] In contrast to widespread opinions, the ESCo service package does not automatically need to include financing. Financing can be provided by the building owner, the ESCo or a third financing partner, depending on who can offer the better conditions. In any case, the ESCo can be used as a vehicle and facilitator for financing. This topic has been elaborated in more detail in [Bleyl+Suer 2006] or [Bleyl+Schinnerl 2008a].

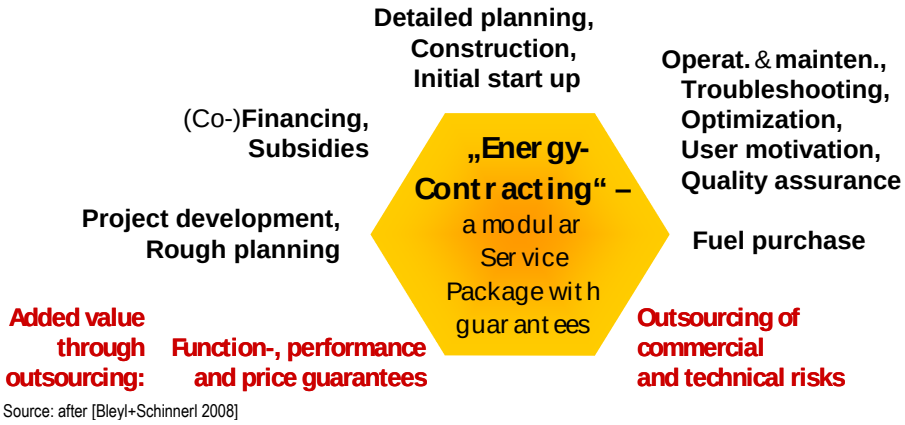

Figure 4 Energy-Contracting: A modular energy service package with guaranteed results for the client

All the tasks shown in the figure, such as planning, construction and financing, as well as all the ongoing components of the service, such as operation and maintenance, optimization, purchasing of fuel and quality assurance, have to be covered by the building owner or the ESCo throughout the contractual period.

In the ESCo's prices, all the expenditure items for the defined scope of services throughout the contractual period must be included ("all inclusive prices"). Correspondingly, project or life cycle costs (LCC) are calculated at the Energy-Contracting model.

The functional, performance and price guarantees provided by the ESCo and the outsourcing of technical and economic risks to the ESCo constitute an added value for the client, which should be considered at the comparison with an in-house implementation.

Energy Supply Contracting projects usually achieve 15-20 % efficiency improvements in the conversion from final to useful energy. Energy performance contracting projects typically realize efficiency gains of 20-30 %. With the Integrated Contracting approach (cf. chapter 6.1) or a Comprehensive Building Refurbishment model (cf. chapter 6.4) even higher potentials can be unlocked. CO_2-Emission reductions are in many cases above 50 % because of a change to energy carriers with lower carbon content or renewables.

6 Think Tank Key Results

The Think Tank has worked on a variety of topics, which have led to publications and presentations at various national and international events (cf. chapter 4 of Final Activity Report for a list of publications and presentations). The following subchapters include abstracts of the publications of the Think Tank topics. For more details on the topics you may refer to the publications in the appendix of this report.

Other topics worked on (e.g. Definition and standardization, cooperation with Tasks XIX and XXI, smart meters, implementation of [2006/32/EC], Industrial ESCo customers …), which have not led to a publication so far, are not mentioned here.

6.1 "Integrated Energy Contracting. A New ESCo Model to Combine Energy Efficiency and (Renewable) Supply in Large Buildings and Industry" (Abstract)

One of the most urgent energy policy and energy economics challenges continues to be the search for suitable "tools" to execute energy conservation potentials. The level of success is far from satisfactory as the continuous increase in final energy consumption reveals. Since the mid of this decade, Energy Services have climbed high on political agendas and have even reached the headline of energy legislation [2006/32/EC].

"Energy Contracting" (EC) is cited many times as a smart multi-purpose-instrument, which will help to overcome market barriers for Energy Efficiency (EE). While a number of obstacles can be overcome with the EC concept, the realistic potentials, the pros and cons, the limits and added values of ESCo products in comparison to in-house implementation need further clarification.

Energy Performance Contracting (EPC) projects, if implemented properly, have successfully delivered guaranteed energy savings of 20 % and above since they were first introduced in Europe around 1995. Nevertheless, their share in the ESCo market is around 10 % only and market diffusion is essentially limited to the public sector and spread very unevenly throughout Europe.

Besides requiring dedicated and persevering project developers, the EPC model itself imposes obstacles from a methodological point of view, especially if the cost baseline is difficult to determine or if adjustments of the baseline are necessary due to changes in utilization of the building or enterprise. As a consequence, transaction cost of EPC projects are particularly high, resulting in minimum energy cost baselines of 100.000 €/a and above. Also the ESCo's risks associated with the EPC savings guarantee may imply considerable safety surcharges.

The latter problems are not encountered with the Energy Supply Contracting (ESC) model, because no baseline is needed to measure savings. Further on, the ESC-model is also common in other end-use sectors such as industry or housing. The short fall is, that the scope of ESC measures is typically limited to the energy

supply side, not covering demand reductions in the building or the production process itself.

This contribution is on advancements of the ESC model. The objective is to enhance the scope of services by integrating demand side conservation measures in the fields of building technologies, building envelope and user behavior.

An important issue is the discussion of suitable quality assurance and performance verification instruments for the EE-measures implemented as a substitute for the EPC-savings guarantee. As a result we propose an Integrated Energy Contracting (IEC) model to unite energy conservation and (renewable) energy supply into an integrated approach. The concept of the IEC business model including quality assurance is displayed in Figure 5.

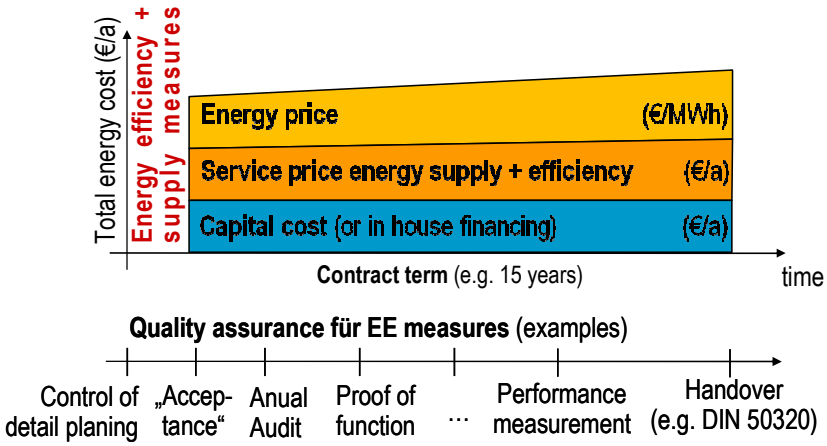

Figure 5 Integrated Energy Contracting Model with quality assurance instruments (examples) to combine energy efficiency and supply

Besides discussing the new IEC model, we present experiences from pilot projects procured by Landesimmobiliengesellschaft Steiermark (Real Estate Company of the State of Styria), Austria. The building owners retrofit goals, the procurement and awarding criteria applied and first project results.

Experience from up to now eight projects has proven the feasibility of the IEC model. In addition to competitive energy prices, energy end-use savings of up to 30 % heat, 12 % electricity and 20 % water consumption have been achieved by integrating demand side measures (e.g. controls, hydraulic adjustment, solar, top floor insulation and user behavior) into the ESC scheme. CO_2 reductions are above 90 %, mainly due to switching to a combination geothermal and biomass energy sources.

The value of the future cash flow change reaches up to € - 250,000 (net savings, including all cost of the EE measures), which could be used to co-finance comprehensive refurbishment of the building shell.

Also for Integrated Energy Contracting (IEC), the decision of the building or business owner to want to invest in energy efficiency remains a basic requirement. We conclude that the proposed Integrated Energy Contracting model achieves to combine the simpler approach of the ESC business model whilst extending the scope of the energy conservation measures to the complete building or enterprises and to all consumption media, e.g. heat, electricity or water.

The EPC savings guarantee is replaced by individual quality assurance instruments, which secure the functionality and performance of the efficiency measures implemented, but not it's exact quantitative outcome over the project cycle, which largely depends on factors external to the ESCo's influence such as changes in ambient climate conditions or utilization of the facility.

Work remains to be done to increase electricity savings and to achieve comprehensive refurbishment including the building shell. Furthermore, fiscal and balance sheet related implications of the IEC Model will have to be reviewed in comparison to EPC.

Subject to further experiences, the IEC model might be a solution, which is more widely applicable to combine energy supply and delivery of EE potentials in large volume buildings and enterprises. Perhaps energy efficiency will achieve a higher market diffusion in combination with energy supply (from Renewables)?

The German version was published in cooperation with the Landesimmobiliengesellschaft Steiermark (Real Estate Company of Styria) who has implemented the model projects (cf. chapter 7).

Amongst others, this topic was presented at the following conferences and workshops:

Date and location	**Title and type of the event**	**Author/presenter and title of the presentation/publication**	**Regional focus**
May 10th 2007, Graz	Expert meeting and stakeholder workshop in cooperation with city of Graz and Ministry of Transportation, Innovation and Technology	2 expert presentations by Jan Bleyl were followed by a discussion: - Integration of Energy Efficiency Measures into Energy Supply Contracting Models - Opportunity Cost Tool	International focus
January 31st 2008 Vienna	Envietech '08, Vienna	Demand Reduction First! Integrating Demand Side Measures into Energy Supply Contracting Models	International focus
April 7th 2008, Vienna	ARS-Akademie Energi-Contracting Seminar	Bleyl, Jan W.; Auer, Monika: Energieeffizienzprojekte umsetzten: Energie-Contracting oder Eigenregie – eine Einführung	National focus
October 1st 2008, Graz	NOEST Energy Lunch (Netzwerk Ökoenergie Steiermark)	Bleyl, Jan W.: Neues Contracting Modell: Energielieferung + verbrauchsseitige Einsparmaßnahmen	Regional focus
October 30th 2008	Netzwerktreffen "Österreichische Aktivitäten im Technologieprogramm der IEA"	Bleyl, Jan W.: Verbrauchsminimierung zuerst! Energieliefer-Contracting mit verbrauchsseitigen Einsparmaßnahmen (Integriertes Energie-Contracting)	National focus

Date and location	Title and type of the event	Author/presenter and title of the presentation/publication	Regional focus
November 10th 2008	ARS-Akademie Energi-Contracting Seminar	Bleyl, Jan W.: Energieeffizienzprojekte umsetzten: Energie-Contracting oder Eigenregie – eine Einführung	National focus
20. November 2008, Vienna	building workshop, Austrian Energy Agency	Bleyl, Jan W.: Integrated Energy Contracting Landesimmobiliengesellschaft Steiermark. Goals, Implementation Model and First Results	National focus
November 20th 2008 Vienna	Fachworkshop "Nutzung von Energiedaten in der Bestandsbewirtschaftung"	Bleyl, Jan W.: Integriertes Energie Contracting bei der LIG Steiermark. Ziele, Umsetzungsmodell und erste Ergebnisse	National focus
February 26th 2009 Vienna	ÖEKV-Seminar „Energiemanagement und Energieeffizienz"	Bleyl, Jan W.: Energie Effizienz durch Integriertes Energie Contracting (IEC) in der Praxis. Ziele, Umsetzungsmodell und erste Ergebnisse	National focus
May 8th 2009, Vienna	ARS-Akademie Energi-Contracting Seminar	Bleyl, Jan W.: Energieeffizienzprojekte umsetzten: Energie-Contracting oder Eigenregie – eine Einführung	National focus
June 9th 2009, Vienna	DECA (Austrian Association of ESCOs) workshop, Ausschreibung von Energielieferung und Einsparmaßnahmen	Bleyl, Jan W.: Energieeffizienz umsetzen! Integriertes Energie-Contracting am Beispiel LIG Steiermark	National focus

6.2 "Calculation Tool for Estimation and Visualization of Monetary Saving Potentials" (Abstract)

The calculation tool (OpCo-Tool) aims at a rough calculation and a graphical visualization of monetary energy saving potentials as well as the opportunity costs, which occurs if no energy saving measures are taken. The Graz Energy Agency has developed this calculation tool on the basis of Microsoft Excel and made the groundwork of the development within the project called "Innovative Energy-Contracting-models for trade and industry", which was financed by an Austrian research program.

The calculation tool is an appropriate instrument for energy consultants for the motivation of key actors (of trade and industry enterprises, public institutions, real estate owners …) in the first consulting phase as well as for further consulting actions.

Input data and graphical results:

There are only a few input data necessary for a first rough calculation on the basis of estimated or calculated saving potentials. The results are graphical shown in diagrams and additional summarized with pre-formulated explanations at the input data sheet:

- First the development of the energy costs is visualized at present state without the realization of saving measures (calculated with the average yearly cost increase factors).
- The energy savings potentials of the cost categories fuel energy and operation & maintenance over the planning term – also called opportunity costs – are accumulated and shown in the second diagram between minimum and maximum margins as well as an average value (cf. Figure 6).
- The third diagram compares the energy cost development without saving measures and with the realization of minimum and maximum saving potentials. The net present values of the minimum and maximum potentials over the planning term are also shown in this diagram.

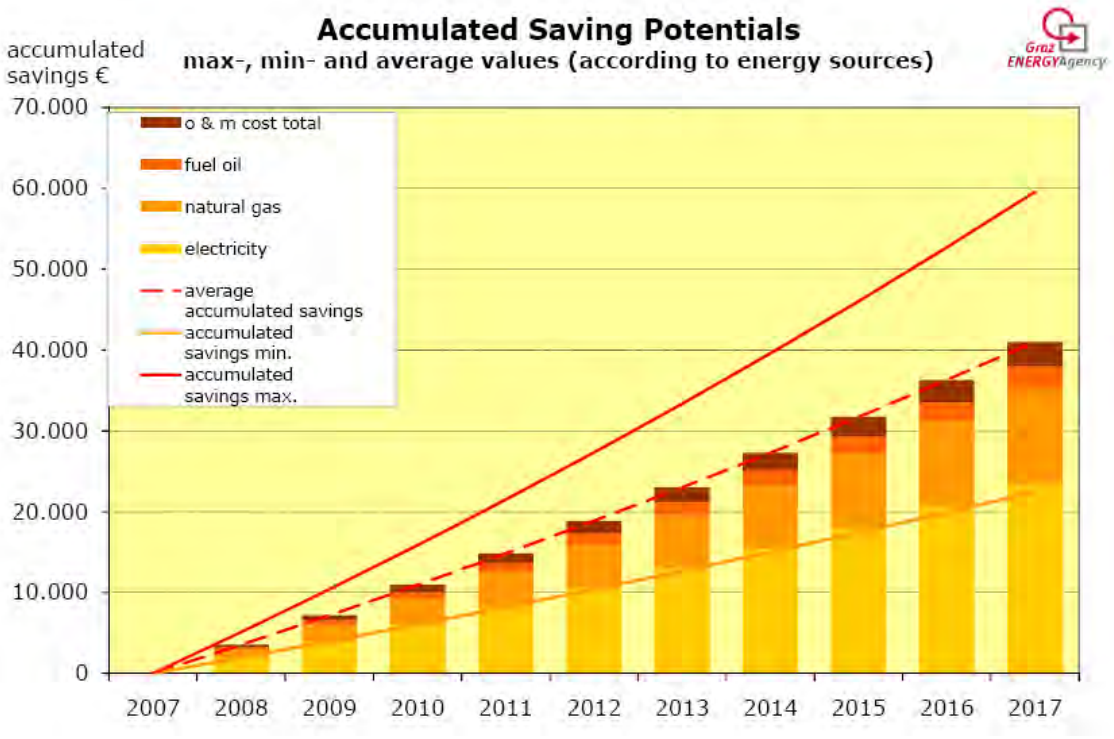

Figure 6 OpCo-Tool: Accumulated Saving Potentials (example)

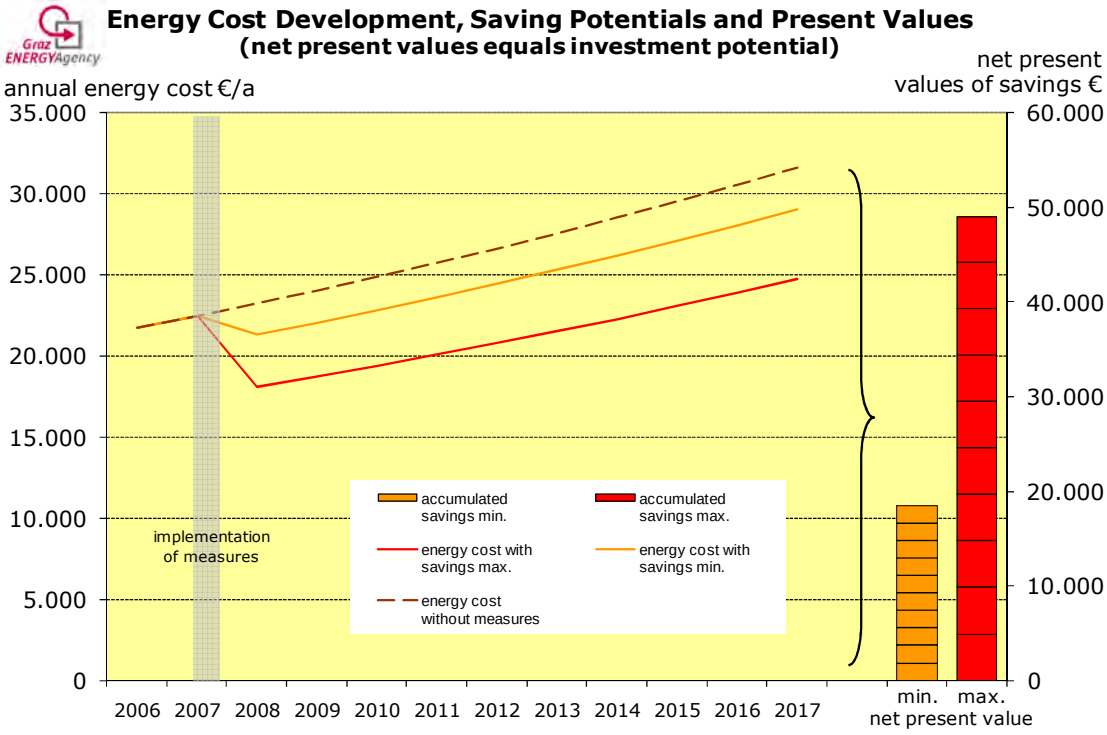

Figure 7 OpCo-Tool: Energy Cost Development, Saving Potentials and Net Present Values (example)

The publication of these results is combined with the financing manual: The Manual "Opportunity Cost Tool, Comparison and Evaluation of Financing Options for Energy-Contracting Projects" does also include the description of the "Calculation Tool for Estimation and Visualization of Monetary Saving Potentials".

Amongst others, this topic was presented at the following conferences and workshops:

Date and location	**Title and type of the event**	**Author/presenter and title of the presentation/publication**	**Regional focus**
May 10th 2007, Graz	Expert meeting and stakeholder workshop in cooperation with city of Graz and Ministry of Transportation, Innovation and Technology	2 expert presentations by Jan Bleyl were followed by a discussion: - Integration of Energy Efficiency Measures into Energy Supply Contracting Models - Opportunity Cost Tool	International focus
November 20th, 2007, by phone	Call Seminar, UNEP-SEFI Public Finance Alliance	Bleyl, Jan W.: Comparison and Evaluation of Finance Options for Energy-Contracting Projects	International focus
April 7th 2008, Vienna	ARS-Akademie Energi-Contracting Seminar	Bleyl, Jan W.; Auer, Monika: Energieeffizienzprojekte umsetzten: Energie-Contracting oder Eigenregie – eine Einführung	National focus
November 10th 2008	ARS-Akademie Energi-Contracting Seminar	Bleyl, Jan W.: Energieeffizienzprojekte umsetzten: Energie-Contracting oder Eigenregie – eine Einführung	National focus
November 14th, 2008, Brussels	Energy Forum Brussels	Bleyl, Jan W.: 1. Opportunity Cost Tool 2. Comparison and Evaluation of Finance Options for ESCo Projects	International focus
May 8th 2009, Vienna	ARS-Akademie Energi-Contracting Seminar	Bleyl, Jan W.: Energieeffizienzprojekte umsetzten: Energie-Contracting oder Eigenregie – eine Einführung	National focus

6.3 "Financing Options for ESCo Projects" (Abstract)

Availability of financial resources is one of the key success factors for the implementation of **Energy-Contracting** projects. (Pre-) Financing energy efficiency investments has become increasingly burdensome for ESCo's as well as their customers, because they reach their credit lines, credit liabilities and fixed assets burden balance sheets and Basel II and international accounting guidelines like US GAP cast their shadows.

Consequently, **innovative finance options** like operate, finance lease or "pure" Forfaiting options have to be considered (and developed further!) and compared to classical finance instruments like credits. Also the question of who is best capable of providing financing – customer, ESCo or a finance institution (FI) as a third party has to be considered. ESCo's are not necessarily the best source for finance themselves. But they can certainly help to arrange for financing.

The approach of this manual is to start from the perspective of ESCo's and their customers (companies, real estate owners or public institutions), who wish to lend money for project financing (demand side). We introduce a comprehensive **customer demand profile** to describe the customers financing requirements and specific framework. The customer demand profile encompasses criteria such as

1. Direct financing cost
2. Legal aspects
3. Securities/collateral required
4. Taxation implications
5. Balance sheet & accounting implications
6. Business Management expenditures

On the **financial supply side**, we describe properties of different finance offers (credit financing, operate and finance leasing and forfaiting) with regard to the criteria introduced in the customer demand profile. The properties are also summarized in a **comprehensive matrix** in the appendix.

To conclude, we compare the above financing offers with the customer demand, discuss their advantages and disadvantages and give recommendations for the finance preparation. We consider factors such as financing cost and fees, tax aspects, balance sheet effects, credit lines, Maastricht criteria, applicability of subsidies as well as suitable project sizes.

As a result **we advocate a comprehensive look at the sum of all business implications of any finance option**. A sole look at direct financing cost as expressed in interest rates or fees will not deliver your optimal financing solution. The best finance package depends on the borrower's background, subsidies as well as the specific project cash flow. And it requires the integration of bookkeeping and tax consultancy into the financing decision.

The proposed customer demand profile offers this comprehensive perspective and may serve as a **checklist** to be adapted to the specific situation of the customer. Likewise, the attached comparison and evaluation matrix of the different finance

options allows taking a comprehensive look at the variety of implications, which can be individually adapted to compare concrete finance offers.

Finally we propose to take advantage of **innovative financing options**, which in return require knowledgeable (leasing) Finance Institutions. For future development, e.g. a **"pure" Forfaiting** finance option based on selling the future project cash flow to an FI would be a very desirable from the customer perspective. This kind of finance model would also help to overcome some of the current balance sheet problems and share project risks according to the project partner's strength and capabilities.

Another goal of this manual is to bring the complex landscape and language of financing closer to those professionals, whose business is to develop and implement energy efficiency projects. We want to support the education of project developers and multipliers such as energy agencies or others to become more knowledgeable partners to financing institutions and real estate owners. And vice versa.

The Manual "Opportunity Cost Tool, Comparison and Evaluation of Financing Options for Energy-Contracting Projects" does also include the description of the "Calculation Tool for Estimation and Visualization of Monetary Saving Potentials" as well as practical examples of financial and operate leasing financing and forfaiting financing.

Amongst others, this topic was presented at the following conferences and workshops:

Date and location	Title and type of the event	Author/presenter and title of the presentation/publication	Regional focus
November 20th, 2007, by phone	Call Seminar, UNEP-SEFI Public Finance Alliance	Bleyl, Jan W.: Comparison and Evaluation of Finance Options for Energy-Contracting Projects	International focus
November 14th, 2008, Brussels	Energy Forum Brussels	Bleyl, Jan W.: 1. Opportunity Cost Tool 2. Comparison and Evaluation of Finance Options for ESCo Projects	International focus

6.4 "Comprehensive Refurbishment of Buildings through EPC" (Abstract)

Energy Performance Contracting (EPC) Projects, if implemented properly, have successfully delivered guaranteed savings since they were first established in Europe about 1995. Consequently the new **EU Directive on Energy End-use Efficiency and Energy Services** supports EPC and views it as an important instrument to implement energy efficiency based on market instruments.

EPC-projects realize demand reduction measures which typically encompass building technologies like HVAC, electrical applications and control systems. In most cases, building envelope refurbishment measures are excluded. As a consequence, large saving potentials are neglected in the refurbishment process and they are lost until the next comprehensive refurbishment cycle of the building some 30 years later. **Obstacles** like no integrated planning approach, too long pay back periods of the energy efficiency investment measures, procurement problems or a lack of knowledge on implementation models and various others are some of the reasons behind.

In this publication, we propose and describe **models how to integrate building refurbishment measures into EPC-models**, in order to achieve a comprehensive refurbishment (CR) of buildings as indicated above (**CR-EPC-models**). We propose three different basic models for the implementation of Comprehensive Refurbishment projects: a "**General Contractor**" (GC), a "**General Planner**" (GP) and a "**CR-Light**" **-EPC–model**. The decision for an implementation model can be taken after completion of preliminary project planning.

Factors for applicability of the models (especially for the public sector) are described out of which the most important ones are 1. share in building construction measures from project total, 2. whether functional or detailed specifications for the awarding of the CR-works and services are applied and 3. who the building owner wants to put in charge of detailed planning, overall optimization and supervision of the project: a GC or a GP?

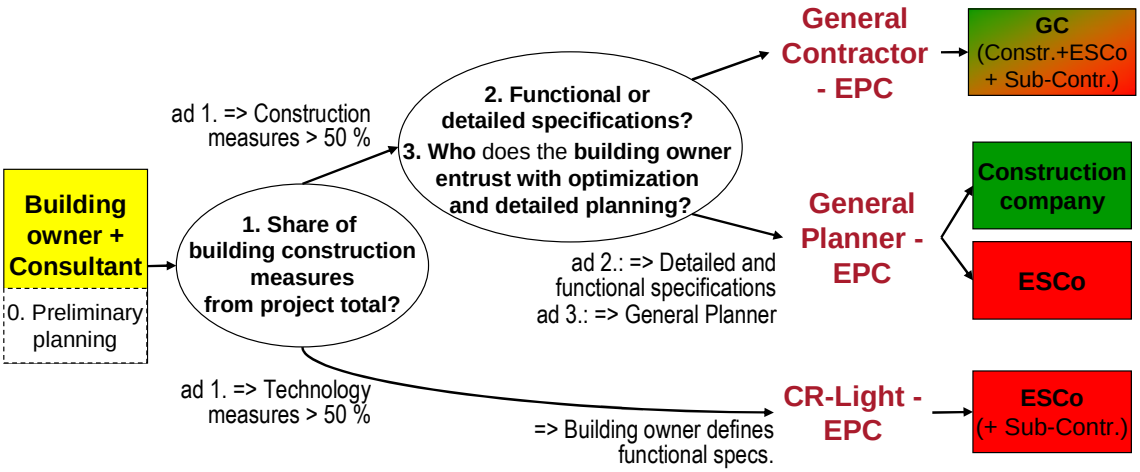

Figure 8 Comprehensive Refurbishment-EP-Model selection flow chart

To sum up, the publication gives **conclusions and recommendations** for the implementation of CR-projects and a short **outlook** on future activities and research.

Amongst others, this topic was presented at the following conferences and workshops:

Date and location	**Title and type of the event**	**Author/presenter and title of the presentation/publication**	**Regional focus**
May 2007, Nice	ECEEE 2007 summer study	Bleyl, Jan W.: Comprehensive Refurbishment of Buildings with Energy Services	International focus
October 24th 2007 Nice	ESCO Europe 2007	Bleyl, Jan W.: Comprehensive Refurbishment of Buildings with Energy Performance Contracting	International focus

6.5 "Energy Contracting: How Much Can It Contribute to Energy Efficiency in the Residential Sector? Transaction and Life Cycle Cost Analyses, Market Survey and Statistical Potential" (Abstract)

German statistics count 39,3 Mio apartments in the residential sector with a rental share of 59,4 %. Energy use for space heating and warm water in residential buildings accounts for more than a quarter of the final energy consumed in Germany. Yet, energy efficiency (EE) is not a priority for most building owners. At the same time Energy Contracting (EC) as a market based instrument to access saving potentials has climbed high on political agendas and has even reached the headlines of EE-legislation [2006/32/EC]. But the realistic potential, the limits and obstacles of Energy Service Company (ESCo) products in the residential sector are not well enough understood yet, as the limited market success and repeated statements by different stakeholders tell us.

Answers to these questions are thought in a recently completed research study for the German government. We have undertaken a conceptual analysis of Energy Supply Contracting (ESC) as the market prevailing product as well as an economic analysis of transaction cost and a life cycle cost comparison between in-house and ESCo implementation. The results are compared with the empirical data of a comprehensive market query, interviews and workshops with stakeholders and case studies. Last but not least, we studied statistical housing data to estimate suitable ESCo market potentials in the residential sector.

In this paper, we do not address legal obstacles and the split incentive dilemma, constituted by the lack of a reliable legal framework for the implementation of ESCo projects (for more details, please refer to [Eikmeier et al., 2009]).

Over the range of 30-1,000 kW_{therm} installations, the life cycle cost comparison reveals no significant cost advantage for ESCo compared to in-house projects. We found a cost effective minimum project size of 100 kW_{therm} for ESC-projects, derived from transaction cost accrued to implement ESC projects. This figure is confirmed by the market query.

The market query has further revealed around 250 ESCos, whose dominant product in the residential sector is Energy Supply Contracting. Based on their specialized know how, competent ESCos achieve an average efficiency gain of around 5 %. They are more likely to implement innovative and renewable technologies. Although there is still a lack of market data, it can be implicitly derived from other market data and results of our query that the actual market coverage for ESC in the residential sector is between 10 and 20 %.

In the German residential sector, a market potential of 12.3 TWh/a is considered "preferentially suitable" for ESC: This accounts for only 5.6 % of the total statistical demand. An additional, "conditionally suitable" potential amounts to 102.0 TWh/a, mainly limited by small size of the buildings.

We conclude that the Energy Contracting potential for the residential sector is confined by three major restrictions (in addition to the lack of a suitable legal framework):

1. Due to transaction costs the EC market potential is restricted to project exceeding about 100 kW_{th} in the residential sector.
2. Furthermore, with ESC as the prevailing ESCo product in the residential sector, efficiency gains are restricted to the boiler room. Thus savings are limited to around 20 % compared to existing (or 5 % compared to new in-house) installations, whereas the .energetic saving potential of the typical building is typically twofold.
3. The case for EC can not be built on cheaper cost primarily or other classical outsourcing arguments. Advantages of Energy Contracting can rather be found in the field of outsourcing of technical and commercial implementation and operating risks to the ESCo as well as takeover of function, performance and price guarantees by the ESCo. And if innovative technologies are on demand. Only if these features are perceived as added value by the customers, more EC-products will be able to penetrate the market.

We recommend EC product standardization to access the "conditionally suitable" market. Additional efficiency potentials of typically 20 - 50 % can only be tapped, if demand side building technologies, building envelope (e.g. building insulation, improved glazing) and targeting user behavior are integrated into energy service schemes. This could be achieved either by in-house implementation and/or innovative energy service models such as the Integrated Energy Contracting model [Bleyl 2008]. And off course the legal barriers need to be addressed.

This development requires „educated" customers to demand qualified energy services in the market. Residential building owners or more likely independent facilitators need to learn how to procure ESCo services with guaranteed results. And there is a need to finance this project development process through public money or energy efficiency funds.

This publication was produced in cooperation with Energetic Solutions, building on a project for the German Government [Eikmeier et al. 2009].

Amongst others, this topic was presented at the following conferences and workshops:

Date and location	Title and type of the event	Author/presenter and title of the presentation/publication	Regional focus
June 2009, Nice	ECEEE 09 summer study	Bleyl, Jan W.; Seefeldt, Friedrich: Energy Contracting: How much can it Contribute to Energy Efficiency in the Residential Sector?	International focus

7 National Implementation Austria (Selection)

In addition to the publication, presentation and discussion of the task results, Austrian national implementation activities were designed to execute concrete model projects. The results of the latter implementation activities are described in the next two sub-chapters.

7.1 Landesimmobiliengesellschaft Steiermark: Integrated Energy Contracting

The Landesimmobiliengesellschaft Steiermark (State Real Estate Company, Styria) LIG administers and manages more than 420 buildings in Styria, about 200 objects with an overall area of more than 700,000 m² being owned by LIG. LIG is a 100% subsidiary of the State Government of Styria, Austria [LIG 2009]. To our knowledge, LIG is the first institutional building owner that has systematically applied the concept of Integrated Energy Contracting.

The original motivation of LIG was to substitute heating oil with energy carriers that are renewable as far as possible. In the course of project development, the objectives of LIG's IEC call for tenders were extended and concretized as follows:

1. Implementing demand side saving measures with pay back times of less than 15 years in the fields of building technology, building shell and user motivation and increasing the energy indicators of the buildings;
2. Comprehensive refurbishment of all oil fired heating plants;
3. Reducing CO_2 emissions (which implies a change of energy carriers) and minimizing the overall energy cost.

In 2007/08, the first Europe-wide IEC call for tenders was executed for five buildings with a net floor area of approx. 11,000 m^2. In 2009 Pool 2, which consisted of three real estates with altogether 20.000 m^2, was procured and is currently being implemented. Commissioning is planned for autumn 2009. Still another pool of buildings is under preparation.

The call for tenders was designed as a competition of prices and solutions, based on functional specifications. It was procured in the framework of a negotiated procedure according to public procurement law. To evaluate the ESCo proposals, the following criteria were applied: 1. Lowest project cycle cost for energy supply; 2. Lowest CO_2 emissions and 3. Highest energy cost savings through demand side saving measures proposed by the ESCo.

For all short- to medium-term EE measures with a pay back period of less than 15 years, the bidders could make proposals while stating investment costs, energy cost savings and proposals for quality assurance instruments. These quotations were assessed by a commission entrusted by the client.

Up to now, two pools of buildings have been tendered for, resulting in competitive energy prices for heat supply, almost exclusively from renewable sources. On the demand side an increasing number of saving measures could be procured. In Pool 2, the following energy savings compared to the baseline resulted from the negotiated procurement procedures, subject to monitoring and verification after implementation of the measures in the buildings:

- Thermal energy: 16.8 – 30.8 %
- Thermal power: 0 – 27.6 %
- Electric energy: 4.8 – 11.8 %
- Water: 0 – 20 %
- CO_2: 92 % (primarily due to the change of the energy source (geothermal and biomass))
- Value of future cash flow change: € -15,000 up to € -250,000 including all cost of the EE measures. The negative values represent net savings over the project term.
- Quality assurance instruments (selection): review of detailed planning, "acceptance" after construction phase, computational saving verifications, adjustment protocols, thermographic recordings, measurement of solar thermal output, …

Upon completion of the construction works, the ESCo has to verify compliance with quality standards defined in the functional specifications and the QAI for the energy efficiency measures implemented, in the course of "acceptance".

The ESCo will control and operate the building technology primarily in a web based manner, also allowing access to the building owner to inquire the operating state of the installations, possible failures and consumption data. Furthermore, the ESCo will take over operation, maintenance and replacement of the installations specified in the contract.

The fact that the electricity saving rates are relatively low might indicate the necessity for better preliminary work done by the party preparing the tender specifications and, on the whole, more attention paid to the topic of electric end-use efficiency.

From the upper limit of thermal saving of approx. 30 % achieved, it is quite obvious that thermal overall refurbishment of the building shell within the specified pay back period of 15 years (this corresponds to the contractual period) cannot be implemented without additional subsidies or co-financing (from the negative savings cash flow). For future projects, it is thought about extending the amortization period in order to enable comprehensive refurbishment of the building shell and thus to implement additional energy efficiency measures.

7.2 "Good Practice" Example

The Retzhof of LIG (Landesimmobiliengesellschaft Steiermark – State Real Estate Company Styria) is a complex of buildings consisting of a castle from the 16th cen-

tury as well as two seminar and guest houses from 1960 and 2009 with an overall useful area of approx. 4,000 m^2, which are used as hotel and seminar house.

Figure 9 "Schloss Retzhof": Seminar House of the Province of Styria

The energy related initial situation before refurbishment and the new building can be summarized as follows: high energy costs, inefficient natural gas boiler, no insulation of the castle building (protection of a historic monument) as well as demolition of the old boiler house to make room for the new guest house, including the new heating centre. The consumption indicator amounted to approx. 185 kWh/m^2/year.

From the building owner's perspective, the following goals were in the centre of interest:

1. Replacing the old boiler installation due to demolition;
2. Outsourcing of energy supply and financing of the investments;
3. Reduction of energy demand and costs through demand side saving measures as well as CO_2 reduction

The project was implemented with the support of Grazer Energieagentur GmbH within an Integrated Energy Contracting Model. Central issues are: Combination of energy efficiency measures and supply of useful energy, measure specific quality assurance instruments substituting the EPC savings guarantee. The ESCo contract was awarded in a combined competition of prices and solutions in the course of a two-phase negotiating procedure. The business model is summarized in Figure 5 in the Abstract.

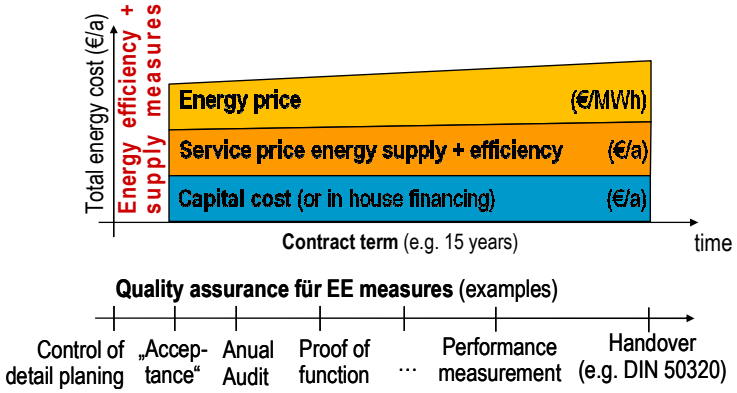

Figure 10 Integrated Energy Contracting Model with quality assurance instruments (examples) to combine energy efficiency and supply

The most important contractual relationships and cash flows are summarized in the following two charts:

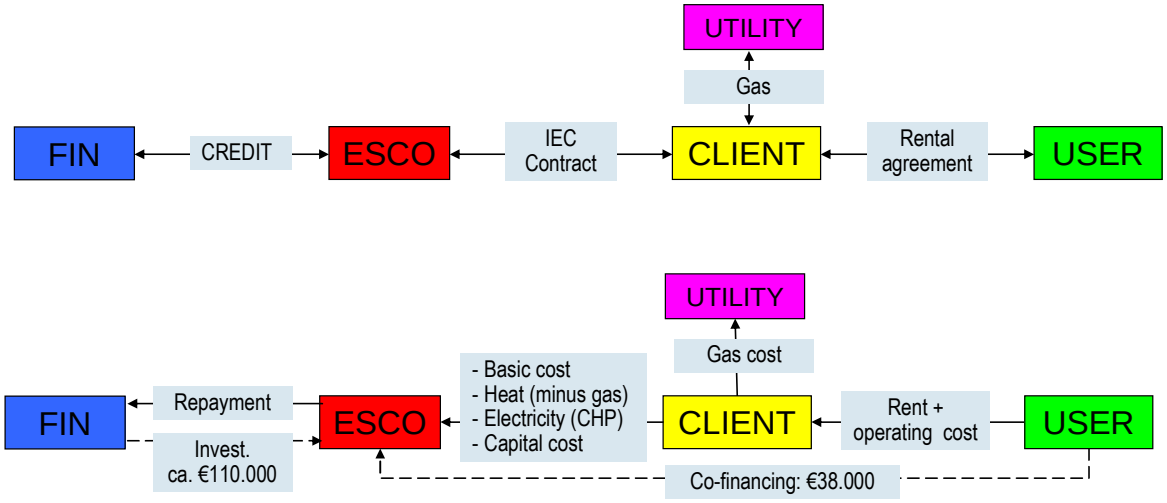

Figure 11 Retzhof: Contractual relationships and cash flows (overview)

From the building owner's perspective, some important experiences and innovative approaches of the project can be summarized as follows:

1. The combination of energy efficiency and supply of useful energy within the IEC Model basically works.
2. From the building owner's perspective, a coordinating and controlling function is even necessary for an ESCo acting as a general contractor. Especially if other building construction projects are simultaneously been carried out as in-house implementation (here: newly building the guest house).
3. The development of comprehensive energy (efficiency) projects requires committed facilitators and a long breath.
4. As for the castle, which is subject to protection of a historic monument, only the insulation of the top floor is possible without problems. The solution with cellulose blown up in an open way is cheap and functional, provided that the loft is not utilized.
5. Thanks to co-financing of the investments by using funds provided by the user of the building, the ongoing capital costs could be reduced by approx. 30 %.
6. The ESCo invests in the CHP plant upon it's own risk. Re-financing will be done by selling electric current to the building owner during the contractual period.

These results apply subject to a systematic monitoring and verification in the course of annual auditing of the buildings. Furthermore, experience from ongoing operation needs to be expected.

Amongst others, this topic was presented at the conferences and workshops which are listed in chapter 6.1.

8 Summary, Conclusions and Outlook

The success of further increasing energy efficiency will play a vital role in coping with the challenges of our common energy future. Avoiding energy consumption by increasing end-use efficiency is a highly effective way to meet all three key targets of energy policies: security of supply, affordable costs of energy services and environmental soundness.

Energy-Contracting - also labelled as ESCo or Energy Service – is a many times proven instrument to implement energy efficiency measures in the fields of lighting, heating, ventilation, air-Conditioning (HVAC), control systems or even comprehensive refurbishment of buildings. An Energy Service Provider (ESCo) takes over the technical and commercial implementation and operation risks and has to guarantee for the performance and results of the measures implemented over the project term. ESCo services are also well suited to implement innovative and renewable energy systems.

The ESCo industry is an expanding business in various parts of the world contributing to the improvement of energy efficiency, control of energy costs and reduction of greenhouse gas and other emissions. At the same time, many end-use market segments are still in a developing stage or have not reached their full potential. The two basic business models of offering energy service packages are Energy Supply Contracting (ESC) and Energy Performance Contracting (EPC), applicable with flexible scope of services and financing arrangements. Our view of the basic features of "real" Energy-Contracting projects is summarized in chapter 5.

Energy Supply Contracting projects usually achieve 15-20 % efficiency improvements in the conversion from final to useful energy. Energy performance contracting projects typically realize efficiency gains of 20-30 %. With the Integrated Contracting approach or a Comprehensive Building Refurbishment model even higher potentials can be unlocked. CO_2-Emission reductions are in many cases above 50 % because of a change to energy carriers with lower carbon content or renewables.

Task XVI has elaborated innovative contributions e.g. on "Financing Options for ESCo Projects", "Comprehensive Building Refurbishment through EPC", "How much can Energy-Contracting contribute to EE in the Residential Sector" or a "Calculation Tool for Estimation and Visualization of Monetary Saving Potentials". And a new ESCo business model labeled as "Integrated Energy-Contracting" (IEC), which combines energy efficiency and (renewable) energy supply in an integrated product [Bleyl 2009]. For a summary and conclusions on these topics we refer you to the conclusions of the respective publications in the annex of this report.

Nevertheless, Energy-Contracting still is a complex product, which can not be procured or sold easily. As it is the case with energy efficiency in general: Many obstacles root in the scattered nature and small units of end-use energy conservation potentials and must not be attributed to Energy-Contracting models.

On the way towards better developed energy service markets work remains to be done. Some general lessons which we have learned are:

- ✓ Successful market development, in particular for EPC (e.g. in the US, Germany, Austria or recently in Sweden) was demand side driven, meaning ESCo customers defined their needs and goals for energy service packages and put out request for proposals on the market.
  To enable the demand side, there is a need for capacity building and exchange of know how and experiences, e.g. with respect to procurement practices, terms of references including (functional) performance specifications and model contracts or quality assurance by the awarding authority.
- ✓ To foster market development, the role of independent market facilitators as mediators between ESCos and their (potential) clients has proved to be of great value. This role requires more active players and deserves better support!
  The facilitator's task is to consult to the customer and help him to define concrete projects, to put out request for ESCo proposals and to evaluate them. And to support the client in preparing meaningful tender documents, which describe performance specifications and the technical, economical, financial, organizational and legal framework of the energy service package to be procured and a model contract.
- ✓ Financing is not necessarily the core business of ESCos. Their core competence usually lies in technical, economic, and organizational matters of an energy service package. In many cases including a financing institution (FI) as a third party to take over financing matters and risks makes good sense.

  Financing should be individually arranged from a combination of future energy cost savings (project cash flow), third party financing, investment cost allowance (from the customer) and subsidy programs. In other words: ESCos should serve as finance vehicle, not necessarily as financiers (cf. [Bleyl+Schinnerl 2008a]).
  Weather financing is a bottleneck or not, turns out to be very different in various markets.
- ✓ Energy-Contracting is a flexible and modular energy service package. Most energy efficiency projects differ in their contents and general conditions. Therefore, it has proved to be sensible to adapt the ESCo business model (e.g. ESC, EPC or IEC) and the scope of services to the individual project. This also implies the ESCo customer may define – depending on his/her own resources – what components of the energy service will be outsourced and which components are carried out in-house, e.g. financing or regular on-site maintenance.
- ✓ Energy efficiency improvements are not the driving force for most of the projects but rather a (beneficial) side effect. Non-energy goals or benefits like investments in more effective production processes, compliance with legal requirements (e.g. emissions control or work place regulations), external appearance and image improvements or CO2-reductions are more important to business or building owners. Project developers need to listen better to the needs expressed by the customer side and to build strategic alliances to incorporate energy efficiency goals or minimum performance

standards early on in the project development process, e.g. in co-operation with property developers, building investment funds or facility managers.

- ✓ High priority should be placed on the development of concrete projects in the end-use sectors of public institutions, tertiary sector, trade and industry as well as housing. It is important to optimize investment decisions according to project (or better life) cycle cost and to ensure the results of the energy efficiency measures on a long-term basis. In this regard, ESCo models inherently have substantial advantages to offer.

The underlying goal is to increase understanding of Energy-Contracting as a flexile and high potential tool to implement energy efficiency projects. And to unbiasedly discuss advantages and disadvantages, limitations and realistic potentials of outsourcing energy service packages to ESCos in comparison to in-house implementation.

This list does not claim to be exhaustive and country specific additions and adaptations to these proposals for National Implementations Activities are suggested, off course.

Task XVI was extended for a 2nd three year period until June 2012 as decided by the IEA DSM Executive Committee. Work is being continued within it's established structure consisting of the Energy Service Expert Platform, individual National Implementation Activities, carrying out research on innovative Energy-Contracting models (Think Tank) and nationally and international dissemination activities:

- ✓ Think Tank research and documentation will be conducted in a number of areas, e.g.
  - A new "Integrated Energy-Contracting" (IEC) model to combine energy efficiency and supply (from renewable sources) was recently introduced. Secondly, the IEC model proposes to apply qualitative and quantitative quality assurance instruments to verify energy savings without baselines. (Task XVI discussion paper, published in October 2009, download available from www.ieadsm.org)
  - (Public) procurement of energy services: A guide how to purchase a "real" energy service package (scheduled for publication in 2010)
  - Comprehensive refurbishment of buildings (continuation): Extending the scope of ESCo services to the building shell. Collection and documentation of good practice examples (scheduled for publication in 2010)
  - Calculation tools for procurement of energy services, e.g. for comparison of different ESCo offers and in house implementation cost including non-monetary criteria

  Further topics will be proposed by the OA and decided in mutual agreement with the country experts.
- ✓ All country experts will continue to conduct country specific National Implementation Activities (NIAs) in order to support capacity building, market development or initiation of model projects. Already ongoing activities can be integrated into the NIAs.

- ✓ The Energy Services Expert Platform will continue to serve the country experts mutual exchange and networking, to support national implementation activities and communication with their stakeholders and to provide access to innovative and competitive Energy service models and tools from the Think Tank.
- ✓ Task XVI has received considerable interest in its previous work and publications, inter alia expressed in invitations to conferences and workshops to more than fifteen IEA as well as non IEA countries. This international and national dissemination activity of Task XVI work will be taken further and will also enhance the visibility of the DSM program as a whole. The task will also continue to organize stakeholder workshops in conjunction with its bi-annual expert platform meetings.

In order to achieve energy policy goals and sustainable cost reductions, there is an urgent need to support all suitable political, regulatory and market based instruments for the implementation of Energy Efficiency and Renewables. Accessing energy saving potentials through outsourcing to an ESCo or in-house implementation remains one of the most important and, at the same time, most demanding tasks, which can only be advanced in a concerted action with as many players active in energy policy and industries as possible.

ESCo models offer integrated solutions for the project life cycle, encompassing planning, construction and operation & maintenance. Energy-Contracting is an interdisciplinary approach, which takes care of technical, economical, financial, organizational and legal aspects of the implementation process in order to achieve guaranteed performance and results of the efficiency technology deployed. This highly integrated and multidimensional approach opens up solutions, which are not achievable through a standard, disintegrated implementation process, e.g. life cycle cost optimization across investment and operation budgets or integrated planning or performance guarantees over the complete project cycle, all summarized in one ESCo contract.

At the same time this requires well educated stakeholders on the customer and the ESCo side with an understanding and resources of all the disciplines involved. And it requires new organizational routines, in particular on the customer side, e.g. with regard to procurement practices, interdisciplinary co-operations between different departments and project engineers or long-term cross-budgetary financial management. Last but not least: The decision of the building or business owner to tap into energy efficiency resources (either voluntarily or forced by regulations) remains a basic requirement – independent of the implementation model.

Strong efforts on all levels of policy framework, capacity building and concrete market development remain to be done on the way to better developed energy service markets and to more competitive energy service products. In case of questions or ideas for further co-operation, your feedback is highly welcome. You can reach the authors at bleyl@grazer-ea.at or schinnerl@grazer-ea.at.

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11.6 IEA Demand Side Management Programme (short description)

'Promoting Energy Efficiency and Demand-Side Management for global sustainable development and for business opportunities'.

The Demand-Side Management (DSM) Programme is one of more than 40 co-operative energy technology programmes sponsored by the International Energy Agency (IEA).

Since 1993, the IEA DSM Programme has worked to develop and promote tools and information on demand-side management and energy efficiency. As a result of this collaborative work between countries in Asia, Europe and North America, the programme has created a 'tool box' of resources and information for governments, utilities and energy companies to help them incorporate DSM measures in their energy policies and activities.

Thus, for whoever wants to develop or use demand side management activities or related policies and for whatever purposes, the IEA DSM Programme should be the natural first resource to consult to make use of experiences learned and to further develop DSM and Energy Efficiency tools.

Objectives

The Programme has two major objectives directed at its two major stakeholder groups. The Programme will provide to:

(a) governments of the participating countries, increased capabilities to develop policies and programs for more effective use of DSM and energy efficient products [Government includes administrations, authorities, regulators etc and their associations.] and to

(b) energy businesses, the information and tools necessary to create new cost-effective products and services in response to domestic and global opportunities. [Energy businesses include system operators, transmission and distribution companies, brokers, wholesalers, utilities and their associations. Suppliers of "enabling hardware and software technologies" are included in this category.]

But the Programme should also enable access to information to

(c) stakeholders that advocate energy efficiency and sustainable energy systems arguments and knowledge about the opportunities.

You can find more detailed information at the website of the IEA demand side management: www.ieadsm.org.

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