SUSTAINABLE ENERGY IRELAND

# Assessment of the Potential for ESCOs in Ireland





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## TABLE OF CONTENTS


**Executive Summary** 1

**1. Introduction** 4

1.1 Background 5

1.2 Objectives 6

1.3 Approach 7

**2. Energy Policy and Regulatory Review** 8

2.1 Policy Overview 8

2.2 EU Legislative Review 9

2.3 Domestic Regulatory Review 12

2.4 Summary of Policy and Regulatory Situation 13

**3. Review of Energy Prices** 15

3.1 Gas Prices 15

3.2 Electricity Prices 15

**4. ESCO Definitions** 18

4.1 EU Definition 18

4.2 UK Energy Systems Trade Association (ESTA) 19

4.3 National Association of Energy Service Companies (US) 20

4.4 Swiss Contracting 22

**5. Survey of European Energy Service Companies** 23

5.1 Maturity of the Industry 23

5.2 European ESCO Associations 24

5.3 Operating Sectors 24

5.4 ESCO Product Offerings 25

5.5 ESCO Contract Types 26

5.6 ESCO Market Drivers 31

5.7 Barriers to ESCO Market Development 32

5.8 Lessons Learned in the Establishment of ESCO Markets 33

5.9 Country Specific Measures to Promote the ESCO Industry 34

**6. The Irish ESCO Market** 39

6.1 Existing Irish Energy Services Companies 39

6.2 Perceived Barriers to ESCO Development in Ireland 40

6.3 Potential ESCO Industry Market Size 41

**7. Options for ESCO Market Development** **51**
7.1 Summary of ESCO Market Barriers 51
7.2 Option 1: Intermediary Agency 52
7.3 Option 2: Public Sector Take Up 55
7.4 Option 3: ESCO Business Model 57
7.5 Other Options 60
7.6 Implementation Strategy 62
7.7 Further Research 65

**8. Cost-Benefit Analysis** **66**
8.1 Impact on Ireland's Carbon Footprint 66
8.2 Sensitivity Analysis 68

**9. ESCO Case Studies** **69**
9.1 Thameswey Energy Ltd. 69
9.2 RWE Solutions 73

## FIGURES

Figure 1 ESCO Model as defined by the Swiss Contracting association

Figure 2 Sectors Targeted by ESCO's

Figure 3 Third Party Financing with ESCO borrowing

Figure 4 Third Party Financing with energy user/customer borrowing

Figure 5 Simplified Model of Non-Recourse Project Financing

Figure 6 Details of the German ECO Tax 1999-2003

Figure 7 Proposed Irish ESCO Business Model

Figure 8 Possible ESCO Charging Models

Figure 9 Project Economics of a 200kW$_e$ Fuel Cell CHP, 2003[34]

Figure 10 Ireland $CO_2$ Emissions and Distance to Kyoto Target

Figure 11 Market Prices over time by Consumer Group

Figure 12 Average daily demand projections

Figure 13 Idealised Structure of the Irish Gas Market

Figure 14 Brent Crude Forward Market as of February 2005*

Figure 15 NYMEX Crude Oil Futures Price Quotes as of September 2005

Figure 16 Historic Electricity Prices

Figure 17 Generator Maximum Continuous Output

Figure 18 System Availability

Figure 19 Impact of EU-ETS prices on Electricity Prices

**APPENDICES**

1. Domestic Energy Regulations

2. Review of Energy Prices

3. ESCO Industry Questionnaire

4. Potential $CO_2$ Abatement Values

5. The Reality of Industry Payback Criteria

6. Feedback from ESCO Workshop

7. The UK Enhanced Capital Allowance Scheme Energy Technology List

8. Hidden Cost Ranges Industrial and Non-Domestic Sectors

# Executive Summary

This study, commissioned by Sustainable Energy Ireland, is aimed at assessing the potential for energy service companies (ESCOs) in Ireland as a mechanism for energy efficiency. For clarity we will adopt the EU definition of an ESCO as a company that: guarantees energy savings and/or the provision of the same level of energy service at a lower cost through the implementation of an energy efficiency (or renewable energy project) and is rewarded based directly on the energy savings achieved. This is also known as Energy Performance Contracting.

The market for ESCOs is well established in some EU countries, however the uptake in Ireland has been slow. This is due largely to a lack of awareness of the ESCO concept, a lack of regulatory targets/incentives for energy efficiency, reluctance to risk outsourcing energy services and possibly a lack of attention from international ESCOs who have been focussed on larger markets. This study is aimed at developing potential options that could be used to improve the uptake of energy services via the ESCO model.

## Approach

The approach taken has centred on five main tasks:

- A review of Irish/EU regulations regarding energy and energy efficiency that may have an impact on energy prices and the ESCO market;
- An assessment of European ESCO's and ESCO Associations in order to understand the nature of the ESCO business, products offered and business models in place;
- An assessment of the Irish energy services market to determine existing status and future potential;
- Analysis and presentation of options for future policy initiatives;
- Obtaining feedback on report findings and development options from a delegation of energy service providers, government representatives and potential energy service consumers.

## Regulatory and Market Development Factors

In general, the existing and planned Irish and EU regulatory environment regarding energy and energy efficiency is highly favourable for the development of an ESCO industry in Ireland. Examples of such regulations include:

- Draft EU Directive on energy end-use efficiency and energy services;
- Emissions Trading Directive;
- Energy Performance of Buildings Directive;
- Directive on the production of electricity from Renewable Energy Services;
- Directive on the Promotion of Cogeneration.

With regard to energy prices, (which will have an impact on the uptake of energy efficiency measures and hence energy services), domestic market developments allow us to project a downward trend over the long term. However in the short to medium term the drivers are trending upwards, and in combination with the current geo-political situation

regarding energy markets, the existence of spiralling fuel costs represents a favourable environment for energy service companies to develop.

## Barriers to ESCO Market Development

The main barriers to ESCO market development have been identified as:

- A lack of customer knowledge/awareness;
- The transaction costs of implementing energy service contracts (particularly in the public sector);
- Reluctance from organisations to enter into long term contracts;
- A perceived fear or unwillingness to outsource energy services;
- Energy savings are not a priority due to a lack of targets regarding energy reduction/efficiency.

## Report Key Findings

- The existing Irish market for ESCOs is minimal (only two organisations could classify themselves as ESCOs). However there are a significant number of organisations currently acting as energy service providers (without the energy performance contracting element);
- The cost effective potential market size for ESCOs in Ireland is estimated to be €49 – €110 million per annum by 2020.
- In order to maximise potential, it is proposed that ESCOs in Ireland adopt flexible (or customised) contractual arrangements with clients and be governed by the following key principles regarding ESCO involvement:
    - They will act as a single source to clients in the provision of energy services
    - They will operate performance based contracts offering one or more of:
        - ◇ A guarantee of energy savings
        - ◇ A guarantee of plant performance
        - ◇ A guarantee of energy cost rates
    - They will enter into ongoing/long term partnerships with clients
- Drawing on innovative developments from other countries, the following options for ESCO market development should be considered by policy makers:
    - Incorporate responsibilities for promoting and supporting, financially, a limited number of ESCO projects into an existing government agency;
    - Focus should be centred on the public sector to create exemplar case studies (without neglecting the industrial and commercial sectors);
    - Measures to further promote the up take of energy efficiency should be developed. These could include implementation of instruments such as:

- ◇ An enhanced capital allowance scheme – allowing 100% tax write-off for purchases of specific energy efficient equipment thus improving the cash flow and payback for ESCO type projects

- ◇ The achievement of specific energy efficiency targets for industry and commerce (such as those defined in the Draft Directive on Energy Efficiency and Services) implemented through a white certificate trading scheme.

A simple cost/benefit analysis of the proposed options for ESCO market stimulation estimates a highly positive NPV due to the cumulative nature of the benefits/energy savings. Expressed in terms of tonnes of Carbon ($CO_2$) emissions, this equates to a total saving of over 200,000 tonnes over a ten year period.

# 1. Introduction

ESCOs offer a range of services that can help end users buy and use energy efficiency cost-effectively. They typically promote performance contracting as a financial mechanism for encouraging the use of their services, thus guaranteeing a level of savings from an improvement programme and receiving payment from those savings. The benefit for customers is that they take on minimal risk while entering into the contract, which can help overcome some barriers to implementing energy efficiency projects.

Another potential motivation for ESCOs is the desire to concentrate on core business, which has led to the trend of out-sourcing. An ESCO can accumulate specialist knowledge, exploit economies of scale and use longer paybacks because risk is shared over several projects. If an ESCO happens to be a state owned or semi-state utility it can obtain finance on better terms as part of State-guaranteed borrowing and can therefore offer attractive packages to customers (assuming market liberalisation has not occurred).

Experience throughout the EU and elsewhere has shown that an active ESCO market results in greater energy efficiency outcomes and consequently $CO_2$ emission reductions. The energy services market is relatively well established in the US and elsewhere in Europe. Additionally, a draft EU Directive on energy end-use efficiency and energy services proposes, inter-alia, the introduction of targets for cumulative annual energy savings for both the private and public sectors, and that member states make instruments and contracts available to public and private purchasers of energy services and energy efficiency measures.

However, the development of an energy services market in Ireland has been slow. Suggested reasons for this slow uptake include:

- A lack of awareness of the ESCO concept (and value it can provide) from potential consumers of energy services and financial institutions;
- A lack of incentives and regulations to focus organisations' attention on addressing energy use and efficiency;
- A reluctance to outsource energy services based on fear (perceived or real) of a loss of control and/or the potential for redundancies;
- A reluctance from existing energy service providers to risk entering into agreements that link payment to performance under contractually binding arrangements;
- International ESCOs focussing attention on larger, more lucrative markets (such as the UK, Germany etc.) where ESCO penetration has still to reach maximum potential.

This study is aimed at assessing the market for ESCOs (in the rest of the EU as well as Ireland), with a view to developing options to be considered by policy makers, in order to help stimulate the market in Ireland.

## 1.1 Background

The European Climate Change Programme fosters the need for both an increase in the penetration of renewable energy sources as well as end-use energy efficiency. In doing so it aims to improve the security of energy supplies and meet international climate change obligations.

It has been estimated that the cost effective potential for improvement arising from end-use energy efficiency (EE) measures lies in the region of 20% (across all sectors of the economy).[1] Enviros Consulting has over 20 years experience in the implementation of energy efficiency programmes in industry and the commercial/public sectors. In our experience a significant proportion of EE measures can be achieved at no or low cost, which in economic terms favours them over others, (e.g. clean technology or renewable energy) in the attainment of climate change targets. End use energy efficiency can also act as an alternative to new capacity in order to meet future supply shortfalls. This may also be of particular relevance to Ireland in the coming years, as electrical generating capacity struggles to meet demand requirements.

The market in Europe and the US has been in existence since the 1970's, having developed when firms attempted to establish energy performance contracting as a viable, self-sustaining business activity, following the OPEC oil crises. Within the EU, the ESCO model has been developed and promoted by the European Commission since 1988, with early initiatives aimed at promoting the ESCO concept, and the use of third party financing. Additional support measures from the EU have come via the THERMIE and SAVE programmes, the publication of two standard ESCO-type contracts in 1996 and more recently the GreenLight, Green Building and Motor Challenge Programmes.

However, there is growing evidence that the achievement of the aforementioned 20% energy efficiency objective may prove more difficult than would be expected from a rational and economic point of view. Enviros is currently working with DEFRA in the UK, as part of its Energy Efficiency Innovation Review. This project is assessing the true hidden costs, or barriers, to the take up of energy efficiency measures, as a result of the failure of energy efficiency promises to meet expectations. Another study by Stavins et al, Harvard University in 1999, notes that in the US, actual energy savings from utility sponsored programmes only achieved 50 - 80% of the predicted saving and that actual internal rates of return on domestic energy conservation investments were 10% rather than the engineering estimates of 50%.[2]

The barriers or hidden costs associated with the take up of energy efficiency technology can be summarised as:

- *Lack of information about technologies/practices in society*. At the societal/market level, a well-working, efficient market is characterised by perfect (or near-perfect) information flow. To the extent that public information is not communicated efficiently, the market is imperfect and represents a market failure. The example of the difference between perceived benefits of smoke alarms and their actual benefits is such an example of this failure.

- *Principal/agent problem*. In some cases, the party that makes the purchase is not the one who pays the bills for the use of the technology. A well cited example is where the builder of a new house cannot credibly represent its energy efficiency to the buyer, in which case the sale price does not reflect its efficiency rating. Similarly, a landlord may not be able to recover all of the value of the energy efficiency investments when

[1] European Commission, June 2005, Green Paper on Energy Efficiency or Doing More With Less
[2] Jaffe, Newell, Stavins, Resources for the Future, 1999, Energy Efficient Technologies and Climate Change, Issues and Evidence.

tenants pay the fuel bills. Those living in nursing homes (or apartments) where utility costs are included in the rent may not see any incentives to conserve energy.

- *Distorted prices.* Consumers do not always face the true costs of the energy they use. Average pricing instead of marginal cost pricing for natural gas and electricity is one example where prices are artificially low and conceal the true cost of new energy supplies. Subsidies through uninternalised environmental externality costs from fossil energy and hydroelectric, also distort prices away from their true level.

- *The hassle factor.* It costs something to learn about a new device or appliance and how a technological improvement fits into one's home or firm. There may also be greater costs in learning about the reliability of suppliers of new technologies than in learning about the reliability of suppliers for proven technologies. The purchase price of a new product is the lower limit of its true cost.

- *Risk aversion.* Consumers are often risk averse. Whereas capital costs for energy efficient investments are fixed and known, the savings are often uncertain, depending on prices of energy and rates of usage. As such users apply high discount rates to energy efficient investments. In some instances, especially where prices of products are falling, eg condensing boilers or variable speed drives (VSDs), a consumer may save more by waiting for prices to reach a given level later than could be saved on operating costs with a current purchase. It can be shown that it can pay to wait, despite the fact that the current net benefits of take up of the technology are positive.

- *Access to capital.* In many organisations, even though energy saving projects can demonstrate adequate returns, there is limited capital for such investments. This is common through the economy but is even more acute in the public sector where raising external finance is less practised. In addition, intermediaries, such as banks often have an aversion to the risk associated with early adoption of new technologies and techniques, leading them to continue to support out-dated technology and concepts.

The ESCO concept it is believed can help overcome some or all of these barriers and a significant opportunity exists for it to help deliver on energy efficiency expectations. There is however still a need for policy support in the form of help for the dissemination of ESCO activities, quality standards, and access to finance, as the industry is still at an infancy stage in Ireland.

## 1.2 Objectives

The aim of this study is to understand the nature of the ESCO market as it exists in Europe currently, identify where it has developed successfully and determine the reasons for that success (as well as looking at the barriers to development) with a view to presenting options to policy makers for the promotion of ESCOs in Ireland. The study will:

- Define what an ESCO is and the types of services they offer;

- Summarise the Irish market and look at regulatory developments for energy with a view to addressing the likely impact of these developments on energy services in the short, medium and long terms;

- Identify international markets/countries where ESCOs have been successfully introduced, highlighting countries with comparable markets to Ireland and establishing the key elements of the successful introduction of ESCOs;

- Assess the potential size and scope of the ESCO market in the Irish economy, with particular attention to the industrial and tertiary sectors;

- Identify ESCO companies or companies offering ESCO type services in the Irish market, as well as companies operating in other EU countries with the ability to operate in Ireland;

- Identify the types of contracts and business models being used, in Ireland and elsewhere, with a view to determining which types have a prospect of being effective in Ireland;

- List the product offerings of a typical ESCO or of an ESCO likely to succeed in the Irish market;

- Identify the barriers to market development in the current policy and market service environment in Ireland;

- Identify any current or proposed EU legislation and/or programmes that could aid or inhibit the development of an ESCO market in Ireland;

- Consider the effects of energy prices on the ESCO market in Ireland;

- Develop a set of options that could be used for market development with energy efficiency as the prime objective; to include short, medium and long term options and strategies at both policy and programme levels, and an estimate of cost vs. benefits for each.

## 1.3 Approach

The approach taken has centred on five main tasks:

- A review of Irish/EU regulations regarding energy and energy efficiency that may have an impact on energy prices and the ESCO market;

- An assessment of European ESCO's and ESCO Associations in order to understand the nature of the ESCO business, products offered and business models in place;

- An assessment of the Irish energy services market to determine existing status and future potential;

- Analysis and development of options for possible future policy initiatives;

- Obtaining feedback on the report findings through a workshop attended by energy service providers, government representatives and potential energy service consumers.

# 2. Energy Policy and Regulatory Review

In assessing the potential for ESCOs to operate effectively in Ireland, it is important to understand the direction of energy policy within Ireland as well as the structure, conduct and performance of the Irish energy market. Energy policy is briefly reviewed in section 2.1 below. This is followed by a review of the key European legislation drivers in Ireland in section 2.2 and domestic regulations in section 2.3.

## 2.1 Policy Overview

The Irish energy policy landscape is defined by three intersecting themes: Competitiveness of supply to consumers, Sustainability, and Security of Supply[3]. The policies and legislation developed to support these themes may not always be consistent. For example, market liberalisation, under the competitiveness of supply objective, is ultimately aimed at reducing costs for consumers. However under the theme of sustainability, it is likely that the cost of energy will increase, as more costly, renewable technologies are implemented.

Responsibility for implementing energy policy lies with a range of organisations, including:

- Department of Communications, Marine and Natural Resources (DCMNR)
- Department of Heritage, Environment and Local Government (DHELG)
- Sustainable Energy Ireland (SEI)
- Commission for Energy Regulation (CER)
- Environmental Protection Agency (EPA)

As well as the above policy themes, the Irish energy market is characterised by a number of physical constraints and existing policy decisions. These include:

- Limited indigenous fossil fuel sources – Fossil fuel in Ireland is limited to some off-shore natural gas fields and peat sourced from wetland bog. Each of these fuels has limited supply potential evident by the fact that Ireland now imports 89% of its energy needs[4].
- Nuclear power has been ruled out as a viable resource – although plans had been proposed to build four nuclear power stations in the 1970's, these were abandoned in the face of mounting public opinion on the subject, which still exists today.
- Limited potential for new hydro power – there are five large scale hydro power projects in place in Ireland (all owned by the ESB). This has not changed since 1990 and no new projects are planned. The practicable resource for small scale hydro has been estimated as approximately 38MW, but it is unlikely that this will be realised in the short to medium term. [5]
- Limited electricity interconnection capacity – with the exception of the limited capacity available on the North-South interconnector, Ireland's electricity market is completely isolated from wider European markets (although new capacity on the

[3] International Project Financing Association, Irish Energy Briefing, April 2005, Irish Energy Policy and Priorities, Bob Hanna, Chief Technical Advisor (Energy), DCMNR
[4] Sustainable Energy Ireland, January 2005, Energy in Ireland 1990-2003 Trends, issues and indicators
[5] Sustainable Energy Ireland, August 2004, Renewable Energy in Ireland, Trends and issues 1990-2002

North-South interconnector is planned as part of the All Island Energy Market and an interconnector between Ireland and Britain is to be developed).

- Ireland's peripheral location in terms of the gas chain/pipeline – With the UK expected to become a net importer of gas in 2005, Ireland will be the end consumer on a trans-European gas pipeline with the greater potential for supply disruptions that arises as a result.

The combination of interactions across policy themes, plurality of responsibilities for implementing policy and physical constraints creates significant uncertainty for long term energy price forecasting and hence decision-making for energy suppliers. This applies as much to ESCOs as all firms involved in the energy supply chain.

## 2.2 EU Legislative Review

This section identifies the main current or proposed EU legislation that will impact on the market for ESCO's in Ireland. This is provided by seven pieces of legislation:

- Dir 2003/87 – Directive on Establishment of an Emissions Trading Scheme
- Dir 2001/77 – Promotion of electricity produced from renewable energy sources in the internal electricity market;
- Dir 2002/91 – Energy Performance of Buildings;
- Dir 2003/54 – Common rules for the Internal Market in Electricity;
- Dir 2004/8 - Promotion of cogeneration based on a useful heat demand in the internal energy market;
- Dir 2004/18 – Coordination of procedures for the award of public works contracts, public supply contracts and public service contracts;
- COM 2003/739 – Draft Directive on energy end-use efficiency and energy services.

**Dir 2003/87 – Directive on Establishment of an Emissions Trading Scheme**

The EU Emissions Trading Directive sets installation level targets for large $CO_2$ emitting facilities throughout Europe. It instructs that national authorities provide a cap or allocation for each entity in the scheme based on a set of rules. Companies can then trade allowances in an EU wide market from 2005. The Kyoto Protocol provides that emissions trading will commence from 2008 among Annex B Parties and, accordingly, the proposed EU scheme is a forerunner for this international scheme covering initially the period 2005-2007.

Participation in the trading scheme is mandatory for certain activities above set thresholds. For Ireland the main participants include the power generation sectors and high energy-intensive sectors. The Directive is concerned only with certain activities which relate to the emissions of $CO_2$.

**Dir 2001/77 - Promotion of electricity produced from renewable energy sources in the internal electricity market**

The purpose of this directive is to increase the contribution of renewable energy sources to electricity production and requires member states to set national indicative targets. In the Annex to this directive, the Commission recognised that in Ireland the contribution of RES-E (Electricity generated from Renewable Energy Sources) was 3.6% of gross electricity consumption in 1997, and gave a target value of 13.2% by 2010. In accordance with this Directive, the Department of Communications Marine and Natural Resources, reported progress to the Commission in 2003. The report suggested that by 2010 renewable energy would contribute to 11.17% of the gross electricity consumption, resulting in a shortfall of some 2%. It is noted that the predictions include only projects under the 2005 and 2006 support programmes. This Directive clearly presents an opportunity for ESCOs specialising in renewable energy projects.

**Dir 2002/91 – Energy Performance of Buildings**

The purpose of this Directive is to improve the energy performance of buildings in the Community and requires the application of minimum requirements for energy performance for both new buildings and major retrofits or large buildings (above 1000$m^2$ of useful floor area), the introduction of energy certificates and regular inspections of boilers and air-conditioning systems, and heating installations where the boilers are more than 15 years old. The increase in regulation surrounding the initial installation and operation of energy services within buildings may encourage the building owners to "out-source" the supply, operation and maintenance of such energy services, thus creating an opportunity for ESCOs.

**Dir 2003/54 – Common rules for the Internal Market in Electricity and Dir 2003/55 – Common rules for the Internal Market in Gas**

These Directives define the rules for the operation of the internal market in electricity and gas and ensure, inter-alia, the non discriminatory access for new entrants to existing transmission and distribution infrastructure. The Electricity directive also allows the preferential dispatching of generating installations using renewable energy sources and/or combined heat and power. The expected outcome of these Directives is to increase competition in the supply of energy, leading to a reduction in prices for consumers. However, falling prices for energy do not encourage either careful consumption or investments in energy efficiency. Consequently, a dilemma of increased consumption resulting from lower prices caused by the introduction of market forces exists which acts as a potential hindrance to the development of an ESCO market.

**Dir 2004/8 - Promotion of cogeneration based on a useful heat demand in the internal energy market**

This Directive requires the Commission to establish harmonised efficiency reference values for cogeneration at the latest by 21/02/06. Based on the reference values Member States should then within six months introduce guarantees of origin for electricity produced by high efficiency cogeneration. The Directive also requires Member States to establish analysis of national potential for HE cogeneration and separately to analyse barriers to achievement of potential, thereafter reporting to Commission every four years on progress on increasing the share of high efficiency cogeneration. Member States are also expected to ensure that support schemes for cogeneration are based on useful heat demand and primary energy savings. Member States may also facilitate access to grid system for electricity produced from small scale and micro CHP. CHP is a core offering of many ESCO's in Europe, and as such any moves by the Commission to support and further improve the take-up of CHP will come as a boost to the industry.

**Dir 2004/18 – Coordination of procedures for the award of public works contracts, public supply contracts and public service contracts**

This update to previous directives on Public Procurement, introduces a new procedure for public procurement, the "Competitive Dialogue", which may be used where the contracting authority is pursuing a 'particularly complex' public contract. A public contract may be considered 'particularly complex' where the contracting authority is not able to objectively define the technical means capable of satisfying their needs and objectives and/or not able to specify the legal/financial make up of a project. In the competitive dialogue "the contracting authority conducts a dialogue with the candidates admitted to that procedure, with the aim of developing one or more suitable alternatives capable of meeting its requirements, and on the basis of which the candidates chosen are invited to tender.

In 2004 the Commission also issued a Green Paper (COM 2004/327) on Public Private Partnerships with the objective of launching a debate on the application of Community law to PPP. It is interesting to note that the Green Paper considers PPP's as "forms of cooperation between public authorities and the world of business which aim to ensure the funding, construction, renovation, management or maintenance of an infrastructure or the provision of a service." Clearly the engagement of ESCO's by a public body would fall within this broad definition.

In this Green Paper the Commission stated its view that the introduction of the competitive dialogue should provide interested parties with a procedure which is well adapted to the award of contracts designated as public contracts.

**COM 2003/739 – Draft Directive on energy end-use efficiency and energy services**

On the 10th December 2003, the Commission issued a proposal for a Directive on Energy end use efficiency and energy services. This proposal is issued under the co-decision mechanism, and has already received opinions from the European Economic and Social Committee (EESC) and the Committee of the Regions (CoR). It was discussed at the Council on 29th November 2004 where it was been revised and then sent to Delegations from the Member States. On 7th June 2005 the European Parliament approved the draft with amendments. The revised draft was then submitted for discussion at the Council on 28th June 2005.

The outcome of this discussion was that national energy ministers rejected the binding proposals, replacing them with indicative targets only, though member states would still be obliged to achieve a 6% reduction in energy consumption over a six year period. Moreover, ministers also scrapped the Commission's suggestion to set higher targets for the public sector - at +1.5% per year - and replaced it with an assertion that governments ensure the public sector plays an exemplary role in fulfilling the directive's requirements.

The next steps for the directive involves the ministerial agreement to be formalised at a later Council meeting and transmitted to the Parliament (co-legislator on the matter) for a second reading. If no agreement can be found between Parliament and Council, the matter will be referred as a last resort to a special conciliation committee

This Directive:

- Introduces targets for cumulative annual energy savings for both the private and public sectors. Sectors covered by the EU Emissions Trading Scheme and IPPC Regulations are excluded from the scope. In the amendments rejected by the ministers, these targets were defined as: Private Sector - 3% for the first 3 years, 4% for the subsequent three years and 4.5% for the final three years; In the Public Sector equivalent targets of 4.5%, 5.5% and 6% had been proposed, however, as stated these higher limits have been rejected.

- Requires that energy distributors or retail energy sales companies refrain from any activities that might impede the delivery of energy services;

- Requires that member states remove any national legislation that impede or restrict the use of financial instruments and contracts for energy saving, and make instruments and contracts available to public and private purchasers of energy services and energy efficiency measures;

- Allows the Member States to establish funds to subsidise financial instruments for energy savings, in addition to delivery of energy efficiency programmes and other energy efficiency measures.

## 2.3 Domestic Regulatory Review

The main domestic regulations that will likely have an influence in an ESCO market in Ireland are summarised below, with further detail included in Appendix 1.

- *Market liberalisation* – As of February 2005, all customers are now free to choose their electricity supplier (although to date, domestic customers still have no choice due to a lack of entrants in the market, and the ESB still retains 80%+ market share) and full market opening in the gas market is expected by the end of 2005.

- *Renewable Energy* – A competitive tender process (the Alternative Energy Requirement (AER) programme) has operated since 1995 to ensure lowest cost development. However, not all those awarded contracts proceeded with developing projects. Recently the government announced a change in the renewable energy support mechanism to a fixed feed-in tariff system to encourage capacity development to meet targets under the RES-E, as outlined above[6]. To date the details of the tariffs to be applied have not been announced.

- *EU Emissions Trading Scheme (ETS)* – Despite recent trends in the decoupling of economic growth from emissions, Ireland is still significantly over (approximately 8 Mt) its ETS target.[7] The ETS imposes a cost on government and the private sector on the emission of carbon dioxide and thus provides an incentive to reduce those emissions.

- *All Ireland Market for Energy* – The All Island Energy Market Development Framework was announced in November 2004. Benefits are expected through the effective combining of two smaller markets into a larger one, which in the longer term should prove a more attractive location for investors.

[6] Irish Wind Energy Association Annual Conference, Dundalk, April 2005
[7] EPA, September 2004, Ireland's National Allocation Plan

- *Interconnection* – Although substantially interconnected for gas[8], interconnection for electricity is not quite so robust, with only 330MW transfer capacity from Northern Ireland in place. The government recently announced plans to develop two 500 MW interconnectors to Wales (as well as a second interconnector to NI). However experience indicates that the planning, financing and development of such projects can take between seven and ten years to complete[9], and so are unlikely to impact Ireland's electricity generation adequacy in the short-medium term.

- *Fiscal policy measures*

  - Renewable energy tax relief (in the form of a deduction for tax purposes from a company's profits) is permitted for corporate equity investments in specific renewable energy projects. This relief has recently been extended to the end of 2006. [10]

  - Leasing of plant and machinery: Under the Finance Act 2004, the lessors of short life assets have two options for computing taxable income. Under pre-2004 rules income is calculated by treating gross lease payments as income and allowing capital allowances on the asset. The new rules permit only the interest element of lease payments to be taxed with no capital allowance, leading to a more even spread of payments. [11]

- *Public procurement procedures* – EU public procurement procedures apply in Ireland above a threshold of €150,000. Below this threshold, national guidelines known as the Green Book apply. Under the Green Book guidelines contracts above a €50,000 value should be advertised as part of a formal tendering process. Guidelines also exist for the purchase of goods such as electricity and fuels, where the recommended approach is to leverage volume demand and reduce associated transaction costs. [12] Additionally, purchasing is favoured over leasing and funding for projects generally comes from annual budgets

## 2.4 Summary of Policy and Regulatory Situation

Table 1 summarises the various policies and regulations in place or planned, both at an EU and domestic level, highlights the potential impact each may have on the market for Energy Service Companies, and rates each as having positive, negative or neutral impact. Overall, the existing and planned energy regulations depict a regulatory environment that is becoming more focussed towards the provision of energy in a sustainable manner. This should have a highly positive impact on the development of an ESCO industry in Ireland.

[8] Commission for Energy Regulation , Gas Capacity Statement 2003
[9] Eirgrid - Transmission System Operator Ireland, November 2004, Generation Adequacy Report 2005-2011,
[10] DCMNR, 2004, Application for the Certification of a Renewable Energy Project Under Section 486B of The Taxed Consolidation Act, 1997 (Updated 2004)
[11] KPMG,.April 2004, Taxing Times, Publication on The Finance Act of 2004
[12] National Public Procurement Policy Unit, Department of Finance, April 2005, National Public Procurement Policy Framework

**Table 1 Summary of Policy and Regulatory Impact on ESCO Industry**

| Regulation | Impact on ESCO Market Development | Rating* |
|---|---|---|
| Emissions Trading Directive | Imposes a cost on carbon emissions and so provides an incentive for investment in carbon abatement technology, as might be supplied by an ESCO | +++ |
| RES-E Directive | Sets out targets for renewable energy electricity for a member state. However there is no incentive for organisations to source RE | + |
| Energy Performance of Buildings | Increases regulation around the installation and operation of energy services, which may favour outsourcing | +++ |
| Liberalisation of energy markets | Increases competition in energy supply, leading to a reduction in energy prices for consumers. This does not encourage careful consumption or energy efficiency investment. However, energy supply companies may offer energy services as an added value offering | Neutral |
| Promotion of Cogeneration | CHP is a core offering of many ESCO's, and so any support measures are likely to be favoured by the industry | ++ |
| Procedures for the co-ordination of public contracts | The introduction of "Competitive Dialogue" procedure as well as the Green Paper on PPP will assist ESCOs in their dealings with public authorities | ++ |
| Directive on energy end-use and energy services | Introduces targets for energy savings and allows member states to establish funds for energy savings | +++ |
| Irish Market liberalisation | As with the EU directives on the internal market | Neutral |
| Renewable Energy | Fixed feed in tariff will encourage RE projects, and assist ESCO's offering this service. However there are no targets for heat from RE sources. | + |
| All-island market for energy | Aimed at making the market more competitive with a view to reducing energy prices for consumers | - |
| Interconnection – gas | The gas market is already well interconnected ensuring robust supply in the medium term. As such it is not likely to have an impact on ESCO development | Neutral |
| Interconnection – electricity | With interconnection to Britain now only in the planning stages, it is likely that Ireland will remain tight on electricity supply in the medium term. As such measures that will help reduce electricity demand (e.g. Demand Side Management Programmes) should be welcomed | + |
| Fiscal policy – Renewable Energy Tax Relief | Provides an incentive for organisations to invest in renewable energy companies, but not in renewable energy equipment. However, it could promote the development of Special Purpose Vehicles for the provision of renewable energy projects | + |
| Fiscal policy – Leasing of plant and machinery | Allows a more even spread of tax payment on leased equipment. However it is not likely to have a major impact for ESCOs | Neutral |
| Public procurement procedures | Procedures as they currently stand will act as a barrier to the development of ESCOs in the public sector, as they impose a prohibitively high transaction cost at the contract development stage. | -- |

* The Rating Scale used above can be classified as: + Slightly positive, ++ Moderately positive, +++ Highly positive, - Slightly negative etc. A '+++' rating is given where a regulation directly affects the energy services industry, whereas a rating of '++' is given where a regulation might have an indirect impact and a '+' rating is provided where there is potential for an associated impact on the energy services market as a result of a policy/regulation. A neutral rating is provided if the regulation will have no impact on the industry or the impact is unclear at this point.

# 3. Review of Energy Prices

We have analysed how market developments will influence electricity and natural gas prices over the medium to long-term. Details of this analysis are included in Appendix 2, with a summary of the findings below. It should be noted that as both electricity and natural gas are linked to the price of international traded goods (oil and coal), this is only one component of the price forecast, and we have not analysed the structure of global demand and supply in the oil and coal markets and their implications for natural gas and electricity prices.

Partly due to the lack of domestic energy sources, Ireland currently has higher than average energy prices compared to energy prices in Europe. These are summarised by consumer group in Table 2 below.

**Table 2 Energy costs compared to other EU countries[13]**

| | Electricity | Natural Gas | Fuel Oil |
|---|---|---|---|
| Industry | 4th most expensive | 6th most expensive | 3rd most expensive |
| Household | 10th most expensive | 11th most expensive | 5rd most expensive |

## 3.1 Gas Prices

On the basis of known developments in the Irish gas markets it is likely that overall there will be downward pressure on gas prices. This downward pressure is due primarily to the development of the Corrib gas field from which additional supply should outweigh additional demand and reduce Ireland's dependence on imported gas, with a 10% projected reduction in the price of crude oil lowering the costs of natural gas imports. The extent of this reduction will depend on the expected beach price of natural gas from the Corrib gas field and the volume of gas produced.

The projection for the medium term, however, is more dependent on the time it takes to connect the Corrib gas field to the Irish gas supply system. Under the weak supply scenario presented by the CER supply and demand forecasts, there is a deficit of natural gas at times of peak demand in the strong growth and weak supply forecast in 2006 and 2007. This scenario would increase the price of natural gas in the Irish market during these years. However, if the connection to the Corrib gas field is made according to the current schedule, then these shortfalls should be avoided and the price of gas should decrease.

## 3.2 Electricity Prices

There are a number of drivers that allow us to project a downward trend in electricity prices, these would include:

- Falling natural gas prices with the development of the Corrib gas field and a reduced cost of natural gas in international markets.
- Liberalisation and the increased market size with connections to the UK and Northern Ireland.

[13] Sustainable Energy Ireland, January 2005, Energy in Ireland 1990 to 2003 Trends, Issues and Indicators

These changes however, will take a number of years to occur, and during the interim period, there is an expected shortfall in generation capacity, that is likely to maintain the current price level. In addition to this shortfall, there are increased costs associated with:

- The provision of renewable electricity (an estimated 1% increase in electricity costs);
- The EU-ETS (an estimated 4% increase in electricity costs)

The eventual impact on electricity prices will depend upon the timing of new energy infrastructure and changes in the international energy markets.

Table 3 below summarises the various market structure and regulatory factors and their likely impact on prices. In the short-medium term, policy and market structures are likely to have an upward influence on energy prices which would favour energy efficiency investment and ESCO development. Over the long term however, we would expect to see these factors placing downward pressure on prices.

Ultimately though, if recent trends are maintained, the influence of global markets will have an even greater impact on prices than any domestic measures, existing or planned. This is evident from The Commission for Energy Regulation proposals for increases in gas tariffs of just over 25% in 2006[14] as well as electricity price increases of 2-3%[15]. (Note: The wholesale cost of producing electricity has increased by 14.4% due mainly to the increased cost of fossil fuels on international markets. However, other costs related to networks and supply are expected to decrease due to factors such as efficiency gains, investment in new infrastructure and customer growth achieved over recent years. This has allowed the CER to offset some of the cost increases due to fossil fuels against reductions elsewhere).

[14] Commission for Energy Regulation, July 2005, Proposed decision on BGÉ's gas prices for 2005/06
[15] Commission for Energy Regulation, July, 2005, Electricity Revenue Review 2006-2010

**Table 3 Impact of Energy Policy on Prices**

| Policy | Scenarios | Probability weighting | Impact on price |
|---|---|---|---|
| Interconnection with GB | Not built<br>Built on part merchant basis by 2010<br>Not in place until 2015 | Low<br>High<br>Medium | The proposed new interconnectors with GB would improve the fuel security in Ireland and reduce the risk of medium term under capacity. This is likely to have an effect on the stability of energy prices and may act to reduce prices. |
| All island energy market | Completion within 5 years<br>Interconnection with GB (long term) | High<br>Medium | The all island energy market planned in the short term is likely to lead to efficiency gains in the distribution system. An estimated 21 to 36 million Euro savings per annum are envisaged. The longer term integration with GB markets is likely to improve efficiency further. GB electricity wholesale prices are typically 10% lower than the price in Ireland and the import of electricity should put downward pressure on Irish wholesale prices. |
| 13.2% TPER target | Target not achieved by 2010 | Medium | Failure to achieve the renewable energy target may result in more stringent policy measures to be adopted. Fixed feed in tariffs have already been announced. This is likely to increase prices. Currently in the UK, OFGEM estimates renewable energy costs to add 2% onto the average utility bill for a domestic consumer, (the percentage increase will be greater for industrial consumers). |
| EU ETS Phase 1 | Low prices (<10 Euro/t)<br>High prices (>10 Euro/t) | Medium<br>High | THE EU ETS could increase electricity prices by up to 5% during the first phase of the EU-ETS. The extent of this increase will depend upon the market price for carbon, and the position of the Irish regulatory authorities on the extent to which carbon prices can be passed through to the end consumer. |
| EU ETS Phase 2 | 10% of allowances auctioned<br>Low prices (<10 Euro/t)<br>High prices (>10 Euro/t) | High<br>Medium<br>High | Phase II is likely to put further pressure on energy prices. The level of increase will depend on the prices of carbon - which in turn depends on the overall cap for different countries and sectors. Prices will also depend on the allocation methodology and whether a percentage of allowances will be auctioned. |

# 4. ESCO Definitions

As outlined in Section 1, ESCOs are a key mechanism in the drive for energy efficiency improvements, by helping to achieve energy savings while sharing the risk associated with such projects. However, a survey by the European Commission DG JRC (ESCOs in Europe) describes an industry that is still in its infancy stage and, to a large extent struggling to get off the ground (with a few notable exceptions such as Gernany, Austria, Hungary and France).[16] There are also significant differences highlighted in terms of the types of ESCO projects (sectors, sizes, etc.) and how they are implemented.

A first step in establishing an ESCO market in Ireland is to understand what is meant by the term, what services are provided and activities carried out by ESCO's. This will serve to guide policy development for ESCO's operating in Ireland and ensure any incentives introduced are targeted at the appropriate area.

## 4.1 EU Definition

The European Commission, DG, JRC has in recent years supported a number of policy initiatives to foster the ESCO industry in Europe. This led to the first European ESCO Conference "Creating the Market for the ESCOs Industry" held in Milan, May 2003. One of the primary goals of this conference was to "present and define the role of ESCOs in the European liberalised energy market…"[17] In addition the JRC has developed a website dedicated specifically to dissemination of information regarding ESCOs.

The JRC defines ESCO's as organisations that:

- Guarantee the energy savings and/or the provision of the same level of energy service at a lower cost through the implementation of an energy efficiency (or renewable energy) project;
- Are rewarded based directly on the energy savings achieved;
- Typically finance or assist in financing a project by guaranteeing savings;
- Retain an operational role, over the financing period of a project, to measure and verify the savings against contractual arrangements.

ESCOs differ fundamentally from what are termed Energy Service Provider Companies (ESPCs). While both offer similar services, ESPCs provide a service for a fixed fee or as added value to the supply of equipment or energy. ESPCs may have some incentives to reduce consumption, but compared to an ESCO, ESPCs do not assume any risk in case of underperformance, i.e. ESPCs are paid a fee for their advice/service, ESCOs are paid (either in whole or at least in part) based on the results of their recommendations.

The type of services that an ESCO might deliver includes:

- Energy analysis and audits;
- Energy management;
- Project design and implementation;
- Maintenance and operation;

[16] European Commission, DG, JRC, 2005, Energy Service Companies in Europe, Status Report
[17] http://energyefficiency.jrc.cec.eu.int/ESCO/esco.htm

- Monitoring and evaluation of savings (Monitoring and Targeting, M&T);
- Property/facility management;
- Energy and/or equipment supply and;
- Provision of service (such as space heating/cooling, lighting etc.).

Energy savings guarantees can take the form of a reduction in energy flow/use, with savings sufficient to service the debt acquired by implementing the efficiency project. Alternatively the same level of energy service can be provided for less money.

## 4.2 UK Energy Systems Trade Association (ESTA)

The UK Energy Systems Trade Association or ESTA is an energy management trade association. Its main focus centres on demand side energy efficiency of buildings, building services and process services.

ESTA members (numbering over 100) offer products and services covering energy efficient monitoring, control, operation, and management of buildings, building services and process services. ESTA member companies are also involved in the promotion of energy efficient systems and practices and assisting building designers and managers to improve working environments and reduce operational costs.

ESTA members are divided into groupings according to the services/products they offer. Two groups highlighted as offering ESCO type services are:

a) Contract Energy Management Group

The Contract Energy Management Group comprises companies that offer contracted out services for the operation and maintenance of site services to all sectors with a focus on energy management and energy efficient operation. They provide expertise and finance to make improvements in energy efficiency in virtually every type of building and industry.

CEM companies invest their own capital and charge for the environmental service provided as an ongoing revenue charge which can be less than the current costs. Contracts can be as short as 3 years but are more typically 10 years and they can be applied to specific aspects of a site's services in isolation e.g. lighting, heating system, etc, or for the whole site.

To qualify for membership of the CEM Group within ESTA an organisation must offer:

- Management of some aspects of energy use.
- Transfer of some risk from the client to the member (usually based on providing agreed service levels).

Some members also offer customers investment funding but this is not an essential requirement for membership.

b) Independent Energy Consultants Group

ESTA IECG members offer advice on broad energy policies and on specific energy saving measures. Many are prepared to back their assessments with funding for their measures.

The IECG comprises organisations that have the expertise to provide advice to clients on matters relating to energy including energy policy, energy management practice, performance, recommending energy cost reduction measures and supporting implementation, training and energy purchasing.

IECG Members are required to demonstrate that the advice they give is independent of any particular fuel and of individual suppliers. In addition to the ESTA requirements for membership, IECG members are required to have been in the business for at least 3 years or to demonstrate personal professional activity in the IECG market.

Members can demonstrate their attributes by undergoing a professional review where they must produce at least 5 examples of reports involving energy advice over at least a 3 year period. The review is carried out by existing IECG members.

According to ESTA, the biggest barrier to the uptake of ESCO services in the UK marketplace is that the term 'Energy Services' is associated too strongly with domestic users and services provided by energy supply companies. ESTA believes the available service can come from a much wider set of suppliers. In the UK for non-domestic customers it is usual for the ESCO to manage the contract and then buy energy supplies where it is most advantageous for the customer - so energy suppliers are not the main source of ESCO/CEM.

It may be appropriate in domestic situations for energy suppliers to take a leading role but ESTA does do not believe this is true for non-domestic. For this reason ESTA and members use the term 'Contract Energy Management' as they feel this more accurately reflects the role taken in such contracts.

## 4.3 National Association of Energy Service Companies (US)

The National Association of ESCOs (US) defines an ESCO, or Energy Service Company, as a business that develops, installs, and finances projects designed to improve the energy efficiency and maintenance costs for facilities over a seven to 10 year time period. ESCOs generally act as project developers for a wide range of tasks and assume the technical and performance risk associated with the project. Typically, they offer the following services:

- develop, design, and finance energy efficiency projects;
- install and maintain the energy efficient equipment involved;
- measure, monitor, and verify the project's energy savings; and
- assume the risk that the project will save the amount of energy guaranteed.
- These services are bundled into the project's cost and are repaid through the dollar savings generated.

ESCO projects are comprehensive, which means that the ESCO employs a wide array of cost-effective measures to achieve energy savings. These measures often include the following:

- High efficiency lighting;
- High efficiency heating and air conditioning;
- Efficient motors and variable speed drives, and;
- Centralized energy management systems.

NAESCO believes the concept of performance based contracting is key to setting ESCOs apart from other firms that offer energy efficiency, like consulting firms and equipment contractors. In this way, when an ESCO undertakes a project, the company's compensation, and often the project's financing, are directly linked to the amount of energy that is actually saved.

Typically, projects require a large initial capital investment and offer a relatively long payback period. The customer's debt payments are tied to the energy savings offered under the project so that the customer pays for the capital improvement with the money that comes out of the difference between pre-installation and post-installation energy use and other costs. For this reason, ESCOs have led the effort to verify, rather than estimate energy savings. One of the most accurate means of measurement is the relatively new practice of metering, which is direct tracking of energy savings according to sanctioned engineering protocols.

NAESCO also sees many performance-based energy efficiency projects offering other ancillary services, namely

- *Maintenance contracts* – whereby the cost of maintenance is folded into the overall cost of the project. Therefore, during the life of the contract, the customer receives the benefit of reduced maintenance costs, in addition to reduced energy costs. As an additional service in most contracts, the ESCO provides any specialized training needed so that the customer's maintenance staff can take over at the end of the contract period.

- *Education and partnership* – another critical component of many energy efficiency projects is the education of customers about their own energy use patterns in order to develop an "energy efficiency partnership" between the ESCO and the customer. A primary purpose of this partnership is to help the customer understand how their energy use is related to the business that they conduct.

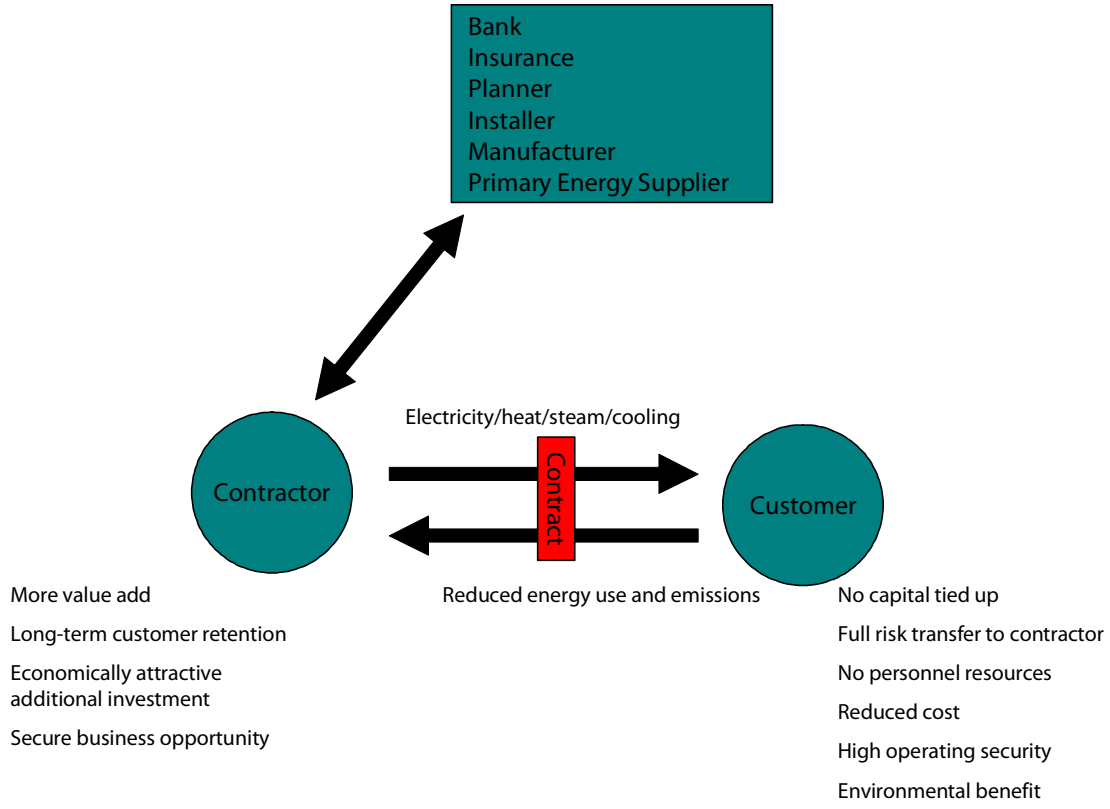
- *Removal and disposal of hazardous materials* - when, for example, existing fluorescent lighting equipment, ballasts that contain PCBs, and fluorescent light tubes that contain traces of mercury are replaced, the old equipment must be disposed of as hazardous waste. Upgrades to heating, air conditioning, and ventilation systems may involve the removal of asbestos and would also be properly disposed of by the ESCO.

Historically, the energy service industry is relatively young. Most U.S. ESCOs place the industry's origins in the late 1970s and early 1980s when energy prices rose dramatically following the 1973 OPEC oil embargo and the Iranian Revolution in 1979. These events created the opportunity to make a business out of reducing customers' growing energy costs.

## 4.4 Swiss Contracting

The diagram below summarises the Energy Service Company model envisaged by the Swiss Contracting association. This model equates to Third Party Financing with ESCO borrowing, discussed in further detail in Section 5.5.2.

**Figure 1 ESCO Model as defined by the Swiss Contracting association**



# 5. Survey of European Energy Service Companies

To further understand the nature of the ESCO industry, the services offered and the business models in place, a range of ESCOs across Europe were contacted to assess the following:

- The maturity of the ESCO industry in the country
- The existence of any ESCO associations or agencies
- The sectors targeted
- The products/service offered
- Nature of ESCO Contracts (including the size of projects and methods for determining savings from a project)
- Incentives for developing an ESCO market
- Barriers to developing an ESCO market

ESCO organisations from the UK, France, Belgium, Netherlands, Spain, Germany, Czech Republic, and Slovak Republic were interviewed as part of the survey. Appendix 3 contains the specific interview questions used and the results are summarised below as well as a description of the drivers and barriers in each country. In total 47 organisations were contacted and interviews held, with seventeen.

In addition, a detailed interview was held with Paolo Bertoldi from the Eureopan Commission, DG, JRC, Institute for Environment and Sustainability, Renewable Energies Unit, who has researched and authored several papers on the ESCO industry in Europe.

## 5.1 Maturity of the industry

The ESCO industry has been promoted across Europe since the 1980s. [18]

- In 1988 the European Commission adopted a Recommendation to Member States to promote ESCOs and the use of third party financing;
- 1992 EC Directive (93/76/EC) was introduced for the design and implementation of third party financing programmes in the public sector;
- THERMIE and SAVE programmes promote ESCO's and third party financing activities;
- 1996 standard contracts for buildings and industry published;
- 2002 GreenLight Program created a preliminary list of ESCOs operating in the lighting field;
- 2003 EU survey of ESCOs and establishment of EU ESCO database online.

The majority of the ESCO companies contacted in our survey were established in the early 1990's; while several of them could trace their roots to well before that time (even to the early part of the twentieth century), these tended to have been founded by large

[18] European Commission, DG, JRC, 2005, Energy Service Companies in Europe, Status Report

companies or were subsidiaries of large companies. France, Germany and the UK had the most mature ESCO industries with the French energy service companies (of a type) having been established in the post war period.

The industry as defined today however is relatively young, with the majority of companies establishing Energy Performance Contracting services in the early to mid 1990's. The market in Central and Eastern European (CEE) countries was established slightly later in the late 1990's.

## 5.2 European ESCO Associations

Most of the organisations contacted were members of one or more associations linked with the ESCO market and the services they offer. However none were members of the European ESCO Association, EFIEES – The European Federation of Intelligent Energy Efficiency Services – This most likely is due to the relative youth of this umbrella federation – it was officially founded on the 13th May 2005 and sees its main role as defending the interests of its member associations within the European Institutions.

The main associations identified were:

- ESTA – Energy Services Trade Association, UK;
- PECU – Bundesverband Privatwirtschaftlicher Energy-Contracing Unternehmen, Germany;
- FG3E – France (a member of EFIEES);
- Association for PPP and Pracovni skupina pro EPC (Working group for EPC at the Czech Chamber of Commerce, Czech Republic.

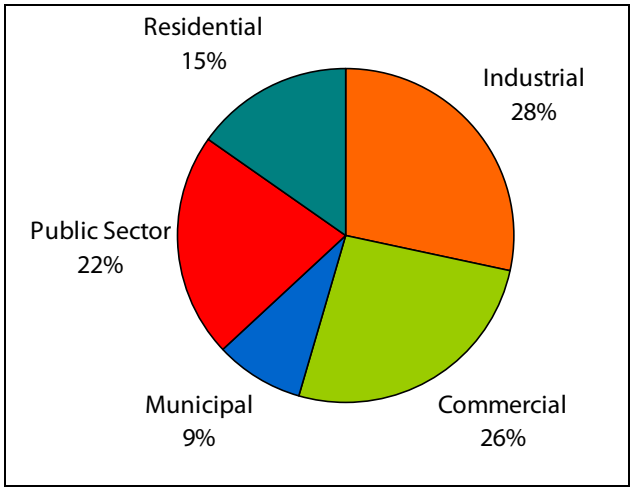
## 5.3 Operating Sectors

Figure 2 shows that the sectors in which the ESCO organisations, interviewed for this report, operate is evenly split across industrial, commercial and the public sector. This is not an indication of the number or size of contracts in place but merely highlights the sectors in which the respondents targeted marketing and sales efforts. The residential sector figured highly as a target area, with the exception of the UK. This is most likely due to the prevalence of district heating schemes in mainland Europe – a rare occurrence in the UK and Ireland.

In addition to our own survey, the Energy Service Companies in Europe Status Report 2005[19] survey of ESCO organisations states that 50% of surveyed ESCO projects occur in the industrial sector, with the public sector achieving 37.5% (based on 24 respondents). It should be noted however that neither survey is statistically significant and little inference should be drawn for the total population.

[19] European Commission, DG, JRC, 2005, Energy Service Companies in Europe, Status Report

**Figure 2 Sectors Targeted by ESCO's**




## 5.4 ESCO Product Offerings

The nature and type of products offered by the organisations contacted varied greatly, ranging from niche ESCOs offering renewable energy services only, to major players offering a full range of energy services, both as ESCO's and as Energy Service Provider Companies (ESPC's); This was particularly so in the UK, where organisations that offered Contract Energy Management (CEM) also participated in Facilities Management – operation and maintenance only contracts, project finance initiatives (PFI), public private partnerships (PPP), energy management, monitoring and targeting and energy purchasing. In Germany the term energy contracting was a much more defined concept and offered by all but one of the respondents. The products offered by the ESCOs interviewed is summarised below.

**Table 4 ESCO product offering**

| Supply side | Demand side |
|---|---|
| Energy performance contracting/Contract energy management | Energy management and efficiency advice (incl. energy audits, bureau services) |
| Financing | Monitoring and controlling / targeting |
| Facilities Management (lighting, space heating, cooling, hot water) | Operation and maintenance |
| Energy generation/CHP | |
| Energy procurement | |
| Water pumping | |
| Lighting | |
| Heating | |
| Compressed air | |
| Renewable Energy | |

## 5.5 ESCO Contract Types

The nature of contracts (or business models) used by the ESCOs interviewed varied on a case by case basis. All but one of the organisations interviewed offered some form of energy performance contracting (or contract energy management in the UK). Variations however existed, dependent upon the nature of the services being offered, and could therefore differ for each contract. To quote one German ESCO interviewed "*There are, however, many different models available and individual solutions are therefore possible and preferred*."

### 5.5.1 Energy Performance Contracting

Energy Performance Contracting (EPC) is the term used when an ESCO funds energy efficiency/renewable energy projects (requiring capital expenditure) from the resultant cost savings (or income stream from renewable energy produced). This is a form of creative financing and can be useful for clients that lack capital funds, technical knowledge, manpower or management time to implement energy efficiency or renewable energy projects.

### 5.5.2 Sources of Finance

There are three methods by which ESCO projects can be financed:

- ESCO financing – The ESCO funds projects through its own sources of capital, debt or lease instruments (rarely is equity used to finance projects);
- Energy user/client financing – Funds are obtained from the user/clients own sources
- Third-party financing – Funds are provided by a third party, normally a financial institution. The third party may assume rights to the energy savings or take a security interest in the capital equipment used in the project. Under third party financing there are two arrangements (depicted graphically in Figures 3 and 4).

    1. ESCO borrowing
    2. Energy user/client borrowing backed by an energy savings guarantee agreement to reduce the perception of risk to the financial institution.

**Figure 3 Third Party Financing with ESCO borrowing**

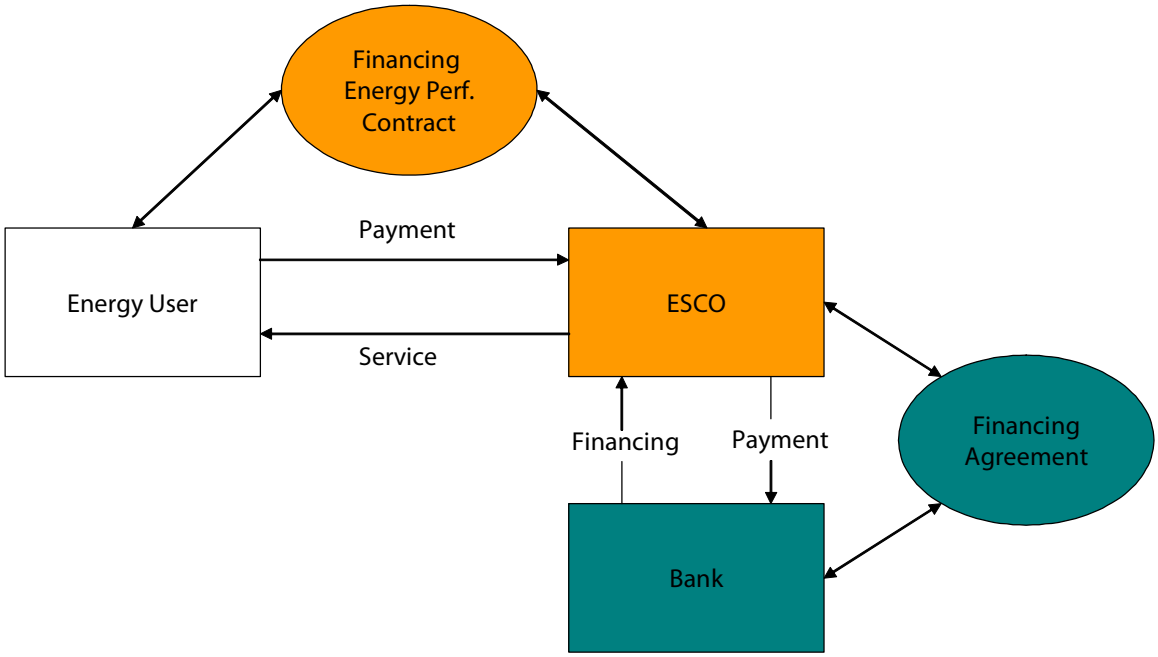
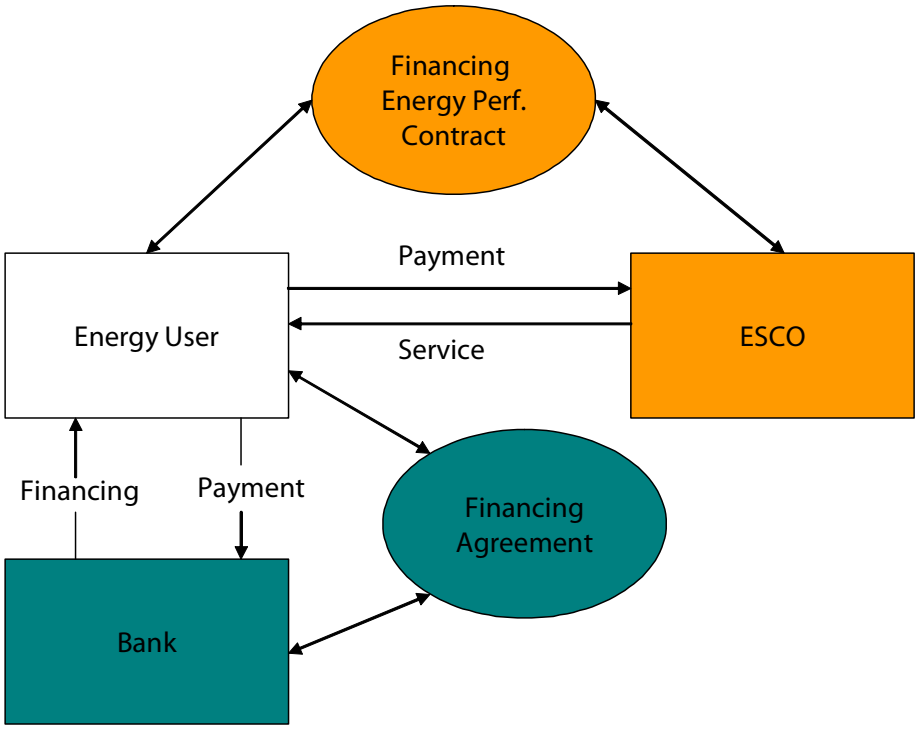



**Figure 4 Third Party Financing with energy user/customer borrowing**



### 5.5.3 Performance Contracting Models

The description below is a summation of the main contracts in place as identified via the market assessment and interview with the JRC.

There are two main contract types that can be established between an ESCO, the customer and the lender.

- Shared Savings – Under this model the **cost savings** are split between the ESCO and the customer in accordance with a contractual percentage for a predetermined length of time. The ESCO undertakes performance and credit risk for the project. This is off balance sheet financing on behalf of the customer/client.

- Guaranteed Savings – Under the guaranteed model a specified level of **energy savings** are guaranteed by the ESCO, and the projects are typically financed by the customers who can obtain financing internally, from banks or other third party. Under this model it is likely that the contract will contain a clause pertaining to a floor price for energy, i.e. debt levels will be met (through energy savings) provided energy prices do not fall below a certain threshold. Under guaranteed savings the ESCO assumes the performance risk for the project (i.e. by implementing the project the ESCO guarantees a saving in its energy consumption). The guaranteed savings are used to service the debt obligations.

Table 5 details the typical allocation of risk under the two types of contracts.

**Table 5 Typical Risk Allocation Under Performance Contracting Models**

| Contract Type | Project Performance Risk | Credit Risk |
|---|---|---|
| Shared Savings | ESCO | ESCO |
| Guaranteed Savings | ESCO | Customer/Lender |

Other common contractual arrangements that are variations of the Shared and Guaranteed Savings models include:

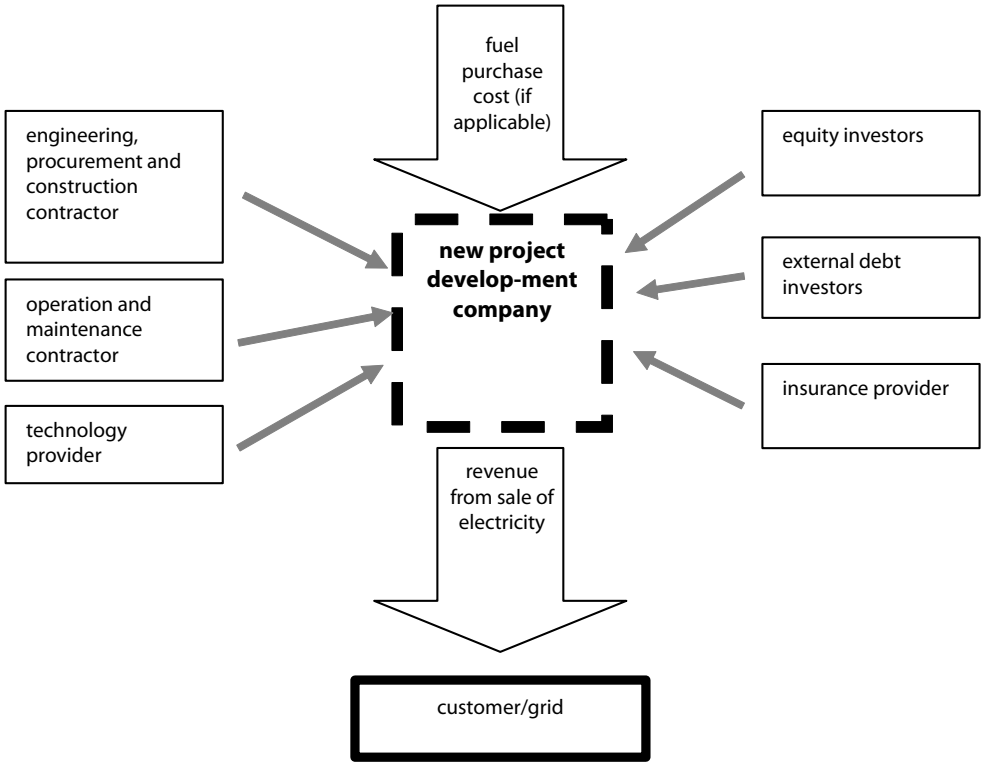
- Contract for Energy Management / Chauffage – This type of contract equates to outsourcing of the clients energy supply, whereby the ESCO (or ESPC) takes control for the provision of an agreed set of energy services. This may also include fuel/electricity purchasing in a liberalised energy market. The ESCO guarantees the supply availability and is remunerated based on the efficiency savings it can generate. Savings can be guaranteed (for example as a percentage reduction from the existing energy costs) or shared, or a combination of both used. The fee paid by the client is based on its current energy bill less a percentage saving. Therefore the more efficiently and cheaply the ESCO can supply the service the greater its earnings.

- First out – Under this contract all energy and cost savings are used to pay interest and amortisation of the loan until full repayment. A first out contract generally contains a detailed breakdown of the estimated total project cost, together with ESCO mark-ups guaranteed fees. The customer should be able to track through how the total project value is arrived at and what the ESCO's profit margin is. The savings are generally utilised by the ESCO until total project costs are recovered or until the end of the contract term, whichever comes first.

- Build-Own-Operate-Transfer (BOOT) – Under this contract the ESCO provides the service for a defined period, after which the ownership is transferred to the client. During the contract period the ESCO is remunerated based on the costs plus a profit element. This

type of contract uses a special purpose delivery vehicle as a means of off-balance sheet, non-recourse project financing (Figure 5).

**Figure 5 Simplified Model of Non-Recourse Project Financing**




- Leasing – Where clients make lease payments based on the cost savings and tax benefits, associated with the depreciation of equipment. There are two types of leasing arrangements

    - Capital Lease (Finance Lease or Hire Purchase) – The capital assets remain in the legal ownership of the lessor (i.e. the ESCO). The client does not take legal ownership until the final instalment is made. However, under accounting rules, the true nature of a transaction, (i.e. where the substantial risks and rewards lie) not the legal form, should be accounted for and so this type of transaction appears on the client's balance sheet.

    - Operating lease – The assets remain in the ownership of the lessor and the customer essentially rents the equipment. However the assets can eventually be returned (in a useable form) so not all the risks and rewards reside with the lessee. Therefore the transaction does not have to appear on the customer's balance sheet. There are usually tax benefits associated with the depreciation of the leased equipment which will go to the ESCO.

However, a recent report commissioned by the US Congress as part of the Sarbanes-Oxley Act of 2002 and produced by the US Securities and Exchange Commission (as well as proposals from the International Accounting Standards Board), on off-balance sheet activity favours the re-writing of lease accounting standards for treatment of operating

leases based on contractual cash inflows and outflows.[20] Under this method both the lessor and lessee would report their economic interest in the lease assets, as well as assets and liabilities related to the lease payments. It is uncertain, at this point, when these changes will be implemented, their exact nature and the likely impact they might have on the leasing market and consequently the ESCO market.

Other contract types identified include:

- Guaranteed energy consumption
- Guaranteed $CO_2$ emissions
- Guaranteed internal conditions

The size and length of contracts varied considerably depending on the particular service being offered. The average value of projects from the ESCOs interviewed ranged from €3,000 to €1 million and the average length of contracts was between five and fifteen years.

### 5.5.4 Methods for Determining and Verifying Savings

Within the organisations contacted, each case was considered unique and savings measured on a case by case basis. The only exception to this was for Germany, where standards were available for buildings.

### 5.5.5 Contract Terms

Typical contract terms identified include:

- *Establish a baseline* – highlighted as a crucial element of any ESCO contract was the need for an agreement between ESCO and customer on the consumption history (as well as what caused the consumption). This forms the basis of the energy saving proposals and is generally established through a site audit. Without an agreed upon baseline it is impossible to measure the actual savings made and therefore for the ESCO to be accuratley rewarded;
- *Contract length* – As highlighted above ESCO contracts tend to establish long term relationships so the full benefits of a contract can be realised. As different models will specify if or when ownership of assets should return to the customer, specification of contract length and options for extension are important;
- *Performance adjusted payments* – as an incentive for energy savings the ESCO is rewarded on the basis of its performance against the baseline. In some cases (particularly smaller projects) there is the need for a fixed element of the ESCO payment, as savings may not entirely cover the costs incurred by the ESCO. In addition, payments may also be linked to the cost of energy;
- *Acknowledgement of responsibilities* – This term should clearly identify where responsibilities lie between ESCO, customer and any third party involved, in terms of ownership of key objectives and tasks;

[20] US Securities and Exchange Commission, June 2005, Report and Recommendations Pursuant to Section 401(c) of the Sarbanes-Oxley Act of 2002 On Arrangements with Off-Balance Sheet Implications, Special Purpose Entities, and Transparency of Filings by Issuers

- *Ownership of risks* – with particular reference to the servicing of debt obligations, the contract should clearly stipulate where responsibility lies and also identify the project risks and where they exist for each party;

- *Equipment to be installed* – All equipment to be installed should be identified and linked to associated responsibilities and ownership.

- *Identify how savings will be measured and verified* – Another critical element of any ESCO contract. The measurement and verification of energy savings are potentially a source of contention between ESCO and the customer. It is therefore important to define and agree upfront how they will be determined. A method for translating energy savings into financial terms should also be agreed. The measurement and verification element of the contract should clearly define how saving calculations will deal with variables such as production levels, occupancy rates, external temp etc.

## 5.6 ESCO Market Drivers

Drivers for the development of ESCO's in the surveyed countries are summarised below. It is helpful to distinguish these drivers by country as the nature of the energy market (i.e. the extent of its liberalisation) may have an impact on the market potential and the drivers that can help stimulate demand.

**Table 6 ESCO Market Drivers by Country**

| Country/Region | Drivers |
|---|---|
| UK | Carbon taxes |
| | Energy price increases |
| | Government funding (mainly for renewable energy technologies) |
| | Other regulatory targets regarding energy |
| | The desire by the private sector to reduce costs without taking on financial and technical risk |
| Germany | Renewable energy and energy efficiency funding programmes |
| | Higher energy prices due to the Eco-tax (with exemptions for CHP, renewable energy, highly efficient gas power plants) |
| Spain | Special electricity pricing for renewable energy or cogeneration/CHP |
| CEE | Energy prices |
| | Government funding (3% of investment costs) |
| | Legislative framework (particularly with regard to the public sector with limited access to capital for necessary reconstruction and buildings rehabilitation) |
| France/Belgium | A tradition of outsourcing (where responsibility for heating etc has been traditionally the responsibility of local municipalities who did not have the technical capability to manage the installations and thus outsourced to specialist companies) |
| | Within the commercial and industrial sector it has been the trend of outsourcing |

## 5.7 Barriers to ESCO Market Development

Table 7 below summarises the main barriers to the development of an ESCO market for the various countries surveyed.

**Table 7 ESCO Market Barriers by Country**

| Country/Region | Barriers |
|---|---|
| UK | Customer knowledge/awareness of what is available or where to go to look for it |
| | Transaction costs |
| | Spark gap (differential between electricity and gas prices) not large enough |
| | Public sector tendering is lengthy, inflexible, unwieldy and costly |
| | Economic climate mitigates against long-term contracts favouring 3-5 year contracts which rules out a significant amount of potential projects |
| Germany | Energy savings are not a priority (despite higher prices) – security of supply and good management are more important |
| | Delay in liberalisation of the gas market |
| | Fear of outsourcing |
| | Length of contract |
| Spain | Price of energy is too low |
| CEE | Funding for the rehabilitation of public sector municipal and regional property (75% funded by EU and 20% by state) |
| | Complicated legislation for financing/procedures etc. (public sector) |
| | EPC/TPF too complicated for public sector to accept |
| | Lack of stability in companies |
| | Disbelief in non-traditional methods |
| | Not yet achieved a critical mass of projects |
| France/Belgium | A preference for traditional concepts in the public sector (e.g. time/materials type contracts) |
| | Lack of knowledge and hence confidence in the ESCO concept |

In addition to those barriers identified from our survey, the following barriers to the development of energy performance contracting have also been highlighted by the European Commission, DG, JRC.[21]

[21] European Commission, DG, JRC, 2005, Energy Service Companies in Europe, Status Report

- Low awareness and mistrust from potential customers caused by:
    - Lack of understanding of the opportunities of energy efficiency
    - Issues over the perceived technical risks that may be introduced
    - Fear of job losses/ aversion to outsourcing
    - Lack of understanding of energy use patterns and load profiles
    - Lack of project financing culture
    - Lack of confidence in ESCOs due to the short track record
- Limited understanding of energy performance contracting by financial institutions. Largely due to limited experiences conservative lending patterns for energy efficiency project financing (high interest rates and short terms) are maintained.
- Small size of projects – small projects often fail to gain financing (large financial institutions are not interested), which perpetuates the conservative lending patterns and lack of understanding of banks.
- Awareness of leasing contracts – whereby organisations want to own what is on their premises.

## 5.8 Lessons Learned in the Establishment of ESCO Markets

The experiences of ESCOs in the established ESCO markets surveyed and further a field can vary considerably between countries. However there are a number of common lessons that developing ESCO markets can benefit from[22]:

- *Failure to understand the complexities of the process* – When organisations, understanding only the simple concept of the ESCO industry (projects funded out of avoided energy costs), they fail to recognise the critical risk management and financial transaction implications involved. Consequently project failures occur and the industry is tarnished. Training and certification of individuals is highlighted as a means to overcoming this problem (as opposed to the certification of organisations;
- *Performance Contracting goes beyond the purchase of equipment* – ESCOs should be able to deliver a service to customers that goes beyond equipment purchasing. A focus on equipment defeats the purpose of performance contracting. Equipment is only the vehicle to deliver the expertise and services the ESCO offers;
- *Establishing a baseline via an investment grade audit* – An investment grade audit considers the affect of proposed measures over time. The audit should act as a financial investment guide upon which ESCOs can base their guarantees;
- *New technology* – ESCOs can only guarantee the performance of equipment that has a track record on savings and maintenance. New technologies should only be introduced outside the guarantee contract;

[22] Proceedings of the First European Conference on Energy Service Companies, Milan 2003, Lessons Learned Around The World, Hansen, Kiona International Inc.

- *Operation and Maintenance* – Operation and maintenance costs can make or break a project, it is therefore important that O&M personnel are bought into the project and have the training and oversight to ensure the equipment is operational as specified;

- *Measurement and Verification* – The development of an ESCO industry depends on accepted measurement and verification procedures. The International Performance Measurement and Verification Protocol (IPMVP) is gaining recognition as a standard in this field. Whatever the procedure used, agreeing it with the customer is the foundation of effective energy efficiency planning and is critically important to ESCO performance contracting;

- *Communication* – Continuous flow of two way communication between ESCO and customers can address problems as they arise and ensure they do not turn into major issues;

- *Obtaining financing* – For ESCOs to gain access to sources of finance they need to be able to develop bankable feasibility studies to bankers who are educated in, and understand the concept of performance contracting. This will require development of skills by ESCOs to present bankable projects and for bankers to become educated in energy efficiency financing matters as a priority.

## 5.9 Country Specific Measures to Promote the ESCO Industry

In this section we detail some of the country specific measures in place that have helped in the development of the ESCO industry throughout Europe. It is difficult to assess the impact each has had on the market in each country, other than by stating that each was cited by ESCO's contacted through this research as being effective, in that they stimulate the potential for energy efficiency investments.

### 5.9.1 Germany

***German Energy Agency (DENA)***

The Deutsche Energie-Agentur GmbH (DENA) - German Energy Agency is the German competence centre for energy efficiency and renewable energies. Its objectives include the environmentally friendly production, conversion and use of energy, and the development of sustainable energy systems with a greater emphasis on renewable energy sources.

To this end DENA initiates, coordinates and implements innovative projects and campaigns at a national and international level. It provides information to end consumers, works with all social groups active in politics and the economy and develops strategies for the future supply of energy. Its shareholders are the Federal Republic of Germany and the KfW Bankengruppe (KfW Banking Group).

The Germany Energy Agency is also in charge of promoting energy contracting in Government and public sector buildings. Again this is limited to information campaigns.

***Programmes of the Kreditanstalt fuer Wiederaufbau (KfW):***

This organisation provides low interest loans for new building and refurbishment projects as well as finance for energy efficiency and renewable energy measures. The loans are available to private households, companies and local authorities. Various "packages" are available and include the financing of:

- Building energy efficiency measures
- New energy efficient boiler systems, CHPs
- Building integrated renewables (biomass, PV, geothermal)
- Low energy and passive houses

KfW also support small scale renewables, including solar, PV and biomass.

***Federal Programme for the Support of Renewable Energy***

The German government have also introduced legislation to support renewable energy deployment which obliges grid operators to off-take electricity from renewables at fixed tariffs (similar to that to be introduced in Ireland).

***The German ECO Tax[23]***

On April 1, 1999 the German Government introduced an Ecological Tax Reform (ETR) that increased the price of energy. Higher taxes on energy consumption are aimed at providing economic incentives to save energy and use it more efficiently, thus leading to more innovation in new technologies. Figure 6 details the specific measures of the ECO tax as they have been introduced over a five year period.

To avoid harming Germany's competitive position, the tax revenue is returned to the tax payers by using the money to lower retirement benefit deductions. By lowering non-wage labour costs, the labour factor becomes cheaper, and existing jobs can be saved even while new jobs are created (especially in the renewable energy sector).

The ETR provides incentives to:

- save energy and use it more efficiently;
- use low- sulphur and sulphur-free fuels;
- invest more in renewable energy sources;
- develop energy-saving products (e.g. fuel-efficient-cars),

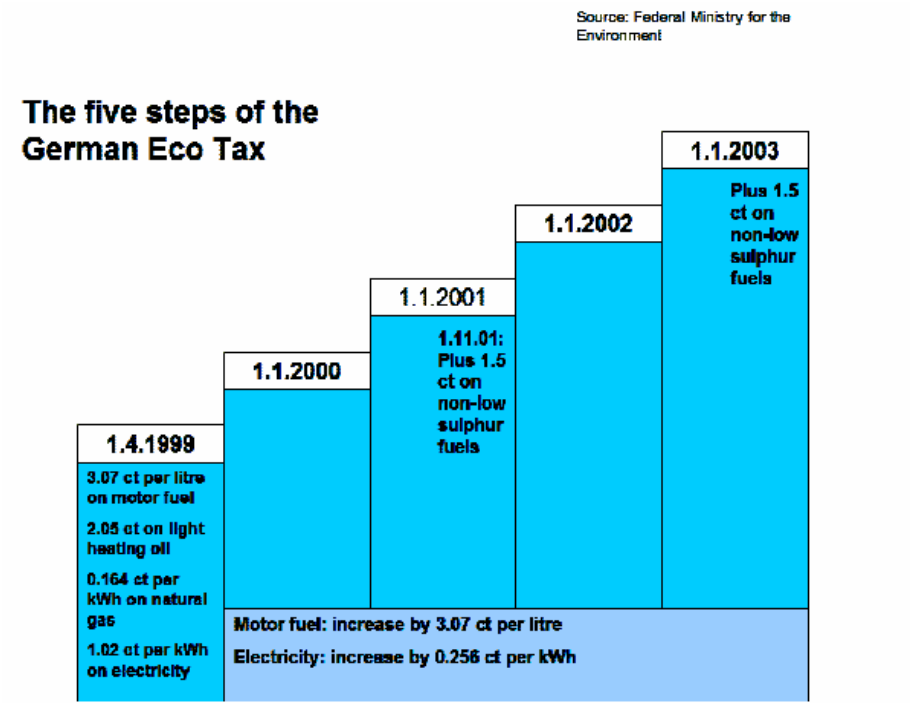
and has led to:

- A reduction in fuel consumption of newly produced cars by up to 20%;
- A further reduction of emissions of road traffic;
- An increase in the number of passengers travelling by public transport and those making use of car-sharing agencies;
- Two digit growth rates for manufacturers of solar thermal plants for warm water treatment and a boom in renewable energies, leading to the creation of new jobs (250, 000 by 2003).

[23] FÖRDERVEREIN ÖKOLOGISCHE STEUERREFORM e.V. (Green Budget Germany), Information on Ecological Tax Reform (http://www.eco-tax.info/)

Furthermore the ETR contributes to Germany's Kyoto goal to reduce $CO_2$ emissions by 25 % in 2005 compared to 1990.

**Figure 6 Details of the German ECO Tax 1999-2003**




### 5.9.2 UK

***The Climate Change Levy***

The Climate Change Levy is part of a range of measures designed to help the UK meet its commitment to reduce greenhouse gas emissions. It is chargeable on the industrial and commercial supply of taxable commodities for lighting, heating and power by consumers in the following sectors of business:

- Industry;
- Commerce;
- Agriculture;
- Public administration; and
- Other services.

The levy does not apply to taxable commodities used by domestic consumers, or by charities for non-business use. All revenue raised through the levy is recycled back to business through a 0.3% cut in employers' national insurance contributions, introduced at the same time as the levy, and support for energy efficiency and low carbon technologies.

The levy is applied as a specific rate per nominal unit of energy. There is a separate rate for each category of taxable commodity, i.e. electricity, gas etc. The levy package is expected to lead to reductions in carbon dioxide emissions of at least 2.5 million tonnes of carbon a year by 2010. However, there are several exemptions from the levy, including:

- Electricity generated from new renewable energy (e.g. solar and wind power)

- Fuel used by good quality combined heat and power schemes ("Good Quality CHP" - certified via the CHP Quality Assurance Programme CHP*QA*)

- Fuels used as a feedstock

- Electricity used in electrolysis processes, for example, the chlor-alkali process, or primary aluminium smelting.

***Climate Change Agreements (CCAs)***

Under the Climate Change Levy Programme, Climate Change Agreements have been established. CCA's provide entitlement to an 80% reduction in the rates of the climate change levy for energy intensive sectors, in return for agreeing to reduce emissions and/or energy use. CCAs are drawn up and agreed between relevant trade associations and Department for Environment, Food and Rural Affairs (DEFRA). The trade associations make the agreements on behalf of the companies within the sectors concerned. These umbrella agreements detail the facilities covered by the agreement and the relevant process. They also list sector targets, and the conditions which apply to participating companies.

***Enhanced Capital Allowances (ECAs)***

The Enhanced Capital Allowances scheme enables a business to claim 100% first-year capital allowances on their spending on qualifying energy saving plant and machinery. It is an integral part of the Climate Change Levy Programme.

Businesses can therefore write off the whole of the capital cost of their investment in these technologies against their taxable profits of the period during which they make the investment. This can deliver a helpful cash flow boost and a shortened payback period. Details of the type of equipment that qualify for the ECA are included in Appendix 7.

***The Carbon Trust***

The Carbon Trust is an independent company funded by the UK Government, established to help business and the public sector reduce carbon emissions now and capture the commercial opportunities of low carbon technologies. One of its key objectives is to remove the technical, economic and regulatory barriers that impede the transition to a low carbon economy.

The Carbon Trust is focused on reducing carbon emissions in the short and medium term through energy efficiency and Carbon Management and in the medium and long-term through investment in low carbon technologies. It aims to achieve this by:

- Developing and implementing programmes that will accelerate the transition to a low carbon economy. This includes:

- Delivering independent information and advice on energy saving and carbon management to the business and public sector.

- Promoting the Government's energy efficiency Enhanced Capital Allowances Scheme to encourage investment by business in qualifying energy saving technologies and products and managing the Energy Technology List of qualifying energy saving equipment;

- Investing in the development of low carbon technologies in the UK:

- Research and development funding to encourage innovation in the low carbon sector through Carbon Vision and RD&D.

- Technology Acceleration Projects for specific technologies and markets with significant carbon reduction potential and where the Carbon Trust can be material;

- Direct help for pre-commercial and commercial organisations with low carbon technologies through the Carbon Trust's Incubator Programme and Venture Capital.

The Carbon Trust also pay for energy surveys to companies with energy bills greater than £50,000 per year and arrange 0% fixed interest energy efficiency loans (from £5,000 to £100,000) for small to medium sized businesses, where the estimated value of energy saved over the first five years exceeds the capital amount.

### 5.9.3 Spain

The Instituto para la Diversificación y Ahorro de la Energía (Institute for Energy Diversification and Saving), IDAE is a public, business-structured organisation reporting to the Ministry of Industry, Tourism and Commerce through the General Secretariat for Energy.

Its strategic goal is to promote energy efficiency and the rational use of energy in Spain, to support the diversification of sources of supply and promote the use of renewable sources of energy, with the aim of developing and consolidating an energy model based on security, quality and sustainability. The Institute carries out dissemination, awareness-raising, and technical advisory activities, and also develops and finances innovative projects that train, inform and serve as an example for all energy consuming sectors.

As part of its offering, IDAE acts as an ESCO and provides third-party finance for investment projects in energy saving and efficiency and energy generation projects using alternative sources, such as renewable energy. The IDAE is the main sponsor of this mechanism of finance in Spain and has been using it successfully since 1987.

Under the heading of TPF the IDAE provides a range of financial operations that share the following characteristics:

- The investment is made, in whole or in part, by an enterprise other than the user (IDAE), which is solely responsible for the technical and financial management of the project.

- The investment starts to be recouped in IDAE operations as of the moment the new facility comes into operation and will depend on the energy output of the project and its economic value.

# 6. The Irish ESCO Market

In this section we conduct a review of existing companies offering energy services in Ireland. Through this analysis we will assess the product/service offering, domestic understanding/acceptance of the ESCO concept and opinion on the barriers to ESCO development in Ireland. We then move on to estimate the potential market size in Ireland.

## 6.1 Existing Irish Energy Services Companies

Given that this study has been commissioned, it is no surprise that the extent of the ESCO market in Ireland at present is minimal. A survey[24] conducted by the ESRI in 2000 (published in 2004) identified ESCO type organisations operating in Ireland falling into three categories:

1. Companies that offer contract energy management

2. Companies that engaged in the supply of combined heat and power (CHP)

3. Companies that manage their clients' facilities (facilities management).

These categories were used to identify the following organisations as offering ESCO type services in Ireland (this is not an exhaustive list):

- *Dalkia Ireland* – Dalkia in Ireland is part of the Dalkia group that operates in 32 countries with 40,100 employees and 5.1 billion turnover. Dalkia in Ireland directly employs 210 people and has a turnover of 30 million Euros. Dalkia's scope of services includes facilities management and energy management. Their client base covers a wide variety of market sectors including Pharmaceutical, Food / Beverage, Banking, Information Technology & Communications and Media.

- *RWE Solutions* – RWE Solutions is a subsidiary of RWE, with 12,600 employees and a turnover of almost Euro3bn a year. RWE does not have a base in Ireland, however they are linked with Diageo, to supply energy, steam, compressed air, cooling, water, wastewater, nitrogen and carbon dioxide at the Guinness sites in London, Dundalk and Dublin. This includes an agreed reduction in energy costs.

- *ESB Independent Energy* – Part of the ESB Group, ESBIE was established to compete in the liberalised energy market. ESBIE offers green energy sales, energy management, energy auditing and CHP services to clients. Under its CHP service offering they offer the potential to enter into commercial arrangements for the design and installation of equipment to shared-savings schemes and facilities management.

- *Powertherm* – Powertherm is an energy consultancy company, that also implements equipment solutions in the area of energy efficiency, CHP and renewable energy technologies.

- *Energia* – Irelands largest independent energy supplier, Energia also offer an energy efficiency service to business and industrial consumers, which includes energy auditing and financing options for capital projects. Energia provide cost savings through the sale of energy, however, they do not enter into energy performance contracting as part of the added value energy efficiency service offering.

[24] ESRI, S. Scott, Aug 2004, ESCOs In Ireland, Investigation of Energy Service Companies in 2000,

- *Fingleton White & Co.* – A firm of consulting engineers, Fingleton White have undertaken a range of CHP projects for clients in the industrial sector. In doing so they have developed a number of Build, Own and Operate facilities which are operated through separate associate companies.

- *Edina* – Another supplier of CHP generating equipment (through sale or hire). Edina conduct research to identify savings before implementing a solution, and offer after sales maintenance. However energy performance contracting is not currently offered.

- *BG Cogen* – Part of Bord Gais, BG Cogen was established to exploit the potential for gas-fired CHP stations, as a means to increasing gas sales. BG has stepped back from this market a little due to the unfavourable gas prices in relation to electricity. Energy performance contracting was not something BG Cogen have considered to date.

- *Clearpower* – Clearpower offer an outsourced Managed Heating Service – providing corporate and government clients renewable heating services (using wood fuelled boilers) while financing the investment to minimise the upfront capital required. Clients of Clearpower purchase the energy they use plus a monthly standard charge to cover fuel, equipment, maintenance and operation. Clearpower offer savings guarantees through the sale of energy with performance guarantees on the equipment used.

- *Vector Facilities Management* – Vector offer a full range of workplace and facilities management services. This includes energy and utility management, as well as maintenance of equipment as part of a long term partnership.

- *Natural Power Supply* - NPS is a provider of boiler technology and services for the conversion of short-rotation wood crops to energy. As part of its Metered Heat Supply service, NPS supplies bioheat on a metered basis and will supply, install, finance, fuel and maintain the equipment.

The above organisations were contacted as part of this research with nine providing a response. While many of these organisations fall under the definition of energy service providers (ESPC's) most do not offer any guarantee on the savings generated or performance based contracting. Only Dalkia and RWE Solutions, with their full range of energy service offerings operated this model.

The most common model prevalent in Ireland was along the lines of the BOOT – build own and operate model. This, as is common across Europe, was favoured by the providers of CHP.

## 6.2 Perceived Barriers to ESCO Development in Ireland

Of the organisations who responded to our survey, all were aware of the ESCO concept, expressed an interest in developing it further within Ireland, and were interested in the outcome of this study. The comments received regarding the market/regulatory barriers to development of the ESCO market (in order of priority) are as follows:

- A lack of awareness from potential customers of the ESCO concept;

- A lack of government regulations and targets with regard to energy efficiency and heating policy;

- A reluctance to outsource energy services, which are guarded closely by engineers in this country. This opposition to ESCO's among potential client's existing staff arises due to concerns about redundancies;

- The transaction costs of developing an ESCO contract, particularly with the public sector (which under current procedures is too costly);

- A reluctance from those offering energy services to take the risk to guarantee savings on a contractual basis;

- While banks are willing to fund energy efficiency projects, the right individual within the bank is difficult to source.

- The spark price spread (difference between gas and electricity prices) has not favoured CHP development for some years;

- Delays in the setting up of connection agreements with independent suppliers;

Of the above barriers many are identical to those identified through the survey of European ESCOs, with the exceptions being the lack of regulatory targets and a reluctance to take the risk in terms of entering into energy performance contracts. It is essential therefore, that any policy developments, aimed at addressing the ESCO market in Ireland, tackle these issues.

## 6.3 Potential ESCO Industry Market Size

For the purposes of this study we will define the market size as *that proportion of the end-use energy efficiency potential for Ireland which ESCO's can realistically capture.* Clearly there are other revenue streams that ESCO's can/will generate as part of their service offering (such as service charges, operations and maintenance charges), which may not come under the energy efficiency heading. However in consideration of the strategic objectives of Sustainable Energy Ireland (to promote sustainability and energy efficiency), the potential for end use energy efficiency is the key measure.

The European ESCO market was estimated in the year 2000 to be in the region of 150 million Euro per annum, while the market potential has been estimated to be between 5 to 10 billion €/year[25]. This indicates that there is a great potential to increase ESCO activities in the EU including Ireland. Other sources put the cost effective potential for improvements from end use energy efficiency measures in the region of 20% of energy use. [26]

It is questionable, as stated in Section 1, whether 20% energy efficiency gains are achievable. Enviros have recently completed a project for DEFRA in the UK to update the UK's energy efficiency cost models, taking into account recent developments in fuel prices and identifying and modelling the impact of hidden costs on the take up of energy efficiency (EE) technologies.

An underlying hypothesis for the DEFRA study was that the penetration of EE measures is not as rapid as expected, due to inaccuracies in previous models developed and their inability to reflect real world decision-making and behaviour. As part of this study Enviros identified five categories of "missing" costs that are generally costs incurred by the project "host", and additional to the costs a contractor would charge. These hidden costs relate to various stages in the project development cycle:

- *Project Identification:* Includes time and costs associated with identifying the energy saving measure and gathering information necessary to make an initial decision on

[25] European Commission DG, JRC, 2005, Energy Services Companies in Europe, Status Report
[26] European Commission, June 2005, Green Paper on Energy Efficiency or Doing More With Less

whether to proceed. Information sought will include costs (eg through obtaining rough quotes) or published information, benefits, practical issues and names of suppliers.

- *Project appraisal:* This describes the step beyond initial project identification to more fully assess its costs and benefits. For large capital projects in industry this can be very time consuming requiring several levels of management approval. This step also involves selecting suppliers. Again this can be time consuming for large projects.

- *Project commissioning:* Once the decision to go ahead with the project is taken time is then required to manage the commissioning process. This will typically involve regular meetings with contractors and suppliers. This comprises a large part of the "hassle" factor. For example in the domestic sector this would include having to wait in for contractors of cavity wall insulation.

- *Production disruption:* Production disruption includes interruptions to the production process during the installation of the measure. These costs vary by measure. E.g. metering may require drilling to gas pipes, whereas installation of VSDs can be done by quickly attaching to a new flange.

- *Additional engineering:* Additional engineering includes the additional work borne by the host (both design and physical installation) that is sometimes required when new equipment is installed. This may include M&E engineering and land take if new space is required. The costs for this work may be covered under contingencies in initial engineering cost estimates. However, because these costs are borne by the host and they are site specific, they are typically not quoted in vendors costs and rarely included in cost models. A typical example is the installation of drainage piping for domestic condensing boilers.

As well as missing costs, two hidden costs were identified:

- Perceived delivery risk

  This is the perceived risk that the EE measure will not perform as stated (by the supplier or from third party literature) over its expected lifetime. These risks arise from:

  - Belief of exaggeration of the part of supplier
  - Expectation of some rebound / comfort taking effect
  - Expectation that savings will not be sustained over time
  - Lack of understanding of what the EE measure can achieve

  Our experience suggests that these risks are greatest where there is a strong behavioural component, eg switching off lights, change management programmes in industry.

- Ongoing management and supervision time

  It is likely that operating costs do not fully take account of the time taken up in managing an EE measure once it has been commissioned. This will apply more to behavioural measures for which management time will be required to monitor and supervise ongoing implementation.

We therefore believe that a more accurate estimation of market size will be determined by incorporating these hidden/missing cost factors into calculations, as carried out in Section 6.3.1.

### 6.3.1 Market size based on carbon marginal abatement cost (MAC) curves for energy efficiency technologies

This method leverages the UK government (DEFRA) $CO_2$ abatement cost models in the domestic, non domestic and industrial sectors.

***Background to the development of Energy Efficiency (EE) cost models***

The DEFRA models were originally developed to estimate the cost effective savings by 2020 (in terms of tonnes of $CO_2$) from a range of energy savings measures, applied across various sectors of the economy. The models were recently updated by Enviros to take into consideration the following key factors in the adoption of new technologies and behaviours by society:

- *Technology penetration rates* – A bottom up analysis of technology penetration rates was undertaken, based on discussions with a sample of suppliers of energy efficiency equipment and services. The penetration rates were then applied to the cost models;

- *Early equipment replacement* – To account for the cost of replacing equipment before the end of its useful life. EE measures that require replacement of existing equipment tend to be undertaken when the equipment reaches the end of its useful life. As such, replacing equipment before the end of its useful life incurs a cost of accelerated depreciation;

- *Realistic payback criteria* – The models were updated to apply discount rates for EE projects to reflect the reality of industry payback criteria. (Much of industry typically uses a payback threshold in the range of 1 – 2 years for EE projects – See Appendix 5).

- *Categorisation of EE measures by type* – Namely behavioural change, engineering measures, non-engineering measure;

- *Categorisation of EE measures by cost* – Namely no, low or high cost measures

An example of some energy efficiency measures analysed is shown in Table 8.

**Table 8 Examples of EE Categorisation**

| | Behavioural | Engineering | Non-Engineering |
|---|---|---|---|
| **No Cost** | Turning off IT equipment | Certain lighting measures (with no marginal cost) | n/a |
| **Low Cost** | M&T | Motors, compressed air, appliances | Insulation, double glazing, lighting controls |
| **High Cost** | n/a | Variable speed drives<br>Furnaces/kilns | Heat recovery |

Under the assumption that the energy efficiency technical potential is similar between Ireland and the UK, we have leveraged the UK models, in order to determine cost effective EE potential in Ireland. The approach taken to determine the Irish EE potential is as follows:

- Obtain the UK Carbon reduction potential figures (in terms of tonnes $CO_2$/year) for a range of EE projects/technologies, across non domestic and industrial sectors using the DEFRA Carbon MAC curve models discussed above;

- Express UK carbon reduction potential as a % of total UK carbon emissions from a range of EE projects; For example the estimated technical carbon reduction potential through the installation of condensing boilers in the non-domestic sector (commercial and public sectors) is 4.91% of total emissions for that sector.

- Calculate Irish carbon reduction potential based on % UK carbon reduction potential (calculated in the previous step) and Irish carbon emissions by sector sourced from SEI reports – Profiling Energy Consumption and $CO_2$ emissions in Industry and Service Sectors.

- Calculate potential energy cost savings based on the energy expenditure per tonne of carbon emitted (Source: SEI reports – Profiling Energy Consumption and $CO_2$ emissions in Industry and Service Sectors).

This approach takes into account the hidden and missing costs previously discussed. It considers low and high hidden and missing costs based on an assumed range of time and/or costs for the various stages of the project development cycle identified above (Details are provided in Appendix 8). We believe this provides a more accurate indication of the potential for energy efficiency gains and therefore the potential ESCO market size. The results also provide an estimate of the technical potential for energy efficiency gains, i.e. the gains that would be achieved if all energy efficiency projects were implemented regardless of whether they achieved a positive NPV.

Table 9 shows a technical potential energy efficiency gain of 3.35 Mt $CO_2$. However this falls to between 1.25 and 1.97 Mt $CO_2$ when project economics and hidden and missing (H&M) costs are considered.

**Table 9 Energy Efficiency Carbon Abatement Potential of Irish Industrial and Tertiary Sectors**

| | Carbon Abatement Potenital Mt CO2 | | | |
|---|---|---|---|---|
| | **Technical Potential** | **No H&M Costs** | **Low H&M Costs** | **High H&M Costs** |
| Industry | 1.27 | 0.76 | 0.57 | 0.46 |
| Tertiary Sector | 2.08 | 1.21 | 1.10 | 0.79 |
| *Commercial* | 0.832 | 0.49 | 0.44 | 0.32 |
| *Public Sector* | 0.832 | 0.49 | 0.44 | 0.32 |
| *Other* | 0.412 | 0.49 | 0.218 | 0.157 |
| **Total** | **3.35** | **1.97** | **1.67** | **1.25** |

The carbon abatement potential for all energy efficiency measures, depicted in Table 9, translates into a technical energy efficiency gain of €341 million[27], which is reduced to €128 - €200 million if project economics and hidden and missing costs are considered (Table 10).

**Table 10 Potential Cost Savings from Energy Efficiency Projects**

| | Potential EE Cost Savings €m | | | |
|---|---|---|---|---|
| | **Technical Potential** | **No H&M Costs** | **Low H&M Costs** | **High H&M Costs** |
| Industry | 85.88 | 51.08 | 38.20 | 31.14 |
| Tertiary Sector | 255.17 | 149.15 | 135.29 | 97.14 |
| *Commercial* | 102.255 | 59.771 | 54.215 | 38.924 |
| *Public Sector* | 102.255 | 59.771 | 54.215 | 38.924 |
| *Other* | 50.661 | 29.613 | 26.860 | 19.284 |
| **Total** | **341.05** | **200.23** | **173.49** | **128.27** |

We have then estimated the annual ESCO market potential, based on industry experience, of capturing 10, 20, or 30% of the energy savings, as calculated in Table 10. This is shown in Table 11. This calculation gives a technical ESCO market size of €34 - €102 million.

[27] Energy Expenditure: Carbon Emissions ratios are estimated to be €122.95/tonne for the services sector and €67.50/tonne for the industrial sector, based on SEI figures (Energy Expenditure € /Related CO2 Emissions ktCO2)from its Profiling Energy and CO2 Emissions Reports. This reflects a higher carbon intensity in the services sector.

However this falls to €20 - €60 million when the economics of projects are considered and even further (to €13 – 39 million) if high hidden and missing costs are taken into account.

**Table 11 Estimated ESCO Market Potential**

| | Estimated ESCO Market Potential €m | | | |
|---|---|---|---|---|
| | **Technical Potential** | **No H&M Costs** | **Low H&M Costs** | **High H&M Costs** |
| 10% market capture | 34.1 | 20.0 | 17.3 | 12.8 |
| 20% market capture | 68.2 | 40.0 | 34.7 | 25.7 |
| 30% market capture | 102.3 | 60.1 | 52.0 | 38.8 |

In order to check the accuracy of the above estimation we will compare this method with market estimations based on three other sources of information relating to the potential ESCO market size, namely;

- The estimated annual EU market potential for ESCO's of €5-10 billion and calculation of Ireland's share of this market, based on the ratio of Irish GDP to EU GDP to determine
- The estimated annual EU market potential for ESCO's of €5-10 billion and calculation of Ireland's share of this market, based on the ratio of Irish energy expenditure to EU energy expenditure
- Estimated energy efficiency gains of 20%

### 6.3.2 Check against the EU ESCO market potential (using GDP)

This method scales the European estimated market potential for ESCO's (€5-10 billion)[28] to the Irish market, based on the ratio of GDP levels between Ireland and Europe. Under this approach the market size is estimated at €71 - €141 million.

However, the €5-10 billion figure will contain a factor for ESCO market potential in the residential sector, which is unlikely to be attained in the Irish market place. As such these figures should be reduced by as much as 25%, giving a potential market size of €53 - €106 million (Table 12).

[28] Euoprean Commission, DG, JRC, 2005, Energy Services Companies in Europe, Status Report

**Table 12 Estimated Irish ESCO market size (as a proportion of EU market potential, based on GDP)**

| | €m Low | €m High |
|---|---|---|
| Estimated EU ESCO Market Potential[1] | 5,000 | 10,000 |
| EU 15 GDP[2] | 9,612 | 9,612 |
| Irish GDP[2] | 136 | 136 |
| Ratio of Irish to EU 15 GDP | 1.41% | 1.41% |
| Estimated Irish ESCO Market Potential | 71 | 141 |
| **Market Potential (discounting residential sector)** | **52.98** | **105.96** |

[1] Energy Services Companies in Europe, Status Report, 2005, EC, DG, JRC
[2] European Energy and Transport - Trends to 2030, DG, TREN

### 6.3.3 Check against the EU ESCO market potential (using Energy Expenditure)

This method scales the European estimated market potential for ESCO's (€5-10 billion)[29] to the Irish market, based on the ratio of energy expenditure between Ireland and Europe. Under this approach the market size is estimated at €122 - €243 million.

However, the €5-10 billion figure will contain a factor for ESCO market potential in the residential sector, which is unlikely to be attained in the Irish market place. As such these figures should be reduced by as much as 20% (given a potential residential market share of 25% for ESCOs in Europe), giving a potential market size of €91 - €183 million (Table 13).

**Table 13 Estimated Irish ESCO market size (as a proportion of EU market potential, based on Energy Expenditure)**

| | €m Low | €m High |
|---|---|---|
| Estimated EU ESCO Market Potential[1] | 5,000 | 10,000 |
| Approximate EU Energy Expenditure[2] | 300,000 | 300,000 |
| Approximate Irish Energy Expenditure[3] | 7,300 | 7,300 |
| Ratio of Irish to EU Energy Expenditure | 2.43% | 2.43% |
| Estimated Irish ESCO Market Potential | 122 | 243 |
| **Market Potential (discounting residential sector)** | **91.25** | **182.50** |

1 Energy Services Companies in Europe, Status Report, 2005, EC, DG, JRC

2 EU Green Paper on Energy Efficiency – 20% savings to 2020 equates to €60 billion per year

3 SEI – Irish energy expenditure running at approximately €20M/day, SEI press release

http://www.irish-energy.ie/content/content.asp?section_id=1050&language_id=1&publication_id=1392

[29] Euoprean Commission, DG, JRC, 2005, Energy Services Companies in Europe, Status Report

### 6.3.4 Check against market size based on 20% of Irish energy use

This approach takes the commonly quoted figure for potential European energy efficiency gains of 20% (to be attained by 2020) and applies it to Irish energy consumption figures to give an estimate of the theoretical potential energy savings. It then estimates the market share for ESCO's as a % of these efficiency gains. In this instance we have considered three scenarios of ESCO's being able to capture 10, 20 or 30% of the energy efficiency (EE) market.

Under this approach the residential, transport and agricultural sectors have been discounted, as it is highly unlikely that ESCOs will operate in these sectors in Ireland.[30] The theoretical ESCO market size in Ireland therefore is estimated to be in the region of €30 - €90 million. The results are broken down in Table 14.

**Table 14 Estimated Irish ESCO market size (based on 20% efficiency gains)**

| | Final Energy Consumption[1] | Cost[2] | Potential Energy Efficiency Gain (20%) | Cost Saving Potential from EE Gains | Est. EE Market Captured by ESCO | | |
|---|---|---|---|---|---|---|---|
| | | | | | 10% | 20% | 30% |
| | Mtoe | €m | €m | €m | €m | €m | €m |
| Industry | 2.2 | 820.6 | 0.44 | 164.1 | 16.4 | 32.8 | 49.2 |
| Transport | 4.5 | 1678.5 | 0.90 | 335.7 | n/a | n/a | n/a |
| Residential | 2.8 | 1044.4 | 0.56 | 208.9 | n/a | n/a | n/a |
| Tertiary[3] | 1.8 | 671.4 | 0.36 | 134.3 | 13.4 | 26.9 | 40.3 |
| *Commercial* | 0.7 | 255.1 | 0.14 | 51.0 | 5.1 | 10.2 | 15.3 |
| *Public Sector* | 0.7 | 255.1 | 0.14 | 51.0 | 5.1 | 10.2 | 15.3 |
| *Other* | 0.4 | 161.1 | 0.09 | 32.2 | 3.2 | 6.4 | 9.7 |
| Agriculture | 2.8 | 1044.4 | 0.56 | 208.9 | n/a | n/a | n/a |
| **Total** | **14** | **5259** | **3** | **1052** | **29.8** | **59.7** | **89.5** |

[1] Energy in Ireland 1990-2003, Trends, Issues and Indicators, SEI, Jan 2005

[2] Based on an oil price of $60/bbl equating to €373/tonne

[3] Services sector split by employment levels, Profiling Energy and CO2 Emissions in the Services Sector, SEI, Apr 2005

As previously stated, this approach is based on the assumption of 20% energy savings, which realistically may be very difficult to achieve (without significant government support and or other measures). The estimate is however within reasonable proximity to the figures calculated previously.

[30] While ESCO's do operate in the residential sector in Europe, due to the minimal level of district heating schemes in Ireland, it is unlikely that this sector will attract ESCO activity.

### 6.3.5 Summary

We believe that the method which takes into account the hidden and missing costs associated with energy efficiency projects will give a more accurate estimation of the market size.

Table 15 compares the potential market size calculated via the four methods.

**Table 15 Summary of Potential Irish Annual ESCO Market Size**

| Method | Low €m | High €m |
|---|---|---|
| Based on $CO_2$ abatement costs for EE measures (no H&M costs) | 20 | 60 |
| Based on estimated EU ESCO market of €5-10bn and EU/Irish GDP | 53 | 105 |
| Based on estimated EU ESCO market of €5-10bn and EU/Irish Energy Expenditure | 91 | 183 |
| Based on potential for 20% energy efficiency gains | 30 | 90 |

Taking median values of the highest and lowest estimations a reasonable estimation for market size lies between €49 and 110 million per annum by 2020. If we assume that hidden and missing costs are high then this estimate will clearly be lower (estimated to be in the region of €47-104 million).

### 6.3.6 Impact of Energy Prices

Energy demand in a particular sector has been modelled as a function of income (or other appropriate activity variable) and relative prices by the ESRI as part of a study conducted on behalf of the EPA[31]. These models place the long run price elasticity of demand, for electricity and non-electrical energy in the industrial and services sectors, in the region of -0.33. This means that for a 1% increase in electricity prices there is a corresponding fall in the demand for energy of 0.33%, indicating limited price sensitivity to price changes.

The ESRI model also allows for the fact that demand is slow to respond to changes in income or prices because very often these changes require capital investment (e.g. in new more energy efficient boilers) that takes time to implement.

If we take the impact of price rises as directly affecting investment in energy efficiency measures (and correspondingly the ESCO industry) we can estimate the impact of energy prices on the ESCO market size estimated above.

[31] Environmental Protection Agency, 2004, The Macro-Economic Effects of Using Fiscal Instruments to Reduce Greenhouse Gas Emissions (2001-EEP/DS8-M1), Final Report

**Table 16 Impact of Energy Prices on ESCO Market Size**

| Energy Price Scenario | Impact on Energy Efficiency Uptake | ESCO Market Size |
|---|---|---|
| 10% increase | 3.3% | €51-113 million |
| 50% increase | 16.5% | €57-128 million |
| 100% increase | 33% | €65-146 million |

In line with the limited price sensitivity of energy demand to prices we would also expect, as shown in Table 16, that estimates for the ESCO market size do not change significantly even with a doubling of energy prices.

# 7. Options for ESCO Market Development

This section outlines options that, if adopted, would serve to improve the potential for an ESCO industry to develop in Ireland. The options have been chosen to address the major barriers identified in the context of this research. Those barriers are summarised in Section 7.1 below with the details of the recommended options presented in Sections 7.2, 7.3, 7.4 and 7.5. Section 7.6 then outlines an implementation strategy for the proposed options, also summarising the potential costs.

## 7.1 Summary of ESCO Market Barriers

Through the course of our work we have identified significant barriers to ESCO market development. The main barriers appear to revolve around:

- Lack of information/knowledge. Building owners in both the public and private sector, and operators of industrial facilities have a limited awareness of ESCO's or EPC (Energy Performance Contracting) type contracts and hence are not in a position to judge the benefits of such outsourcing structures.

- Lack of incentives to invest in energy efficiency measures. With the exception of the high price of energy there is little incentive to invest in energy efficiency. This is particularly prevalent in organisations where their energy spend is low in comparison to their overall costs and profits.

- The technical complexity of energy saving measures and intelligent facility management imposes great challenges to average customers, e.g. when comparing the offers and identifying appropriate technical solutions. In cases where internal expertise for such assessment is not available, external support by consultants plays an important role during the specification and preparation of the project. However, in both cases – with or without consultant – the customer is confronted with the problem that he/she has to judge an external proposal. There will be a demand for pragmatic aid in commissioning, comparing, selecting and controlling of technical planning services.

- Public procurement procedures. For all publicly funded institutions, where projects whose value exceeds €150,000 are to be undertaken they must be publicly tendered following EU Procurement Directives. There is currently a lack of clarity regarding which procedures to follow where there is an element of a public/private partnership (PPP/PFI – Project Finance Initiatives), indeed recently the European Commission started a consultation on the application of procurement directives to PPP contracts. Whereas the procurement guidelines strictly demand a precise and complete ex-ante analysis of all measures, costs and risks before the first offer to the ESCO can be made, in practice this task has to be delegated to the ESCO in order to benefit from the special expertise of the service. Moreover, due to unforeseeable technical difficulties projects always require a degree of flexibility and a gradual refinement of the concept during the stages of planning and realisation. Normally, this is handled through ongoing negotiations between the ESCO and the client in order to develop the best solution. Public authorities, however, are forbidden to deviate from an agreement once made which limits the scope for a search for better solutions.

- Lack of Finance for ESCOs / EPC contractors. Conventional financial institutions will tend to look at the balance sheet of the company when assessing its creditworthiness rather than the financial performance of the projects to be financed. The nature of ESCO operations means that, to outsiders unfamiliar with their business models, they represent high risk companies to lend to, since they normally will have financial structures involving significant quantities of debt.

- The small scale of ESCO projects relative to the size of projects normally dealt with by the Project Finance arms of the financial institutions. For a financial institution to assess project financing the project sizes will typically be in excess of €15 million, below this amount the operating overhead for the institution is too great in relation to the expected revenues form the project.

- The length of the project development cycle. From initial opportunity to signed contract can take 12-18 months for significant ESCO projects. During this period the ESCO is incurring costs without any guaranteed revenue streams. If new ESCOs are to develop within the Irish market they may need some form of support during this phase of the project development cycle.

- A reluctance to outsource. As with any outsourcing activity a number of barriers are raised, such as a fear of redundancy, a loss of control, or simply a reluctance to believe the claims for potential savings available.

## 7.2 Option 1: Intermediary Agency

The key option to overcome the main barriers to ESCO formation within the Irish market is the establishment of an Intermediary Agency to act as a focal point and a centre of excellence in this domain for a period of time. If the agency were created as a new body it would necessitate supplying a full contingent of staff and equipment, with the associated costs. However, such an agency could be incorporated into existing government structures/bodies, thus ensuring reduced overheads and staffing costs and allowing easier ramping up of personnel as and when the need arises. It would also allow for an easier transition when the agency reaches the end of its useful life. The agency's role would go beyond information delivery. It would act as an intelligent intermediary between the ESCOs and their customers and between the financial community and the ESCOs. In the following sections we expand on:

- Its potential roles and responsibilities

- The operational structure of the agency

- The financial structure of the agency

- Its participation in project financing.

The existence of such an agency providing the above services would benefit ESCO market development by:

- Assisting the development of new energy service companies in Ireland, without discriminating against any already established;

- Development of energy pools or carbon clubs in order to minimise transaction costs;

- Encouraging the uptake of ESCO involvement in the public sector;

- Encouraging the take up of ESCO contracts by reducing the perceived risk;

- Improving access to finance by offering public sector guarantees to investors;

- Acting as an arbitrator in disputes

As stated, the agency could fall under the responsibilities of an existing state agency/agencies with a focus on energy and/or public private partnerships.

### 7.2.1 Potential Role and Responsibilities

We see the main responsibilities of an Intermediary Agency as:

- To plan and execute an awareness raising campaign, initially within the public sector and then leveraging the resources developed, to transfer the focus of the campaign towards the private sector

- To manage and operate a Project Development Fund. This project development fund will provide grants to consulting companies and ESCOs for the identification of viable project opportunities. The agency will then screen the opportunities and select a limited number to carry forward into the project development phase. In this phase the agency should provide part funding for the detailed technical/economic feasibility study and preparation of the business case to potential ESCO customers.

- To provide quality assurance throughout the project development cycle providing the specialist technical/financial resources that may be lacking in the client base.

- To provide advice and guidance to clients on contracting with ESCOs, aggregating the small scale financing, legal and technical advisory requirements of individual projects to capture economies of scale.

- Broker financing for projects. To manage and operate a Project Implementation Fund. This implementation fund will provide the source of debt capital to the ESCOs within the Irish market unable to obtain their own project funding. We believe that this fund should be sourced from Independent Financial Institutions. Given the comments above regarding the attitude of financial institutions towards creditworthiness, we consider that the repayments to the fund should be backed by government guarantee (to attain lower debt costs).

- To manage and operate a registration procedure for ESCOs and Energy Performance Contract companies. With the Implementation fund subject to Government Guarantee, it is important that the companies benefiting from it are adequately screened. The agency should develop and implement a registration system for ESCO and EPC contractors which looks at their technical and management capabilities to implement projects as well as their financial viability and the risk profile presented by their portfolio of projects.

- To provide information dissemination/training to financial institutions on energy efficiency financing and protocols

- To establish an ESCO Association of Companies for organisations operating within the sector with alignment to the European ESCO Association (EFIEES)

- To act as a first port of call arbitrator on any conflicts/disputes that may arise over the implementation of energy service projects.

### 7.2.2 Agency Structure

To manage the Agency we envisage the following core staffing requirement:

- Director. The Director will provide leadership and direction to the agency and will participate in discussions with the ESCOs and potential clients. The Director will need good communication skills and ideally a background in/knowledge of the ESCO business. If the agency is to be established as part of an existing agency then the Director need only be focussed on this area for 20% of the time;

- Technical Specialists. The technical specialists will have the responsibility for managing the technical aspects of the project development cycle and will provide technical support during the assessment of the ESCO projects requests for financing;

- Legal Specialist. The Legal specialist will mainly provide support to clients on the contents of the ESCO contracts and on procurement procedures (where the clients are in the Public sector);

- Financial Specialists. The Financial specialists will have responsibilities for the financial aspects of management of the Project Development Fund and will assess the appropriate cost of debt financing for the ESCOS where they are to be funded from the Project Implementation Fund;

- Support staff for administration duties etc.

We would see these core staff being augmented by external specialists for specific elements of overall strategy.

### 7.2.3 Agency Financing

There is a requirement for two main sources of finance for the Agency:

- An annual grant to cover the operational costs of the agency;

- An annual grant to finance the project development fund.

Estimates for the potential size of these grants are provided in Section 8. Initially it is likely that the project opportunity pipeline will be large in relation to the number of ECSO contracts signed due in part to the length of the project development cycle and in part to the institutional barriers that remain. As the Agency gains experience within the Irish market their ability to screen projects will improve and they will be better able to target the use of the project development fund. We consider that, initially, those projects proceeding to contract should incur their own project development costs – i.e. this should be included in the financing cost of the project. As the market develops and as the skills of the agency improve, it may be possible to charge the full costs of the project development fund to the financing costs for the ESCO projects.

### 7.2.4 Project Financing

As mentioned previously, it is proposed that the Project Implementation Fund be sourced from Independent Financial Institutions and its allocation to projects managed by the Agency. Repayments to the Financial Institutions would come from the revenues of the projects financed. In determining the cost of debt capital for the ESCOs the Agency should apply the required recovery rate for the PIF and add:

- A risk premium specific to the nature of the project being financed;

- A cost for the project development (i.e. spreading the cost of project development over the lifetime of the debt financing)

- Optionally - a cost for the management of the PIF

The PIF should not be seen as a 'soft' option for financing of ESCO projects – where ESCOs have the financial capacity to source their own project financing they should be encouraged to do so through the application of market based costs for capital – i.e. through setting of the cost of debt financing from the PIF at a rate higher than an established ESCO would expect to pay if using its own resources.

As an alternative to pure debt financing, the Agency could also consider a mix of debt and equity financing of projects through participation in Special Purpose Vehicles set up on a project specific basis where this was the route preferred by the customer and ESCO. In this case the finance would be repaid through dividends income from the equity stake and any additional debt financing for the project.

As a market stimulation measure the Agency should have a finite lifespan. It is anticipated that at the end of its life it will be managing a portfolio of debt/equity financed projects bringing in revenue streams. At this stage it should be possible to "sell" the portfolio of revenue streams to a third party investor and exit the market.

#### 7.2.5 Consultation with Stakeholders

Whilst we consider the Intermediary Agency to be theoretically sound, we would also suggest that as part of a policy development initiative a consultation exercise should be undertaken to promote the idea to the government departments, financial institutions, existing and potential ESCOs to gather feedback on its viability and any suggestions for improvement to its structure, responsibilities and financing. Whilst this could be undertaken via a series of workshops, it may prove more effective to organise a range of bilateral meetings with policy developers to allow more detailed discussions to take place.

## 7.3 Option 2: Public Sector Take Up

In many countries within the EU, the public sector has provided the first examples of ESCO type activities. The Public sector provides many positive characteristics for ESCOs:

- They are significant energy consumers;

- They are financially viable and able to enter into long terms agreements for the provision of services;

- They normally operate with restrictions on their capital and operational budgets. This gives rise to some inflexibility in the financing of projects and thus provides an opportunity for ESCOs to provide assistance.

Conversely, and for the same reasons, ESCOs also provide many positive characteristics for the Public Sector.

It is assumed at the outset that in Ireland the Public Sector is largely unaware of the potential role of ESCOs in the provision of services; hence action to stimulate the take up of ESCOs within the Public Sector could be undertaken with the objectives of moving these organisations from:

- Unaware to Aware
- Aware to Interested
- Interested to Committed
- Commitment to Action

### 7.3.1 Unaware to Aware

There is no single homogenous target audience for an awareness raising campaign. People involved in a decision to implement an ESCO funded project will be drawn from many functional areas within the public sector:

- Finance
- Engineering
- Procurement/Contracting
- HR

**Potential Activities for the Intermediary Agency**

1. Briefing papers targeted to the main functional responsibilities, with invite to a briefing event. Whilst the papers will have a common core set of information, they should be adapted and targeted to the interests of the main functional responsibilities. The preparation of these papers should be subcontracted.

2. Briefing Events. Having raised awareness via the briefing paper the next phase in awareness raising would involve the hosting of a series of briefing events, where typically the audience would see presentations from the Agency, from established ESCOs regarding projects that they have undertaken and from previous customers of the ESCOs who would give their experience of working with ESCOs.

3. Articles in public sector journals.

4. Website with case studies / briefing papers / key links. The Agency should develop an information resource to back up its awareness raising activities, the most obvious solution being a website, initially containing an explanation of the role and responsibility of the Agency, the series of briefing papers and links to the many resources that already exist on the Web (e.g. the JRC website).

### 7.3.2 Aware to Interested

**Potential Activities for the Intermediary Agency**

1. Visits to similar organisations in EU who have implemented ESCO contracts. Government bodies interested in pursuing the ESCO concept should be encouraged to visit other similar public sector bodies where ESCO funded projects have been undertaken. These visits should not be restricted to the UK, but should also look at other EU Member states, especially the new Member States where much market development activity has taken place.

2. Detailed case studies on Website. The Agency can add to the information resources by sponsoring the preparation of detailed case studies for publication on its website.

### 7.3.3 Interested to Committed

**Potential Activities for the Intermediary Agency**

1. The Project Development Fund (see above). The project development fund has as its objective the preparation and presentation of business cases to potential customers. The Agency could consider participation in any subsequent meetings between the ESCO and potential client to assist the ESCO in persuading the client to commit to a project.

### 7.3.4 Committed to Action

**Potential Activities for the Intermediary Agency**

1. Development of a Procurement File for Public Sector organisations drawing on best practice and establishing standard contracts that can be drawn upon to help reduce transaction costs.

2. Provision of independent technical, financial and legal expertise to the public bodies to facilitate the agreement of contracts with the ESCOs.

### 7.3.5 Extension to the Private Sector

Much of the information resources developed to overcome the barriers within the public sector will also have some utility within the private sector, and a similar awareness raising / communications strategy could be adopted.

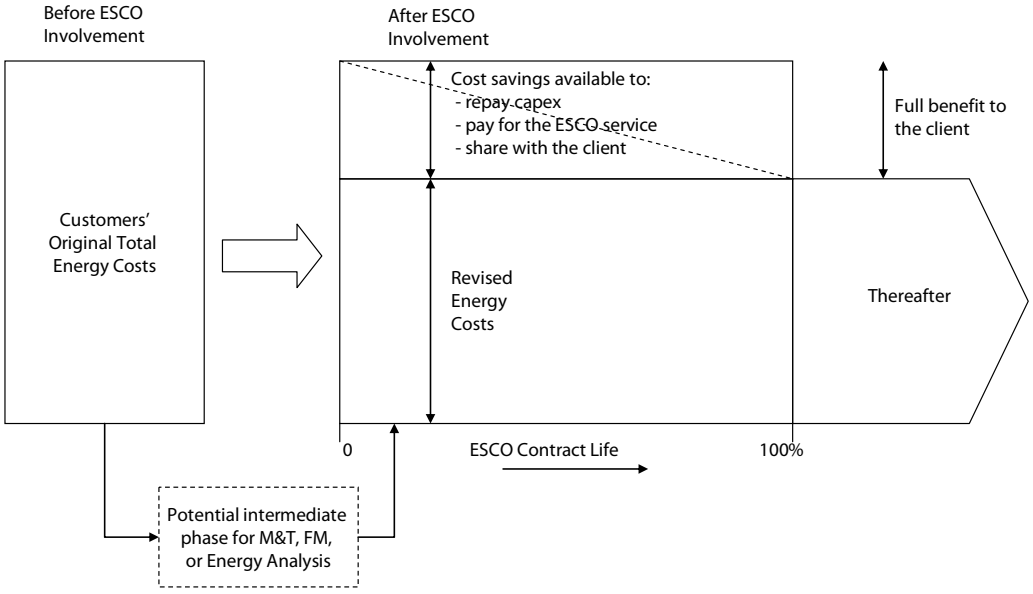
The private sector typically faces less institutional barriers in terms of the decision making process and in addition are not constrained in any form by public procurement procedures. One of the lessons learnt from the discussions held with ESCOs in the initial stages of this project was the value of case studies as a means to promote the concept, particularly if the customer is willing to participate in the promotion. Whilst maintaining that the Agency's initial focus should be on the public sector, we would propose also that it seeks out a few opportunities in the private sector to take advantage of the faster decision making cycle and some potentially large gains. Opportunities that emerge within this sector, stimulated by activities of ESCOs or other market actors within the energy sector, should be given equivalent levels of support to the public sector.

## 7.4 Option 3: ESCO Business Model

In Europe, the ESCO market developed initially on the basis of a relatively few business models. This is no longer the case in the current market place, as lessons have been learned and experience gained. While it can be useful to group some of the major business models/contractual arrangements into specific categories, for explanatory purposes, this can become largely an academic exercise. Based on our research it is clear that there are now a large variety of models in place, and customisation of contracts on a case by case basis is the norm.

In this regard, and, so the market in Ireland can be developed without additional hindrance, we would propose that when promoting the ESCO industry the intermediary agency promotes a flexible ESCO model. This is the best approach for stimulating the market; in that no one option (which might suit a potential client over another) is restricted and the potential for developing the market is maximised. This model does not specifically define how savings are achieved or how they are to be shared, if at all, but simply outlines a set of common principles for implementation of an ESCO contract. The details of each situation should then be left up to the negotiations between ESCO and client. This flexible approach is depicted graphically in Figure 7.

**Figure 7 Proposed Irish ESCO Business Model**




The principles of ESCO involvement are as follows:

- *Single Source* – the ESCO will act as a single source for the energy services and all ancillary/related services. In other words the ESCO co-ordinates/controls all contributions to the contract (finance, new plant suppliers, design, installation, O&M and warranty services)

- *Performance Based Contracting* – whereby the ESCO will offer one or more of the following:

    - A guarantee and measure of the proposed energy savings. While this is difficult to achieve, particularly where variables such as production or occupancy levels will have an affect on energy consumption, it will be attractive to potential clients.

    - A guarantee of plant performance. This can take the form of a guarantee of energy efficiency as well as for the delivery of the energy needs of the client and is simple to demonstrate.

    - A guarantee of energy cost rates subject to minimum take and/or sliding scales. This concept tasks the ESCO with selling energy as used, typically by the tonnes of steam or the MWh of heat or electricity delivered into the clients system. The ESCO takes the risk and cost of conversion from the fuels used, and hence to ensure it can recover adequate costs in the event of reduced energy take by the client the ESCO needs to build in safeguards (such as minimum take clauses).

- *Ongoing/Long term Energy Partnership*

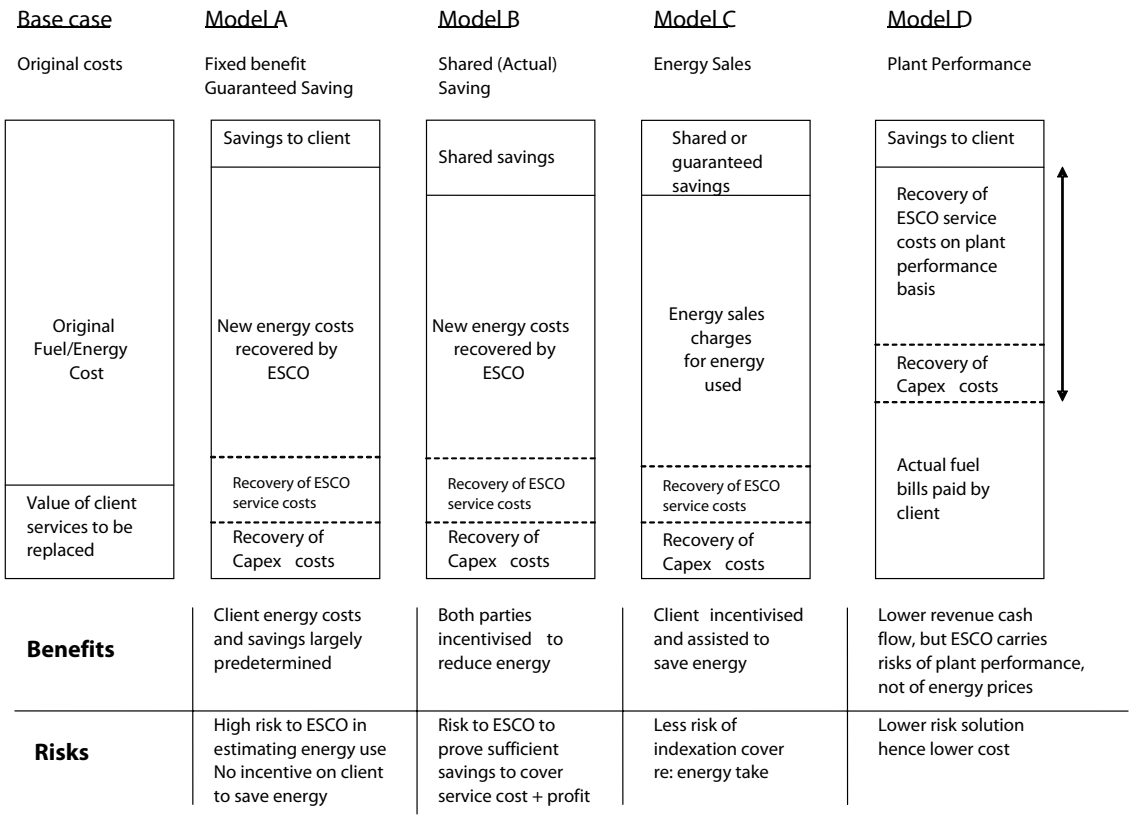
    - Aimed at minimising energy use and emissions

    - Providing monitoring and targeting information and analysis

    - Advising on, and anticipating the impact of, change (e.g. legislation)

Figure 8 below depicts a range of charging models that could be adopted under this flexible model outlined above, and also summarises the main benefits and risks of each. It should be noted however that other variations not outlined here could also be adopted.

**Figure 8 Possible ESCO Charging Models**




- *Base Case (Pre ESCO Involvement):* The band of "value of client services to be replaced", relates to the existence in many full ESCO contracts of savings the client makes by not having to provide so much in the way of operational, maintenance, and repair costs itself (under the new arrangement the ESCO may do much of this, and/or the plant is more automated). This client saving may be used by the ESCO to help justify the overall cost savings.

- *Model A:* Here the ESCO has to pay for the new energy bills (new energy bills recovered), and out of the difference between that and the "total original fuel/energy costs" has to recover service and capex costs, as well as produce the guaranteed saving element that has been committed to the client.

- *Model B:* This is very similar to Model A except that the savings are shared between the ESCO and client giving both parties an incentive to reduce energy. The risk with this

model, as for A, is in estimating the energy cost and proving sufficient savings to cover service cost and profit

- *Model C:* The difference with this model is the client is charged by metering the usable energy actually takes in the form of MWH of electricity, heat (central/district/space heating), tonne of steam for process use, from the plant, rather than an "agreed" charge based on the original energy bills. Under this model there is less risk of errors due to the ESCO incorrectly forecasting the impact on energy use of changing production rates, occupancy rates, weather etc.

- *Model D:* Under this model the ESCO guarantees a level of plant performance (which includes energy efficiency levels) as opposed to energy costs. This is a lower risk solution.

It is likely that Models C and D would initially be more favourable in the Irish marketplace as these are the lower risk approach for ESCOs.

## 7.5 Other Options

Whilst the establishment of an agency in itself should act to stimulate the development process for ESCOs, there are other actions that could be considered which could aid this process:

- Enhanced Capital Allowances

- Introduction of White Certificates

### 7.5.1 Option 4: Enhanced Capital Allowances

Capital allowances allow the costs of capital assets to be written off against a business's taxable profits and thus take the place of depreciation within the commercial accounts of that business. Typically the capital allowance for an investment will be spread over a number of years, e.g. 25% per year on a declining balance basis. Enhanced Capital Allowances (or First Year Allowances) is the name given to specially increased rates of allowances. ECAs allow a greater proportion of the cost of an investment to qualify for tax relief against a business's profits of the period during which the investment is made. They bring forward the time tax relief is available for capital spending[32].

Following the example of the UK, the Irish Government could consider introduction of an ECA scheme for energy efficient technology or equipment. The main elements of the UK scheme are:

- A criteria list which contains details of the energy-saving criteria that must be met for each of the technology classes eligible for ECAs. These criteria can be made progressively tougher as technological performance improves over time.

- A product list which contains a list of products that have been certified as meeting those standards.

In the UK the scheme is open to all purchasers of energy efficient technologies and thus acts as a general stimulation measure for investment in energy efficiency. To make this a specific measure for ESCOs it would be possible to link the ability to claim ECAs to the ESCOs registration with the Intermediary agency. By linking the ability to claim ECAs to registration, it may be possible to avoid the need to administer and maintain the criteria

[32] UK Inland revenue website ( www.inlandrevenue.gov.uk ).

lists and product lists and to replace them with classes of technology for which the ECA is available. This relies on the assumption that the ESCO will generally adopt the most energy efficient technologies. By removing the need to maintain the lists the overhead costs for programme operation are thus avoided.

When ESCOs are starting up they will typically incur the investment costs for the project prior to the receipt of any revenues, thus in the year of investment the ESCO may make a loss – the presence of an ECA would thus be of limited benefit. In ongoing operation the ESCO will be investing in certain projects and receiving revenues from others thus the ECA would become effective. The scheme therefore for be better targeted to the business model of ESCOs if there was a degree of flexibility in the timing of the capital allowance.

### 7.5.2 Option 5: White certificates

To date the Irish government has not introduced any form of carbon tax or levy and thus, for businesses, the only mechanism that exists to impose improvements on energy efficiency is the EU ETS – and this only directly impacts a limited number of facilities.

A different policy measure, which is in advanced stages of implementation within the UK and Italy and is planned within France, is the "White certificate", a market based instrument to promote energy efficiency.

White Certificates are tradable certificates for energy saving and thus are similar in principle to "Green certificates" for renewable energy supplies and the "Brown Certificates" for carbon emissions. In the UK system, the Energy Efficiency Commitment 1 (EEC) programme required that all electricity and gas suppliers with 15,000 or more domestic customers must encourage or assist those customers to take energy-efficiency measures in their homes. In EEC 2 suppliers with at least 50,000 domestic customers (including affiliated licenses) are eligible for an obligation. Suppliers who are not able to achieve their obligations within their own customer base are able to meet their obligation through the purchase of certificates from other suppliers who had exceeded their obligation.

Whilst in the UK the programme is targeted at the suppliers of energy this need not be the case, a programme could be developed that targeted the users of energy. Such a programme would at a minimum require:

- Targets to be set for defined customer sectors;
- A means of verification and reporting of energy savings made;
- A means of trading certificates;

The proposed Directive for End Use Efficiency and Energy Services contains proposals for targets for energy efficiency and could provide a stimulus for development for such a scheme.

From the perspective of an ESCO there is a benefit in the White certificates since they provide an additional potential revenue stream associated with each of their projects, and specifically with the ESCO business model, the systems for measurement and verification of savings made are an inherent part of the contract between the ESCO and the customer.

White Certificates are not a "simple" policy option to implement, issues that would need to be addressed[33] include:

[33] Bertoldi, P., Rezessy, S., Lagniss, O. and Voogt, M. "White, Green and Brown Certificates – How to make the most of them"

- The size of the target and the reference point (this could be linked to the targets set in the Draft Directive on energy end use and efficiency);

- How targets should be apportioned amongst the target group;

- What projects, technologies should be included (savings could result from technology based projects; exogenous and endogenous conditions such as changes in temperature, production rates, occupancy levels; behavioural changes). How genuine are the savings and how durable are they;

- Trading rules, including property rights;

- Tools to mitigate price volatility;

- Institutional infrastructure.

This complexity, we consider, places the design of such a system outside of the scope of this project – it may be worthwhile for SEI to consider the topic as a study in its own right.

## 7.6 Implementation Strategy

A phased approach could be taken to the implementation of the proposed options for ESCO market development. If this is to be the case then we would prioritise across short, medium and long term timeframes as outlined below.

- Short term (0 – 1 year)

    i. Establish an ESCO intermediary agency (option 1) within an existing structure

    ii. Focus the development activities of the agency towards the public sector (option 2)

    iii. Promote a flexible ESCO business model (option 3)

- Medium term (1 – 5 years)

    iv. Implement an enhanced capital allowance scheme (option 4)

- Long term (> 5 years)

    v. Implement a white certificate trading scheme (option 5)

**Table 17 Implementation Strategy**

| Option | Barrier(s) addressed | Implementation Assumptions | Est. Costs (€k pa, excl. start up costs) | Est. Benefits (€k pa) |
|---|---|---|---|---|
| | | ***Short Term Objectives*** | | |
| Option 1:<br>Intermediary ESCO Agency | ☐ Lack of information<br>☐ Complexity of projects<br>☐ Lack of finance<br>☐ Small scale of projects<br>☐ Length of project development cycle<br>☐ Reluctance to outsource | ☐ Agency is incorporated into an existing government body<br>☐ It will exist for a limited period of time (until a market has been established) estimated at 10 years<br>☐ Staff numbers will be ramped up/down at the beginning/end of its life<br>☐ When fully operational it will consist of five staff from legal, technical and financial backgrounds as well as support staff and a director (20% of the time), costing €440k p.a.<br>☐ It will seek to identify 50 ESCO opportunities per year<br>☐ It will partly fund (at a level of 40%) 10 feasibility studies per year<br>☐ It will seek to add 10 new contracts per year after 4 years<br>☐ Average energy bill for a client (or pool of clients) is €500k p.a.<br>☐ Average value of an ESCO contract is €100k pa (or 20% of the energy bill) | 978 | 1,000 |
| Option 2:<br>Public sector focus | ☐ Lack of information<br>☐ Complexity of projects<br>☐ Lack of finance<br>☐ Length of project development cycle | ☐ Initial awareness raising activities of €150k in the first year<br>☐ Awareness raising of €50k per year after the first year<br>☐ Other costs are incorporated into the operational costs of the agency | 50 | Incorporated into the agency benefits |
| Option 3:<br>Flexible business model | ☐ Lack of information/knowledge<br>☐ Complexity of projects | ☐ No costs incurred as this will be part of the promotional activities associated with the agency | - | Incorporated into the agency benefits |

| Option | Barrier(s) addressed | Assumptions | Est. Costs (€k pa, excl. start up costs) | Est. Benefits (€k pa) |
|---|---|---|---|---|
| | | ***Medium Term Objectives*** | | |
| Option 4:<br>Enhanced capital allowance scheme | ☐ Lack of finance<br>Lack of incentives | ☐ The cost of operating an Enhanced Capital Allowance Scheme is that of one administrator at €50k<br>☐ Responsibility for administration o f the scheme could lie within the proposed agency<br>☐ This will result in an additional ESCO contract per year | 50 | 100 |
| | | ***Long Term Objectives*** | | |
| Option 4:<br>White Certificate Trading | ☐ Lack of finance<br>☐ Lack of incentives | ☐ Involves setting energy efficiency ta rgets (estimated to be €50k as a one off consultancy study)<br>☐ Costs for establishing a scheme are estimated to be €350k in the first year (developing allocation strategy and establishing allowances)<br>☐ Costs of maintaining a registry estimated to be €50k with responsibility for enforcing the targets with the EPA<br>☐ This will result in a further 3 ESCO contracts per annum | 50 | 300 |

## 7.7 Further Research

Areas for which further research would be required centre on the introduction of Enhanced Capital Allowance Schemes, Energy Efficiency targets and White Certificate Trading. Such research could review the experience of other countries that have implemented similar measures with a view to understanding in more detail the actual costs/benefits realised.

# 8. Cost-benefit Analysis

An indicative cost benefit analysis has been conducted for the major options discussed above. As well as those assumptions outlined in Table 17 above, it should be noted that:

- The proposed agency will be incorporated into an existing government structure and so overheads will be reduced accordingly;
- Employment overheads (PRSI, pension etc.) are estimated at 20% of the annual salary costs for the agency;
- Costs and benefits to the exchequer as a result of increased/reduced tax revenues, VAT receipts, employment etc. have not been considered as part of this analysis;
- A discount rate of 6% has been assumed to reflect a public sector organisation;
- The benefits of ESCO involvement are assumed to be the cumulative value of energy savings achieved, (as the energy savings will be ongoing).

The results of this cost benefit analysis are detailed in Table 18 below. The results show a highly positive NPV as a result of the cumulative energy savings with a payback between the third and fourth years (Payback = 3.3 yrs) of operation of the various activities. While the NPV is very highly positive it should be noted that the costs fall to government while the benefits are gained by private and public organisations (as well as society as a whole).

## 8.1 Impact on Ireland's Carbon Footprint

Considering the cumulative benefits of the proposed options over the ten year period, and assuming a 50:50 split of energy savings from electricity and gas, then the estimated carbon saving to the Irish economy is 202,842 tonnes $CO_2$ (assuming electricity price of €0.1/kWh and gas price of €8/GJ or €0.04/kWh) – Table 18.

## Table 18 Cost-benefit analysis of proposed options

| Year | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Costs (€k)** | | | | | | | | | | |
| Awareness Raising Activities | 150 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| Opportunity identification and screening | 200 | 200 | 200 | 200 | 200 | 200 | 200 | 200 | 200 | 200 |
| Feasibility study funding | 200 | 200 | 200 | 200 | 200 | 200 | 200 | 200 | 200 | 200 |
| *Total operational expense* | *550* | *450* | *450* | *450* | *450* | *450* | *450* | *450* | *450* | *450* |
| Salary Costs | 255 | 255 | 255 | 440 | 440 | 440 | 440 | 440 | 440 | 440 |
| Office and overhead costs | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| Employment Overhead | 51 | 51 | 51 | 88 | 88 | 88 | 88 | 88 | 88 | 88 |
| **Total agency costs** | **906** | **806** | **806** | **1028** | **1028** | **1028** | **1028** | **1028** | **1028** | **1028** |
| | | | | | | | | | | |
| Enhanced capital allowance scheme admin | 0 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| EE Targets | 0 | 0 | 0 | 0 | 0 | 50 | 0 | 0 | 0 | 0 |
| White Certificate Trading | 0 | 0 | 0 | 0 | 0 | 350 | 50 | 50 | 50 | 50 |
| **Total Annual Costs** | **906** | **856** | **856** | **1078** | **1078** | **1478** | **1128** | **1128** | **1128** | **1128** |
| | | | | | | | | | | |
| **Benefits (Energy Savings)** | | | | | | | | | | |
| No. of new ESCO Contracts/year | 0 | 2 | 5 | 8 | 10 | 10 | 13 | 13 | 13 | 13 |
| Value of new ESCO contracts (€k/year) | 0 | 200 | 500 | 800 | 1000 | 1000 | 1300 | 1300 | 1300 | 1300 |
| **Annual Benefits (€k/year)** | **0** | **200** | **700** | **1500** | **2500** | **3500** | **4800** | **6100** | **7400** | **8700** |
| | | | | | | | | | | |
| **Net Benefit** | **-906** | **-656** | **-156** | **422** | **1422** | **2022** | **3672** | **4972** | **6272** | **7572** |
| Discount Rate | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% |
| Discount Factor | 0.943 | 0.890 | 0.840 | 0.792 | 0.747 | 0.705 | 0.665 | 0.627 | 0.592 | 0.558 |
| Discounted Cash Flows | -854.717 | -583.8377 | -130.9806 | 334.2635 | 1062.601 | 1425.43 | 2442.09 | 3119.494 | 3712.387 | 4228.165 |
| **NPV** | **14,755** | | | | | | | | | |
| IRR | 55.45% | | | | | | | | | |
| | | | | | | | | | | |
| **Savings expressed in GWh** | | | | | | | | | | |
| Electricity (Assuming elec price = 10c/kWh) | 0 | 1 | 3.5 | 7.5 | 12.5 | 17.5 | 24 | 30.5 | 37 | 43.5 |
| Gas (Assuming gas price = 4c/kWh) | 0 | 2.5 | 8.75 | 18.75 | 31.25 | 43.75 | 60 | 76.25 | 92.5 | 108.75 |
| | | | | | | | | | | |
| **Savings expressed in tonnes $CO_2$** | | | | | | | | | | |
| Electricity (Assuming emission factor = 0.651 $kgCO_2$/kWh) | 0 | 651 | 2278.5 | 4882.5 | 8137.5 | 11392.5 | 15624 | 19855.5 | 24087 | 28318.5 |
| Gas (Assuming emission factor = 0.198 $kgCO_2$/kWh) | 0 | 495 | 1732.5 | 3712.5 | 6187.5 | 8662.5 | 11880 | 15097.5 | 18315 | 21532.5 |
| | | | | | | | | | | |
| **Total Carbon Savings (t $CO_2$)** | **0** | **1146** | **4011** | **8595** | **14325** | **20055** | **27504** | **34953** | **42402** | **49851** |
| | | | | | | | | | | |
| **Accrued Carbon Savings over programme life (t CO2)** | **202,842** | | | | | | | | | |

## 8.2 Sensitivity analysis

To analyse the sensitivity of our assumptions, we have considered the following scenarios, the results of which are detailed below in Table 19:

- S1: Project take-up is approximately half that initially projected
- S2: Project costs are double those projected
- S3: Project take-up is halved and costs are doubled

**Table 19 Sensitivity Analysis**

| Option | NPV (€m) | IRR (%) | Payback (Yrs) |
|---|---|---|---|
| S1 | 3,083 | 20.19 | 4.77 |
| S2 | 7,381 | 22.53 | 4.67 |
| S3 | -5,176 | n/a | 6.97 |

Under these scenarios a negative NPV is obtained if costs are double and expected project take up is half the originally projected amount.

# 9. ESCO Case Studies

This section details two ESCO's in operation. The first of these, Thameswey Energy Ltd. was selected because it has parallels with the proposed option for developing an ESCO Agency financed jointly from government and the private sector. Specifically Thameswey provides a good example of an ESCO:

- Focussed on public sector activities;
- Financed through public private partnership;
- Operating a recycled capital fund for project implementation.

The second case study RWE Solutions Ltd. offers an example of a private sector ESCO operating in both the industrial and commercial sectors and actively present in Ireland (the Guinness breweries in Dublin and Dundalk).

## 9.1 Thameswey Energy Ltd.

Woking Borough Council (WBC) is well known for being one of the most energy efficient councils in the UK. For over 15 years WBC has implemented a series of sustainable energy projects, including the UK's first small-scale CHP/heat fired absorption chiller system, the first local authority private wire residential CHP systems, the largest domestic photovoltaic installation and the first local sustainable community energy systems.

Since the council first drew up its energy efficiency and environmental policies in 1990/91 it has achieved its target of reducing energy consumption by 40% in 10 years (actually reaching 43.8% saving with a $CO_2$ emission reduction of 96,588 te, a 71.5% saving).

To achieve this, in part, the council established an innovative energy efficiency recycling fund, where financial savings achieved from energy and water efficiency projects were ploughed back into the capital fund, creating an ongoing recycled capital fund (ESCO finance model), which led to a total investment by 2001 of £2.7M from an original seed fund of £0.25M, enabling savings of nearly £4.9M.

Central to achieving these figures was the establishment of the UK's first Environmental and Energy Services Company and ESCO called Thameswey Ltd and Thameswey Energy Ltd, respectively.

### 9.1.1 The Formation of Thameswey Energy Ltd.

Thameswey Ltd (TW) was incorporated in 1999 and is an Energy and Environmental Services Company or EESCO wholly owned by Woking Borough Council with the key aim of entering into public/private partnerships to deliver its energy and environmental strategies and targets. In addition, the Memorandum of Articles and Articles of Association for TW enable it to participate in energy services projects both inside and outside the Borough of Woking.

TW was established by WBC in order to overcome some of the capital and revenue constraints placed on the local authority, which finances are strictly controlled by Central Government. By establishing a public private partnership ESCO it was hoped that private finance could be secured more readily and the Council could realise its energy and environmental objectives. In addition, the Local Authorities (Companies) Order 1995 states that Local Authorities cannot invest more than 20% in private companies, otherwise the private company would be treated as a Local Authority and subject to the same Central Government capital controls.

Before it could establish such a structure WBC obtained funding as part of the UK governments Energy Saving Trust ESCO Programme to seek counsel's opinion on local authority powers with respect to forming or participating in ESCO's. The outcome of this work was the establishment of Thameswey to take forward WBC's objectives, from a small scale using local authority funding, to a large scale level using primarily private finance. The Council owns the intellectual property in Thameswey and the registered trademarks.

The principal objectives of TW are:

- To promote energy efficiency, energy conservation and environmental objectives by providing energy and/or environmental services
- To develop and implement technologies for the production and supply of energy
- To produce and supply energy (and any related by-products) in all its forms
- To acquire and hold interests in the shore capital or loan capital of any company or corporation and in particular in companies engaged in the energy and/or the environmental business
- To provide financial, managerial and administrative advice, services and assistance
- To make facilities and services available for its customers and customers of companies in which it holds an interest.

As part of these objectives TW established Thameswey Energy Ltd. (TEL), a PPP Energy Services Company between Thameswey Ltd and ESCO International A/S (which is owned by Miljo–Sam Holding APS. Miljo–Sam Holding APS is owned by Pen-Sam (a Danis pension fund) and Hedeselkab who also own Hedeselskabet Miljo og Energi A/S, a Danish green energy company).

Projects are financed with shareholding capital and private finance with project development carried out jointly between the Council and Hedeselskabet Milijo og Energi A/S who also own DDH Contractors UK Ltd. who act as the turnkey contractor on large scale energy schemes. Hedeselskab is a foundation committed to environmental projects whose patron is Queen Margatrethe of Denmark.

TEL was incorporated in 1999 and capitalised in 2000 and its principal objectives are:

- To own and operate plant for the production and supply of electricity, heat and chilled water to customers and activities ancillary thereto
- To develop and implement technologies for the production and supply of energy
- To produce and supply energy (and any related by-products) in all its forms

TEL is the vehicle through which WBC invests in energy and environmental services projects. TEL's project finance comprises 20% shareholding capital and 80% loan finance capital. Of the shareholding capital 19% is provided by WBC via TW and 81% is provided by HME via ESCO International A/S. The loan finance is also procured through HME. Thus for every £38,000 invested by TW, the result is £1,000,000 in total project investment. This innovative funding mechanism is similar to the Council's energy efficiency recycling fund (discussed above) which ensures the Council always has sufficient shareholding capital to invest in TEL projects regardless of project size.

Although the Council is a minority shareholder in TEL, it owns the intellectual property in Thameswey and the Thameswey registered trademarks.

TEL provides sustainable energy services to:

- Other local authorities

- Public bodies and the private sector both within and outside Woking, and within local government powers

### 9.1.2 Fuel Cell CHP Programme

One of TEL's schemes included the first phase of the first town centre private wire CHP/absorption cooling district energy system in the UK. The use of private wire enabled green electricity to be sold directly to the customer and avoided transmission and distribution charges and electrical losses through the national grid/distribution networks.

The project comprised 1.46 $MW_e$ of CHP, 1.4 MW of heat-fired absorption cooling and 160 m3 of thermal storage distributed over 5 buildings in Woking Town Centre. Buildings are interconnected with heat and chilled mains and high voltage/low voltage private wire networks. The scheme satisfies its own electrical demands and exports surplus power over the public wires to sheltered housing residents and other local authority buildings. In the event of a National Grid or local Seeboard power cut, the system continues to operate in 'island' mode. The system is fully exempt from the Climate Change Levy and as the system grows, this benefit will be extended to other local businesses.

The fuel cell CHP project was part of a wider scheme that was developed over two phases. Phase 1A incorporated the installation of the fuel cell CHP project to serve the Woking Park "Pool in the Park/Leisure Lagoon" complex and Phase 2A served the Woking Leisure Centre by heat and chilled water mains and private wire, with the fuel cell operating as the lead CHP 24 hours a day, 365 days a year. The 24 hour heat load for the fuel cell CHP was a key aspect of the economic and environmental performance. The fuel cell CHP supplements existing CHP system in the Leisure Lagoon.

The economic performance of the fuel cell CHP in comparison with the conventional UK fuel supply and conventional CHP is detailed below. The UK fuel supply is taken as the benchmark which attracts the UK Climate Change Levy of 0.43p/kWh for centralised power station electricity and 0.15p/kWh for natural gas supplies. Good quality CHP and renewable energy is exempt from this Climate Change Levy.

Energy Services contracts include both the energy and maintenance costs of the primary energy plant. Hence, annual energy and maintenance budgets are used for the project economics calculations and applied to all of the primary energy plant in the Pool In The Park/Leisure Lagoon plus standby and top up electricity from the grid and standby and top up heat from the boilers.

**Figure 9 Project Economics of a 200kW$_e$ Fuel Cell CHP, 2003[34]**

| | | | |
|---|---|---|---|
| Capital Costs | | | £1,046,774 |
| **Pool in the Park Energy and Maintenance Budgets, Annual** | | | |
| Electricity | | | £ 145,621 |
| Woking Park Lighting Electricity | | | £ 7,900 |
| Gas | | | £ 45,349 |
| Plant Maintenance (inc. existing CHP) | | | £ 20,853 |
| | | | £ 219,723 |
| Energy Services Budget | | | £ 219,723 |
| Export Income from Housing | 368,229kWh @ 5.8p/kWh | | £ 21,349 |
| Climate Change Levy Exemption | 1,629,360kWh Elec. @ 0.43p/kWh | | £ 7,006 |
| | 2,530,300kWh Gas @ 0.15p/kWh | | £ 3,795 |
| | | | £ 251,881 |
| **Pool in the Park Energy and Maintenance Expenditure** | | | |
| Fuel Cell CHP Gas | 4,553,010 kWh @ 0.936p/kWh | | £ 42,616 |
| CHP Gas | 2,855,635 kWh @ 0.936p/kWh | | £ 26,729 |
| Boiler Gas | 205,345 kWh @ 0.936p/kWh | | £ 1,922 |
| Availability | 500kVA @ 2.7p/kVA X 365 days | | £ 4,930 |
| Fixed Charges | £2.33 per day X 365 days | | £ 850 |
| Import Electricity | 80,950 KWh @ 4.14p/kWh | | £ 3,350 |
| | 101,368 kWh @ 2.32p/kWh | | £ 2,410 |
| Existing Primary Energy Plant Maintenance (inc CHP) | | | £ 20,853 |
| Fuel Cell CHP Maintenance | | | £ 28,100 |
| | | | £ 131,760 |
| Fuel Cell Stack Replacement | | | £ 31,500 |
| | | | £ 163,260 |
| **Simple Payback** | | | |
| Annual Savings | = | £251,881 - £163,260 | |
| | = | **£88, 261 pa** | |
| **Simple Payback** | = | £1,046,774 | |
| | | £ 88,261 | |
| | = | **11.8 Years** | |

### 9.1.3 TEL's PV Installations

Woking Borough Council has also installed the largest PV (photovoltaics or solar electricity) system in the UK. Brockhill House comprises 53 'extra care' sheltered housing dwellings with kitchen, restaurant and other community facilities.

The maximum electricity demand of the site is 60kW. It has a natural gas fired combined heat and power unit which gives an output of 30kW$_e$ and also has installed 80kW photovoltaic roof electricity generation capacity. The photovoltaic system comprises 36,666 solar cells in 1,018 high efficiency monocrystalline silicon modules The light to electricity generation efficiency is between 16% and 18%.

A second project will incorporate 4 kW of photovoltaic screening on the civic offices roof which will be interconnected to the Victoria Way multi - storey car park via Woking town centre CHP - phase one private wire system as phase one of a proposed solar electric vehicle scheme.

### 9.1.4 Other Activity

The organisation is also in the process of acquiring all the primary energy plant in the council's housing stock and corporate property, with a target of replacing it with CHP or other sustainable energy systems within 7 years. The first phase of this acquisition was completed in 2002 with further phases to follow as and when sustainable energy systems are implemented in the council's buildings.

### 9.1.5 Contractual Arrangements

Thameswey Energy provides residential customers with sustainable energy services at less cost than their previous energy suppliers. Non residential customers are provided with bespoke energy service contracts. This lower cost provision is achieved, despite the higher upfront capital costs of the energy plant, by the sale of heating, cooling and particularly electricity to the customers.

Each project is bespoke with Thameswey Energy providing a potential customer with a breakdown on how the cost is worked out. A non residential customer's current electricity unit price is normally matched and the energy services costs are assimilated into the heat and chilled water unit prices. The customer's electricity consumption will be reduced since electricity is no longer needed to generate cooling. The energy services prices agreed at the commencement of the long term contract are index linked annually so the customer maintains the benefits of the contract throughout its duration.

There are further benefits to the customer in that there is a transfer of risk from the customer to Thameswey of the primary energy plant. Thameswey is responsible for the design and implementation of the plant, inflation, financing, maintenance, etc. as well as the green energy and stand by and top up supplies which offers customers further security of supply. There is also the additional benefit of 'green kudos' by being a customer of Thameswey.

## 9.2 RWE Solutions

RWE Solutions AG (formerly TESSAG Technische Systeme & Services AG), was formed in 1999 as a leading service provider for the energy technology infrastructure of industrial and energy supply companies. As RWE's (a large German utility company) services management company, RWE Solutions AG is responsible for providing, integrated solutions in the energy, utility supply and services sectors. The company serves industrial and energy sector customers from all over the world, along with the RWE Group's major customers.

The company employs around 12,600 employees and generates annual sales of around €2.8 billion. Formed from a number of separate subsidiary companies (Lahmeyer, Piller, SAG, Nukem, Smit and Starkstromgerätebau), RWE Solutions can look back (through these subsidiary companies) to over one hundred years of corporate history.

RWE Solutions is structured along the following market facing divisions:

- Utility Solutions

  This division provides design, engineering, construction maintenance and turnkey supply for distribution networks, switch gears and substations for High Voltage Power Systems, it also provides Geographical and Network Information and Network Information Systems to the sector.

- Communication Technologies

  Providing consulting, planning, construction, service and maintenance for carriers and suppliers of systems for fixed and mobile networks.

- Energy Distribution and Services

  Providing the construction and maintenance of electricity distribution networks, pipe systems, lighting systems, traffic overhead lines, traffic signal systems.

- Nuclear Services

  Providing nuclear fuel services, plants and processes for the nuclear industry, decommissioning of nuclear plants, and engineering services for nuclear power plants.

- Solar technology

  Providing solar cells, solar modules, system technology and special product technology/projects.

RWE Solutions describe their business as one of planning, constructing and managing energy infrastructures and media for industry and the utility sector. They achieve this by fostering long-term relationships with customers that are based on partnership. They are one of the top three European energy service providers.

### 9.2.1 Products and Services

RWE employs a total cost of ownership concept by optimising the total costs of a clients' infrastructure. This is achieved by giving consideration to the future operating costs when planning a facility and providing customised solutions ranging from consulting planning and implementation to long term service and outsourcing contracts. Services are delivered in three areas:

- Energy Generation

  Providing economically viable and sustainable projects that are long term, efficient, meet demand needs, conserve resources and environmentally sound. Services are provided for conventional energy generations as well as wind.

- Energy and grid infrastructure

  Providing planning and route project planning, construction or optimisation of networks and network systems. As well as optimisation and modernisation measures for existing plant, maintenance and servicing, and delivery/installation of components.

- Energy Supply

  Providing customers from the industrial and energy sector integrated total solutions from a single source, covering the entire life cycle of plants. This involves tailor made solutions ranging from planning and implementation of turnkey plants to the supply and disposal of energy and utilities

### 9.2.2 Diageo Contract Energy Management

Diageo (manufacturer of leading drinks brands such as Guiness, Beamish, Harp, Smirnoff and Baileys) has entered into a long term multi-utility alliance with RWE solutions, at its breweries in London, Dublin and Dundalk.

As part of cost reduction initiatives within Diageo, the utility supply is being optimised on an outsourced basis, with the objective of halving the specific energy consumption of 200 MJ/hectolitre (MJ/hl) to a best in class level of 100 MJ/hl and to simultaneously significantly reduce the utility process cost. The 15 year contract agreed between RWE and Diageo (at its Park Royal Facility in London) in October 2002 makes RWE responsible for complete energy and media supply and the operation of utility infrastructure on a contracting basis.

Essentially RWE Solutions provides the brewery with the utilities for the production process, namely:

- Steam;
- Compressed air;
- Treated water;
- Nitrogen;
- Carbon dioxide.

RWE Solutions also dispose of the wastewater through the support of its sister company Thames Water. As part of this contract RWE acquired all utility auxiliary installations and distribution systems on the site, including those for electricity, natural gas, and water. The operating and maintenance personnel for these installations is made available by the Thames

Water service subsidiary Engenica which also took over the Park Royal personnel employed in the energy area.

The primary raw materials, electricity and natural gas, are procured by RWE Solutions and supplied by the sister company Innogy. The water supply is from Thames Water – also procured by RWE Solutions.

In order to achieve the major energy and process cost savings, as of mid-2003 RWE Solutions planned, financed and constructed over a period of about 12 months, an energy efficient and low maintenance cooling system and low maintenance cooling system and a new system for anaerobic wastewater treatment and purification.

As a result of these investments, Diageo has also availed of an 80% reduction in the government Climate Change Levy and within one year reduced energy use from 200 to 104 MJ/hl.

Following the implementation of the contract in the London site, a similar contract has been implemented in Diageo's Dundalk and Dublin breweries, as of summer, 2003. In order to reduce the energy and process costs, in line with the agreement, RWE Solutions Ireland have invested almost €6 million in existing and new infrastructure facilities.

Some of the initiatives undertaken at the Dublin brewery include:

- Optimisation of the carbon dioxide and nitrogen plants, including the replacement of instruments and process control systems;
- Installation of a new and more efficient plant for anaerobic effluent treatment and purification;
- Upgrade of the SCADA system for more precise monitoring of the supply and disposal systems;
- Retrofitting of meters for more accurate metering of the utilities supplied to Diageo.

The key products and services provided as part of this Build, Own, Operate (BOO) contract include:

- Supply of electricity, natural gas, industrial gases, steam, water, heat, cooling and compressed air;
- Water processing and effluent treatment;
- Takeover, operation and modernisation of energy and utility plants and associated distribution networks;
- Recruitment and training of a site operations and maintenance team;
- Implementation of energy management systems;
- Service level agreements;
- Takeover and management of existing supplier relationships;
- Flexible remuneration models (volume-based or flat-rate).

### 9.2.3 Savings Contract Agreement with Sainsbury's

Aimed at reducing its annual energy costs by 12% an energy savings contract agreement between Sainsbury's UK and RWE Solutions is part of a broadly arrayed improvement programme to improve Sainsbury's competitive position.

Since May 2002, RWE Group affiliate Innogy has supplied Sainsbury's 470 stores with electricity and 400 stores with natural gas at fixed prices as part of four year agreement. At the same time RWE Solutions also initiated an energy savings programme at the group.

As part of the programme to achieve the targeted savings, Sainsbury's has earmarked a total of €23.5 million for investment (against an annual energy spend of €80 million per annum). Savings are initially identified via a team of experts on the basis of available data, know how and industry best practices, as well as targeted on-site audits. Pilot trials are then run and as soon as feasibility studies verify a positive outcome for an individual measure it is implemented across the board, assisted by RWE. The products and services that have been delivered include:

- Supply of electricity, natural gas, industrial gases, steam, water, heating, cooling and compressed air
- Water processing and wastewater treatment
- Construction, management, operating and upgrading of energy and media plants and associated distribution networks, either conventionally or on a contracting basis
- Takeover of operating and maintenance personnel
- Implementation of multi-utility management systems
- Service Level Agreements
- Flexible remuneration models (volume-specific, savings-oriented, flat-rate)

# APPENDICES

1. Domestic Energy Regulations
2. Review of Energy Prices
3. ESCO Industry Questionnaire
4. Potential $CO_2$ Abatement Values
5. The Reality of Industry Payback Criteria
6. Feedback from ESCO Workshop
7. The UK Enhanced Capital Allowance Scheme Energy Technology List
8. Hidden Cost Ranges Industrial and Non-Domestic Sectors

# 1. Domestic Energy Regulations

**Market Liberalisation**

Arising from the need to comply with the EU directive on the internal market (rather than from within Ireland), reform of the electricity sector began with the Electricity Regulation Act 1999 and was further advanced by the European Communities (Internal Market in Electricity) Regulations 2000 (S.I. 445 of 2000).

As of February 2005, all customers are now free to choose their electricity supplier. This has been a staged process whereby electricity users with an annual energy requirement greater than 0.1GWh have been free to choose their own electricity supplier from 19 February 2004. To facilitate market liberalisation a transmission system operator (TSO – Eirgrid or ESB National Grid) has been established to operate and administer the country's high voltage transmission lines. Any eligible party may gain non-discriminatory access to these lines at cost-based rates determined by the regulator.

To date, the domestic sector market has yet to see supplier switching, as none of the independent supply companies are currently offering a service to customers in the sector. While it is expected that this situation will change over time, there are still general concerns regarding the structural reforms introduced, and their ability to deliver a truly competitive market place – The Competition Authority of Ireland has stated that "*meaningful market entry has not occurred and prices to industrial customers remain higher than in other EU member states (due largely to the manner in which the relationship between the ESB and the transmission system operator has been legislated*)"[34]. It is believed that new legislation aimed at implementing Directive 2003/54/EC should at the least ensure effective decision making rights rest with the system operator, but there is also concern over the effectiveness of competition in the power generation market – the ESB retains the vast majority (80%+) of generating plant in the country and only two large-scale Independent Power Producers (IPP) have been commissioned (one of which is part owned by ESB) while several players have withdrawn from the market in recent years. The effect of this has been that investment in generation has not kept pace with increased demand, resulting in generation shortfall forecasts in Eirgrids Generation Adequacy Report for 2004 and 2005.

Consequently, a study to review the electricity sector in Ireland has been commissioned by the DCMNR. This review will examine, inter alia, the existing institutional arrangements and market structure, and assess their appropriateness. It will also identify a range of alternative structures for the ESB and provide recommendations, based on detailed business cases, on the most suitable arrangements for the market as a whole. Ultimately however there will need to be significant political will if liberalisation is to be realised to its full potential.

As with the EU Directives on internal markets for electricity and gas, market liberalisation is expected to reduce the costs of energy to consumers. As such this does not encourage the take up of end-use energy efficiency measures or equipment and so works against ESCO's offering these services. However with the introduction of new energy suppliers, providing energy services as an added value offering it is unclear as to the exact impact market liberalisation will have on the ESCO industry.

[34] Competition Authority, SMi Energy Conference Nov 2004, John Evans and David O'Connel, Liberalising for a Competitive Electricity Market

**Renewable Energy**

Ireland is well endowed with renewable energy sources. Wind resource, on a per capita basis, is amongst the highest in Europe. However, the development of renewable energy technology is generally quite low compared to other countries[35].

Since 1995 Ireland has run a competitive tendering process to encourage renewable energy and CHP technologies to enter the market – the Alternative Energy Requirement (AER) Programme. There have been six AER competitions since 1995, (three of which have included CHP). The competitive bidding process has however encountered problems. While it has ensured that the lowest cost developments were chosen, not all of the winners proceeded with developing plants, even with a guaranteed source of income. The original target for each round of the AER versus what was actually added to the grid in terms of new electrical generating capacity is shown in Table 20.

**Table 20 AER Capacity Targets vs. Capacity Developed[36]**

| AER Programme | Contracted Capacity (MW) | Actual Capacity Added (MW) |
|---|---|---|
| AER I | 75 | 70.62 |
| AER II | 30 | 0 |
| AER III | 158.75 | 42.11 |
| AER IV | 52.6 | 18.353 |
| AER V | 363 | 50.85* |
| AER VI | 365 | 226.202* |

* Either commissioned or under construction

Following a review of renewable energy policy, targets and programmes, in April 2005, the Minster for Communications, Marine and Natural Resources, has announced a change in the type of support mechanism to a fixed feed in tariff system[37]. This support system will be designed specifically to encourage new capacity development and will only apply to newly built projects. The minimum conditions necessary to apply for support, will also be changed, by adding a valid grid connection offer to the existing conditions applied to AER VI to ensure that projects that qualify for support are actually in a position to build within a reasonable timeframe.

Details of the Fixed Feed-In Tariff System now confirmed are:

1. Large wind energy (over 5 Megawatts) 5.7 cent per Kilowatt hour
2. Small wind energy (under5 Megawatts) 5.9 cent per Kilowatt hour
3. Biomass (landfill gas) 7.0 cent per Kilowatt hour
4. Hydro and other biomass technologies 7.2 cent per Kilowatt hour.

[35] SEI Renewable Energy in Ireland – Trends and Issues 1990 – 2002
[36] Department of Communications, Marine and Natural Resources, AER Programme and profile of AER I – VI Competitions
[37] Irish Wind Energy Association Annual Conference, Dundalk, April 2005

While there are questions over the impact these tariffs will have on new build renewable energy projects, it can only serve to enhance the potential for ESCOs offering RE. On the negative side however, there are no targets set with regard to heat generated from renewable energy sources.

**Interpretation of the EU Emissions Trading Scheme (ETS)**

The Kyoto Protocol sets out the timeframe and targets for the implementation of greenhouse gas reductions. The EU has an overall burden of reduction equal to 8%. Accordingly, Ireland is permitted to increase its emissions by no more than 13% above 1990 levels. (Most other countries are obliged to reduce their emissions. Some of the largest EU countries such as the UK and Germany have to make significant reductions compared to their 1990 levels).

The Directive considers two phases of implementation. Phase one is the so-called pilot period running from 1 January 2005 to 31 December 2007. Subsequent phases are in five-year periods thereafter. This has implications for the method of allocating the trading cap. For the three-year period beginning 1 January 2005 Ireland has allocated 97% of allowances free of charge to existing facilities, with 1.5% of total allowances set aside for new entrants. A total of 0.75% of allowances will be initially auctioned by the EPA, these figures are summarised in Table 21 below.

**Table 21 Final Allocation Breakdown[38]**

| Recipient | Total Allowances Permitted (tonnes of $CO_2$, 2005-2007) |
|---|---|
| Installations permitted before 31/03/2004 | 65,006,999 |
| New Entrant Set Aside | 1,004,400 |
| CHP Set Aside | 446,400 |
| To be auctioned | 502,201 |

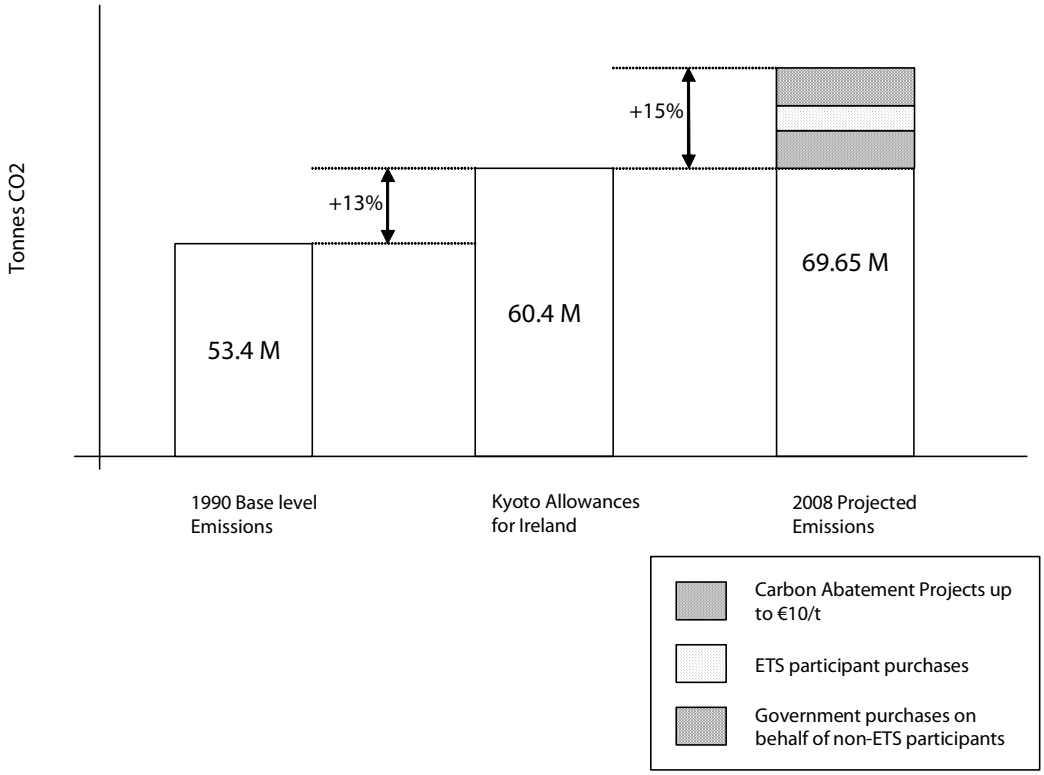
The latest estimates available show that energy-related $CO_2$ emissions in Ireland have decreased by 2% in 2003. The figures also highlight that the decoupling of energy and emissions growth from economic growth that began in 2002 continued in 2003 (economic growth increased by 4% in 2003, energy consumption remained almost at 2002 levels)[39].

Despite this recent trend however, Ireland is still significantly over its ETS target (see Figure 1 below). With its allowance under Kyoto set at 60.363 Mt p.a., $CO_2$ emissions for 2005 are projected as: 22.4 Mt within the trading sector covered by the ETS and 45.8 Mt for non ETS covered emissions (approximately 8 Mt over the allowance). No targets have been set for other sectors (i.e. agriculture, residential, waste and transport) to reduce their emissions. As a result, the Irish government is expected to purchase approximately 3.7 Mt p.a. through the flexible mechanisms, for the first Kyoto phase 2008-2012, in order to meet the shortfall (based on a carbon price of €10/t with industry availing of all abatement options up to the equivalent cost).[40]

[38] EPA, March 2005, Final Allocation Decisions,
[39] SEI, January 2005, Energy in Ireland 1990-2003, Trends, Issues and Indicators
[40] EPA, September 2004, Ireland's National Allocation Plan

For Ireland, the ETS imposes a cost on government and the private sector on the emission of carbon dioxide and thus provides an incentive to investment in equipment, procedures etc. that can reduce emissions more economically. This is clearly an incentive which ESCO's can leverage as organisations seek to reduce their exposure from a commodity carbon market.

**Figure 10 Ireland $CO_2$ Emissions and Distance to Kyoto Target**




**All Ireland Market for Energy**

In November 2004, both governments in Ireland announced the All Island Energy Market Development Framework. This framework set out the policy context for the two Governments, regulatory authorities and industry in creating the All-island market. Given that to some extent a cross border market already exists the aim of the development framework is to ensure:

- Improved economic and energy supply benefits;
- Opportunities for enhancing the value of the energy industries on the island, through external links with Great Britain and continental Europe;
- Renewable energy and energy efficiency opportunities where the benefits can be enhanced by acting on an all-island basis are pursued;
- Market structures are integrated, and infrastructure investment is secured, in order to improve island-wide efficiencies in the sector;
- Ultimately that regulatory and system operator arrangements for the island as a whole are unified and geared to the delivery of measurable benefits. Although separate structures may still be required to oversee the local market in each jurisdiction;

- The necessary policy, legislative and administrative arrangements to implement the development programme are identified quickly so that necessary action can be taken in a timely and effective manner;

- The vision of an All-island Energy Market is translated into reality by identifying the short, medium and long-term priorities that need to be addressed. The timescales for this process to be set within the wider context of the strategic development of the EU Internal Market for electricity and gas;

Potential long term benefits include:

- Larger, single market with competitive energy prices.

- Open and transparent competition at all levels in the marketplace and for all energy sources, including combined heat and power (CHP) and renewables.

- A more stable and attractive investment location.

- Consequential improvements to national and international competitiveness of the wider industrial sector.

- Greater security of supply.

- A robust, integrated infrastructure.

- Sharing a more diverse energy mix.

- Greater energy efficiency.

- Greater consumer choice of supplier of energy or of energy services.

- Longer term savings through rationalisation of functions in regulation, system operation and transmission asset planning and ownership.

- Improved organisation of energy research through the emergence of an all-island network of academic and industry expertise.

Since then the regulators in both markets have published their high level designs for the creation of the Single Electricity Market (SEM) for Ireland. The SEM will establish, for the first time, a single wholesale market in which buyers and sellers of electricity on the island will trade all their electricity on a daily basis; the structure proposed is a wholesale trading system based on the concept of a gross mandatory pool. This trading vehicle has been selected for its suitability to the requirements of the market on the island, and in particular the need to effectively meet increasing demand for electricity while maintaining security of supply.

Benefits will be attained by effectively combining two relatively small markets into one larger market. Under the new arrangements the lowest cost generating plant on the island as a whole will be run first, leading to lower overall fuel costs. In the longer term the combined market is expected to be a more attractive location for new investors than the two smaller current markets.

As with market liberalisation an all Ireland energy market is expected to reduce prices for consumers and act as a disincentive for energy efficiency take up, and ESCO's. Alternatively new energy suppliers may provide energy services as an added value offering as a means of retaining consumers or attracting new ones.

**Inter-connection**

Ireland is already substantially interconnected for gas, ensuring that transmission capacity is extremely robust in the medium term.[41] From Brighouse Bay in Scotland there are now two pipelines connecting Ireland to the UK. An interconnector to Belfast is also planned, however this will be used to supply expected shortfall in Northern Ireland.

Interconnection for electricity, however, is not quite so robust. The power system in the Republic of Ireland is connected to the Northern Ireland system via AC interconnectors. At present the interconnector transfer capacity North to South offered to the market is 330 MW. While flows in excess of 330 MW may occur for a period immediately after the loss of a generation unit in the Republic of Ireland, firm continuous trades in excess of this amount are not allowed for system security reasons.

In August 2004 the DCMNR announced the intention to develop two 500 MW interconnectors to Wales. A report from the Commission for Energy Regulation looking at the feasibility of all the interconnectors costs being borne by the private sector revealed that the Public Private Partnership or hybrid merchant/regulated model was the one favoured. The CER are currently working with consultants to develop an initial conceptual design with a view to holding a competitive bidding process for development of the project. Additionally, as part of their commitment to an all-island energy market the governments in the Republic of Ireland and Northern Ireland have recently endorsed plans for a second North-South interconnector.

These interconnection projects are likely to have an impact on the long term Generation Adequacy position in Ireland. However experience indicates that the planning, financing and development of such projects can take between seven and ten years to complete. [42] This provides an opportunity for ESCOs (at least in the medium term) to assist in reducing energy demand levels as a means of mitigating potential generation shortfalls.

**Fiscal policy measures**

While general fiscal policy may have an impact on any business, we have only considered those policy measures that are likely to have a specific influence on the operation of ESCOs in Ireland.

***Renewable Energy Tax Relief***

In Ireland**,** tax relief is permitted under Section 486B of the Taxes Consolidation Act, 1997 (inserted by section 62 of the Finance Act 1998 and amended by section 43 of the Finance Act 2002 and section 39 of the Finance Act 2004)[43]. Whereby corporate equity investments in certain renewable energy projects, namely hydro power, solar power, wind power and biomass are given tax relief. The relief takes the form of a deduction for tax purposes from a company's profits for an investment in new ordinary shares in a qualifying company. The relief is capped at 50% of all capital expenditure (excluding land), net of grants, on a single project up to €9.5 million. Investment by any one company or group of companies in more than one qualifying energy project is capped at €12.7 million per annum. The Department of Communications, Marine and Natural Resources certify qualifying renewable energy projects and thereafter the Revenue Commissioners administer the tax relief.

As part of the Finance Bill of 2004 the qualifying period for tax relief for corporate investment in certain renewable energy projects is being extended from 31 December 2004 to 31 December 2006.

[41] Commission for Energy Regulation, Gas Capacity Statement 2003
[42] Eirgrid - Transmission System Operator Ireland, November 2004, Generation Adequacy Report 2005-2011,
[43] DCMNR, 2004, Application for the Certification of a Renewable Energy Project Under Section 486B of The Taxed Consolidation Act, 1997 (Updated 2004)

***Leasing of plant and machinery***

The Finance Act of 2004 introduces an alternate method of computing taxable profits for lessors of short life assets. A short life asset is one whose useful life is not greater than eight years and which leased on terms such that 90% of its initial value will be recovered from lease rentals in not more than eight years. Under pre-2004 rules the income of the lessor is calculated by treating gross lease payments as income and allowing capital allowances on the asset. The new rules follow the accountancy treatment i.e. that only the interest element of lease payments are taxed and no capital allowances are available. This has no effect on the amount of tax actually payable by the lessor, but it allows a more even spread.[44] These measures are not likely to have a major impact on the development of an ESCO market.

**Public procurement procedures**

Public Procurement procedures in Ireland consist of National Guidelines, as well as European Union ("EU") Public Procurement Directives which govern supply, services and works contracts, namely:

- Directive 92/50/EEC as amended (the "Services Directive") relates to the procedures to be followed in the award of public service contracts, such as architectural, engineering and project management consulting services;

- Directive 93/36/EEC as amended (the "Supplies Directives") relates to procedures to be followed in the award of Public Service Contracts for purchasing goods and supplies;

- Directive 93/37/EEC as amended (the "Works Directive") relates to the procedures to be followed in the award of public works contracts, such as building and civil engineering works. This directive also covers "Public Works Concessions" which are the same as public works contracts except that the consideration is usually in the form of a right to exploit the works as well as sometimes involving a monetary payment. The key element in determining whether a contract is a public works contract or a concession depends on the form that the consideration takes.

The National Guidelines, known as the "Green Book", set out the procedures to be followed by Contracting Authorities in the award of public sector contracts where the thresholds in the EU Procurement Directives have not been met or where the contract is not dependent on the State for more then 50% of its funding or on European Union funding. The Green Book sets out specific requirements for the advertising of contracts not governed by the EU Public Procurement Directives as well as setting out a basic outline of current EU obligations in relation to Public Procurement. Under Green Book guidelines, contracts above €50,000 and up to the value of the EU thresholds for advertising in the OJEU should be advertised as part of a formal tendering process (normally via the Irish Governments e-Tenders website).

The Department of Finance has also published guidelines on purchasing strategy for goods/services with a high relative spend but relatively easy to secure supply (including goods such as electricity, fuels or telecommunication). The approach recommended is to reduce unit costs by leveraging volume demand into the market and reduce associated transaction costs.[45]

Another factor which may have relevance to public sector procurement of energy services relates to leasing. The guidelines state that purchasing will, in the longer term, generally tend to provide better value for money than leasing. And although leasing is not completely ruled

[44] KPMG,.April 2004, Taxing Times, Publication on The Finance Act of 2004

[45] National Public Procurement Policy Framework, National Public Procurement Policy Unit, Department of Finance, April 2005

out, Contracting Authorities are advised to ensure that any leasing arrangements proposed would be more advantageous than purchase, taking account of any tax implications.

Finally the manner in which funding is obtained for projects (i.e. normally from annual budgets), could have an impact on the take up of ESCO contracts in the sector. In a value for money report on Energy Management in the Health Service the Office of the Comptroller and Auditor General cite that progress on energy projects can be hampered by the present system of funding. All funds for energy are included in current budgets. The report goes on to recommend that consideration be given to introducing some assignment of funds for capital purposes. Alternatively where initiatives to achieve medium and long term savings in energy running costs have been identified and duly appraised, there may be merit in borrowing for projects with short payback periods. [46]

In the context of an ESCO contract, which may run for up to 15 years, it is likely that EU procurement procedures will apply. It is also likely that the contract will fall under all three of the EU directives, i.e. services, supplies and works. The complexity arising from public sector procurement can add greatly to the transaction costs incurred by ESCOs when attempting to structure contracts in the sector. Changes (such as the introduction of the competitive dialogue outlines above) in the guidelines for energy efficiency/ESCO type contracts would be beneficial for the support of an infant ESCO industry. Additionally, the promotion of contracts that might favour leasing or performance contracting as well as contracts that offer the most energy efficient solution under the most economically advantageous conditions would also be beneficial.

[46] Energy Management in the Health Service, Report on Value for Money Examination, Office of the Comptroller and Auditor General, April 95

## 2. Review of Energy Prices

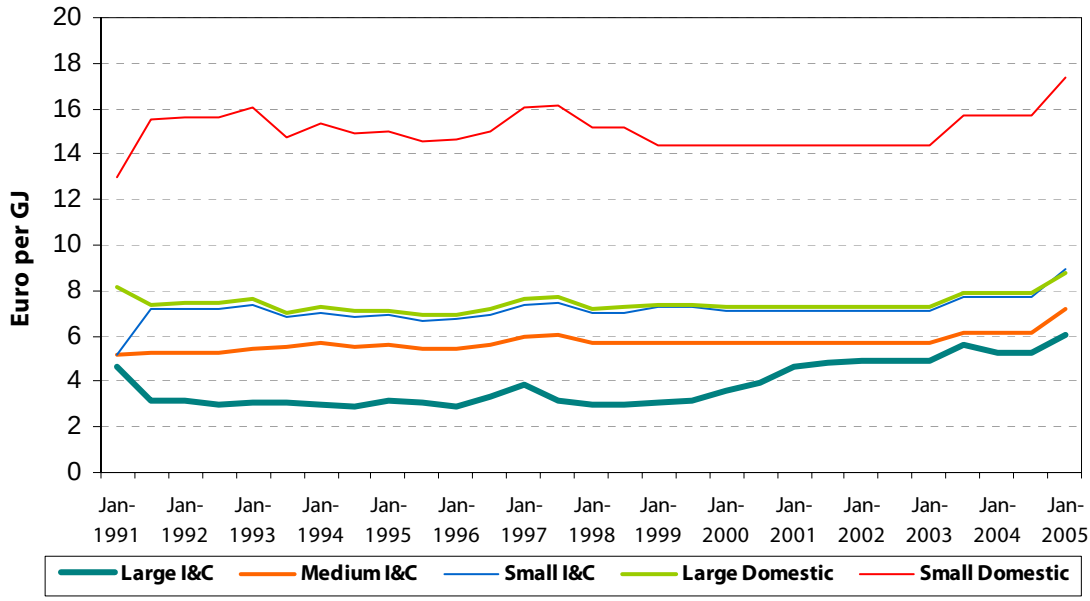
As both electricity and natural gas are linked to the price of international traded goods (oil and coal), this is only one component of the price forecast. We have not analysed the structure of global demand and supply in the oil and coal markets and their implications for natural gas and electricity prices. Where we do reference the long-term forward price of crude oil, it is to present market expectations of long-term price trends, not short to medium term price adjustments.

**Impact of market resources and structure on prices**

***Natural Gas***

The natural gas market is divided according to groups of end-users, with the price varying according to the quantity of gas, and the type of tariff. Figure 11 shows the change in market prices over the last 15 years for five consumer groups in the domestic and the industrial and commercial (I&C) sectors.

**Figure 11 Market Prices over time by Consumer Group[47]**




This chart shows that the price of natural gas in nominal terms remained constant for most of the 1990s. However, in the largest gas consumer groups the cost of natural gas has increased by 21% since 2000, and increased in all other consumer groups by between 20% and 26% since 2003.

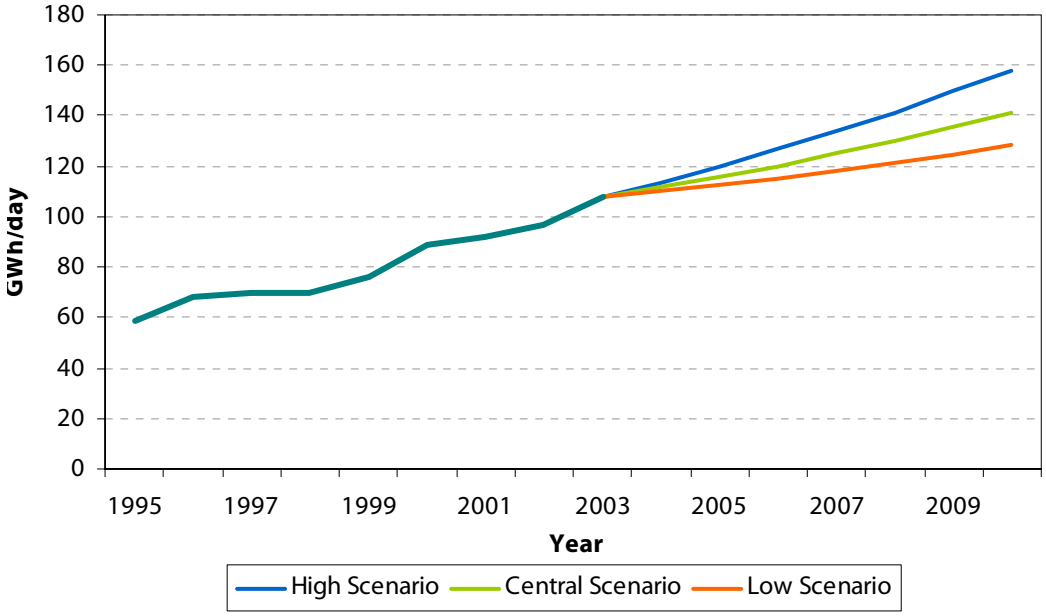
In this section we will look at the factors that have an impact on the gas price to examine their influence on future natural gas prices in Ireland.

[47] Historical gas price data is supplied by Eurostat

*Demand for Natural Gas*

Historically the consumption of natural gas has increased at an annual rate of 4.8% (excluding the closure of Irish Fertiliser Industry site) and although the rate of growth is expected to slow in both the central and low growth scenarios, the quantity of natural gas consumed is expected to continue rising. In Figure 12 we show the average daily consumption in GWh for Ireland projected through to 2010[48].

**Figure 12 Average daily demand projections**




These projections show that even under the low demand scenario gas consumption is expected to increase by approximately 2.5% per year, and under the high scenario the annual increase is expected to be over 5.5%. These scenarios suggest that the average demand for natural gas will be 30 – 50 TWh higher in 2010.

Whilst this represents a considerable increase in the total demand for gas, this is still only half of the additional supply expected to be supplied by the Corrib gas field once the Bellanaboy terminal is operational.

In addition to domestic growth of gas demand, additional demand may come from exporting natural gas to Northern Ireland through the south north pipeline. Currently the Northern Ireland gas market is connected to Scotland through the SNIP pipeline which can supply up to 73.6 GWh/day and should provide enough capacity to supply the Northern Ireland market until 2007/08. Peak supply periods and additional demand after 2007/08 is likely to be supplied through the Irish gas network with the construction of a new south-north pipeline. By 2009/10 this is expected to account for a transfer of 2.5 GWh through the Irish market.

[48] Commission for Energy Regulation - Gas Capacity Statement 2004

*Supply of Natural Gas*

The supply of natural gas can be categorised according to four sources of supply given below.

- *Beached gas*. Beached gas supplies are gas introduced to the market directly from a gas field. Beached gas requires additional refining and processing prior to being supplied to the market. The volume of beach gas is determined by the rate of decline in existing gas fields, new fields that are bought on stream and supply disruptions. In Ireland currently there are two sources of beached gas[49]

    - Inch – The Inch terminal has collected natural gas from the Kinsale, Ballycotton and Seven Heads fields. Currently the Inch terminal has a capacity equivalent to 40.5[50] GWh/day, however, this is expected to decline to between 7.3 and 17.3 GWh/day by 2006/07 due to the depletion of the Kinsale gas field.

    - Bellanaboy. – Bellanaboy terminal has yet to be developed but is expected to introduce a supply of over 100 GWh per day from the Corrib gas field in 2007.

- *Interconnector Supplies*. The cost of natural gas through the Interconnector is determined by the price of gas in the UK, European markets and transport costs. As the majority of European gas contracts are still indexed to oil prices[51] and the UK surplus is reduced, the Interconnector gas price is expected to become dependent on international oil prices. Currently the Interconnector could provide 255 GWh per day, however, if the capacity of the export terminal at Brighouse bay was extended then this could be increased to almost 500 GWh per day. The current position of the CER is that this should only be undertaken in the event of continuous supply deficit.

- *Storage*. Some storage facility is currently provided by Marathon this is expected to be developed as a commercial storage facility in 2006. This storage facility will provide a 170 mscm of storage space and provide a peak withdrawal capacity of 2.5 mscm/day (23 GWh/day). The storage facility is used to balance system demand and supply changes and provide additional gas during periods of peak demand.

- *LNG*. LNG is natural gas that has been liquefied so that it can be more easily transported over distance. Ireland does not have currently have any LNG terminals planned.

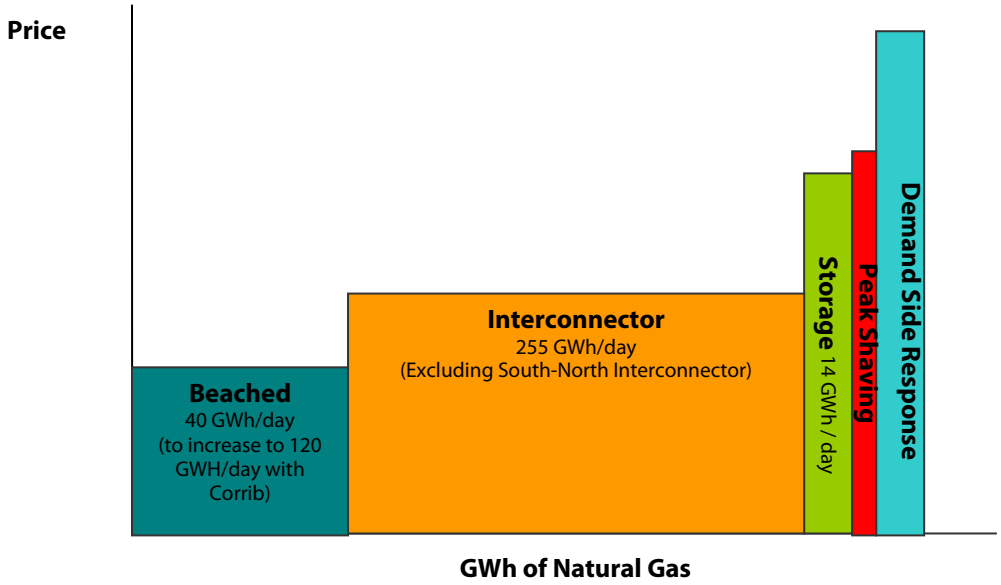
In Figure 13 we have a merit order, showing the supply of natural gas within an idealised natural gas market.

[49] Commission for Energy Regulation - Gas Capacity Statement 2004

50 A conversion factor of 40 MJ per M3 of natural gas has been assumed in all calculations

[51] OFGEM, 2004, OFGEM's Probe into wholesale gas prices, 232/04a

**Figure 13 Idealised Structure of the Irish Gas Market**



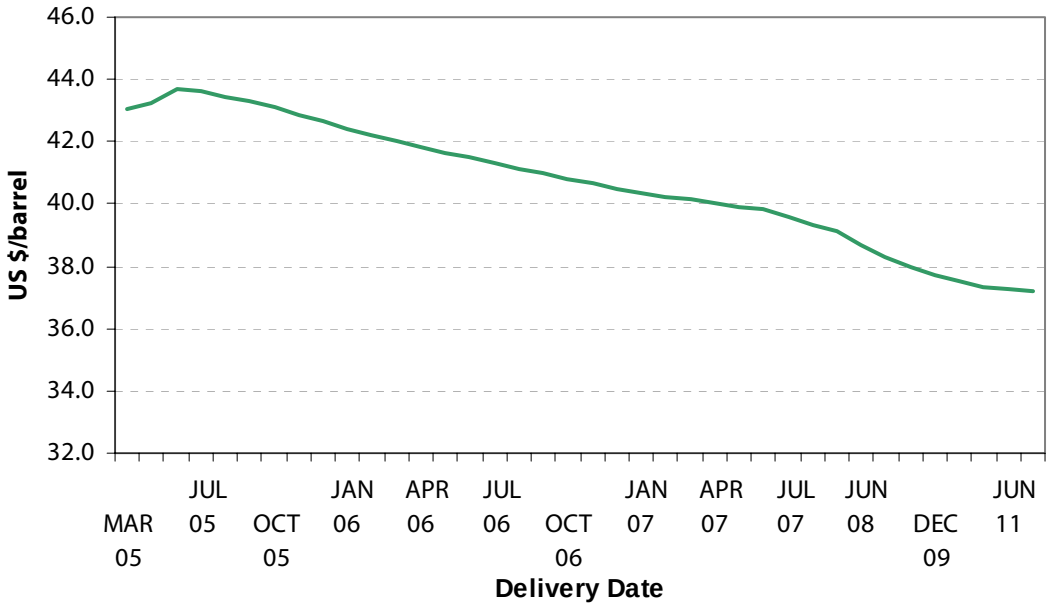

We can see from this merit order that with the development of the Corrib gas field and the Inch terminal, that the supply of beached gas will be one of the most important determinants of future gas prices in Ireland. As the supply of beached gas is increased, the wholesale price of gas in the Irish market should fall, although the extent of this reduction will depend upon the economic characteristics of the Corrib field. Delays in supplying gas from the Corrib field to the Irish natural gas market will have a significant impact on gas prices in Ireland by increasing Ireland's dependence on imports from the Scottish interconnectors.

The second most important supply-side determinant is the interconnector with the UK and the dependence of Irish gas prices on the European / UK gas price. Historically the majority of European gas contracts have been established with the price of natural gas index linked to the price of oil, giving a strong correlation between changes in oil price and changes in gas price. With the UK moving from a position of net export to net import, this correlation between oil and natural gas price is increasingly influencing the UK market price.

If we assume that the price of gas maintains a strong correlation with the price of oil, then current market expectations – given by the forward price for Brent crude, shown in Figure 14 - would suggest a fall in the cost of gas by approximately 10% by 2011.[52]

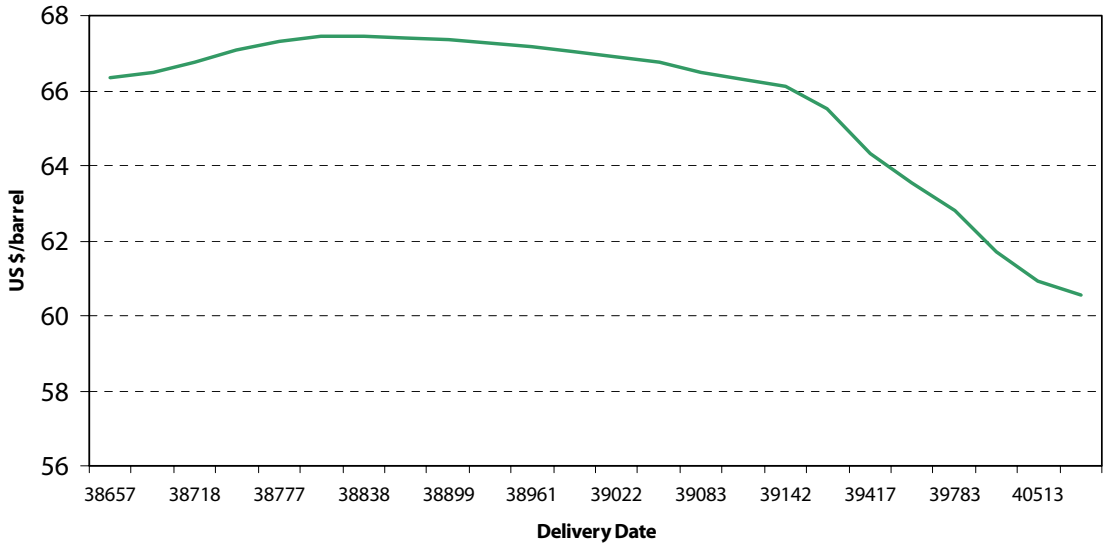
[52] International Petroleum Exchange forward market in February 2005

**Figure 14 Brent Crude Forward Market as of February 2005***




*While the above chart shows oil futures as of February 2005, there has clearly been a step change in the price of oil since that time (for numerous reasons). However, taking NYMEX oil futures quotes as of September, Figure 15, there is still a similar trend (i.e. an approximate 10% price decline) expected over the long term.

**Figure 15 NYMEX Crude Oil Futures Price Quotes as of September 2005[53]**

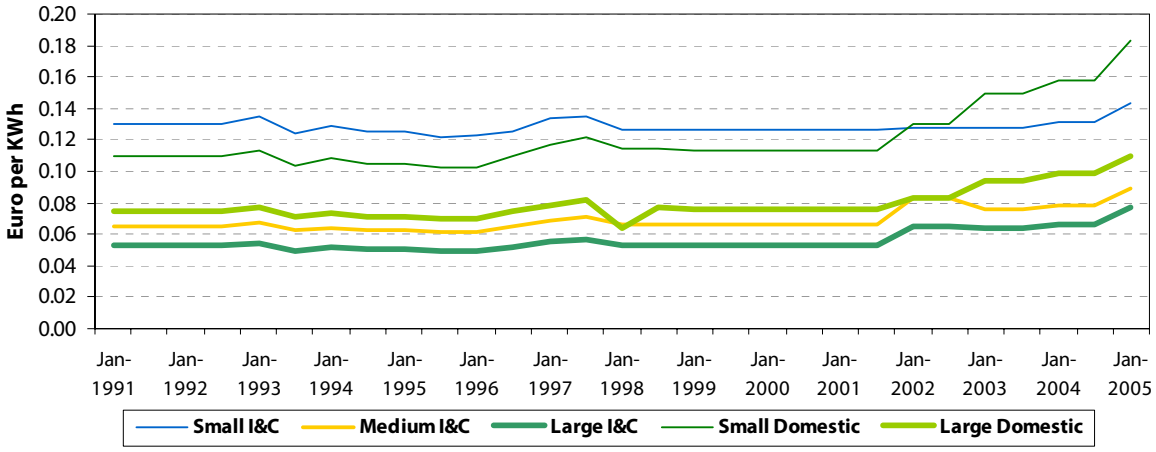



[53] Commodity Future Price Quotes for Light Sweet Crude Oil, New York Mercantile Exchange

***Electricity***

As with natural gas, the electricity market is divided into several different end user groups, with the price varying according to the quantity of electricity consumed, and tariff. Figure 16 shows the change in market prices over the last 15 years for five representative consumer groups in the domestic and the industrial and commercial (I&C) sectors.

**Figure 16 Historic Electricity Prices[54]**




This chart shows that, having remained generally constant since 1991, the price of electricity has increased for all consumer goods over the last 3 years with a 60% increase in electricity prices for small domestic customers and 35% to 46% for other consumer groups.

*Supply of Electricity*

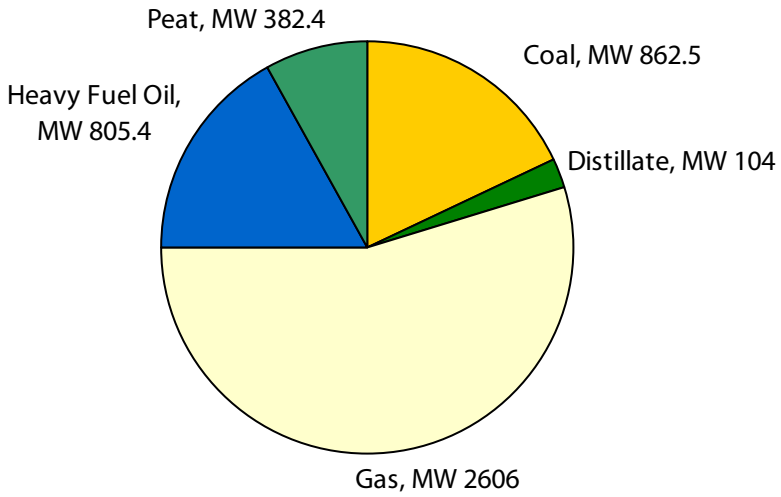
We have considered the supply of electricity from three possible sources; the generation from thermal electricity generation plants, additional electricity generation from renewable energy plants, and the import of electricity from the UK through Interconnectors.

*Thermal Plants*

The supply by licensed electricity generators has been deregulated since 2000. Ireland currently has 21 thermal generating plants. The maximum electrical output of existing generators by fuel type is shown in Figure 17.

[54] Historical electricity price data is supplied by Eurostat

**Figure 17 Generator Maximum Continuous Output[55]**




In 2003 the CER requested expressions of interest for new generation facilities. Two tenders were accepted (out of five) with a total generating capacity of 515 MW. These generating units are expected to be commissioned in the first half of 2006 along with an additional generating unit at Huntstown expected to supply an additional 400 MW in 2007.

Combined with this additional capacity some generating units, up to 357 MW of capacity, are expected to be decommissioned by the end of 2007[56]. It is however feasible that the lifetime of this capacity could be extended in the event of supply shortages until at least 2011.

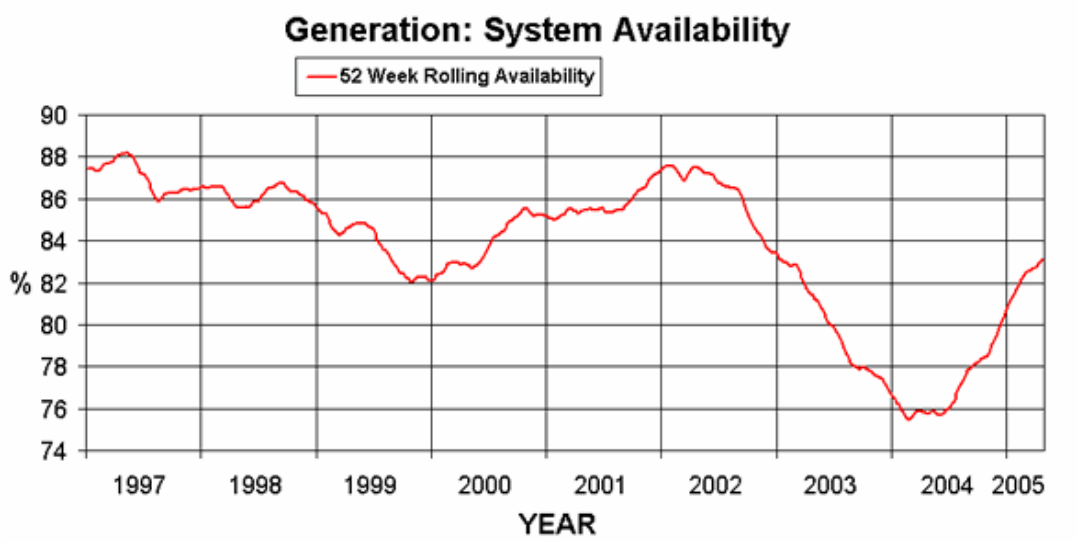
The Generation Adequacy Report[57] suggests that if the availability performance could be improved to a range from 80.7 to 88.5%, then capacity shortages would not be evident until at least 2009. Whilst, if availability could be improved to that of the benchmark levels (88%), then there would be no plant deficits until 2011. Figure 18 shows that system availability has recently increased to 82%, if this rate of availability is sustained then capacity shortages should be avoided.

[55] ESB National Grid http://www.eirgrid.com/EirGridPortal/DesktopDefault.aspx?tabid=Download%20Centre

[56] Generation Adequacy Report, 2005 – 2011, Transmission System Operator Ireland, Nov 2004.

[57] Generation Adequacy Report, 2005 – 2011, Transmission System Operator Ireland, Nov 2004

**Figure 18 System Availability[58]**




*Renewable Electricity Generation*

Under the EU Renewables Directive (2001/77/EC), Ireland must generate 13.2% of electricity consumption from renewable sources by 2010. To achieve, as outlined in the previous Section, Ireland has held a series of Alternative Energy Competitions.

Under the AER scheme, winning bidders are entitled to a 15-year power purchase agreement whereby the ESB buys the electricity output of the winning facility at the bid price. The additional cost of electricity procured under the AER schemes is spread across all electricity consumers. The capacity that is currently being developed under the AER is shown in Table 22.

[58] ESB National Grid; http://www.eirgrid.com/EirGridPortal/dataviewer.aspx?tabid=SO%20-%20Generation%20System%20Availability&TreeLinkModID=1451&TreeLinkItemID=12

**Table 22 Capacity developed under the AER Scheme[59]**

| | Capacity Delivered ($MW_e$) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Technology** | **AER I** *(Commissioned)* | **AER III** *(Commissioned)* | **AER IV** *(Commissioned)* | **AER V** *(Commissioned)* | **AER V** *(under construction)* | **AER VI** *(Commissioned)* | **AER VI** *(under construction)* | **Total** |
| **Small scale Hydro** | **2.304** | **1.67** | **-** | **-** | **-** | **0.02** | **0.782** | **4.776** |
| Landfill Gas | 11.804 | 2.928 | - | - | - | 6.755 | 1.00 | 22.487 |
| Wind energy | 45.80 | 37.51 | | 43.35 | 7.50 | 48.66 | 166.11 | 348.93 |
| Biomass anaerobic digestion | | | | - | - | - | - | 0 |
| Combined Heat and Power (biomass) | 10.716 | - | 18.353 | - | - | 2.875 | - | 31.944 |
| Offshore wind energy | | | | - | - | - | - | 0 |
| Totals ($MW_e$) | 70.62 | 42.11 | 18.353 | 43.35 | 7.50 | 58.31 | 167.892 | 408.135 |

In the first three AER competitions the price has fallen by 31%[60]. In the AER VI competition which closed on the 24 April 2003. There were three categories offered for wind energy[61]:

- large-scale onshore (with a price cap of 5.216 eurocent per kWh),
- small-scale onshore (price cap of 5.742 eurocent per kWh), and
- offshore (price cap of 8.400 eurocent per kWh).

The AER VI prices are fully indexed to the Consumer Price Index and there is an option for an accelerated (+35%) payment in the first 7.5 years (with a corresponding reduction for the concluding years).

For the provision of renewable energy, ESB is allowed to collect a premium from consumers through a public service obligation (PSO) levy on all electrical bills. The premium is charged above the Commission for Energy Regulation's (CER) designated best new entrant price (approximately €48/MWh)[62]. This mechanism was originally put in place primarily to support the continued operation of peat-fired thermal generation plants. If the costs (including

[59] Alternative ENergy Requirement Programme – June 2005
http://www.dcmnr.gov.ie/Energy/Renewable+Energy+Division/Renewable+Energy+Division.html
[60] European Commisssion, State Aid N540/03 – Amendments to Alternative Energy Requirement Scheme 19/08/2004
[61] Brazilian, Denny & Malley; Challenges of Increased Wind Energy Penetration In Ireland, Wind Engineering Volume 28, No 1 2004 pg 43-56
[62] Brazilian, Denny & Malley; Challenges of Increased Wind Energy Penetration In Ireland, Wind Engineering Volume 28, No 1 2004 pg 43-56

collection charges) are split in a weighted fashion, in 2004, peat generation will account for 78% of the public service obligation levy and AER purchases will account for 22%.

As highlighted in Section 2, the AER programme has been revised to a fixed feed tariff system.

Assuming that the differential between the fixed feed in tariff system for renewable energy provision and the designated best new entrant price remains constant as under AER VI, then to achieve the 13.2% renewable energy target would indicate that the average cost of electricity would increase by 0.0005 €/KWh an increase of approximately 1%.

*Ireland-UK Interconnector*

As discussed previously, the Irish government has approved the development of two 500 MW interconnectors between Ireland and Wales, these interconnectors will have the capacity to provide approximately 20% of Ireland's electricity requirement[63]. The development is expected to start in 2006 with the interconnector finished in 2008. This interconnector is expected to have a number of benefits including:

- Economies of scale in operating reserve and system security;
- Larger generating unit sizes are economical in larger systems;
- Scope of dispatch

These benefits reduce the operating costs of supplying electricity in Ireland and should put a downward pressure on prices.

*Demand for Electricity*

Given recent economic conditions average demand growth of 3.8% a year is expected to continue until 2010[64]. This rate of growth is likely to continue to create electricity generation shortfalls over the next couple of years until additional capacity and new interconnectors can be established and reducing the likelihood of any reduction in prices.

**Impact of Energy Policy and Regulations on Prices**

The ultimate objective of energy policies in Ireland is to ensure a secure supply of energy at a minimum cost to consumers. Clearly some of the regulations discussed in Section 2 above are aimed at achieving this objective. However other factors, particularly those aimed at ensuring sustainability in terms of energy supply, complicate the issue and will ultimately lead to price increases. The situation is complicated even further by Ireland's reliance on imported fuel and the nature of the geopolitical energy market. In assessing the impact regulations will have on energy prices we have looked at potential scenarios arising from each of the main factors summarised in Table 4 below.

***Gas Market Regulatory Structure***

The Irish Gas market has been increasingly subjected to competitive supply for natural gas since 1995. Currently the market is divided into two sectors

- *Franchise Sector* – Domestic and commercial customers that consume less than 0.5 mscm/yr and are supplied by Bord Gais Energy Supply. This accounts for approximately 15% of the gas market by volume.

[63] Quarterly Review of the Irish Electricity Market, ESB National Grid, Summer 2004
[64] ESB National Grid, Generation Adequacy Report 2004-2010

- *Eligible Sector* – Industrial customers that consume more than 0.5 mscm/yr and are eligible to contract with a supplier other than Bord Gais Energy Supply. The eligible sector accounts for approximately 85% of the gas market by volume.

The 0.5 mscm/yr threshold was introduced on the 1st of Jan 2003, and this threshold is expected to be removed on the 1st of October 2005, as a move towards full market opening.

Economic theory would suggest that the full market opening should reduce the price of natural gas in Ireland as the market becomes more competitive. Historically prices, however, there have been no significant changes in prices around previous market opening events. Furthermore as full market opening will only affect 15% of the total gas volume, the impact of additional deregulation is expected to be limited.

***Electricity Market Regulatory Structure***

*Market Liberalisation*

The electricity supply market obtained full market opening in February 2005 although ESB is still the dominant generator and this dominance combined with the size of the Irish market discourages additional competition[65]. With the establishment of an All Island Market, and interconnectors to Wales the level of competition will be increased and will put downward pressure on the prices. Up until now however, no significant change in market price has been realised from market liberalisation.

*All Island Market*

A memorandum of understanding on the All Island Electricity Market was signed in 2004 that will merge the Irish and Northern Ireland's electricity market into a single market. This will increase the total generation capacity included in the Irish market from 5,615 to 7,750 MW (a 38% increase) whilst increasing the total electricity supplied from 23000 to 31,200 GWh (a 35% increase)[66].

With the All Island Market, there will be benefits resulting from economies of scale in the size of the market and the requirement to operate a running reserve. In addition, the Interconnector between Northern Ireland and Scotland should encourage arbitrage between the UK, Northern Ireland and Irish electricity markets lowering consumer prices, however, recent price increases in Northern Ireland and limitations on the Interconnector capacity are likely to minimise any observable impact on unit prices.

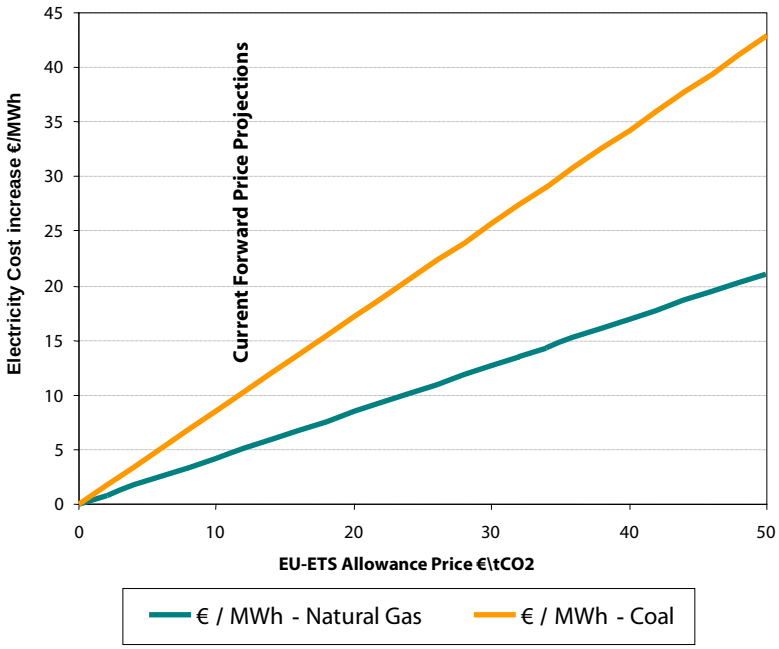
*European Emissions Trading Scheme*

Forward trades have been occurring on the EU-ETS since 2003, and during that time the price has increased from €10/t $CO_2$ to the current €20+/t$CO_2$. However the market is still new, and is relatively illiquid. The current price may not therefore be representative of a long-term average price. The economic impact of the EU-ETS on electricity prices will depend on the fuel consumed by the marginal electricity generator, its generating efficiency and the extent to which allowance prices are passed through to the end consumer.

The impact of EU-ETS is shown in Figure 19 according to the marginal generating plant (and assuming that the full cost of allowances is passed through to the end consumer).

[65] J. Evans & D. O'Connell, Competition Authority, Liberalising for a competitive electricity market , SMi Energy Conference, Nov 2004
[66] Quarterly Review of the Irish Electricity Market, issue 9, 2004

**Figure 19 Impact of EU-ETS prices on Electricity Prices**




This indicates that at current market prices, and assuming that natural gas is the source of fuel for the marginal generator, then electricity prices should increase by approximately 0.01 €/KWh – a 4% increase on the average household bill – whilst if coal is the marginal generator then the price will increase by approximately 0.017 €/KWh. However, the extent to which the EU-ETS will impact Irish electricity prices will depend upon the extent to which the regulator allows the price to be passed through to the end consumer.

In January 2005, electricity prices were allowed to rise by 3.5% to accommodate the higher fuel prices, network improvements and the emissions trading costs. Further prices increases relating to emissions trading are expected to occur[67].

In Phase II of the EU-ETS each country has to achieve binding commitments to reduce greenhouse gas emissions. The allocation is therefore expected to impose more of a constraint on the carbon emissions of installations included in the EU-ETS, which will increase allowance prices. Some forecasts suggest that prices could increase to €30/t $CO_2$ during Phase II giving a corresponding increase in electricity prices of between 12 and 25€/t$CO_2$.

[67] Large Industry Energy Network – Energy Focus, Sept 2004

## 3. ESCO Industry Questionnaire

| **Assessment of the potential for ESCOs in Ireland** | |
|---|---|
| Background:<br>Sustainable Energy Ireland is Ireland's national energy authority, tasked with promoting and assisting the development of sustainable energy. Its remit relates mainly to improving energy efficiency, advancing development and competitive deployment of renewable sources of energy and combined heat and power, and reducing the environmental impact of energy production and use, particularly with respect to greenhouse gas emissions.<br>Enviros has been contracted by SEI to assess the potential for energy service companies (ESCOs) in Ireland, as a mechanism for energy efficiency. | |
| Company Name: | |
| Company Address: | |
| Company Contact (Name, title): | |
| Size and history of organisation | Start date<br>No. of employees<br>Turnover<br>No. of contracts/clients |
| No. of competitors in the country | |
| Membership of ESCO Associations (or other professional organisation) | |
| Sectors targeted (Industrial, commercial, municipal, residences etc): | |

| |
|---|
| ESCO Type:<br>e.g. Renewable Energy Services, Contract Energy Management investment intensive long term contracts, Facilities Management – operation and maintenance and M&T type contracts, Other (describe): |
| Services offered<br>Energy generation/CHP<br>Water pumping<br>Office lighting<br>Building lighting<br>Building services (and type)<br>Renewable energy (and type)<br>Demand side management of power distribution<br>Other |

| | |
|---|---|
| Average value of projects (range) | |

Describe the Business models in place, e.g.:

Energy performance contracting (first out, shared/guaranteed savings Guaranteed availability

Third party financing (if TPF how are financing arrangements structured? Via technical (to achieve specific results), financial (energy prices a factor) or economic (interest rates a factor) risk? Special purpose vehicle used?

Model focussing on energy management techniques (e.g. monitoring and maintenance, M&T, automated fault analysis etc.

Supply side services

How are savings determined (do you have standard methodologies or is each case customised)?

What are the main regulatory /market conditions that helped establish the ESCO market in the country e.g.

carbon taxes

energy prices

government funding

other government targets, financial and legislative frameworks/support etc..

For each please determine details (i.e. extent of taxes, funding levels, and the actual impact they had)

What are/have been the main challenges/barriers to success for the ESCO industry in your country?

# 4. POTENTIAL $CO_2$ ABATEMENT VALUES

## Table 23 Potential for $CO_2$ Abatement (by Technology) for the Services Sector

Potential CO2 Abatement Ireland MtCO2

| Behavioural / Engineering / Non-Engineering | No / Low / High Cost | Technology | Total Potential Carbon Abatement | CE Potential, No H&M Costs | CE Potential, Low H&M Costs | CE Potential, High H&M Costs |
|---|---|---|---|---|---|---|
| Behavioural | No Cost | Heating - Reducing Room Temperature | 0.15 | 0.15 | 0.14 | 0.10 |
| | | IT Equipment | 0.10 | 0.10 | 0.03 | 0.00 |
| | | Other Electrical | 0.03 | 0.03 | 0.02 | 0.01 |
| Behavioural Total | | | **0.27** | **0.27** | **0.19** | **0.12** |
| Engineering | High Cost | Motor - Variable Speed Drives large | 0.014 | 0.00 | 0.00 | 0.00 |
| | Low Cost | Compressed Air | 0.008 | 0.00 | 0.00 | 0.00 |
| | | Catering | 0.03 | 0.03 | 0.02 | 0.02 |
| | | Heating - Condensing Boiler | 0.34 | 0.30 | 0.29 | 0.28 |
| | | Lights - Fluorescent Tubes | 0.10 | 0.05 | 0.05 | 0.05 |
| | | Lights - Compact Fluorscents Lamps | 0.13 | 0.13 | 0.13 | 0.13 |
| | | Lights - High Frequency Ballasts | 0.24 | 0.00 | 0.00 | 0.00 |
| | | Lights - Other | 0.05 | 0.01 | 0.01 | 0.01 |
| | | Motors | 0.00 | 0.00 | 0.00 | 0.00 |
| | | Flat Screen Monitors | 0.01 | 0.00 | 0.00 | 0.00 |
| | | Windows - Double Glazing Air Filled | 0.08 | 0.00 | 0.00 | 0.00 |
| | No Cost | Heating - More efficient air conditioning | 0.06 | 0.06 | 0.06 | 0.02 |
| Engineering Total | | | **1.06** | **0.57** | **0.55** | **0.50** |
| Non Engineering | Low Cost | Building Management Systems | 0.11 | 0.00 | 0.00 | 0.00 |
| | | Heating - Optimising Start Times | 0.13 | 0.00 | 0.00 | 0.00 |
| | | Heating - TRVs Fully Installed | 0.06 | 0.06 | 0.06 | 0.04 |
| | | Insulation - Roof | 0.07 | 0.03 | 0.03 | 0.00 |
| | | Insulation - Wall | 0.08 | 0.00 | 0.00 | 0.00 |
| | | Lighting Controls | 0.30 | 0.28 | 0.28 | 0.13 |
| Non Engineering Total | | | **0.74** | **0.37** | **0.36** | **0.17** |
| Grand Total | | | **2.08** | **1.21** | **1.10** | **0.79** |

## Table 24 Potential for $CO_2$ Abatement (by technology) for the Industrial Sector

Potential CO2 Abatement Ireland MtCO2

| Engineering / Behavioural / Non-Engineering | No / Low / High Cost | Technology - new name | Total Potential Carbon Abatement | CE Potential, No H&M Costs | CE Potential, Low H&M Costs | CE Potential, High H&M Costs |
|---|---|---|---|---|---|---|
| Behavioural Measures | No Cost | Best practice | 0.008 | 0.008 | 0.008 | 0.008 |
| | | Increase gas collection | 0.014 | 0.014 | 0.014 | 0.014 |
| | | Other Behavioural | 0.010 | 0.010 | 0.009 | 0.009 |
| | High Capital Cost | Best practice | 0.010 | 0.010 | 0.010 | 0.010 |
| | | Energy management | 0.004 | 0.002 | 0.002 | 0.002 |
| | | Other High Capital Cost | 0.002 | 0.000 | 0.000 | 0.000 |
| | Low Capital Cost | Best practice | 0.006 | 0.006 | 0.006 | 0.006 |
| | | Energy management | 0.091 | 0.071 | 0.030 | 0.017 |
| | | O&M | 0.008 | 0.008 | 0.008 | 0.007 |
| | | Other Low Capital Cost | 0.030 | 0.009 | 0.007 | 0.002 |
| **Behavioural Measures Total** | | | **0.182** | **0.137** | **0.093** | **0.075** |
| Engineering measures | No Cost | External cullet | 0.005 | 0.005 | 0.005 | 0.005 |
| | | HEMs | 0.001 | 0.001 | 0.001 | 0.001 |
| | | Other Behavioural | 0.001 | 0.001 | 0.001 | 0.001 |
| | High Capital Cost | Process control | 0.237 | 0.153 | 0.119 | 0.115 |
| | | HEMs | 0.008 | 0.004 | 0.004 | 0.004 |
| | | High efficiency trays | 0.010 | 0.010 | 0.010 | 0.000 |
| | | Hot charging | 0.007 | 0.007 | 0.007 | 0.007 |
| | | Improved drying | 0.017 | 0.017 | 0.014 | 0.014 |
| | | Improved packing | 0.010 | 0.009 | 0.009 | 0.000 |
| | | Improved Refrigeration | 0.004 | 0.003 | 0.003 | 0.003 |
| | | Tower furnace | 0.009 | 0.009 | 0.009 | 0.009 |
| | | VSDs | 0.067 | 0.066 | 0.026 | 0.006 |
| | | Other High Capital Cost | 0.263 | 0.039 | 0.032 | 0.032 |
| | Low Capital Cost | Process control | 0.118 | 0.107 | 0.086 | 0.069 |
| | | Heat recovery | 0.013 | 0.008 | 0.006 | 0.004 |
| | | HEMs | 0.009 | 0.007 | 0.006 | 0.006 |
| | | High effy luminaire | 0.012 | 0.008 | 0.004 | 0.002 |
| | | VSDs | 0.058 | 0.051 | 0.026 | 0.019 |
| | | Other Low Capital Cost | 0.112 | 0.038 | 0.033 | 0.032 |
| **Engineering measures Total** | | | **0.959** | **0.542** | **0.402** | **0.328** |
| Non-Engineering Measures | No Cost | Heat recovery | 0.012 | 0.012 | 0.012 | 0.012 |
| | | O&M | 0.035 | 0.015 | 0.014 | 0.009 |
| | | Other No Cost | 0.002 | 0.002 | 0.002 | 0.002 |
| | High Capital Cost | Heat recovery | 0.003 | 0.003 | 0.003 | 0.003 |
| | | Improved scheduling | 0.003 | 0.003 | 0.003 | 0.003 |
| | | Other High Capital Cost | 0.019 | 0.003 | 0.003 | 0.003 |
| | Low Capital Cost | Barrel insulation | 0.010 | 0.010 | 0.005 | 0.000 |
| | | boiler operation | 0.003 | 0.003 | 0.003 | 0.003 |
| | | Improved process | 0.004 | 0.004 | 0.004 | 0.004 |
| | | Process improvement | 0.030 | 0.015 | 0.015 | 0.014 |
| | | Other Low Capital Cost | 0.009 | 0.007 | 0.006 | 0.005 |
| Non-Engineering Measures Total | | | **0.131** | **0.078** | **0.071** | **0.059** |
| **Grand Total** | | | **1.272** | **0.757** | **0.566** | **0.461** |

# 5. THE REALITY OF INDUSTRY PAYBACK CRITERIA

Much of industry typically uses a payback threshold in the range of 1 – 2 years for energy efficiency (EE) projects. (A multinational paper company recently championed an initiative to apply a 3 year payback criteria to (EE) projects. This was unprecedented in the company)

Applying payback criteria is a crude way of screening out risky projects because one does not trust the cash flow forecasts, or as means of prioritising expenditure of scarce capital.

Rejecting projects with paybacks of over 2 yrs is similar to applying a discount rate of 50% on an NPV calculation. Figure 20 below depicts the relationships between NPV and payback for a range of discount rates, while Table 25 summarises how applying specific payback criteria equates to the discount rate.

**Table 25 Payback criteria vs. Equivalent discount rate**

| Payback criteria | Equivalent discount rate |
|---|---|
| 1 yr | 100% |
| 1.5 yr | 66% |
| 2 yr | 50% |
| 3 yr | 33% |

# 6. FEEDBACK FROM ESCO WORKSHOP

The workshop was held on 31st August 2005 at SEI's offices in Glasnevin. The objectives of the workshop were:

- To present the findings from the study work to date
- To obtain feedback from the audience on the main barriers against ESCO development and drivers to stimulate ESCO development
- To present options for overcoming the barriers and to support the drivers.

The workshop agenda reflected the objectives, initially there was a presentation by Enviros of the findings of their study, including the options to stimulate the market. This was then followed by an open discussion on the key barriers and drivers. Prior to the discussion, general points were invited from the audience concerning the presentation.

**General Discussion Points**

1. The first general point concerned the models, the view was that there seemed to be two main models of ESCOs, in the first the ESCO installed technology, which in itself leads to energy savings and therefore cost savings; in the second the ESCO looks at operational type measures without the addition of very low cost technology (e.g. improved controls, changes to operational parameters, etc). Were any other models considered?

The response from Enviros was that in the discussions held with the ESCOs in Europe the point was made repeatedly that the services offered were customised to the individual needs of the customer and hence ESCO's could include greater or lesser proportions of either service and in addition may provide other services as well (e.g. energy supply).

2. Had the study considered the impact of the new accounting standard "IFRS 4"? In this standard if an ESCO installs equipment that is closely aligned to the customer's process the value of the asset and the debt associated with the asset should also appear on the customer's balance sheet (thus affecting the core ratios used by investors). This accounting standard is to become operational from January 2006.

Whilst to date the study had not considered the impact of changes to accounting standards, this was clearly an important point and would be addressed. Dalkia, stated that whilst this is true, solutions exist that allow the customer to continue to benefit from the asset yet still keep it off the balance sheet.

**Barriers**

*Lack of Customer Knowledge*

1. There was general agreement that customers had only limited awareness of the business models of ESCOs.

2. The point was made that if the ESCO is to focus on demand side measures that there is a greater level of suspicion even though these savings are some times easier to achieve.

3. Outsourcing and performance guarantees are relatively commonplace within the Irish market, the basic knowledge of these forms of business arrangement could be considered to exist, what is lacking is the knowledge that these techniques can be applied to energy efficiency/energy supply. Thus when confronted with an ESCO offering there is suspicion.

4. A suggestion was made that Energy Suppliers should stimulate the market for ESCOs, i.e. through the development of their own ESCO operations – whilst they may be reducing their energy sales they would be obtaining revenue from the services supplied which would offset any loss of revenue. Energy suppliers are also in the position of understanding the energy baselines of the clients. Dalkia expressed the opinion that there can be organisational issues when an energy supplier also offers ESCO services since the services are often seen to be in conflict with their energy supplies. Examples were offered of Powergen in the UK who tried to offer energy services but eventually gave up (at the cost of their CEO) and AHS Emstar – again initially owned by an energy supplier but eventually sold off. Even now, Dalkia faces issues with having part ownership by EDF event though their core business is energy services.

*Transaction Costs (especially in the Public Sector)*

1. It was considered important to simplify procedures within the public sector, especially from a legal point of view. In France they had recently changed the law regarding purchasing / procurement within the public sector.

2. The high transaction costs need not be considered a barrier particularly in the public sector where the length of contract is able to be longer hence the transaction costs can be spread over a longer project lifetime.

3. The issue in the public sector is that the people involved in the procurement may not have adequate experience to understand the issues in ECSO type contracts for energy services. There is also the question of Responsibility vs Authority, e.g. in schools the people may have devolved budgets for energy but would not have the necessary authority to negotiate contracts for energy services. It is for this reason that ESCO contracts have historically been undertaken in hospitals where the Authority and responsibility are generally heold together.

4. Question from OPW whether the existing EU Procurement Directives (Works, Services and Supplies) allowed for 15 year contract lengths – and in particular what Directive would apply for an ESCO contract.

5. Need to simplify procedures for Schools – Dept of Education responded that the Boards of Management runs the School and gets an annual grant for costs thus in theory they have the ability to negotiate ESCO contracts however in their experience much more transparency is required in the offers that the ESCOs make. Cited two examples – in the first the ESSCO offered a "Rolls-Royce" solution which would cost more than necessary, in the second the ESCO offered to sell renewable energy at a discount to current market price for fossil fuel.

*Long Term Contracting – Fear of Outsourcing*

1. The long term nature of the contracting need not be a barrier provided that there were strategic reviews at periodic intervals and get out clauses that were equitable for both sides.

2. The long term nature of the ESCO offering may be in conflict with the short term nature of the energy supply market – perhaps linked to confusion between energy suppliers and energy services.

3. Short term energy supply contracts are the norm. With the coming of the All Island Market for energy supplies, there will be greater price stability and uncertainties will be reduced thus longer term contracts may be more acceptable. Again this is linked to market confusion between energy suppliers and ESCOs.

4. The main fear is to be tied into a long term energy supply cost (in a volatile market) and not necessarily a long term relationship – solution is therefore to split energy costs and capital costs in ESCO offer. ESCOs are about efficient utilisation and not just price of energy.

*Energy Costs not a priority*

1. This may be true but it depends on the business. In recent years energy costs have been rising and now, outside of the labour costs, are a priority for the majority of businesses.

2. IBEC represented that the rates of increase seen over the last couple of years have made energy costs a top priority for business and this is likely to stay the situation over the next couple of years.

*Complexity of Contracts*

1. The ESCO contracts are not more complex than other contracts, it is just that there are more people involved in the contract negotiation and they may not be familiar with the concept, the language or the terms used.

2. There is a need for a significant attention to detail when negotiating the contracts – especially the baseline energy consumption and how this relates to the conditions in the contract.

3. ESCO contracts are relatively simple but they need to be explained to the potential customers. Because the relationship is long term, they must cover all potential eventualities and thus these must all be explained.

*Difficulty in accessing finance for ESCO*

1. There is a lack of capability in the finance community.

2. The finance community needs to be presented with a variety of examples from ESCOs – these case studies need to be much more detailed than currently available and show the types of returns possible for an investor from an ESCO project.

**Conclusions**

1. Need for demonstration projects in Public sector

2. New financial mechanisms are highly unlikely from the government, equally any new agencies are unlikely to be supported by the government – a better route would be to expand the activities of an existing agency. Any options involving financial instruments would be welcome.

3. In terms of the perceived risks there is a need to really address information and awareness in the report.

## 7. THE UK ENHANCED CAPITAL ALLOWANCE SCHEME ENERGY TECHNOLOGY LIST

The technologies that currently appear on the Energy Technology List (as from 26th August 2004) are as follows:

- Air-to-air energy recovery
- Automatic Monitoring and Targeting
- Boilers
- Combined heat and power (CHP)
- Compact heat exchangers
- Compressed air equipment
- Heat pumps for space heating
- HVAC zone controls
- Lighting
- Motors
- Pipework insulation
- Refrigeration equipment
- Solar thermal systems
- Thermal screens
- Variable speed drives
- Warm air and radiant heaters

Only energy saving products that meet the scheme's published energy-efficiency criteria can qualify for inclusion in the Energy Technology Product List. The **Energy Technology Product List** provides detailed information on the products from all technology categories (apart from CHP, lighting and pipework insulation), that meet those energy-efficiency criteria.

CHP qualifies as energy-saving plant and machinery if it is certified as "Good Quality CHP" under the quality assurance programme for CHP (CHPQA www.chpqa.com) and has been granted a "certificate of energy efficiency". You can find out how to identify **CHP** that meets the eligibility criteria and hence spending on which can qualify for enhanced capital allowances, by reading the Eligibility Criteria section.

A certification scheme is required for **AMT Equipment**. Certificates will be issued by DEFRA in response to applications received by the Carbon Trust that declare the qualifying expenditure incurred at each site on:

a) portable AMT Equipment listed on the ETL;

   and/or

b) AMT installations for which elements A, B & C exist and all components claimed for are listed on the ETL. ECA are claimed in the same way as other capital allowances on the Corporation Tax Return for companies and the Income Tax Return for individuals and partnerships. Capital Allowances are given in respect of capital expenditure incurred wholly and exclusively on the provision of Plant and Machinery for use in a person's trade. It is a requirement of the Capital Allowances Act that as a result of incurring the expenditure, the Plant and Machinery belongs to the Claimant.

For **Lighting and Pipework Insulation technologies**, although individual products are not listed, the details of the manufacturers who can supply ECA-eligible products/installations can be found on the Energy Technology Criteria List and in the online Exhibition. Note that not all of the manufacturers products/installations will necessarily meet the eligibility criteria and it is the purchaser's responsibility to check with the manufacturer which of their products meet the criteria and are available to claim an ECA.

## 8. Hidden Cost Ranges Industrial and Non-Domestic Sectors

**Table 26 Hidden Cost Ranges for Industrial and non-domestic sectors**

| Project stage | Evidence in the literature | Non-Dom value | Industrial value | Justification |
|---|---|---|---|---|
| Project Identification | Search and information costs are given as 1-6% of investment, larger projects less than bigger projects by Hein and Blok(1995). Up front costs (taken to mean information and serchcosts) are quoted as 5-7% of capital costs by Most et al. (2004). | 0.5-2 hrs | 3-10 hrs | Assuming 6% project identification cost on a £10,000 project and 1% on £100,000 project. |
| Project Appraisal | Hein and Blok(1995) quote decision making at 1-2% of the initial investment. Sorrel et al (2000) estimate negotiating cost at 5-10% of investment costs. | 0.5-5 hrs | 0-100 hrs | From 6-12 range based on project sizes above. |
| Project Commiss'g | Monitoring and management of the installation process is estimated at less than 1% of investment by Hein and Blok(1995). | 0.5 -5 hrs | 1% -6% of capex | Based on Enviros experience |
| Production Disruption | No evidence in the literature. | 0 -2.5% of capex | 0 -5% of capex | Based on Enviros experience |
| Additional engineering | No evidence in the literature. | 5 -20% of capex | 5 -30% of capex | Based on Enviros experience |
| Risk of delivery | Perceived risk of the viability of energy projects is calculatedas 6-30% of electricity prices (IEA). Newell and Stavins(1999) estimate this risk increases the hurdle rate for EE projects by by10%. Baylis et al. comments that the bigger the company the more they believe in the cost savings presented to them, but only more than 40% of micro-firms (1-10 employees) and 60% of small firms (10 –50 employees) trust that savings will be delivered. This figure increases to 80% for medium sized firms (50-249 employees). | 5-20% of energy savings | 5-20% of energy savings | Based on the sources quoted left. |
| On Going Management | No evidence in the literature. | 0-12 hrs | 6 –60 hrs | Based on Enviros experience |
| Generic transaction cost (real costs only) | Transaction cost for engineering and procurement are quoted at 12-150% of capital costs (Bieniek2000 cited in Ostertag, 2001). Michaelowaet al (2003) describe transaction costs at 12-18% of capital costs. Taylor (1999) estimates management costs at 10-15% of equipment costs. The risk pemiumsrequires by ESCOsto implement demand side management are estimates at 10-30% of projected savings by Berry (1989) and Nadelet al (1993)-both in Swisher(1995). | 10-30% of capex | 10-30% of capex | Upper range from Berry (1989) and lower range from Michaelowa(2003) |

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