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## Skills and Training for a Green New Deal : Comhar SDC Report and Recommendations

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# Skills and Training for a Green New Deal

**Comhar SDC Report and  
Recommendations**

**September 2010**

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## **Acknowledgments**

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We also wish to thank and show our appreciation to members of the Comhar Council for their support and feedback and pay particular recognition to all those that attended the project workshop which provided many useful insights and key inputs for the report.

## Foreword

It is one of the paradoxes of economic development that, as economies begin to recover, skill shortages emerge even in the presence of high unemployment. There is a steady stream of stories from Germany and other countries now emerging from recession to the effect that firms in high growth areas are suffering from skill shortages and the inability to meet opportunities because they can't find people with the right skills, aptitudes and ambition to meet their expanding requirements. The market of course will go some way to solving this problem on its own, as firms invest in training to meet their needs, and recruit from other countries where the labour supply better fits their requirements. But they will under invest in training, because often then can't get the return on their investment, as those with the right skills are attracted to other companies. And this problem is especially acute in the case of small companies, whose viability could be threatened if they devote significant resources to training of staff who then move on.

This is the situation we find in the emerging green areas of the economy, where meeting new opportunities require training, but the incentives for the market on its own to provide it are insufficient in certain cases. The analysis and recommendations in this report are designed to address this skills gap, but we propose that it be done in ways that minimise the costs of intervention. This is achieved by recommending that the various initiatives and infrastructures already in place be adapted to address this opportunity, rather than proposing major new initiatives.

But meeting the skill needs of this emerging economy is only relevant if policies continue to support the evolution of the Irish economy towards a sustainable future. And this requires that we continue to keep policy focused on the four 'I's'; Investment in supportive infrastructure [the grid, water metering and green infrastructure (nature and ecosystem services) are key]; Incentives (carbon tax and water pricing are essential if there is to be sustainable income for enterprises and individuals who reduce their pressures on the environment), Information (consumers and producers need the right information at the right time on performance – smart meters for water and power are essential if care and parsimony are to be rewarded and waste penalised) and Innovation (to create and sustain enterprise we need export businesses, and these are only possible with new and better ideas).

I am grateful to Eoin McLoughlin who has led this effort from the staff side, and his steering committee and all the others who provided input and advice. If the recommendations are acted upon, it will simultaneously help us all make the transition to a more productive country with more jobs and a better environment.

**Frank J. Convery,**  
**Chairperson, Comhar Sustainable Development Council.**

## Executive Summary

Sustainable development and the need to move towards becoming a low-carbon and resource efficient society is an evolving area of policy and of action by governments, industry, providers of education and training and others. Internationally, while the topic is seen as being of critical importance to future patterns of employment, policy-makers are only starting to get to grips with the skills implications. This can be seen in a profusion of reports from international bodies, from governments and from interested national groups on different aspects of green jobs and green skills.

This report seeks to add to the evidence base by examining the role of the skills and training sector in supporting a Green New Deal for Ireland. This was an area identified as requiring further research in Comhar SDC's original Green New Deal report<sup>1</sup>. The skills and training required to implement the Green New Deal is not just a matter for Central Government. There are a wide range of other parties such as industry, higher and further education institutions, Local Government as well as civil society organisations that all have important roles to play. The current work of Comhar SDC in this area is about developing recommendations as to how to advance each of these different elements to ensure an integrated delivery of a skills and training programme that supports the realisation of a more sustainable Ireland.

Specifically, the research addresses a number of key aspects related to the skills agenda focused across a range of different policy areas. The analysis includes providing a qualitative and quantitative assessment of the type and volume of skills that may be required and the establishment of the baseline situation in Ireland regarding the current provision of courses and institutions involved in delivering skills and training in this area. Based on this assessment an analysis is then carried out identifying possible key skills gaps that may impede progress in our attempts to transition towards becoming a low-carbon and more resource efficient society. The research also considers suitable policy options, financing mechanisms and awareness raising activities for Ireland to develop best practice in this area as well as providing guidance for future work in this field.

Due to its focused nature, the report should not be read as reflecting the full skills and labour market implications of the Green Economy for Ireland. Important areas that are only covered to a very limited extent include the skills needs of Green exporting industries, industries concerned with energy efficiency in non-residential buildings, and also waste processing, recycling and related areas of activity. While implementing the Green New Deal will have wider consequences for economic activity and employment, these consequences are beyond the report's scope.

### Key Skill Gaps and Needs

#### *Skills for Developing, Producing and Supplying Products and Software*

While businesses supplying products and software useful in the implementation of the Green New Deal are not the main focus of this report, implementation of the Green New Deal itself will provide many opportunities for Irish businesses in these areas to develop. This sort of business depends on the initial education system,

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<sup>1</sup> [http://www.comharsdc.ie/files/2009\\_TowardsGNDIreland\\_rpt.pdf](http://www.comharsdc.ie/files/2009_TowardsGNDIreland_rpt.pdf)

competing with firms in other sectors for skills in areas including computing and electrical engineering. Increasing numbers of college entrants are choosing these areas, and higher education institutions are increasing student numbers.

There is a need for more PhD level graduates in areas relating to the generation, transmission and network management of electric power. A supply of graduates in computing with domain knowledge of energy and sustainability-related industries would make a valuable contribution to the ability of Irish technology companies to innovate and market software and other technology products in the area.

#### *Skills in Construction and Installation*

There is a substantial requirement for people to work in infrastructure development though much of that requirement is well supplied. With a construction industry in which employment has collapsed in recent times, there is a more than adequate supply of most major types of skill. Similarly there is a need to add to the skills of people with construction craft skills and who are semi-skilled to work in retrofitting of buildings for energy efficiency, but this is being addressed effectively by FÁS and by businesses in the area.

There is a need for construction and installation skills to support the installation of renewable energy and electricity grid developments, although this is mostly best handled by businesses contracting in the area, separately or in cooperation with each other, at least for wind and ocean energy. As biomass, renewable heat and micro-generation increase in prevalence, there will be a need for specialist training in these areas.

Increasing investment in water and waste water infrastructure should drive a need for more skills in the area. FÁS provides suitable training courses at cost, so the issue here is more one of funding than of training availability. There will be a need to ensure that the specialist skills needs associated with major infrastructural projects involving tunnelling (such as Metro North) can be supplied from within Ireland.

#### *Skills for Operation and Maintenance*

As the volume of renewable energy infrastructure increases, the numbers required to operate and maintain it will also increase. The main specialist requirement will be for people with technician level skills in wind energy, CHP, and (if good progress is made) biomass and ocean energy.

There will also be a need for changes in skills in the trade of mechanic as electric vehicles are introduced, which will require changes to apprenticeships. Existing mechanics are likely to get training from vehicle manufacturers or their agents/distributors.

#### *Skills in Growing, Harvesting and Transport*

Skills in growing, harvesting and transport will be important to the development of a biomass energy sector, and the details of the skills requirement will depend on the types of biomass grown. This will require skills development for farmers, and/or for contractors responsible for planting and maintaining lands, linked to the growth of activity in the area. There are well established mechanisms already in place through

Teagasc for training farmers, which has lead responsibility for developing bio-energy crops. Teagasc will have to ramp up its activity as and when bioenergy develops.

The bioenergy industry itself is likely to have a significant role too, as bioenergy favours a significant degree of supply chain integration, to ensure markets for growers, and supplies for bioenergy businesses, and to maximise efficiency along the value chain.

### *Skills in Management and Design of Sustainability*

One of the key broad areas of skill that cuts across the Green New Deal is that of the skills required to make good decisions about the management of sustainability, including making good design decisions. Professionals concerned with buildings, including architects, construction managers, civil/structural engineers, building services engineers, production engineers and energy management professionals need a good understanding of energy efficiency, and how best to design interventions to get best value for money in improving efficiency.

Professionals involved in renewable energy, including electrical engineers, mechanical engineers, people concerned with managing biomass business systems and others, need a good technical understanding, and the ability to use it in both designing and managing renewable energy systems.

Work on developing the National Grid has a very substantial design aspect, with the challenges being increased substantially by the fact that important parts of what is being done are at the leading edge of network management because of Ireland's high commitment to wind as a source of power. The design aspects of the grid go beyond engineering design, to areas including economic analysis and design of markets. This points to a need for more people with very high levels of skills, such as at PhD level, in areas including Electrical Engineering and Energy Economics.

The design of transportation systems, and the development and management of initiatives such as Smarter Travel Areas require the application of a range of disciplines, including Engineering, Economics and Social and Behavioural Sciences. As those working in the area are mostly from an engineering background, there is a need to broaden their base of skills and knowledge and to bring in some people with high level skills in other relevant areas. There should be a need for more people with cross-disciplinary PhD level skills in Transport Studies to fill these roles than are currently available.

In the public sector, there will be a need for quite substantial numbers of public servants to have skills in green procurement, carbon accounting, carbon management, energy management and the economics of sustainability. As most of the requirement is for people already employed in the public service to add these skills to their existing skills portfolio, a substantial continuing education and training intervention will be required. The Institute of Public Administration, the Civil Service Training Centre, and other education and training providers can play a key role by integrating appropriate modules in their training programmes.

### *Sustainability Business Skills*

The Green New Deal can only be implemented through the active involvement of businesses and there are deficiencies in the business skills currently in place relative to what will be required for the future. For instance:

- Based on feedback from stakeholders, there are significant management deficiencies in many businesses providing retrofitting services for the existing housing stock.
- Renewable energy industries are growing fast, and there will be a need for considerable management development activity as they grow.
- The need for new skills in green procurement, carbon accounting and carbon management in the public sector is matched by a need for suppliers to the public sector to acquire similar skills and knowledge, and to be able to use the skills and knowledge for business purposes, to sell, market and assure the quality of products and services that offer environmental benefits.

### *Skills for the Public and for Civil Society Bodies*

The public, as individuals and as participants in civil society organisation, have important roles to play in implementing the Green New Deal. There is considerable scope to improve public knowledge and awareness in ways that will support the Green New Deal, including:

- Making householders better prepared to purchase energy efficiency products and services, microgeneration technologies and renewable heating systems
- Making better informed choices about modes of travel and carbon efficient vehicles
- Contributing to implementing the Green Infrastructure approach to planning

### **Short-Term Policy Priorities**

The report makes twenty-one recommendations in total which are grouped under six key category headings ranging from research and education to training for industry. Fortunately, a large part of the requirement is for measures to reshape existing provision, or to leverage existing resources to provide different courses than at present, and does not inherently require significant additional expenditure.

Key and urgent areas of action required that will require additional expenditure are as follows:

- Action to improve management and professional-level technical skills within energy efficiency retrofitting businesses
- Action to guarantee the availability of resources to form and continue industry training networks in areas of industry required to deliver on Green New Deal priorities

- Action in the public service to deliver the skills required for Green Procurement, Carbon Accounting, Carbon Management and Energy Management
- Action to deliver education, training and graduate placements for the unemployed to work in roles in industry that will progress the Green New Deal
- Growing higher education research in key relevant areas
- Further investigation on specialist skills in tunnelling to ensure that Irish construction workers can benefit from jobs in projects such as Metro North that involve substantial tunnelling work

There is also a need to develop new and modified provision in a number of areas, and it is hoped that most of the costs of doing this can be absorbed by the relevant providers, as a normal part of the process of updating courses and devising new courses. Key areas of action include the following:

- A higher education “Education for Sustainable Development” initiative
- Developing new provision in higher education in a number of specific disciplinary areas
- Updating apprenticeships and devising multidisciplinary apprenticeships
- Updating relevant courses, such as in Landscape Horticulture, at Further Education colleges
- Further developments in Continuing Professional Development and other provision by business, professional and civil society organisations

## **Section 1: Introduction**

### **1.1 Background**

In October 2009, Comhar Sustainable Development Council published *Towards a Green New Deal for Ireland*, in which it made concrete proposals for a programme to address the economic recession and also environmental and social problems.

The report defined a Green New Deal as follows:

- Revive the Irish economy and create job opportunities through building an innovative, low-carbon and resource efficient society
- Protect ecosystems and biodiversity while reducing fossil fuel dependency
- Provide for greater social inclusion through stimulating green new jobs, reducing fuel poverty and delivering better access to transport
- Build ecological resilience and capacity to adapt to climate change

The report proposed that the Irish Government should invest in green stimulus measures across a range of different policy areas that included the following:

- Improve the energy efficiency of the existing housing stock
- Renewable energy
- Transforming the National Grid
- Delivering Sustainable Mobility
- Public Sector Investments
- Skills and Training
- Green Infrastructure

The report saw skills and training as providing a necessary underpinning without which the full positive impact of a Green New Deal programme would not be realised. It advised that proposals on the potential role that skills and training can play in delivering the Green New Deal should be developed. The current report responds to this need.

### **1.2 Green Jobs and the Green New Deal**

The Green New Deal for Ireland is about accelerating Ireland's transition to a sustainable economy and society and boosting economic activity in the process. The skills on which this report focuses are those required to implement key aspects of the Green New Deal in the policy areas identified above.

Due to its focused nature, the report should not be read as reflecting the full skills and labour market implications of the Green Economy for Ireland. While we believe that there are major opportunities to build green exporting industries in Ireland, the skills implications of doing so are only addressed here to the extent that is directly relevant to implementing the Green New Deal. It is intended that this research will support and complement further work needed in this area.

While implementing the Green New Deal will have wider consequences for economic activity and employment, these consequences are beyond the report's scope. For example, while spending by those employed in Green New Deal activities will induce

employment in other sectors of the economy, it is difficult to project the scale of this effect with certainty. In any case, the skills and training implications of such induced employment will be no different to those encompassed by any other economic stimulus. The analysis also does not extend to looking at the wider impact of Green New Deal measures on the competitiveness of other industries, and any impact, positive or otherwise, that this may have on jobs in these industries.

The job numbers projected in this report may initially look modest when compared with the headline projections of some other reports addressing the potential for Green Jobs internationally or in Ireland. To a great extent, however, this can be traced to differences of definition rather than to contradictions. Many reports include substantial numbers of jobs in manufacturing, internationally traded services and waste processing activity in the job totals they project, and many also include substantial projections of induced employment in their headline projections, all of which are excluded from the totals set out here.

### **1.3 Methodology Used**

The methodology used in the study encompassed the following:

- An extensive desktop review of the literature
- Analysis of statistical information from a variety of sources
- Interviews with key organisations involved in delivering the Green New Deal
- A stakeholder workshop at which the skills and training requirements associated with the Green New Deal were discussed
- Quantitative modelling of skills requirements where feasible

## Section 2: Skills and Training Needs for the Green New Deal

### 2.1 Introduction

This section considers the skills and training needs for the Green New Deal across a range of different key policy areas. The analysis includes providing a qualitative and quantitative assessment of the type and volume of skills that may be required and the establishment of the baseline situation in Ireland regarding the current provision of courses and institutions involved in delivering skills and training in this area. Based on this assessment an analysis is then carried out identifying where possible key skills gaps may exist. Finally, a set of targeted actions is put forward in each case for further consideration.

### 2.2 Retrofitting of the existing housing stock

Improving the energy efficiency of the existing stock of housing is a major plank of Irish Government policy. Some of the main reasons it is considered a key policy area include the following:

- It offers a substantial opportunity to cut carbon emissions.
- Many of the measures that can be taken to improve energy efficiency will have a negative social cost to Irish society and a negative private cost to householders. With short payback periods, both individual householders and Irish society as a whole stand to save money at current energy prices by taking these measures. If the price of energy rises, as many expect to happen when the global economy revives, these measures will save even more, and the economics of other energy-saving measures will improve.
- Most of the work that can be done on improving energy efficiency requires construction skills. With the construction sector being severely depressed (employment down from a peak of 273,500 on Q2 2007 to 132,800 in Q4 2009), and very high levels of unemployment among construction workers, more work for construction workers is very attractive.

The analysis of skills requirements here is based on the assumption that there will be effective public policies in place to promote retrofitting of existing residential property for energy efficiency. While some individual householders will retrofit their homes even without prompting, the level of activity required to make a big impact quickly will depend on effective public policies.

Most retrofitting projects will fit into one of two categories:

- Small scale projects involving interventions such as draftproofing, efficient heating systems, attic insulation and cavity wall insulation.
- Larger scale projects, particularly in older homes, that usually aim to deal comprehensively with energy efficiency issues, including costlier interventions such as external<sup>2</sup> or internal<sup>3</sup> wall insulation and/or double glazing, often in addition to the types of intervention typically pursued in small scale projects.

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<sup>2</sup> i.e. Insulation on the exterior of external walls.

<sup>3</sup> i.e. Insulation on the interior of external walls.

The sort of small scale projects described are relatively inexpensive, and seldom require much redecoration. They have a short payback period, making them a very good investment for householders. They are important from an overall energy efficiency perspective. Of the order of half the total opportunity for improved energy efficiency in the existing housing stock relates to short-payback interventions<sup>4</sup>. Therefore it is important that householders that do not need, or do not desire, larger scale interventions undertake these small scale projects.

These projects are well suited to the sort of Pay-as-You-Save interventions described in *Towards a Green New Deal for Ireland*, under which the cost of the work is paid by a utility, and is recovered through utility bills. Typically, the amount recovered is capped at around 75% of the amount saved by the project. Such interventions fit well with schemes to reward energy utilities for cutting energy consumption.

The sort of larger scale projects described above typically cost more – anything from several thousand euro to perhaps €20,000 or so. In many cases, they require significant redecoration and/or moving of interior and exterior fixtures. Interior and exterior wall insulation and double glazing have long payback periods, making the economic case for householders less clear-cut. Current energy and carbon prices, increased comfort and the greater market value of an energy efficient house are often more persuasive to householders than direct savings from energy efficiency.

The main existing interventions to promote retrofitting to improve the energy efficiency of the existing housing stock primarily address these larger scale projects. The National Energy Efficiency Retrofit Programme, operated by Sustainable Energy Authority of Ireland, has budgeted €90m in 2010 to assist private households with retrofitting projects, and a further €40m has been budgeted for retrofitting of social housing. These programmes build on and expand the earlier Warmer Homes Scheme and Home Energy Saving Scheme.

The Energy Efficiency Retrofit Programme effectively addresses many of the barriers to undertaking larger scale residential retrofitting projects:

- Subsidies under the Programme both shorten the payback time for householders, making the economics more attractive, and reduce the price to be paid by householders.
- The up-front assessment of the energy efficiency needs and subsequent quality assurance on the works undertaken provide an assurance to householders that they are getting good value and that the quality of the work is in order.
- The Programme, and its fore-runners, have done a considerable amount to build the capabilities needed to undertake retrofitting work to a high standard. The system under which firms must meet certain criteria to register with SEAI to do work under the programme has played an important role in assuring and raising standards.

However, rapid growth has itself caused some problems. SEAI's registration requirements make a necessary contribution to assuring quality, without which it is likely that quality would be very uneven, undermining the national objective of improving energy efficiency, and dissuading householders from investing. Essential though this is, it appears to be functioning as a barrier (or at least a speedbump) to the establishment of new businesses in the area. This appears, in turn, to be weakening competition.

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<sup>4</sup> Ireland's Low-Carbon Opportunity - An analysis of the costs and benefits of reducing greenhouse gas emissions, SEAI / McKinsey, 2009

Also, despite SEAL's attention to promoting quality in energy efficiency work, a significant volume of problems are still found when work is inspected, causing unnecessary problems for all involved and wasting effort on rework. Moreover, some businesses involved in providing energy efficiency services apparently do not have strong capabilities in assessing what energy efficiency interventions are needed, which affects adversely the advice they give householders as to the works that should be undertaken.

While growth in retrofitting activity has been strong, it is not guaranteed that it will continue. Short of compulsion or radical increases in carbon taxation, whether or not it does is not fully within the control of policy. Subsidies at current levels may or may not continue to be effective once the population of natural early adopters among households is exhausted. Energy prices may or may not rise sufficiently to overcome inertia and resistance among householders. A Pay-as-You-Save initiative, if implemented, may attract a greater or lesser uptake. Householders may or may not decide in large numbers that wall insulation and double glazing are a good investment without subsidies.

However, investing in skills can do a lot to increase the take-up of retrofitting services:

- If retrofitting businesses all have the skills required to do a proper assessment of the retrofitting needs of a home, to present these properly to householders, and to manage their own work quality effectively, this should help them to operate in a way that inspires confidence in the market, and also (by reducing rework) cuts their costs significantly.
- If retrofitting businesses have strong skills in sales, client relationship management and marketing specific to retrofitting for energy efficiency, this should improve their effectiveness in generating business, giving a major boost to the number of households that undertake retrofitting projects each year.
- If it is relatively easy (perhaps through training and mentoring programmes) for construction firms, and for people already working in the area interested in starting up on their own behalf, to develop these skills, then the number of firms that can meet Sustainable Energy Authority of Ireland's registration requirements should increase. This should boost competition, driving greater efficiency and lower costs to households, and again boosting uptake.
- While the construction industry's problems mean that there is no shortage of people with the general skills required for energy efficiency retrofitting work, some supplementary training is required before they can work in the area. Initiatives to give this training to unemployed and underemployed construction workers play an important role in boosting the supply of labour available. As will be seen later, the provision of training in insulation for unemployed clients of FÁS should have a particularly positive effect.

While skills studies usually do not consider the skills of the general population, there is a good case for considering householder skills here. One of the major barriers to the uptake of energy efficiency retrofitting services is that householders do not generally know how much they can trust what they hear from those marketing services to them. The problem is a classic economic principal-agent one, where the principal (the householder) has much less information than the agent (supplier of retrofitting services). The principal finds it impossible to be sure how reliable information about the full costs and true benefits from the agent will be, and is unsure whether she or he can oversee the project effectively.

Independent quality assurance under SEAI-managed schemes, and possibly under future schemes managed by utilities, should go a long way towards tackling the principal-agent problem, but greater knowledge among householders should still help, particularly if they are considering undertaking a retrofitting project independently.

### 2.2.1 Type of Skills Required

There are major skills aspects to the energy efficiency strategy:

- The physical work that needs to be done requires construction skills – both skills associated with skilled trades and some work that can be done by people who are semi-skilled.
  - Work on the efficient heating systems requires heating/plumbing and electrician skills. People with heating/plumbing skills are required to install new high efficiency boilers, and in some cases to replace piping and radiators. Electricians are often required to install more sophisticated heating controls, and may have a role in retrofitting boilers.
  - Work on cavity wall insulation can be done by people who are semi-skilled, but who have specific training leading to agrément<sup>5</sup> certification in the specific product they install.
  - Work on internal wall insulation involves a combination of semiskilled work, installing the insulation, and typically skills in plastering to skim over it. Again, installing the insulation required takes specific training leading to agrément certification in the specific product installed.  
Installing interior wall insulation often requires other complementary work. It may require that radiators be moved and/or electrical fittings be moved, requiring heating/plumbing skills and electrician skills. It may require that fitted furniture be moved or replaced, making work for carpenters. It frequently requires that substantial parts of fitted kitchens and bathrooms be replaced or reworked, making work for kitchen and bathroom fitters, tillers and sometimes electricians and plumbers. (In many cases, householders choose to install internal wall insulation at the same time as replacing a fitted kitchen.)
  - Work on external wall insulation requires skills closely related to plastering and block-laying. This is another area where installing insulation requires specific training leading to agrément certification in the specific product installed. There can also be a need for electrician skills (to cope with meters and electrical fittings on the exterior) and plumbing/gas installer skills (to cope with exterior plumbing and/or the gas supply).  
Installing and finishing external wall insulation requires considerable skill; aside from technical issues, the quality of the work can have a major impact on the appearance of the building.
- There is a substantial need for professional level skills relating to energy efficiency in buildings.
  - For retrofitting of residential property, the main requirement is for architects, structural/civil engineers involved in residential, quantity surveyors and other construction professionals to add skills in assessing energy efficiency needs,

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<sup>5</sup> Agrément certification is designed for new building materials, products and processes that do not yet have a long history of use and for which published national standards do not yet exist. There is generally a requirement for installers of agrément-certified products to undergo specialist training in their use.

and in assuring the quality of energy efficiency works undertaken to their existing set of skills. The requirement intersects with the requirement for skills to undertake Building Energy Rating assessments, but it also relates to skills in assessing buildings for energy efficiency projects, and to skills in quality assuring energy efficiency projects.

- There is a similar requirement for skills in energy efficiency in commercial and industrial properties, which extends to there also being a need for professionals whose main skills are in energy management. While this requirement is outside the strict (residential retrofitting) scope of this Green New Deal priority area, it is highly important from a wider energy efficiency perspective. A number of higher education institutions have introduced full time courses addressing this need.
- A critical group in skills terms is that of people operating energy efficiency businesses. This is a challenging role, requiring a broad range of skills, particularly in:
  - Entrepreneurship and general management
  - Energy efficiency assessment and design
  - Energy efficiency sales
  - Energy efficiency marketing
  - Energy efficiency quality assurance

## 2.2.2 Volume of Skills Required

The Department of the Environment, Heritage and Local Government has estimated that the €130m budgeted for residential energy efficiency retrofitting in the current year will support approximately 6,000 jobs. Taking account of the private spending by householders that the public spending will leverage, and assuming that there is enough retrofitting activity undertaken under the scheme in 2010 so that the full budget is spent, this jobs estimate is roughly consistent with our own calculations.

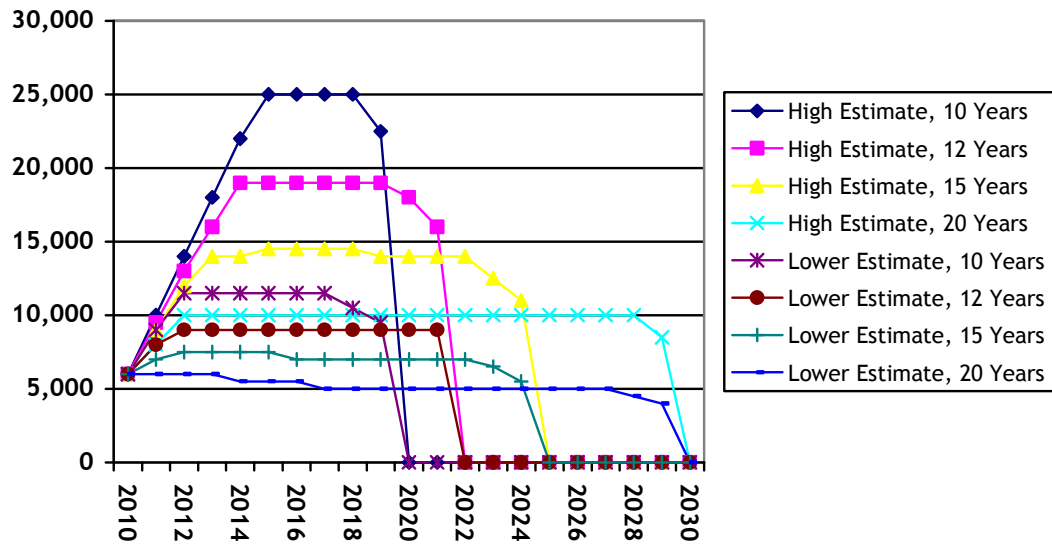
However, there is significant uncertainty about the future:

- Statistics on the existing housing stock are not good enough to estimate reliably how big a job there is to be done nationally.
- We do not yet have a reliable fix on how quickly it is realistic to expect to be able to retrofit the housing stock. An estimate of 20 years, for example, would require roughly half the labour in each year that would apply to an estimate of 10 years.

In recognition of this uncertainty, we have prepared a number of scenarios for future employment in improving the energy efficiency of the existing housing stock. These scenarios make different assumptions as to the size of the job to be done nationally and how fast it can be done. They are set out in detail in Appendix 2 and the outputs are summarised below.

Figure 1 shows how employment in energy efficiency retrofitting of residential property might vary over time under each scenario, taking account of the fact that it takes time to ramp employment up, and that employment is likely to tail off before the end of the period covered by each scenario, before dropping close to zero. At one extreme, employment rises to 25,000 in the scenario based on the high estimate of

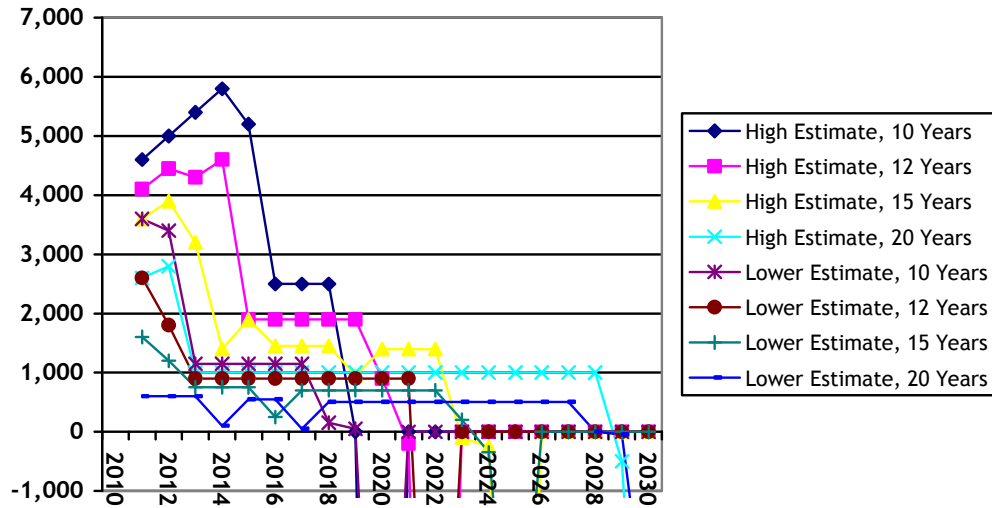
need and tackling it over 10 years. At the other extreme, the level of employment expected for 2010 is more than enough to tackle the lower estimate over 20 years.



**Figure 1 Employment in Energy Efficiency Retrofitting of Residential Property Under Eight Scenarios**

Figure 2 converts these employment scenarios into projections of demand. The projections take account of the likelihood that there will be some flow out of this area of construction work, and represent this by assuming that 10%<sup>6</sup> of those working in the area have to be replaced each year, in addition to the requirement driven by growth in the numbers employed.

<sup>6</sup> The rate at which people working in an industry sector have to be replaced varies between industries and occupations, and can often vary significantly between geographic locations (alternative types of work may be plentiful in some places and scarce in others), over time and depending on the age profile of the workforce. It is too early to make a reliable estimate of the likely rate for the retrofitting industry over the period to 2020. 10% is quite a high number, chosen on the assumption that, in addition to a proportion of those working in retrofitting leaving construction, there is a significant loss of people to other activities within the construction sector each year.



**Figure 2 Projections of Demand for Workers in Energy Efficiency Retrofitting of Residential Property Under Eight Scenarios**

Completion of the requirement for retrofitting is reflected by the appearance of negative demand in Figure 2.

From the perspective of planning to train construction workers to work in retrofitting for energy efficiency, it would seem prudent to assume that the requirement will be at most 2,000 to 3,000 per annum, until greater clarity emerges as to the scale of the requirement and the pace at which it will be possible to address it.

### 2.2.3 Current Skills and Training Provision

The main areas of skill required in improving the energy efficiency of the existing housing stock are as follows:

- Assessing a home’s energy efficiency
- Identifying and recommending improvements that will meet the householder’s needs in terms of improving energy efficiency and value for money
- Carrying out energy efficiency refitting work, primarily in the following areas:
  - Testing for air tightness
  - Improving air tightness
  - Installing attic insulation
  - Installing high efficiency heating boilers
  - Installing improved heating controls
  - Installing cavity wall insulation
  - Installing internal wall insulation
  - Installing external wall insulation

Energy efficiency projects often require complementary work in moving pipes, electrical fittings, built-in furniture and other fixtures, and also in redecorating. In some cases, they also encompass installation of domestic renewable energy systems, the skills for which are discussed under renewable energy.

- Quality assurance on energy efficiency installations
- Managing energy efficiency retrofitting businesses
- Informed purchasing of energy efficiency retrofit projects by householders

### ***Courses in Assessing Home Energy Efficiency***

The main means through which home energy efficiency is assessed in Ireland is the Building Energy Rating (BER) assessment. At the time of writing, there are 15 organisations approved by Sustainable Energy Authority of Ireland to provide training in undertaking BER Assessments. Three of these are Institutes of Technology, and two are colleges of further education. The other 10 are mostly training companies. A small number of providers are involved in providing energy efficiency services themselves.

In a number of cases, colleges provide training in BER assessment as a part of undergraduate education programmes.

### ***Courses in Identifying and Recommending Improvements***

The need for skills in identifying and recommending improvements to householders is addressed through a number of routes, which include amongst others.

- Professional organisations, notably the Royal Institute of Architects in Ireland, provide continuing professional development courses in the area. A current example is a one day course entitled: “Designing Low-Energy Domestic Refurbs – Optimising long term value for your client”
- Tipperary Institute provides an Advanced Certificate course in Domestic Sustainable Energy for architects, builders, engineers and others involved in the area.
- Blanchardstown Institute of Technology has a 2 year Level 7 BSc in Sustainable Electrical and Control Technology for aimed at qualified electricians.
- Higher education institutions have adapted many construction related courses to place a greater emphasis on energy management, and have launched courses in energy management and energy engineering that will also develop skills relevant to recommending improvements. These courses are not targeted specifically on retrofitting of existing homes, and the main opportunities for their graduates are likely to be more in commercial and industrial areas, but they will produce graduates with skills relevant to this area.
- FÁS makes available a course in Energy Efficiency and Renewable Technologies to industry clients, which also provides a means to develop skills in this area. However, the course is not targeted specifically in retrofitting of homes, and it is mostly used to train people to work on energy efficiency and the use of renewable energy in a commercial and industrial context.
- A number of suppliers of energy efficiency technologies provide training in their specific systems to architects and construction industry professionals as a form of continuing professional development.

- The Environmental and Sustainable Construction Association (EASCA) has ran a Retrofit for Energy Efficiency seminar series aimed at contractors, energy assessors and householder on the following topics:
  - Retrofitting for Energy Efficiency - Introduction
  - Extensions – Extending while Renovating
  - Wall Insulation - Cavity Fill, cold bridge, Dry lining, External Insulation
  - Airtightness & Ventilation – draughtproofing, condensation
  - Roof Insulation - flat, pitched, warm roof construction, sloping ceilings
  - Boilers & Heating Controls – other methods of heating water

### ***Courses in Carrying Out Energy Efficiency Projects***

In the main, courses in undertaking energy efficiency work are targeted on people with existing skills in construction at skilled trades or semi-skilled levels.

FÁS provides short training courses for unemployed construction workers in the following relevant areas:

- Air Tightness Testing & Measurement
- Air Tightness Installation
- Domestic Thermal Insulation

A number of private training providers also provide courses in the area, with several providing courses in domestic thermal insulation based on the FETAC Domestic Thermal Insulation certification.

Alongside these more general courses, there are also courses in installing specific technical systems. Installers have to undertake these courses to comply with NSAI Agrément requirements, to validate warranties associated with the installation of the products, and to comply with grant approval requirements where the installation is supported by SEAI. Only Registered Contractors installing NSAI Certified External Insulation Systems are eligible to undertake projects supported by SEAI retrofitting support schemes.

These courses are mainly provided by manufacturers and distributors of the technical systems. As an example, one supplier runs a 3 day course for installers of its external wall insulation system once a month.

### ***Quality Assurance on Energy Efficiency Installations***

SEAI, and specialist contractors working on its behalf, have a key role in quality assurance on energy efficiency retrofitting projects, undertaking training internally.

### ***Managing Energy Efficiency Retrofitting Businesses***

There are no specific training programmes in managing energy efficiency businesses. More generic business management training is available from a wide variety of sources.

### ***Informed Purchasing of Retrofit Projects by Householders***

A number of NGOs provide training to householders to assist them in planning energy efficiency projects. Prominent among these is Cultivate, whose recent courses (some with EASCA) include:

- DIY Home Heating and Energy Saving
- Elements of Green Building (a Level 5 FETAC Module)
- Green Building Course: The Energy Efficient Home

The EASCA seminar series described earlier is targeted on householders as well as builders and energy assessors. Television also plays an important role in this area, with programmes such as RTÉ's About the House doing much to inform the public about home energy efficiency.

#### **2.2.4 Identified Key Skill Gaps**

Retrofitting of residential property will require a supply of people with the skills required to carry out retrofitting projects and existing arrangements for developing these skills are already broadly sufficient. The sharp fall in construction industry employment has created an oversupply of people with the general skills required to undertake the work. Training courses provided by FÁS and others are well suited to developing the skills required to install specific energy efficiency technologies.

There is also a need for the construction-related professions to develop skills to assess energy efficiency of homes, provide advice to householders on choosing energy efficiency measures, and to oversee energy efficiency installers. Professional bodies and others are already active in this area, so while they may still be some skills deficiencies in the area they are being addressed.

There are skill gaps in two main areas:

- There is a need for stronger skills in management of energy efficiency installation enterprises. A wide range of skills require development, including assessing energy efficiency of buildings, identifying and designing the optimum energy efficiency intervention, customer service, sales, quality management, marketing, people management and business management. The need for stronger skills is both for those already managing energy efficiency businesses, and for those with potential to start their own businesses in the area.
- There is a need for much greater knowledge of energy efficiency technologies among householders so that they can buy with greater confidence in what is recommended, and in their ability to assess the quality of what is delivered.

## 2.2.5 Targeted Actions

The targeted actions required are as follows<sup>7</sup>:

- There are existing developments in adapting courses in areas including civil engineering, building services engineering, construction studies, architecture, mechanical and production engineering to place a greater emphasis on energy efficiency and (in some cases) on deployment of renewable energy technologies. These should continue.
- There is a need to re-examine the suite of apprenticeships currently available in the context of the skills requirements associated with the Green New Deal. In many cases, the requirement will be to rebalance existing programmes to place a greater emphasis on areas that are growing in importance. These include: wall insulation (new build and retrofitting) for blocklayers and plasterers; heating controls and renewable energy technologies for electricians and plumbers; skills in energy management, and possibly even some business skills relevant to retrofitting for craftspeople likely to get involved in domestic retrofitting; and energy efficiency for fitters.

As many projects in this area can be delivered most efficiently by people whose skills cut across traditional craft boundaries, FÁS should consider the possibility of introducing new multidisciplinary apprenticeships.

- In each industry sector where developing employee and management skills is important to implementing the Green New Deal, where the industry is well equipped to take a lead in its own development, and where other suitable mechanisms for provision are not already available, the Department of Enterprise, Trade and Innovation should ensure that resources are available to establish and operate an industry training network. While having due regard for the important role of SEAI, the residential energy efficiency and industrial and commercial energy efficiency sectors are among the sectors where this should be considered.
- The most important gap identified is the need for training for entrepreneurs and managers of companies in this industry to raise the standard of management, so as to ensure that all businesses registered to undertake work of this nature are capable of: providing sound and comprehensive advice to householders; delivering projects to a consistently high standard, both in technical terms and in terms of customer satisfaction; operating efficiently with a minimum of rework; and marketing and selling energy efficiency services to householders. As the Sustainable Energy Authority of Ireland (SEAI) plays a central role in developing the residential energy efficiency retrofitting industry, it should have responsibility for ensuring that gaps in provision are bridged.
- Professional and business bodies should continue to develop and deliver education and training for their members (and where appropriate for others) in areas relevant to the Green New Deal, including energy efficiency and energy management.
- Education and training providers moving into provision targeted on the unemployed should take account of the great variety of skills needs that arise

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<sup>7</sup> The full text of recommendations referenced here is in Section 4 of this report. The text here is a summary of those relevant to Retrofitting the Existing Housing Stock.

from the Green New Deal. Energy management for businesses is among the areas that deserve attention.

- Comhar SDC, in consultation with its stakeholders, should take a lead in developing a strategy for awareness raising in relation to the Green New Deal, including Retrofitting of the Existing Housing Stock.

## 2.3 Renewable Energy

Ireland is part way through a major shift towards the adoption of renewable energy. We are working towards an EU target that 16% of all Ireland's energy should come from renewable sources by 2020. Within that, the Irish Government has set a target of 40% of electricity to come from renewables by 2020.

These targets are being addressed in a number of ways:

- The biggest contribution will come from wind power, which accounts for most of the new renewable electricity capacity being installed. It is not yet certain how much capacity will be installed by 2020, but it is likely that it will be in the region of 6,500MW, up from approximately 1,000MW in 2009. The majority of the capacity will be on-shore, but some will be off-shore.

It is possible to be fairly confident about this because most new connections to the National Grid have to be planned and approved long in advance, and because, with prices guaranteed to 2025 under the Renewable Energy Feed-In Tariff (REFIT) scheme, the economics are unlikely to change in a way that will cause plans to be abandoned.

- The Energy White Paper of 2007 set out a target of 500MW of ocean energy to be installed by 2020. There are smaller projects underway or planned, and it seems plausible that this target may be attained if they are successful. However, ocean energy technologies are much less mature than for wind. Much of the activity already planned in the area is in wave energy.
- In bioenergy, there is significant activity across a range of areas, parts of which are linked directly to Government targets. The key targets in the area, which contribute to the overall national target of 16% of energy from renewable sources are as follows:
  - 12% of heat to come from renewable sources by 2020 (Energy White Paper, 2007)
  - 30% of fuel at the three peat power plants to be from co-firing with biomass (Energy White Paper, 2007)
  - 800 MW of power from combined heat and power (CHP) plants by 2020 (Energy White Paper, 2007)
  - 10% of transport fuels to come from biofuel by 2020 (Energy White Paper, 2007); 10% of liquid fuel from biofuels by 2020 (Renewable Energy Directive, 2009, Article 13)

There is activity across a wider range of areas, many of which are encouraged financially by grants (e.g. for energy crops) or price guarantees (relatively high REFIT prices for a range of biomass generating technologies, including high efficiency CHP, biomass CHP, generating based on anaerobic digestion and generation based on biomass combustion<sup>8</sup>).

Overall, the main areas of activity are in:

- Biomass – producing, harvesting and processing biomass for use in other areas of activity, either as a primary activity in its own right (e.g. growing miscanthus), or as a by-product of other activities (e.g. thinnings and waste from timber production).
- Electricity – through cofiring with biomass in peat or coal generating stations, and through using anaerobic digestion or gasification of biomass to produce fuel to drive turbines.
- Combined Heat and Power (CHP) – combusting biomass to produce both electricity and heat, with the heat being used for industrial purposes or for heating commercial or residential buildings.
- Biofuels – producing biofuels such as bioethanol and biodiesel from biomass, and in many cases blending this with fossil fuels. It also includes producing solid fuel products such as wood pellets and briquettes.

Taking an overview of bioenergy, there is a very diverse range of activities in place, mostly operating on a small scale or pilot basis to date. While there is considerable interest in bioenergy, it is not clear which, if any, areas within it will take off on a scale that moves substantially beyond the level supported by the products of existing forestry and agricultural byproducts such as straw.

According to Teagasc, conversion of approximately 10% of grassland to perennial energy crops would be required to meet the 2020 target of 12% of heat to come from renewable sources. Targets for biofuels can be met with imported products, but may alternatively be met in part by substituting native biofuels.

- Ireland has a long history in hydropower, with the Ardnacrusha scheme on the Shannon having been the greatest engineering scheme of the early years after Irish independence, and with a number of other hydropower schemes having been completed over the intervening decades. However, reflecting the fact that the best sites for hydropower are already in use, the scope for growth is limited, so new projects will make only a small contribution towards renewable energy targets.
- While photovoltaic power is making a major contribution to the mix of renewable power generation in many other countries, cloudy skies and Ireland's relatively high latitude make it less economically viable here, so it is likely to be mainly limited to domestic and possibly small commercial use over the period to 2020.

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<sup>8</sup> See, most recently, the announcement by the Minister for Communications, Energy and Natural Resources at <http://www.dcenr.gov.ie/Press+Releases/Minister+Ryan+announces+new+Government+support+price+for+bio-energy.htm>

- Solar thermal energy is a viable source of heat at residential and commercial level, and will make some contribution to the target of 12% of heat coming from renewable sources.
- Geothermal energy is a viable source of heat. Over the period to 2020, the main contribution is likely to be at residential and commercial level, contributing to the target of 12% of heat to come from renewable sources.

### 2.3.1 Type of Skills Required

When considering the types of skill required in renewable energy, it is necessary to distinguish between very different types of activity that take place within each broad technology.

- **Products** – Many of the countries frequently quoted as employing large numbers in renewable energy have substantial renewable energy product industries that are the source of a large part of that employment.

Turbines installed by the Irish wind energy industry are all imported, and there is no specific reason to expect that this will change before 2020. Some wind turbines for use in microgeneration are produced in Ireland, requiring skills little different to those in other light engineering industries.

Globally, the ocean energy products industry is early in its development. Like any other early stage technology industry, it has large numbers of start-ups and specialist ventures of existing companies endeavouring to carve out space for themselves in the global market. There are Irish energy technology businesses in this space, which are involved in pilot projects, so there will be some employment in this area. It is difficult to predict reliably how the industry will appear by 2020.

As with ocean energy, significant parts of the bioenergy sector are early in their development, and there are Irish technology businesses endeavouring to carve out space for themselves. In much of the sector, however, technology is likely to mainly be imported, as with wind.

- **Construction and Installation** – Work on construction and installation associated with renewable energy projects accounts for a substantial part of total employment generated by renewable energy, but lasts only up to the point where the equipment is installed and commissioned. This broad area of activity requires skills in construction, but also in complementary areas such as planning, legal skills, civil engineering and financing. In many cases, final installation work is undertaken by the overseas business that supplies the technology.

Continuing employment in this area depends mainly on there being a constant stream of new projects. Taking a very long term perspective, it will also depend on the eventual need to replace installations as they wear out, and to undertake major upgrades, but it is unlikely that there will be much need for this in Ireland over the period to 2020.

- **Operations and Maintenance** – Work on operating and maintaining renewable energy installations continues for as long as the installations are in operation. However, compared with numbers employed at the construction stage the numbers required are modest. Among the key technical skills required in the area

are technician skills in wind blade, gas turbine, CHP and solid fuel power plant maintenance.

This area of activity includes processing of biomass to produce biofuel products, as wood chip pellets and biodiesel, as well as preprocessing of biomass for uses such as co-firing of electricity generation and Combined Heat and Power (CHP) applications.

- **Growing and Harvesting** – Bioenergy depends on feedstocks. Production and harvesting requires agricultural and forestry skills.
- **Sustainability Management, Engineering and Design Skills** – There is a significant requirement for professional level skills in renewable energy. Some of the key areas are as follows:
  - Electrical engineering skills are relevant to all parts businesses involved in electricity generation, both at the design stage and on an ongoing basis.
  - As bioenergy business systems frequently require close cooperation between different groups, skills in managing networks and in community energy management can be important. A business system may involve long term relationships between growers, harvesters, fuel processing businesses, businesses in generation or combined heat and power, as well as users of heat such as industrial users, commercial enterprises that require heat, and group residential heating schemes. Similar skills may be important in community scale generation initiatives, which may use wind or other technologies.
- **Sustainability Business Skills** – There is a need for business skills in all areas of renewable energy. Many renewable energy businesses are small to medium in terms of the number of people they employ, either because the overall scale of the enterprise is small, or because they contract in many of the skills they need from specialist service firms. They require skills in entrepreneurship and general management. They also require skills in working within the regulatory environment, including effective quality assurance.

In addition, they require skills in working with their customer base. In most cases, this involves business-to-business sales and marketing. In other cases, it requires consumer sales and marketing.

- **Skills for the General Public** – Part of the renewable energy agenda involves direct participation by householders through installing and using renewable heating, or through involvement in microgeneration of electricity from renewable resources. A significant amount of knowledge is required to make informed decisions.

### 2.3.2 Volume of Skills Required

In order to project skills requirements, we looked at the Irish and international literature to identify benchmark relationships between installation of power capacity and labour requirements. Most jobs fall into one or other of the following four areas:

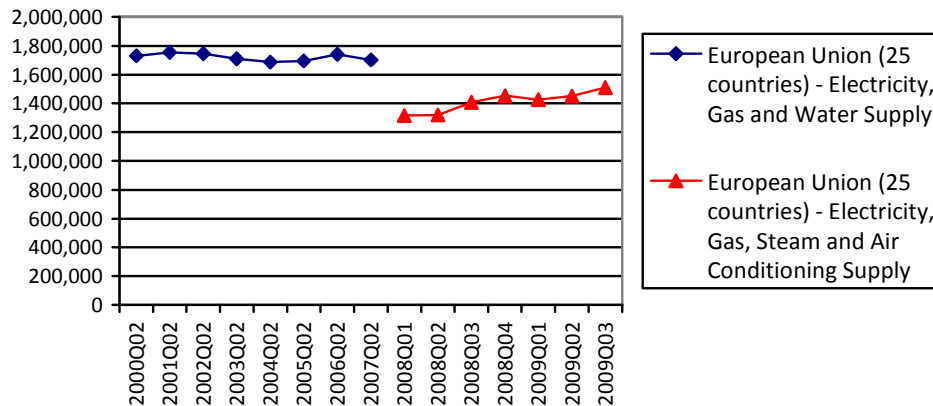
- Products
- Construction and installation

- Operation and maintenance
- Growing and harvesting

It is important when making projections to distinguish between the four areas:

- Jobs in operation and maintenance and in growing and harvesting should continue to exist for as long as the renewable energy installations continue to be used.
- Construction and installation only exist at the development stage. Employment is only continuous if there is a continuous flow of development work.
- Substantial employment in renewable energy products (beyond the R&D and piloting stage) only occurs to the extent that manufacturing is undertaken within the country. Once markets mature, these products are traded internationally, so employment is driven by the competitiveness of the national industry, rather than by local demand conditions.

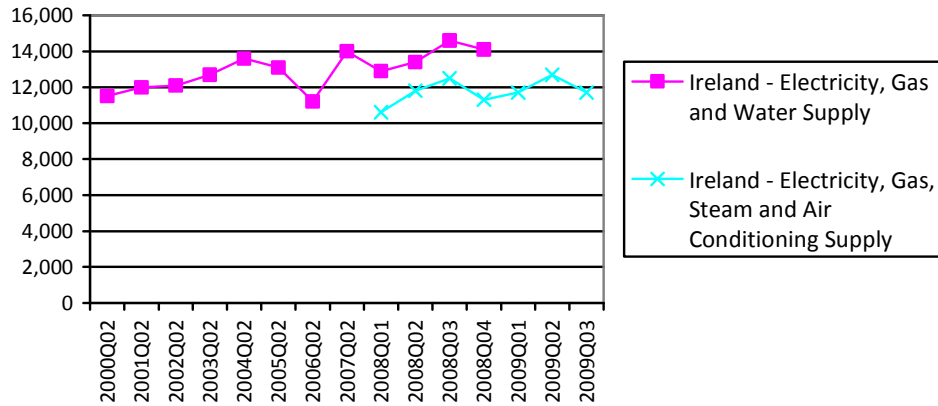
Employment in energy production is currently rising in Europe, apparently driven by the shift in the generating mix towards renewables. Figure 3 demonstrates this with employment data for the EU. Unfortunately, there is a break in the data between 2007 and 2008, associated with a change in the system of industry classification (from NACE 1.1 to NACE 2). A fairly steep upward trend is visible since the start of 2008.



**Figure 3 EU 25 Employment in Electricity (and some other Utility Areas)**

Source: Labour Force Survey data, Eurostat

Figure 4 provides equivalent data for Ireland, in which a longer term upward trend is visible.

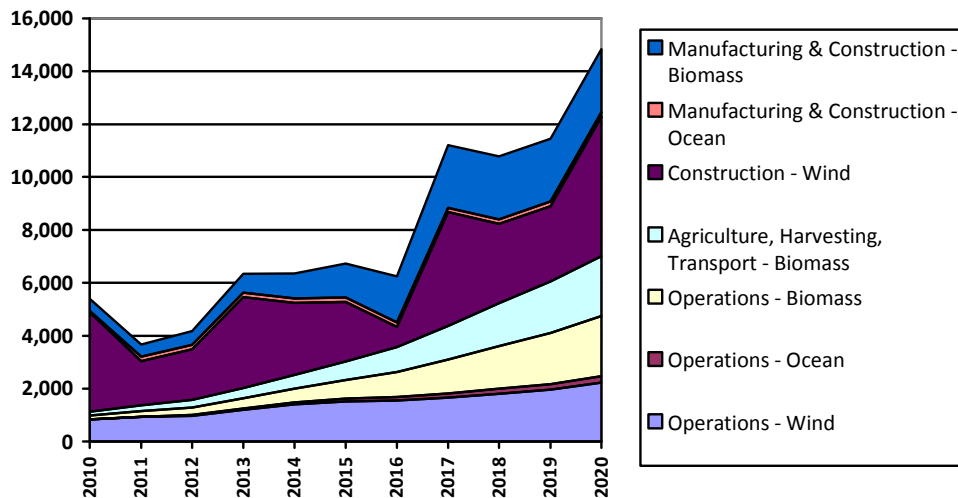


**Figure 4 Irish Employment in Electricity (and some other Utility Areas)**

Source: Labour Force Survey data, Eurostat

To take a view on future levels of employment in renewable energy industries, scenarios were constructed for wind, ocean and biomass energy, which together represent the greatest renewable energy employment potential over the period to 2020. These scenarios are described in detail in Appendix 2.

Figure 5 presents summary totals of numbers employed directly and indirectly under wind energy, ocean energy and biomass energy scenarios. The numbers in each area include both direct and indirect employment.



**Figure 5 Summary of Employment under Wind (Smoothed), Ocean and Biomass Energy Scenarios**

A key point to note is the potential for volatility in employment (direct and indirect) in construction and installation of renewable energy capacity. Volatility in employment in this area appears greater for wind than for the other areas only because there is hard information available as to when it is planned that new capacity will be connected to the grid, whereas the scenarios for ocean and biomass energy are more speculative.

Another key point to note is that the scenario for biomass energy assumes rapid development towards meeting the target that 12% of heat should come from renewable sources by 2020, and that this would be achieved primarily through biomass. There is as yet no clarity that this will actually happen.

Figure 6 converts the employment scenarios into projections of demand. The projections take account of the likelihood that there will be some flow out of employment in each area. It is assumed that 3%<sup>9</sup> of those working in each area have to be replaced each year, in addition to any requirement driven by growth in the numbers employed.

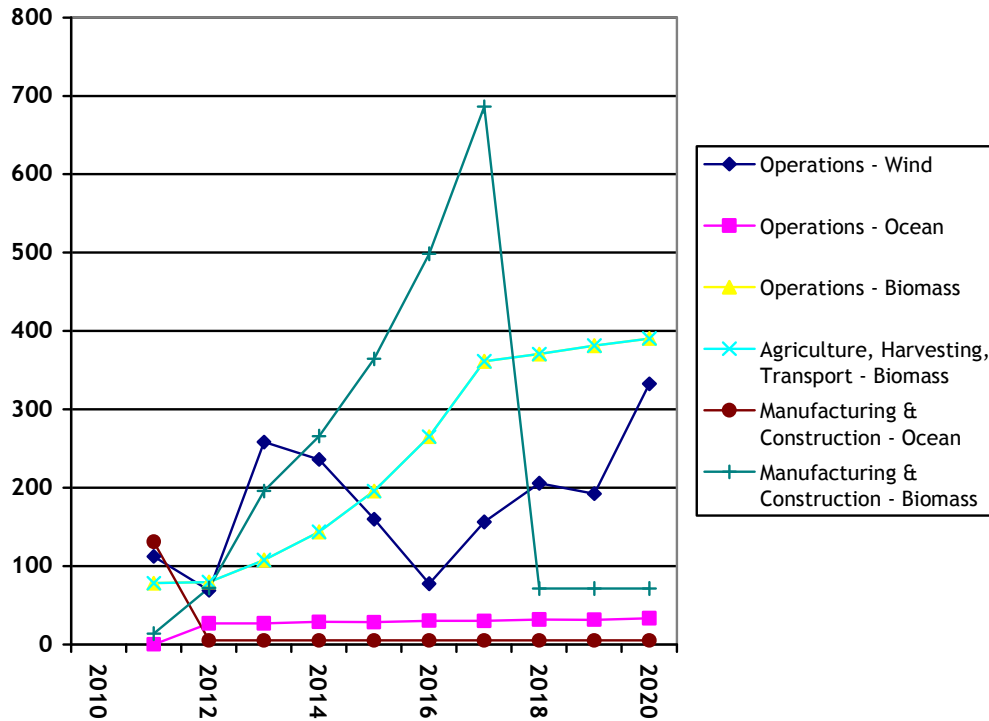
Variations in the rate of growth in wind capacity cause demand for additional employees in wind operations to vary.

Wind power construction employment is omitted from the chart because volatility in activity in the area causes large flows of people in and out of the area, even under the smoothed scenario. The size of these flows is very sensitive to the timing of construction work, and the extent to which the industry succeeds in smoothing activity out over time.

The pattern of demand for people to work in manufacturing and construction activity relating to biomass reflects an assumed initial rapid ramp up in activity in the area, which eventually levels off in 2018, with activity in 2019 and 2020 being at the same level as in 2018.

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<sup>9</sup> The rate at which people working in an industry sector have to be replaced varies between industries and occupations, and can often vary significantly between geographic locations (alternative types of work may be plentiful in some places and scarce in others), over time and depending on the age profile of the workforce. It is too early to make a reliable estimate of the likely rate for renewable energy industries over the period to 2020, but 3% per annum is a fairly neutral number.



**Figure 6 Projections of Demand for Workers in Renewable Energy**

### 2.3.3 Current Skills and Training Provision

Renewable energy is an area that involves many different types of company, using different technologies, operating in differently-structured business systems. The skills required vary with the type of company and the technology.

An important factor is that different types of market require different skills in sales, marketing and stakeholder relationship management.

- A renewable electricity installation whose main purpose is to feed the National Grid is concerned with regulatory and planning matters, and with meeting the technical requirements for connection. It sells a standard product through the Single Electricity Market Operator (SEMO).
- An installation (typically CHP) at a commercial, industrial or area residential site in many cases has a dual role of meeting the site's needs for heat and (some or all) electricity, as well as feeding its surplus to the National Grid. It has more complex customer relationships to manage.
- A business producing renewable heating fuels for the Irish market is likely to require consumer and/or industrial marketing and sales skills. A business producing renewable transport fuels for the Irish market is likely to require a close relationship with the importers and distributors of transport fuels with which their renewable fuels will be blended.

- Biomass producing enterprises, cooperatives and groups need skills in managing relationships with downstream businesses including harvesting and transport businesses, as well as users of biomass.
- Businesses installing domestic renewable energy solutions have sales, marketing and customer relationship management skills requirements that are broadly similar to those of residential energy efficiency retrofitting businesses.

Large biomass plants, including large CHP operations, may also have relatively complex supplier relationships to manage.

### ***Technical and Technology Skills for Renewable Energy***

One of the major trends currently underway in Irish higher education is that of engineering departments moving into the area of sustainable energy. This is occurring at a range of levels – with technician qualifications at Levels 6 and 7, professional degree qualifications at Level 8, Masters courses for graduate engineers and others who wish to specialise in renewable energy at Level 9, and Masters and PhD research programmes at Levels 9 and 10.

Within this overall trend, higher education providers are taking a variety of approaches.

- Some are modifying existing courses in mechanical, production, electronic or electrical engineering, so as to place an increased emphasis on topics relevant to renewable energy.
- Some are introducing new courses focused on energy management, that are most suited to employment in energy using businesses, and in providing services to such businesses. Many of these courses have both an energy efficiency and a renewable energy focus. Skills in renewable energy are relevant to energy using businesses mostly if they have an interest in installing renewable heating, CHP or microgeneration technologies.
- Some are introducing courses to develop skills suited particularly to power generation and renewable energy technology businesses. These range from technician qualifications at Level 7 that are particularly suited to generating operations such as wind farm operations, to PhD research at Level 10 that produces skills to drive innovation in generating technologies, and in management and deployment of renewable energy.

The area is developing rapidly, but a sample of the courses now available in this area is set out in Table 1.

**Table 1 Sample of Higher Education Courses in Renewable Energy**

Level	Qualification	Provider
6	Higher Certificate in Engineering (Wind Energy) – (targeted on unemployed)	Letterkenny Institute of Technology
7	BSc in Renewable Energy and Energy Management	Tralee Institute of Technology
7	BEng in Energy and Environmental Engineering	Tallaght Institute of Technology
7	BEng in Energy Engineering	Galway-Mayo Institute of Technology
8	BEng in Sustainable Energy Engineering (1 year add-on for Level 7 graduates)	Athlone Institute of Technology
8	BEng in Energy Engineering	UCC
8	BE in Energy Systems Engineering	NUI-G
9	MSc in Renewable Energy Systems (available both full time and part time)	Dundalk Institute of Technology
9	MSc in Sustainable Energy Engineering	Waterford Institute of Technology
9	ME in Sustainable Electrical Engineering	DIT
9	MSc in Energy Management	DIT
9	MEngSc in Sustainable Energy	UCC
9	ME in Energy Systems Engineering	UCD
9	Postgraduate Diploma in Electronic Engineering (Renewable Energy Systems)	NUI Maynooth
9	ME in Electronic Engineering with Renewable Energy Systems major	NUI Maynooth
10	PhD Research	Electricity Research Centre at UCD
9/10	Research	Wave Energy Research Team at the University of Limerick
9/10	Research into Energy from Liquid and Solid Biofuels	University of Limerick
9/10	Research into Advanced Materials for Energy Generations and Transmission	University of Limerick

Aside from courses specifically tailored to renewable energy, which are mostly new, graduates in a number of technology disciplines have technical and technology skills that are directly relevant to renewable energy.

Key among these is electrical engineering, with long established Honours Bachelor Degree (Level 8) courses at UCD (Electrical and Electronic Engineering), UCC (Electrical and Electronic Engineering), NUI-G (Electrical and Electronic Engineering), Cork Institute of Technology and DIT.

ESB contributes to the education of electrical engineers. It currently take on approximately 100 apprentices each year, and will offer a number of these the opportunity to study for an engineering degree. It also supports a number of PhD Fellowships in Electrical Engineering.

Other relevant disciplines include:

- Mechanical engineering
- Electronic Engineering
- Civil Engineering
- Computer Applications
- Biochemistry and Chemistry

Aside from mainstream higher education courses, most of which are targeted on those undergoing initial education, there are also technical training courses available for people already in the labour force, many of them focused on installing renewable energy technologies in homes or at commercial and industrial premises.

The following are prominent among these:

- FÁS provides training courses for unemployed construction tradespeople in Intelligent Building Control Systems, Domestic Solar Hot Water Systems Installation and Installation of Domestic Photovoltaic Systems.
- The FÁS Energy Efficiency and Renewable Energy Technologies course for industry, already referenced in relation to energy efficiency.
- The Renewable Energy Installers Academy (REIA) – an Interreg initiative operating in the border counties and Northern Ireland provides training in installing Solar Water Heating, Ground Source Heat Pumps, Biomass (wood), Wind, Photovoltaics and Micro-Hydro power. Dundalk Institute of Technology operates one of REIA's training centres.
- The Tipperary Institute provides an Advanced Certificate course in Renewable Energy for potential renewable energy entrepreneurs and others, as well as an Advanced Certificate in Domestic Sustainable Energy for architects, builders, engineers and others.
- A number of private training companies provide courses in installing renewable energy technologies.

### **37 high-end jobs in new €15m research centre in Cork**

United Technologies Corporation is to establish a unique energy and security research centre in Ireland creating 37 new jobs over the next four years through a €15 million investment. The investment is supported by the Irish Government through IDA Ireland.

The proposed research agenda is based on two main research themes - energy and security systems. The centre will begin in the Tyndall National Institute, UCC, Cork.

UTC employs more than 200,000 people and operates in more than 70 countries. The formation of United Technologies Research Centre Ireland (UTRCI) enables UTC to establish a European research base, thereby creating a strategic technological development presence in its American, Asian and European markets.

A key driver in this decision has been UTC's desire to identify global clusters of expertise to complement its corporate research centres which are based in the US and China where they employ 500 people.

An estimated 74% of the research centres' technical staff hold PhDs or advanced degrees - a profile that is likely to be reflected in the Cork centre.

UTC also announced that it will become the founding member of the International Energy Research Centre (IERC) - a new initiative which will be jointly funded by the Department of Communications, Energy and Natural Resources with funding also from industry sources and the Department of Enterprise, Trade and Innovation.

In addition to the two Departments, stakeholders in the IERC will include key companies, both indigenous and from Ireland's foreign direct investment portfolio, who will determine the research and development agenda.

The Centre will work with leading Irish research groups with technological interest and capabilities relevant to the sustainable energy field and leading European and International researchers working in the area of sustainable energy systems.

### ***Training in Running Renewable Energy Businesses***

There are significant numbers of renewable energy businesses, with some training requirements that are specific to the sector, and others that are more generic.

The specific skills needs of wind businesses are addressed through the Wind Skillnet – a training network that is led by the wind power industry, and funded partly by the industry itself and partly by the State's National Training Fund through the Department of Enterprise, Trade and Innovation via the enterprise-led Skillnets support body. The Wind Skillnet is linked to the Irish Wind Energy Association, which represents wind and ocean energy businesses.

The skills areas which the Wind Skillnet concentrates on are those required to run a wind energy business. Their courses provide training in disciplines such as:

- Grid connections
- Grid code compliance
- Selling Wind Energy (Renewable Energy Feed-In Tariffs)
- Health and safety
- Project management
- Planning
- Asset management
- Training in operating and maintaining particular types of wind turbine
- Wind farm electrical systems

In March 2010, the Irish Bioenergy Association submitted an application to form a Bioenergy Skillnet. According to the Association, “the aim of the Bioenergy Skillnet is to provide quality training and education to all those involved in the bioenergy sector in the Republic of Ireland”.

Irish businesses developing and producing renewable energy technologies have access to a wide range of supports from Enterprise Ireland, which include assistance with management development, mentoring and other skills development services, undertaken as an integrated part of more comprehensive business development initiatives.

The University of Limerick (UL), the National University of Ireland, Galway (NUI Galway), Shannon Development, and Silicon Valley's Irish Technology Leadership Group (ITLG) have announced the launch of the Shannon Energy Valley, a major renewable energy hub in Ireland's Shannon Region.

The Shannon Energy Valley initiative will create a national hub for Energy research and development, industry and commerce with a view to attracting international investment and generating high-end employment in the region.

The Memorandum of Understanding establishing the hub sets out the objectives of the alliance as:

- The creation of a world-class cluster of sustainable energy-related activity to support job creation and business start-ups through national and international investment
- Reduction of Ireland's carbon footprint, energy generation costs, dependency on fossil fuel imports and helping the country meet environmental and emissions commitments
- Enhancing Ireland's capability in the sustainable energy sector by attracting world-class R&D energy expertise, realising its commercial benefits and enabling further, advanced R&D activities
- Growing Ireland's smart economy by developing additional education and training capability at undergraduate and postgraduate levels in specialised energy disciplines.

## ***Biomass Training***

Teagasc is active in bioenergy research and training. Its main bioenergy training and learning activities include:

- Running an annual bioenergy conference in association with other bodies concerned with bioenergy
- Demonstrations and technical days on growing and harvesting bioenergy crops
- Periodic conferences and publications of research on topics such as anaerobic digestion of agricultural waste or the economics of growing energy crops
- Publishing a DVD on bioenergy crops.

The Bioresources Research Centre (BRC) at UCD, which is supported with a Charles Parsons Energy Research Award from the Department of Communications, Energy and Natural Resources, undertakes research in sustainable biomass utilisation, focusing particularly on biomass production systems, biomass-to-energy (including biofuels) and waste-to-energy. The research staff currently includes approximately 25 PhD students.

In academic year 2009/10, BRC provided a graduate certificate course in Green Technologies, funded through the Labour Market Activation Fund, targeted on unemployed graduates. From September 2010, it will provide an MSc in Sustainable Energy and green Technologies. BRC also provides a BE course in Biosystems Engineering, which addresses biomass as a source of energy.

A number of LEADER groups, which have responsibility for rural development in areas of the country, have run biomass conferences for their areas, with assistance from Teagasc.

The Irish Bioenergy Association is active in promoting learning. It and its three subgroups (Wood Energy, Anaerobic Digestion and Pure Plant Oil) undertake learning activities that include conferences and plant visits. As noted earlier, the Association has applied to form a Bioenergy Skillnet.

COFORD, the National Council for Forest Research and Development periodically runs workshops on the themes "From Forest to Gate" and "From Gate to Grate".

Waterford Institute of Technology has a Biofuel Research cluster, which offers opportunities to study for research degrees. The Institute is also involved in the creation and provision of training courses relating to wood biomass energy supply chains.

Dundalk Institute of Technology's Centre for Renewable Technology (CREDIT) undertakes research in a range of areas, including marine biomass as an energy source, and offers opportunities to study for research degrees in the area.

Other higher education institutions active in biomass research, offering research degree opportunities, include:

- University College Dublin (research into Sustainable Agriculture, including Bioenergy)
- University College Cork
- Limerick Institute of Technology (LIT)

Letterkenny Institute of Technology is establishing a Wind Energy Academy as part of a €500,000 initiative backed by the Donegal County Development Board.

The first phase involves a wind turbine maintenance programme, which will be delivered in conjunction with BZEE, a German centre for renewable energy. This programme will run for 26 weeks, with six weeks of industrial placement.

A wind turbine will be installed at the Letterkenny IT campus – subject to planning approval. Donegal currently has 25 wind farms, accounting for 15% of the national wind energy output.

### **2.3.4 Identified Key Skill Gaps**

As the skills required will depend on how renewable energy develops over the period to 2020, projections of skills gaps are contingent on actual events. In particular, there is a fair amount of clarity as to how wind power is likely to develop, there is less clarity with ocean and biomass energy, so skills gaps identified in these areas should be seen as uncertain.

#### ***Wind Energy***

The infrastructure to develop skills in wind energy is developing rapidly, with the Wind Energy Skillnet and various higher education institutions playing key roles in this. Skills gaps in the sector will result mainly from rapid growth in wind energy businesses and operations and from volatility in demand for skills in construction and installation.

As installed wind energy capacity grows, there will be a need to develop relevant entrepreneurship and business management skills among the growing numbers of businesses operating wind installations. There will also be a need for increasing numbers of people with mainly technician level skills to operate and maintain wind farms and to manage their connections to the grid. There will also be some increase in requirement for people with professional level skills in engineering, particularly electrical engineering.

Providers of education and training will have to continue to develop their offerings in these areas if skills shortages and deficiencies are not to appear. Construction firms involved in wind energy seem likely to face skills issues arising mainly from the likely boom-bust pattern of installations – having to recruit large

numbers over a short period, let many of them go again, and then recruit more later. This pattern of employment may result in skills deficiencies and even shortages at times of high growth in installation activity.

### ***Ocean Energy***

Ocean energy is a group of industries that is only in the process of forming in Ireland at present. If it is successful in developing, it will have significant skills requirements. These will depend in part on whether an ocean energy technology industry emerges, requiring substantial engineering, entrepreneurial and business skills, or technology is mainly sourced from overseas.

Irish higher education institutions already have courses and research programmes to develop the required engineering skills. Existing courses, training programmes and mentoring programmes in entrepreneurship and business provided by Enterprise Ireland, higher education institutions and others are well suited to developing the entrepreneurial and business skills that will be required by ocean energy technology companies.

An important area where there is a potential gap is in the skills required to develop and operate ocean energy installations – skills comparable but not identical to the skills required for wind energy. There is no existing mechanism to develop these skills, although the Wind Energy Skillnet might be suited to taking on the role.

### ***Bioenergy***

Bioenergy is another group of industries that is in the process of forming, although it is further advanced than ocean energy. The range of skills required will be greater than under wind and ocean energy, because of the greater complexity of the value-adding chain, under which a large part of the requirement for skills is in growing and harvesting biomass, in which transport and preliminary processing of biomass are significant activities, and in which several different types of technology are used to process biomass for energy. The complexity of the value adding chain means that skills in coordinating and negotiating between producers and users of biomass will also be important.

Current education and training provision is mainly directed towards supporting the skills required at this early stage in the bioenergy sector's development. A very considerable amount of further development in education and training provision will be required to develop the skills required to allow this to occur.

Areas where further developments in provision are likely to be required include:

- Construction and installation of biomass and renewable heat technologies
- Operation and maintenance of biomass energy facilities
- Skills in growing, harvesting and transport of biomass, including agricultural skills, agricultural advisory skills, research skills and skills in harvesting and preliminary processing of biomass
- Electrical engineering
- Managing biomass business systems and networks
- Community energy management

- Business skills in management of biomass-related businesses, including entrepreneurship and general management, sales in the context of sustainability, marketing in the context of sustainability and quality assurance in the context of sustainability
- Skills in developing, producing and supplying biomass technologies

### ***Microgeneration***

Substantially increased adoption of microgeneration and renewable fuel systems by households and businesses will require stronger skills in marketing, selling and quality assuring these among installers, and substantially stronger knowledge of these technologies among householders and business managers.

### **2.3.5 Targeted Actions**

The main targeted actions required are as follows<sup>10</sup>.

- The Irish education sector is already responding to many of the skills demands of renewable energy. Key among the developments already underway are:
  - Adapting courses in areas including civil engineering, building services engineering, construction studies, architecture, mechanical and production engineering to place a greater emphasis on energy efficiency and (in some cases) on deployment of renewable energy technologies. These should continue.
  - There are new courses being launched, at levels from 6 to 9 in the National Framework of Qualifications, in areas including wind energy, broader renewable energy technologies and energy management, with some of these courses being ab-initio courses designed for students first entering college, and others being add-on or masters qualifications designed to enable students with an existing higher education qualification to specialise;
  - A significantly increased level of provision in electrical engineering;
  - Research in electricity generation and distribution; and
  - Research in ocean energy.
- Specific areas where additional new provision should be developed in higher education include options in computing degrees to specialise in IT systems for renewable energy, electricity network management and environmental management.
- There is a need to re-examine the suite of apprenticeships currently available in the context of the skills requirements associated with the Green New Deal. In many cases, the requirement will be to rebalance existing programmes to place a greater emphasis on areas that are growing in importance. These include renewable energy technologies for electricians and plumbers. As many Green New Deal construction jobs can be delivered most efficiently by people whose

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<sup>10</sup> The full text of recommendations referenced here is in Section 4 of this report. The text here is a summary of those specifically related to the area of Renewable Energy.

skills cut across traditional craft boundaries, FÁS should consider the possibility of introducing new multidisciplinary apprenticeships.

- In each industry sector where developing employee and management skills is important to implementing the Green New Deal, where the industry is well equipped to take a lead in its own development, and where other suitable mechanisms for provision are not already available, the Department of Enterprise, Trade and Innovation should ensure that resources are available to establish and operate an industry training network. Sustainability industry sectors in which networks are required include, but are not necessarily limited to: wind and ocean energy (currently covered by the Wind Skillnet); biomass energy; and possibly microgeneration and small scale renewables and perhaps ocean energy technologies.
- SEAI has a central role in promoting micro-generation and residential and commercial renewable heat and CHP, so it should also have responsibility for ensuring that any gaps in provision for the sector are bridged.
- Professional and business bodies should continue to develop and deliver education and training for their members (and where appropriate for others) in areas relevant to the Green New Deal, including renewable energy and energy management.
- Education and training providers moving into provision targeted on the unemployed should take account of the great variety of skills needs that arise from the Green New Deal. Amongst the areas that deserve attention are: energy management for businesses; and technician and engineering skills for renewable energy.

## 2.4 Transforming the National Grid

The National Grid is undergoing a major transformation. Renewable energy imposes demands that the grid inherited from simpler times could not support. The following are amongst the key new demands imposed by renewable energy:

- The National Grid has to facilitate large numbers of independent generating businesses. It has been necessary to implement a market system to trade their output, operated by the EirGrid Single Market Operator.
- The National Grid has to support many more feed-in connections, with hundreds of wind farms, and potentially substantial numbers of biomass generators, CHP generators and ocean energy generators. It will also have to support the surplus from household level microgeneration, where households decide to generate electricity and feed the surplus back into the grid via a smart meter.
- The grid has to be resilient to a high level of variability in output from wind power, taking wind-generated electricity to the extent that it is available, but able to switch in power from other sources to maintain resilience of supply when it is not available. The Irish National Grid already accepts one of the highest shares of wind power in the world<sup>11</sup>, and as seen earlier, it will take approximately five times

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<sup>11</sup> Most other countries that generate substantial volumes of wind power have their national grids tightly integrated with those of neighbouring countries, reducing the total share of power on a single synchronous grid that is accounted for by variable wind energy.

as much in 2020 as it does now. This is an area in which Ireland is at the leading edge of grid management.

- Electric vehicles will draw substantial volumes of power, creating significant grid management challenges and opportunities.
- The National Grid is already integrated with that of Northern Ireland, and there are interconnections with Britain. Substantial interconnection capacity is being provided to assist in addressing network management challenges.

The National Grid is operated and planned by EirGrid. ESB Networks is responsible for delivery of projects developing the Grid, and retains ownership once they are built. The majority of the work involved in a project is undertaken by professional services and other contracting firms.

All firms involved in work on the National Grid have high skill levels, and most are of significant to substantial scale, so they are well positioned to identify their own continuing education and training needs, and to take responsibility for ensuring that these needs are addressed.

The fact that Ireland is already at the leading edge in managing electricity networks using high volumes of wind, and plans to continue to move forward rapidly in this area, means that we are the first to have to find solutions to many challenges of technology and of market organisation. While the number of people required to produce these solutions will not be large, they will have to have world-leading skills in areas that combine engineering, economics and business organisation. It is possible that it may be feasible to build new internationally trading businesses on the technology and expertise that will be developed by solving these challenges.

### **2.4.1 Type of Skills Required**

Key areas of skill required in transforming the National Grid include:

- Transmission network planning
- Electrical/civil/mechanical engineering design
- Information technology
- Economic analysis
- Planning
- Wayleave
- Environmental impact
- Public consultation
- Negotiation
- Market operation
- Construction
- Installation of equipment

The requirement for electrical engineers can be difficult to meet. It is not large in absolute terms, but numbers graduating in electrical engineering each year are low, and demand for their skills has increased as work on developing the National Grid has progressed, as new generating operators have entered the market, and as large volumes of new generating capacity have been added.

## 2.4.2 Volume of Skills Required

Eirgrid has estimated that investment in the National Grid will generate approximately 300 new jobs over a five year period from 2010<sup>12</sup>. These estimates seem plausible and are made up as follows.

- Approximately 30 jobs in EirGrid in the areas of engineering, project management, planning, design and other specialist areas, with recruitment beginning in 2010.
- Employment in building power lines and substations around Ireland, expected to ramp up over the five year period to an additional 200 jobs.
- At least 50 additional jobs in the professional services sector over the next two years.

## 2.4.3 Current Skills and Training Provision

Work on transforming the National Grid requires a very diverse range of skills, both in the organisations with responsibility for the transformation – EirGrid and ESB Networks, and among the many Irish and international businesses that are contributing to the transformation as contractors and suppliers.

Other than electrical engineering, the basic disciplines in which qualifications are required are shared with many other industries, and the numbers required are sufficiently small that they are unlikely to make a substantial difference to the adequacy or otherwise of the supply of graduates.

The further knowledge and skills required on top of initial qualifications are more important. However, on the whole, the businesses that require them are sufficiently capable and well resourced to be able to provide the required education, training, experience and other learning opportunities themselves, or to commission them from independent providers.

To the extent that there are requirements for training that arise from the specific plans of organisations including EirGrid, the Commission for Energy Regulation and ESB Networks and are relevant to a range of businesses, these can be (and typically are) addressed through conferences, briefing sessions, formal training sessions and other mechanisms as appropriate.

As noted earlier, Honours Bachelor Degree (Level 8) education in Electrical Engineering is provided at UCD (Electrical and Electronic Engineering), UCC (Electrical and Electronic Engineering), NUI-G (Electrical and Electronic Engineering), Cork Institute of Technology and DIT.

Within the overall requirement for skills, there is a particular requirement for the very high level skills required to drive innovation in grid management. The Irish National Grid is already exceptional internationally in terms of the share of capacity accounted for by highly variable wind generation. As this share increases rapidly, there will be a need for small volumes of very high level skills in a range of disciplines to solve the major challenges that this poses.

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<sup>12</sup> <http://www.eirgrid.com/media/News%20Release%20-%20Annual%20Report%202009.pdf>

Part of the requirement is for high level skills in engineering, particularly in Electrical Engineering, in market design and in regulation (disciplines such as Economics) to solve the design challenges necessary to solve these challenges optimally. Another part of the requirement is for skills in software, information technology and automated control systems to implement the solutions for Ireland, and the technology business skills required to leverage Ireland's leading position in the area to develop world leading technology businesses. Research centres such as UCD's Electricity Research Centre potentially have a crucial role in supporting the development of these skills through PhD research.

#### **2.4.4 Identified Key Skill Gaps**

In the main, businesses directly involved in developing the National Grid are well equipped to look after their own skills development needs.

There is a need for high end skills to develop the systems required to meet the challenges of heavy reliance on variable wind (and possibly in future) ocean power. This is both a matter of developing these systems for use in Ireland and a matter of leveraging what is learned from this to develop grid management technology businesses. Developing the best possible systems in this area is critically important to reconciling heavy use of renewable energy with the need for a stable reliable supply at a reasonable cost to electricity users, and has the potential to make a material contribution to the development of indigenous knowledge-based industry.

There are not exactly skill gaps in this area – there is already a strong base of skills – but the value of even moderately better outcomes is such that it is worth investing to ensure that we have access to the best possible skills in this area.

#### **2.4.5 Targeted Actions**

The main targeted actions that are relevant are as follows<sup>13</sup>.

- The Irish education sector is already responding to many of the skills demands posed by the Green New Deal. Key among the developments already underway are: a significantly increased level of provision in electrical engineering; and research in electricity generation and distribution. It is important that developments in these areas should continue, and that research funding bodies should continue to grow the volume of research supported in each of the research areas as a means to drive the availability of people with very high levels of skill and knowledge about Irish energy and transport policy.
- Specific areas where additional new provision should be developed in higher education include options in computing degrees to specialise in IT systems for renewable energy and electricity network management.
- The logic for public intervention in continuing education and training is much less compelling where the main players are large, well resourced and/or already highly capable. Such businesses are typically capable of identifying their own skills and training needs accurately, and of sourcing the education and training interventions they require reasonably efficiently. Businesses in these areas

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<sup>13</sup> The full text of recommendations referenced here is in Section 4 of this report. The text here is a summary of those specifically related to the area of Transforming the National Grid.

should properly continue to have responsibility for their own continuing education and training. One Green New Deal area where such businesses dominate is in Transforming the National Grid.

## 2.5 Sustainable Mobility

The key aspects of delivering greater sustainable mobility that are important from a skills perspective are as follows.

- The content of the Smarter Travel strategy points towards a need for substantial skill development among those working in planning, designing and implementing Irish transport networks into the future. Moving away from predict-and-provide models of transport planning to models that prioritise both economic and sustainability objectives, and seek to shape behaviour by transport users, implies a need for a greater breadth of professional and management skills than exists at present.
- The target of having 10% of cars and light commercial vehicles powered by electricity by 2020 implies a range of skills requirements.
  - ESB projects that rolling out the infrastructure to power these vehicles will employ 600 people. The infrastructure will be rolled out over time, making charging points progressively more available, so this level of employment may well continue through 2020.
  - The change in vehicle technology will change the skills required by vehicle mechanics. However, the change in skill requirements is incremental rather than transformative, and so it can most likely be addressed through existing mechanisms for updating mechanic skills, and for updating apprenticeships. Mechanic skills have a history of significant change, with skills in electrical and electronic systems progressively becoming more important. As of Census 2006, there were 14,000 'Motor mechanics, auto electricians, tyre and exhaust fitters' in Ireland.
- The sustainable mobility agenda is likely to reshape the path of transport infrastructure development in Ireland, rather than make any major difference to the volume of investment, or the volume of work undertaken. Examples of areas where investment in sustainable transport is coming to the fore are in cycling infrastructure and the DART Interconnector.

In the main, the types of construction skills required are likely to be similar to those that already exist in the construction sector. The main area where there is significant and predictable potential for different skills is in tunnelling for projects such as the Dublin Metro.

- Promoting Ecodriving, to increase fuel efficiency, will involve changes to driver training, and to the driving test. It will require training for driving instructors. The Road Safety Authority regularly updates its standards, and provides update training for driving instructors. Promoting Ecodriving should fit within these regular RSA activities, and should not require external intervention.

As Ireland has only a small transport equipment industry, most of the skills requirement resulting from Irish adoption of more sustainable technologies will arise

overseas. There is some potential for the Irish software sector to get more involved in the area, which could boost demand for software skills.

### 2.5.1 Type of Skills Required

Moving towards models of transport planning that prioritise both economic and sustainability objectives has major skills implications for organisations involved in transport planning, whether in the public sector or (often through providing professional services) in the private sector. Key areas where new, broader, deeper or different skills are needed include:

- Transport engineering – where many other countries have specialist programmes to educate transport engineers, Irish higher education programmes have broader programmes in civil engineering. Ideally, both have a place in developing the engineering skills required in constructing transport networks. Transport engineering encompasses the physical construction of transportation networks, but typically also encompasses wider transport planning, transport and traffic management, and the study of the behaviour of transport users.
- Transport economics – Making optimal decisions in planning transport networks requires deep capabilities in economic analysis, both from economic and sustainability perspectives. There is a need for greater economic expertise among those responsible for policy, and for planning in the area.
- Behavioural, sociological and marketing skills – With an increased emphasis on economic efficiency and sustainability, the scope for modifying the behaviour of transport users is of increasing policy importance. Many transportation goals can be attained at lower cost, and with lower environmental impact, by changing the behaviour of transport users. A strong base of skills in areas that include behaviour, sociology and marketing is required to pursue this area effectively.

Some examples are as follows.

- In some cases, all that is required is to communicate information effectively on why changes to behaviour are beneficial, and as to how to go about changing. This can be a matter of communicating directly with people as to, for example, why they should walk more, or can be a matter of supporting employers in developing workplace travel plans for their employees.
- In other cases, it may be a matter of changing the ways in which choices are presented, to nudge transport users in the direction of improved choices.
- Sometimes, changes to economic incentives are required, for example in terms of charges for access to roads or for parking.
- In some cases, providing alternative ways to travel, or reducing the need to travel can take pressure off transport networks.

The cost of investing in transport networks is high, so the economic consequences of any misalignment of transportation development plans with objectives are likely to be substantial. A significant investment in analytical, planning and policy-making skills can be justified well on this basis.

This broader range of skills is required at a range of levels:

- At national Government level
- Among public bodies involved in transport planning, and in setting transport policy
- At local authority level (each local authority has to prepare transportation plans, and is responsible for implementing Smarter Travel Areas)
- Among firms that provide professional services in this area.

### **2.5.2 Volume of Skills Required**

The main requirement is to broaden and deepen the skills of people already working in areas relating to travel, and to educate members of civil society. There will be a need to recruit some more people with specialist skills in economics, social sciences, behaviour, transport engineering and possibly marketing into policy and planning roles. However, particularly given current constraints on public sector recruitment, the main challenge is to broaden the skills of those already working in these areas.

### **2.5.3 Current Skills and Training Provision**

Most of the core skills required in the mobility area are supplied by courses that are not specifically related to sustainability.

- There are many higher education courses in civil and environmental engineering, and in construction management in universities and Institutes of Technology, producing graduates suited to a wide range of roles in construction of roads and other transport infrastructure, at technician, design engineering, site engineering and management levels.
- Mechanics are trained through apprenticeships, leading to the award of Level 6 qualifications from FETAC.
- Driving instructors receive update training through courses approved by the Road Safety Authority, prior to undertaking an examination to become an Approved Driving instructor. Drivers receive training from driving instructors.

In the normal course of events, providers of education and training in these areas update and adapt their provision in accordance with changes in skills requirements that they observe. Those responsible for providing continuing education and training provide appropriate interventions to update the skills of those already working in these areas.

- Universities and Institutes of Technology regularly review and update their courses contents as a normal part of academic management. The Irish Universities Quality Board and HETAC play a role in assuring that these processes take place. As transportation systems are an important area of activity for civil engineers, higher education institutions take account of developments in the area when updating their courses.
- FÁS has an established process by which it regularly updates the content of apprenticeships in accordance with changes in skills requirements, such as those that arise from changes in vehicle technology. The mechanic apprenticeship was

already changing quite rapidly, with the increasing use of electronics and software technologies in vehicles, and so the existing process for updating the mechanic apprenticeship is likely to take the emergence of electric vehicles in its stride.

Vehicle manufacturers regularly provide training to existing mechanics to prepare them for technological changes in their vehicles, and it seems likely that this existing mechanism will be sufficient to retrain existing mechanics for electric vehicles.

- Eco-driving is one of the elements covered by the Certificate of Professional Competence (CPC) for professional bus and truck drivers, and has been integrated into the standard driving test.

The ESB and its contractors are likely to be able to develop the specific skills that they need to install the charging infrastructure for electric cars. The ESB regularly takes on apprentices, and indeed in 2009 took responsibility for completing the training of 400 apprentices who had lost their jobs with other employers. The basic skills required in installing charging points are construction skills, which should be in good supply under current labour market conditions.

The requirement for high level cross-disciplinary education in the transport engineering, economic, social and behavioural aspects of transportation policy and design is less well catered for. The Transport Studies and Research Group, which has 10 PhD students, and is based in TCD's Civil Engineering department, is the main centre of educational activity in this area in Ireland. The group has links to other disciplines and higher education institutions through TRIP - the Centre for Transport Research and Innovation in People.

The Transport Studies and Research Group (TSRG) is based at the Civil Engineering Department, Trinity College Dublin. The group is active in transportation research both in Ireland and internationally.

Areas where the TSRG is working include:

- Impacts of Luas on travel behaviour
- Public perceptions of inter-urban public transport
- Developing transport strategies for cities in the developing world
- Impacts of transport induced air pollution
- Evaluation of real-time passenger information on the Lucan Quality Bus Corridor
- Traffic modelling
- Freight distributions in Dublin City Centre
- Advanced data analysis of public transport data.

## 2.5.4 Identified Key Skill Gaps

The main areas where skills gaps have been identified are as follows:

- There is a need for much stronger skills in a range of areas relating to the design of transport policy, the development of transport networks, and the implementation of transport policy. These include Transport Engineering, Transport Economics, Marketing of Sustainable Transport, the Social Sciences of Sustainability and the management of Smarter Travel Area networks.
- There is a need for greater knowledge among the general public, to enable them to make better informed choices about travel modes and carbon efficient vehicles, and to encourage ecodriving.
- With major transport projects involving tunnelling being planned, the limited supply of people with skills in tunnelling mean there is a gap in the area.

## 2.5.5 Targeted Actions

The main areas where actions are required are as follows<sup>14</sup>.

- The Irish education sector is already responding to many of the skills demands posed by the Green New Deal. One of the developments already underway is cross-disciplinary research in transport studies. It is important that developments in this area should continue, and that research funding bodies should continue to grow the volume of research supported as a means to drive the availability of people with very high levels of skill and knowledge about Irish transport policy.
- Specific areas where additional new provision should be developed in higher education include: transport studies (cross-disciplinary - engineering/economics /social sciences); and economics of sustainability.
- There is a need to re-examine the suite of apprenticeships currently available in the context of the skills requirements associated with the Green New Deal. In many cases, the requirement will be to rebalance existing programmes to place a greater emphasis on areas that are growing in importance. These include electric vehicles for mechanics.
- In each industry sector where developing employee and management skills is important to implementing the Green New Deal, where the industry is well equipped to take a lead in its own development, and where other suitable mechanisms for provision are not already available, the Department of Enterprise, Trade and Innovation should ensure that resources are available to establish and operate an industry training network. Sustainability industry sectors in which networks are required could include electric vehicles.
- FÁS and the Rail Procurement Agency should cooperate on identifying the tunnelling-related construction skills that will be required for Metro North, and on devising and delivering courses to enable Irish construction workers to take these jobs.

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<sup>14</sup> The full text of recommendations referenced here is in Section 9 of this report. The text here is a summary of those specifically related to the area of Sustainable Mobility.

- There is a need for education and training in a number of areas for existing public sector employees. Areas relevant to sustainable mobility include: economics of sustainability (for those in a wide range of policy-making roles); and economics and social sciences of transport (for local authority engineers and transport planners). The Department of the Environment, Heritage and Local Government should take a lead in consulting with other Government Departments as to how this should be achieved, and what bodies should take the lead in specifying, designing and organising the delivery of appropriate training.
- Education and training providers moving into provision targeted on the unemployed should take account of the great variety of skills needs that arise from the Green New Deal. Specialist construction skills relevant to infrastructure such as Metro North are among the areas that they should consider.

## 2.6 Public Sector Investments

The Green New Deal public sector investments agenda has two main components with significant skills implications:

1. A Green Public Procurement agenda, designed to move towards only buying green goods and services, so as to achieve objectives that include cutting public energy consumption by 33%<sup>15</sup>, purchasing renewable energy technologies and purchasing recycled, low impact and environmentally benign goods
2. Programmes of public investment in improving sustainability, such as the approximately €500m per annum invested annually in water infrastructure, to be supplemented by an investment of €300m in water conservation projects starting during 2010, 2011 and 2012<sup>16</sup>.

### 2.6.1 Type of Skills Required

From a skills perspective, the Green Public Procurement agenda is mainly about developing the skills required for Green Public Procurement to operate effectively.

There are broadly three groups that require skills:

- Public sector employees involved in procurement, in specifying requirements for procurement, and in managing public service sustainability objectives
- People in private sector firms offering products and services with direct sustainability benefits to the public sector
- People in private sector firms involved in procurement that may wish to promote the sustainability of their own operations to public sector customers, specifically those involved in procurement, in specifying requirements for procurement, and in managing their own firm's sustainability objectives.

While there may be a small number of specialist roles, requiring specialist skills, in the main the requirement is for people with existing professional and management

<sup>15</sup> National Energy Efficiency Action Plan, Department of Communications, Energy and Natural Resources, 2009.

<sup>16</sup> Announced by Minister for the Environment, Heritage and Local Government, 25 January, 2010.

skills to complement their existing skill set with knowledge and some skills relating to sustainability.

- Procurement specialists, both in the public sector and in private sector firms interested in supplying the public sector, require skills in green or sustainable procurement and certification and standards.
- Those involved in specifying requirements for procurement, both in the public sector and in private sector firms interested in supplying the public sector, need both a practical understanding of what sustainability means, and a sufficient understanding of the economics of sustainability to be able to balance sustainability objectives with other proper public policy objectives, among them value for money. As a large number of public servants and private sector employees are involved in specifying requirements for procurement, this implies a need for new skills among a substantial number of people in the workforce.
- Engineers, scientists, product marketers, designers and others involved in developing products and services that may be procured by the public sector need a practical understanding of the implications of sustainability for their work, and an understanding of the economics of sustainability that allows them to develop products that will both offer worthwhile sustainability benefits and good value for money.

The public sector, and also private sector businesses making claims about the sustainability of their operations, will need access to skills in carbon accounting, carbon management and life-cycle assessment. In some cases, these may be specialist roles, requiring substantial training. In others, it may be possible for people working in accountancy or compliance roles to add carbon accounting to their skill set, and for people working in a range of professional and management roles to add carbon management to theirs.

The biggest area of public investment in infrastructure that is directly related to sustainability is in water infrastructure. Exchequer investment has been running at about €500m per annum for a number of years, so there is already a strong base of skills in the area.

## **2.6.2 Volume of Skills Required**

The Government has announced an additional €300m to be spent on water conservation projects that start between 2010 and 2012. It is likely that this will generate something of the order of 3,000 job-years of direct employment, spread out over approximately three years, for a temporary boost to direct employment of approximately 1,000.

As this is occurring in a context where there is a well established contracting industry, and a substantial excess supply of construction workers, it is unlikely that a major public training intervention is required.

Plans to deploy water meters in homes are officially projected to employ approximately 6,000 over 2010 to 2011, requiring construction skills. This appears to mean 6,000 job-years of employment, so if the work is spread out over two full years, the average incremental employment over the period will be 3,000.

### 2.6.3 Current Skills and Training Provision

Skills identified as being required under the Public Sector Investments priority area are in the following main areas:

- The skills in green procurement, carbon accounting, carbon management and sustainability economics required in the public service and among suppliers to the public service to tackle the Green New Deal public sector investments agenda
- The skills in sustainability sales, sustainability marketing and sustainability quality assurance required among suppliers to the public service to demonstrate reliably how they contribute to the green procurement agenda
- Skills in delivery of infrastructural improvements relevant to the Green New Deal, notably the planned incremental investments in water infrastructure described earlier.

There is not yet much education or training provision available in green procurement or sustainable procurement. There have been major developments in education in procurement in recent years, through programmes provided by the Institute for Public Administration, by DCU (notably the MBS in Strategic Procurement) and by the Irish Institute for Purchasing and Materials Management (IIPMM), with public sector employees using all of these providers. However, sustainable procurement does not appear to have yet become a major theme.

There are courses available in carbon accounting and management. Providers include:

- A number of private training companies
- Suppliers of carbon accounting software
- FAS, which provides a training programme in Carbon Footprint Calculation and Reduction for employers
- Engineers Ireland (as part of its Continuing Professional Development programme)
- IBEC (as a topic within its Foundation Course in Environmental Management)

Sustainability is an increasingly important focus of marketing generally, and for this reason it is frequently covered to some extent in mainstream marketing courses. However, as green procurement becomes more significant within the public service, and possibly also in the wider economy, there will be a need for more specialist education and training in the area for businesses supplying these markets.

FÁS is an important provider of training in the water infrastructure field, with courses for industry (also available to local authorities and others) in:

- Water and waste water plant operation
- Water protection and nutrient management planning
- Mains laying / service laying
- Installation, inspection and monitoring of waste water treatment systems

## 2.6.4 Identified Key Skill Gaps

The skills required to implement sustainable management practices within the public service have not yet been widely developed and nor have the skills required by private sector suppliers to support the public sector in adopting sustainable management practices. Such skills needed for the private sector include those in relation to sustainability sales and marketing and sustainability quality assurance.

Key areas where skill development is required in the public service include:

- Green Public Procurement
- Carbon accounting
- Carbon management
- Energy management
- Economics of sustainability

## 2.6.5 Targeted Actions

The main areas where actions are required are as follows<sup>17</sup>:

- Specific areas where additional new provision should be developed in higher education include: economics of sustainability; and Integrating carbon accounting and carbon management into business, engineering and applied science qualifications where this fits with the theme of the qualification.
- In each industry sector where developing employee and management skills is important to implementing the Green New Deal, where the industry is well equipped to take a lead in its own development, and where other suitable mechanisms for provision are not already available, the Department of Enterprise, Trade and Innovation should ensure that resources are available to establish and operate an industry training network. Sustainability industry sectors in which networks are required could include: sustainable supply chain (developing, marketing and selling sustainable products and services); green procurement; carbon accounting; carbon management; energy management; and economics of sustainability.
- There is a need for education and training in a number of areas for existing public sector employees. Areas relevant to sustainable mobility include: green procurement for public servants involved in specifying goods, infrastructure and services to be procured, and for those involved in procurement; carbon accounting for public servants who will work in carbon accounting; carbon management for senior managers, and for those involved in specifying goods, infrastructure and services; and economics of sustainability (for those in a wide range of policy-making roles. The Department of the Environment, Heritage and Local Government should take a lead in consulting with other Government Departments as to how this should be achieved, and what bodies should take the lead in specifying, designing and organising the delivery of appropriate training.
- Education and training courses designed specifically for public sector employees, including those provided by the Institute for Public Administration (IPA) and the

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<sup>17</sup> The full text of recommendations referenced here is in Section 4 of this report. The text here is a summary of those specifically related to the area of Public Sector Investments.

Civil Service Training and Development Centre, should be adapted to include modules on Green Procurement, Carbon Accounting, Carbon Management, and /or the Economics of Sustainability where these topics fit with the theme of the course.

- Professional and business bodies should continue to develop and deliver education and training for their members (and where appropriate for others) in areas relevant to the Green New Deal, including green procurement, carbon accounting and carbon management.
- Education and training providers moving into provision targeted on the unemployed should take account of the great variety of skills needs that arise from the Green New Deal. Amongst the areas that deserve attention are: green procurement, carbon accounting and carbon management.

## **2.7 Green Infrastructure**

Green Infrastructure is the ecological framework needed for environmental, economic and social sustainability. It is a network of green space that conserves natural ecosystem functions, provides benefits to human populations and can assist in halting the loss of biodiversity and decline in ecosystem services.

Biodiversity and the natural landscape provide society with a range of ecosystem services such as the production of food and water, water purification, flood protection, climate regulation and pollution regulation. The natural environment also directly supports diverse industries including agriculture, tourism, pharmaceuticals, forest products, fisheries, horticulture, construction and waste treatment. It also provides a wide range of recreational benefits to society.

Creating Green Infrastructure will require a new approach to spatial planning, one which enables the integration of the value of biodiversity and ecosystem services to the economy and society in decision making. The Green Infrastructure approach for Ireland is primarily about changing the spatial evidence base we use to make choices about managing our natural environment. The Green Infrastructure agenda will require policy changes across a range of areas to underpin its implementation. Examples of areas where policy changes may be required are in land use planning, conservation, agriculture, tourism, economic development and water management. Skills will play an important enabling role.

### **2.7.1 Type of Skills Required**

The key area where skills are required to implement the Green Infrastructure agenda are in spatial planning and environmental management for those whose decisions shape the Irish environment. Important among these are:

- Those concerned with revising and updating the National Spatial Strategy
- Planners and landscape architects
- Other local authority managers and professionals concerned with shaping the environment, including parks managers, engineers and others

- Managers from a wide range of public sector organisations involved in managing significant parts of the Irish environment, including the Office of Public Works, Coillte, Bord na Mona, Waterways Ireland, the River Basin Districts and ESB
- A wide range of providers of professional services, including planning consultants, agricultural consultants, forestry advisors, environmental engineers, civil and transport engineers amongst others
- Those involved in managing public lands, including parks staff and many other local authority employees
- Private landholders, particularly including farmers
- A wide range of civil society organisations interested in environmental management, such as, for example, agricultural organisations, tidy towns committees, regional tourism groups, country sporting interests and residents' groups

In addition, even householders may have a significant role to play, given the role that private gardens have in contributing to biodiversity in urban environments. While changes to initial education have a role to play in developing skills in the key sectors such as ecologists, landscape architects, planners and environmental managers, the overwhelming need is to broaden the skills of people who are already in the workforce, so as to give them the conceptual tools and understanding they need to interpret and implement Green Infrastructure policies.

### **2.7.2 Volume of Skills Required**

The main requirement for skills development to support Green Infrastructure relates to developing the skills of people already engaged in relevant areas.

### **2.7.3 Current Skills and Training Provision**

The main existing courses relevant to skills for the Green Infrastructure agenda are in planning, landscape architecture, ecology, environmental management, sustainable development and horticulture/forestry. Education and training provision that is in these areas and clearly relevant to Green Infrastructure includes the following:

- Tipperary Institute's BSc in Environmental and Natural Resource Management
- Some specialisations within PhD programmes in Sustainable Development at various higher education institutions
- TCD's MSc / Postgraduate Diploma in Biodiversity and Conservation
- FAS' training course in Environmental Management Systems
- Environmental management courses provided by a range of higher education institutions include content relevant to Green Infrastructure.

In the area of training for parks personnel and others involved in maintaining public lands, there are several types of training provider. To the extent that different skills are required to implement the Green Infrastructure agenda, it is likely that the need is to further develop courses from these providers, rather than to make fundamental changes in education and training in the area.

There are relevant initial education courses in forestry and horticulture provided by institutions including UCD, Teagasc's Ballyhaise Agricultural College, Teagasc's College of Amenity Horticulture at the National Botanic Gardens, a number of Further Education Colleges and FAS. These do not currently fill the training needs of the Green Infrastructure agenda, but could potentially contribute to this with appropriate modifications.

Examples of Further Education and Training courses leading to Level 5 certificates in the broad area include:

- Amenity Horticulture; Landscape Design, Construction & Maintenance – Coláiste Stiofán Naofa (Cork)
- Horticulture - Greenhills College
- Horticulture – Amenity - Pearse College of Further Education
- Horticulture - Landscape Gardening & Design - Killester College of Further Education
- Landscape Design - Senior College Dun Laoghaire
- Horticulture – FAS / Westmeath Community Development Ltd / Belvedere House Gardens & Park

There are also relevant interventions targeted on the unemployed. The Community Employment Scheme does a significant amount of work in the area. It provides training to participants sourced from a range of organisations that include Coillte and the VECs. A significant number of participants move on to General Operative jobs in local authorities.

The National Parks and Wildlife Service operates six Education Centres, targeted mainly at schools level, to:

- Promote awareness, knowledge and appreciation of our native flora, fauna and their habitats;
- Foster individual and collective responsibility for the welfare and conservation of our natural heritage; and
- Provide information and advice on environmental issues.

There are also civic organisations doing relevant work in education and training. For example, ECO-UNESCO provides training for sustainable development for youth organisations that encompasses respect for ecological integrity and biodiversity.

The Tidy Towns competition promotes biodiversity actions among the public through its Biodiversity Notice Award, sponsored by the National Parks and Wildlife Service.

#### **2.7.4 Identified Key Skill Gaps**

Green Infrastructure is a new concept to Irish public policy, which will require a significant change in approach by many employed in the public sector, by many in the private sector responsible for management of lands (including farmers), and by private individuals and civic society bodies. There are no existing specific measures planned to develop the knowledge and skills required for this transformation.

Key areas where skills must be developed if the Green Infrastructure agenda is to be pursued effectively include the following:

- Planning and landscape architecture skills
- Sustainable agriculture skills
- Sustainable horticulture and parks skills
- Environmental management
- Social and behavioural sciences and sustainability.

### 2.7.5 Targeted Actions

The main areas where actions are required are as follows<sup>18</sup>:

- The Irish education sector is already responding to many of the skills demands posed by the Green New Deal. Key among the developments already underway are environmental management. It is important that developments in this area should continue.
- Specific areas where additional new provision should be developed in higher education include: environmental management; economics of sustainability; and courses integrating biodiversity with horticulture/agriculture/forestry to provide professional level skills to implement the Green Infrastructure agenda.
- At further education level, there is a need to bring the principles of biodiversity into planning, horticulture and related qualifications, and into relevant community employment initiatives, in order to build the hands-on skills needed to implement the Green Infrastructure agenda in parks and on other publicly-owned lands, and in order to equip those working in the private sector to take proper account of biodiversity in their work. A sustainable development initiative should be pursued jointly by Comhar SDC, as the body taking the lead on the Green Infrastructure Agenda, FETAC and the main Further Education providers active in areas relevant to the Green New Deal agenda, to bring a sustainability perspective and biodiversity content into the descriptors behind relevant further education and training qualifications, and in order to implement these in course delivery.
- There is a need for education and training in a number of areas for existing public sector employees. Areas relevant to sustainable mobility include: economics of sustainability for those in a wide range of policy-making roles; and green infrastructure environmental management for those involved in the management of public lands, in planning and in areas of policy relevant to Green Infrastructure (including, inter alia, planning, agriculture, forestry, waterways, transport, environmental management and enforcement). The Department of the Environment, Heritage and Local Government should take a lead in consulting with other Government Departments as to how this should be achieved, and what bodies should take the lead in specifying, designing and organising the delivery of appropriate training.
- Education and training courses designed specifically for public sector employees, including those provided by the Institute for Public Administration (IPA) and the Civil Service Training and Development Centre, should be adapted to include modules on the Management of Green Infrastructure where these topics fit with the theme of the course.
- Professional and business bodies should continue to develop and deliver education and training for their members (and where appropriate for others) in

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<sup>18</sup> The full text of recommendations referenced here is in Section 4 of this report. The text here is a summary of those specifically related to the area of Green Infrastructure.

areas relevant to the Green New Deal, including environmental management for Green Infrastructure.

- Comhar SDC, in consultation with its stakeholders, should take a lead in developing a strategy for awareness raising in relation to the Green New Deal, including Green Infrastructure.

## **Section 3: Policy Options, Financing Mechanisms and Awareness Raising**

### **3.1 Introduction**

This section describes existing mechanisms for financing education and training. In this context, it reviews the options for financing and delivery of education and training interventions under the Green New Deal. It concludes by describing where awareness raising interventions are required. The analysis in this section is used to underpin the recommendations presented later in the report.

### **3.2 Current Financing Mechanisms**

Existing mechanisms for funding education and training relevant to Green New Deal are no different to those for funding the mainstream of other existing education and training provision. While funding at third level can be flexible within institutions, there is very little spare capacity, and funding for new courses and skills training can only be made available in many cases by replacing or reducing funding in other areas. Increases in student numbers make great demands on resources, particularly in practical areas.

Initial education and training in Ireland is mostly financed from public funds as follows:

- The primary and second level education systems are almost entirely financed through the Department of Education and Skills.
- Further Education, in Colleges of Further Education, in some second level schools, and under schemes such as the Vocational Training Opportunities Scheme, is financed through much the same channels as second level education.
- Funding for full time undergraduate education of Irish and other EU residents at the universities, Institutes of Technology and other higher education institutions is channelled through the Higher Education Authority under the Free Fees scheme and other funding schemes.
- While postgraduate education is funded through student fees, in many cases the fees for research students are covered through research funding schemes.
- Off-the-job training of apprentices is funded from public resources under the National Training Fund.
- Training for public service employees is financed by their employer. In general, public service bodies concerned with education and training provision have to recover the cost of training provided to employees of other public service bodies from the employer.

Most education and training for those in employment is financed privately. Most job-related training is paid for fully by employers. There are some schemes under which a part of the cost is paid using public funds. Examples include part-funding of industry training network activities organised as Skillnets, funded under the National Training Fund, and funding for education and training undertaken as an integral part of company and sectoral development initiatives supported by Enterprise Ireland and other enterprise development bodies (such as, for example, County Development Boards).

FAS was a substantial provider of funding for industry training, part-funding the costs of training in a range of areas, until rising unemployment made it necessary to prioritise training for the unemployed.

Part time education is financed through fees; in many cases these are paid by employers even if the education has no direct relevance to the employee's job.

Many State Agencies provide some education or training to businesses operating within their sphere of interest, either directly or through designing courses that are delivered by private training providers. Financing arrangements vary, with delivery of some courses being part-financed from public resources and delivery of others being funded fully by participant fees.

Education and training for the unemployed is also financed from public funds, through FAS (much of it under the National Training Fund) and under schemes such as the Back-to-Education Allowance.

Current economic difficulties, which have raised the level of unemployment, have inspired the creation of a range of new initiatives to provide education and training opportunities for the unemployed. Examples include:

- The IBEC Gradlink programme under which graduates who have been unemployed for three months can retain their social welfare benefits while undertaking an internship with a business.
- The Labour Market Activation Fund, under which the €20 million has been provided to fund innovative proposals from the public, private, community and voluntary sectors to provide education and training to 3,500 jobseekers this year. These places are to be in addition to 145,000 training and activation places that were already being funded. While applications for the scheme will be closed by the time this report is published, it is likely that new schemes will continue to be developed while unemployment remains at high levels
- Industry networks funded by Skillnets, which were previously responsible only for the training needs of business employees, can now also have a role in providing training to people who are unemployed.

The National Training Fund is a fund to finance a range of schemes aimed at raising the skills of those in employment, providing training to those who wish to acquire skills for the purposes of taking up employment, and providing information in relation to existing, or likely future, skills requirements in the economy. The Fund is resourced by a levy on employers.

HETAC and FETAC, the Higher and Further Education and Training Awards Councils play an important role in shaping provision. HETAC takes account of the need for education in an area of study, and in the geographical region, when deciding whether to give approval for a new course proposed by a higher education institution. FETAC is an important participant in the development of new qualifications that can form the basis for courses to be provided by further education colleges, FAS and other providers of further education and training.

### 3.3 Options for Financing and Delivery of Education and Training Interventions

The issues that the Green New Deal raises as to how education and training should be financed and delivered are limited in scope. In most areas, existing practice provides a well established solution that can draw on existing streams of funding, without a need for incremental or ring-fenced funds. In a few areas, existing practice provides a well established solution, but there may be a need to provide some additional funding ring-fenced to address the Green New Deal. Only in a few areas is there a real choice to be made between viable competing approaches.

- Much of the need for change required to implement the Green New Deal can be addressed by updating and refocusing existing courses. This is a regular, recurring requirement for providers of education and training, which does not, of itself, imply a need for additional resources. The requirement is to ensure that the skills required for sustainable development are given due weight when course revisions occur.
- Providers of initial education and training have a well established pattern of responding when they see skills needs that they can address. With seven universities, 14 Institutes of Technology and several other higher education institutions all seeking to differentiate themselves, and to position themselves as benefiting the economy, there is constant pressure on them to fill any education requirements important to employers or to the national economy that can be identified. From the wider perspective of national higher education strategy, the greater challenge is often to hold higher education institutions back, so that the number of institutions that move into providing education in an emerging area remains proportionate to the likely demand for skills. Much the same pressures exist on providers of initial further education and training. On the whole, financing mechanisms are sufficiently flexible to support them in allocating resources so as to achieve this.
- There are substantial resources going into training for the unemployed, with adverse labour market conditions making it difficult for many of those completing courses to find work. Any intervention that shows good employment prospects for participants at a reasonable cost of provision is likely to be able to find a funding stream that it can use.
- Mechanisms to finance training for those in employment are well developed. However, the volume of funding available is less than in the past. As a result, there is significant competition for funding between sectors and groups for some types of funding.

The industry network model seems well suited to a number of Green New Deal areas, but there is no guarantee that all will be funded under the mainstream Skillnets programme. There are cases in other sectors, such as with the Finuas training network programme for the financial services sector, where a dedicated funding stream is made available, overcoming this hazard. Finuas is managed by Skillnets, which has avoided the need to create a new organisation.

Enterprise Ireland and the other development agencies have well-tried mechanisms for assisting businesses with export potential in meeting their specific people development needs. Some of these are targeted on individual businesses; others target groups of businesses with courses in areas of shared

skill need. The enterprise development agencies have a strong focus on developing Green Enterprise exporting businesses.

Historically, FAS has had an important role in funding industry training for some industries and for some types of employee, identifying skills and training needs, developing training interventions and part-funding the delivery of those interventions. This has been particularly important for industry sectors which do not trade internationally, and are therefore not targeted by the enterprise development agencies. While the need to prioritise training for the unemployed has largely caused FAS to move away from this model of provision, it remains worthy of consideration in cases where a State Agency is the body best positioned to take the lead in developing skills that are important to the implementation of the Green New Deal.

- Public sector organisations fund training, and a considerable volume of education, for their employees, using a combination of in-house training services, private sector training providers, and provision by educational institutions. The Institute of Public Administration (IPA) and the Civil Service Training and Development Centre have a particular specialisation in this area, but the IPA is by no means the only higher education institution that provides education to public servants that is directly relevant to their work.
- Education and training for the Green New Deal will ideally bring people from business and the public sector together in shared provision, in a range of areas including Green Procurement, Carbon Accounting, Carbon Management and Environmental Management aspects of Green Infrastructure amongst others. Some of the areas where this already happens include environmental training programmes for people in employment provided by FÁS, and in a range of part time Masters level courses in the higher education sector.
- The IBEC Gradlink programme provides a useful model for delivering and financing graduate placements in industry, which can be of great value both to businesses and to graduates whose employability is enhanced by the experience they gain, and who are well positioned to move into any permanent paid positions that arise.

### **3.4 Awareness Raising**

Awareness raising has an important role to play in skills development for the Green New Deal. There are a number of groups among which there is a need to raise awareness of the skills needs associated with sustainability. These include the following:

- Many of the Green New Deal areas depend in part or whole on choices made by householders and other members of the public. For example:
  - The rate at which retrofitting of existing housing for energy efficiency proceeds will depend to a great extent on choices made by individual householders.
  - Adoption of microgeneration and domestic/commercial renewable heat technologies will depend on choices made by individual householders and business managers.

- Eco-driving, decisions to change mode of transport, decisions to purchase electric vehicles, and decisions to participate in Smarter Travel Area initiatives will depend to a great extent on choices and knowledge of individuals and business managers.
- Much of Ireland's Green Infrastructure is under the control of private individuals, including farmers and householders, so the success of the Green Infrastructure strategy will depend to a significant extent on choices they make.
- Some aspects of the Green New Deal intersect with other policy areas, such as planning, in which public opinion has a particularly important role in influencing policy and its implementation. Green New Deal objectives are more likely to be given due weight in decision making in these areas if the public is well informed.
- Some of the Green New Deal areas – notably Sustainable Mobility, Public Sector Investments and Green Infrastructure – will rely not just on developing new skills, but also on changes in policy thinking among large numbers of public servants. Awareness raising, as well as more formal education and training, has an important role to play in this.

## Section 4: Conclusions and Recommendations

### 4.1 Introduction

Sustainable development and the need to move towards becoming a low-carbon and resource efficient society is an evolving area of policy and of action by governments, industry, providers of education and training and others. Internationally, while the topic is seen as being of critical importance to future patterns of employment, policy-makers are only starting to get to grips with the skills implications. This can be seen in a profusion of reports from international bodies, from governments and from interested national groups on different aspects of green jobs and green skills.

This report seeks to add to the evidence base by examining the role of the skills and training sector in supporting a Green New Deal for Ireland. This was an area identified as requiring further research in Comhar SDC's original Green New Deal report<sup>19</sup>. The current report makes twenty-one recommendations in total which are grouped under six key category headings ranging from research and education to training for industry. A large part of the requirement which has been identified is for measures to reshape existing provision, or to leverage current resources to provide different courses than at present, and does not inherently require significant additional expenditure.

One of the positive findings from the research is that there is already a considerable volume and variety of education and training provision in place that responds to skills needs presented by the Green New Deal. A very wide range of education and training providers are involved in this, and there is relevant specialist provision at levels from 5 to 10 in the National Framework of Qualifications.

### 4.2 Summary of Key Skill Requirements

Figure 7 summarises the main findings regarding the skills required to address the Green New Deal. The skills are organised under the following headings:

- Products – This refers to skills required in developing and producing products (both manufacturing physical products and producing software products).
- Construction / Installation – This refers both to skills in construction and installation associated with sustainability and to project development stage skills such as planning and environmental impact.
- Operations / Maintenance – This refers to the skills required to conduct operations, and to operate and maintain equipment associated with investments related to the Green New Deal.
- Growing / Harvesting / Transport – This refers to agricultural and forestry skills required to grow and harvest biomass, and to skills in transport and preliminary processing of biomass.
- Sustainability management and design skills – This refers to the professional and management skills required in areas including engineering, science, economics,

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<sup>19</sup> [http://www.comharsdc.ie/files/2009\\_TowardsGNDIreland\\_rpt.pdf](http://www.comharsdc.ie/files/2009_TowardsGNDIreland_rpt.pdf)

social sciences, business network and others, required to develop and implement strategies and plans required to implement the Green New Deal.

- Sustainability business skills – This refers to the skills required to operate businesses delivering sustainability benefits.
- Skills for the Public and for Civil Society Bodies – This refers to skills and knowledge that will allow members of the public and civil society organisations, to play a useful role in pursuing Green New Deal objectives.

	Energy Efficiency of Existing Housing Stock	Renewable Energy	Transforming the National Grid	Providing Sustainable Mobility	Public Sector Investments	Green Infrastructure
Products (Manufacturing / Software / Innovation)	<ul style="list-style-type: none"> <li>• Full range of skills in developing, producing and supplying energy efficiency products</li> </ul>	<ul style="list-style-type: none"> <li>• Full range of skills in developing, producing and supplying renewable energy products</li> </ul>	<ul style="list-style-type: none"> <li>• Skills in developing network management approaches and tools for grid with high wind (variable) supply</li> </ul>			<ul style="list-style-type: none"> <li>• GIS software and services to support documentation and management of Green Infrastructure</li> </ul>
Construction / Installation	<ul style="list-style-type: none"> <li>• Specialist skills for skilled trades</li> <li>• Specialist skills for semi-skilled occupations</li> </ul>	<ul style="list-style-type: none"> <li>• Development – legal, financing etc.</li> <li>• Planning</li> <li>• Construction</li> <li>• Installation</li> <li>• - Wind</li> <li>• - Wave</li> <li>• - Biomass</li> <li>• - Microgeneration</li> <li>• - Renewable heat</li> </ul>	<ul style="list-style-type: none"> <li>• Planning</li> <li>• Wayleave</li> <li>• Environmental impact</li> <li>• Public consultation</li> <li>• Negotiation</li> <li>• Construction</li> <li>• Installation</li> </ul>	<ul style="list-style-type: none"> <li>• Wide range of construction skills that are in good supply</li> <li>• Construction skills (tunnelling)</li> <li>• Electrical technician and engineering skills</li> </ul>	<ul style="list-style-type: none"> <li>• Skills for water infrastructure</li> </ul>	
Operation / Maintenance		<ul style="list-style-type: none"> <li>• Operations – wind, biomass (biomass-fired generation, CHP, anaerobic), wave</li> <li>• Blade technicians</li> <li>• Other maintenance</li> </ul>	<ul style="list-style-type: none"> <li>• Market operation</li> </ul>	<ul style="list-style-type: none"> <li>• Skilled trades (Mechanics)</li> </ul>		
Growing / Harvesting / Transport		<ul style="list-style-type: none"> <li>• Agricultural skills</li> <li>• Agricultural advisory skills</li> <li>• Skills in harvesting and preliminary processing</li> </ul>				<ul style="list-style-type: none"> <li>• Sustainable agriculture skills</li> <li>• Parks skills</li> </ul>
Design and Management of Sustainability	<ul style="list-style-type: none"> <li>• Specialist skills for architects, civil structural engineers, construction managers, building services engineers</li> <li>• Energy management skills</li> <li>• Industrial process skills</li> </ul>	<ul style="list-style-type: none"> <li>• Electrical engineering</li> <li>• Business system /network management</li> <li>• Community energy management</li> </ul>	<ul style="list-style-type: none"> <li>• Transmission network planning</li> <li>• Electrical/civil/mechanical engineering design</li> <li>• Economic analysis</li> </ul>	<ul style="list-style-type: none"> <li>• Transport Engineering</li> <li>• Transport economics</li> <li>• Sustainability marketing</li> <li>• Social sciences of sustainability</li> <li>• Smarter Travel Area network management</li> </ul>	<ul style="list-style-type: none"> <li>• Green procurement</li> <li>• Carbon accounting</li> <li>• Carbon management</li> <li>• Sustainability economics</li> </ul>	<ul style="list-style-type: none"> <li>• Environmental management</li> <li>• Social sciences of sustainability</li> <li>• Behavioural sciences and sustainability</li> <li>• Planning</li> </ul>
Sustainability Business Skills	<ul style="list-style-type: none"> <li>• Entrepreneurship and general management</li> <li>• Energy Efficiency Assessment and Design</li> <li>• Energy Efficiency Sales</li> <li>• Energy Efficiency Marketing</li> <li>• Energy Efficiency QA</li> </ul>	<ul style="list-style-type: none"> <li>• Entrepreneurship and general management</li> <li>• Sustainability sales</li> <li>• Sustainability marketing</li> <li>• Sustainability QA</li> </ul>			<ul style="list-style-type: none"> <li>• Sustainability sales</li> <li>• Sustainability marketing</li> <li>• Sustainability QA</li> </ul>	
Skills for the Public and for Civic Society Bodies	<ul style="list-style-type: none"> <li>• Informed purchasing of energy efficiency projects and products</li> </ul>	<ul style="list-style-type: none"> <li>• Informed purchasing and operation of: (a) micro-generation projects and products; and (b) renewable fuel systems</li> </ul>		<ul style="list-style-type: none"> <li>• Informed choices about travel modes</li> <li>• Informed choices about carbon efficient vehicles</li> <li>• Ecodriving</li> </ul>		<ul style="list-style-type: none"> <li>• Environmental management</li> </ul>

**Figure 7 Summary of Findings on Skills Requirements**

## **4.3 Overview of Key Skill Gaps**

### **4.3.1 Introduction**

This section contains a gaps and needs analysis and addresses the following questions:

- Where are the key skills gaps and needs?
- Where are the gaps due to non-implementation of current policy?
- Where is it an issue of expanding or revising existing provision to include these additional skills?
- Where are new initiatives needed?

### **4.3.2 Key Skills Gaps and Needs**

#### *Skills for Developing, Producing and Supplying Products and Software*

While businesses supplying products and software useful in the implementation of the Green New Deal are not the main focus of this report, implementation of the Green New Deal will provide many opportunities for Irish businesses in these areas to develop. There are well developed support mechanisms in place to assist businesses in these areas in developing, which include support for human resource development, provided by a range of organisations, most notably Enterprise Ireland. Enterprise Ireland and the other enterprise development agencies have identified this as a key area of opportunity, so major gaps in this sort of support are unlikely to exist.

This sort of business also depends on the initial education system, competing with firms in other sectors for skills in areas including computing and electrical engineering. Increasing numbers of college entrants are choosing these areas, and higher education institutions are increasing student numbers.

There is a need for more PhD level graduates in areas relating to the generation, transmission and network management of electric power.

A supply of graduates in computing with domain knowledge of energy and sustainability-related industries would make a valuable contribution to the ability of Irish technology companies to innovate and market software and other technology products in the area.

#### *Skills in Construction and Installation*

There is a substantial requirement for people to work in infrastructure development, but much of that requirement is well supplied. With a construction industry in which employment has collapsed in recent times, there is a more than adequate supply of most major types of skill.

Areas important to the Green New Deal where there is no clear requirement for intervention:

- Unskilled and semi-skilled
- Construction trades

- Legal, financial, planning and other professional skills relevant to development of infrastructure

There is a need to add to the skills of people with construction craft skills and who are semi-skilled, to work in retrofitting of buildings for energy efficiency, but this is being addressed effectively by FÁS and by businesses in the area.

There is a need for construction and installation skills to support the installation of renewable energy and electricity grid developments, although this is mostly best handled by businesses contracting in the area, separately or in cooperation with each other, at least for wind and ocean energy. As biomass, renewable heat and micro-generation increase in prevalence, there will be a need for specialist training in these areas.

Increasing investment in water and waste water infrastructure should drive a need for more skills in the area. FÁS provides suitable training courses at cost, so the issue here is more one of funding than of training availability.

There will be a need to ensure that the specialist skills needs associated with major infrastructural projects involving tunnelling (such as Metro North) can be supplied from within Ireland.

#### *Skills for Operation and Maintenance*

As the volume of renewable energy infrastructure increases, the numbers required to operate and maintain it will also increase. The main specialist requirement will be for people with technician level skills in wind energy, CHP, and (if good progress is made) biomass and ocean energy.

There will also be a need for changes in skills in the trade of mechanic as electric vehicles are introduced, which will require changes to apprenticeships. Existing mechanics are likely to get training from vehicle manufacturers or their agents/distributors.

#### *Skills in Growing, Harvesting and Transport*

Skills in growing, harvesting and transport will be important to the development of a biomass energy sector, and the details of the skills requirement will depend on the types of biomass grown.

This will require skills development for farmers, and/or for contractors responsible for planting and maintaining lands, paced to the growth of activity in the area. There are well established mechanisms already in place through Teagasc for training farmers, which has lead responsibility for developing bio-energy crops. Teagasc will have to ramp up its activity as and when bioenergy activity ramps up.

The bioenergy industry itself is likely to have a significant role too, as bioenergy favours a significant degree of supply chain integration, to ensure markets for growers, and supplies for bioenergy businesses, and to maximise efficiency along the value chain.

### *Skills in Management and Design of Sustainability*

One of the key broad areas of skill that cuts across all of the Green New Deal priority areas is that of the skills required to make good decisions about the management of sustainability, including making good design decisions.

Professionals concerned with buildings, including architects, construction managers, civil/structural engineers, building services engineers, production engineers and energy management professionals need a good understanding of energy efficiency, and how best to design interventions to get best value for money in improving efficiency.

Professionals involved in renewable energy, including electrical engineers, mechanical engineers, people concerned with managing biomass business systems and others, need a good technical understanding, and the ability to use it in both designing and managing renewable energy systems.

Work on developing the National Grid has a very substantial design aspect, with the challenges being increased substantially by the fact that important parts of what is being done are at the leading edge of network management because of Ireland's high commitment to wind as a source of power. The design aspects of the grid go beyond engineering design, to areas including economic analysis and design of markets. This points to a need for more people with very high levels of skills, such as at PhD level, in areas including Electrical Engineering and the Economics of energy.

Transport policy, the design of transportation systems, and the development and management of initiatives such as Smarter Travel Areas require the application of a range of disciplines, including Engineering, Economics and Social and Behavioural Sciences. As those working in the area are mostly from an engineering background, if they have relevant qualifications, there is a need to broaden their base of skills and knowledge, and to bring in some people with high level skills in the other relevant areas. There should be need for more people with cross-disciplinary PhD level skills in Transport Studies to fill these roles than are currently available.

In the public sector investments priority area, there will be a need for quite substantial numbers of public servants to have skills in green procurement, carbon accounting, carbon management, energy management and the economics of sustainability. As most of the requirement is for people already employed in the public service to add these skills to their existing skills portfolio, a substantial continuing education and training intervention will be required. The Institute of Public Administration, the Civil Service Training Centre, and other education and training providers can play a key role by integrating appropriate modules in their training programmes.

In order to implement the Green Infrastructure agenda, there will be a need to give quite substantial numbers of existing public servants additional skills to formulate and interpret policy, and to devise plans.

### *Sustainability Business Skills*

A number of Green New Deal priority areas can only be implemented through the active involvement of businesses, and there are deficiencies in the business skills currently in place relative to what will be required for the future. For instance:

- Based on feedback from stakeholders, there are significant management deficiencies in many businesses providing retrofitting services for the existing housing stock.
- Renewable energy industries are growing fast, and there will be a need for considerable management development activity as they grow.
- The need for new skills in green procurement, carbon accounting and carbon management in the public sector is matched by a need for suppliers to the public sector to acquire similar skills and knowledge, and to be able to use the skills and knowledge for business purposes, to sell, market and assure the quality of products and services that offer environmental benefits.

#### *Skills for the Public and for Civil Society Bodies*

The public, as individuals and as participants in civil society organisation, have important roles to play in implementing the Green New Deal. There is considerable scope to improve public knowledge and awareness in ways that will support the Green New Deal, including:

- Making householders better prepared to purchase energy efficiency projects and products, microgeneration projects and products and renewable heating systems
- Making better informed choices about modes of travel and carbon efficient vehicles
- Contributing to implementing the Green Infrastructure approach to planning

#### **4.3.3 Gaps Due to Non-Implementation of Current Policy**

There is a need to integrate sustainability throughout the education system, which is recognised internationally. 2005 to 2014 has been designated as the Decade of Education for Sustainable Development (ESD) by the United Nations, with UNESCO acting as the lead agency in the area.

The objectives of the Decade of Education for Sustainable Development are to:

- Facilitate networking linkages, exchange and interaction among stakeholders in ESD
- Foster increased quality of teaching and learning in ESD
- Help countries make progress towards and attain the Millennium Development Goals through ESD efforts
- Provide countries with new opportunities to incorporate ESD into education reform efforts

In Ireland, the Department for Education and Skills has responsibility for developing a national strategy for Education for Sustainable Development. While a consultation has been held around a draft, the National Strategy has not yet been published. This contrasts with many other countries, which have implemented ESD strategies.

In the UK the Higher Education Academy operates an Education for Sustainable Development Project.

- Its Subject Centres provide ESD resources that are specific to their subject communities on web areas devoted to sustainability. Resources include case studies, publications, funding opportunities, links and reflective pieces.
- It works closely with the Higher Education funding councils of England, Scotland and Wales, as well as with Academy Scotland and Academy Wales, providing events, reports and networking opportunities.
- It has developed resources for specific constituencies and interests, including:
  - Networking lists (national and regional);
  - Research into employability, student demand, and the work of careers advisors;
  - Research (including funding and publication) into supporting institution-wide change involving the embedding of sustainability across the curriculum and throughout the university at all levels; and
  - Research in interdisciplinary aspects of ESD and the linking between campus and community.

#### **4.3.4 Where is it an Issue of Expanding or Revising Existing Provision to Include these Additional Skills?**

There are many areas where the main issue is to expand or revise existing provision, rather than to undertake substantial new initiatives. These areas include:

- Bringing sustainability more into the mainstream of education through an Education for Sustainable Development initiative
- Updating apprenticeships in construction-related areas and for automotive mechanics
- Revising courses in a range of higher education areas, including buildings-related higher education courses to emphasise energy efficiency, renewable energy and energy management
- Revising courses at further education level in areas such as Landscape Horticulture to take account of the Green Infrastructure agenda
- Ensuring the availability of relevant higher education courses in part-time and flexible modes where feasible
- Building on developments in Continuing Professional Development and other provision by business, professional and civil society organisations

#### 4.3.5 Where are New Initiatives Needed?

The key areas identified where new initiatives are needed are as follows:

- There is a need for a significant initiative to smooth the path of industry-led education and training initiatives. The cost of education and training, the difficulties associated with co-ordination between businesses, and the tendency of small and medium businesses to under-train relative to their skills needs pose significant barriers to the rapid development of skills among those employed in industries involved in implementing the Green New Deal. The high policy importance of rapid progress in these areas justifies prioritising them for assistance, as deficient skills pose risks for the speed, efficiency and quality of Green New Deal implementation.

The industry training network model operated by Skillnets is well suited to addressing this need. Indeed, it is already in use in the wind energy sector (through the Wind Skillnet), and the BioEnergy Association has applied for Skillnets funding for a network.

The costs to the public purse are moderate, with the average Skillnet receiving a subvention of just over €200,000 in 2008.

There is a need for a new initiative in this area to ensure that industry groupings deeply involved in the delivery of the Green New Deal have access to the funding they need to operate training networks.

- Based on feedback from stakeholders, it is apparent that there is an issue with management level skills – encompassing both business skills and in technical understanding of energy efficiency, in businesses undertaking domestic retrofitting work for energy efficiency. There is a need for an intervention in this area to underpin the future success of the retrofitting agenda.
- There is a need for action in the public service to deliver the skills required for Green Procurement, Carbon Accounting, Carbon Management and Energy Management required to implemented existing policy.
- There will be a need for action in a wide range of settings, both public and private, to deliver the skills required to implement the Green Infrastructure agenda.
- There is a need to grow higher education research activity in a number of key areas in order to improve the availability of people with very high levels of skill in these areas. The areas include: research in electricity generation and distribution; research in ocean energy; and cross-disciplinary research in transport studies.
- There is a need for professional and technical representative bodies to integrate appropriate modules into their ongoing training and skills programmes.
- There is a need to ensure that Irish construction workers in sufficient numbers have specialist skills in tunnelling to meet the skills needs of projects such as Metro North that will involve substantial tunnelling work.
- While there is already substantial activity in training for the unemployed to work in retrofitting residential property for energy efficiency, and in some areas of

renewable energy, there is a need for initiatives targeting a wider range of Green New Deal skills areas, including many higher areas of skill.

- There is a need for multidisciplinary apprenticeships in construction, bringing together all the skills required for various types of energy efficiency and domestic/commercial scale renewable energy work.

## **4.4 Recommendations**

### **4.4.1 Introduction**

The skills and training required to implement the Green New Deal are not just a matter for Central Government. They are also a matter for a wide range of other parties, including:

- Industry
- Higher education institutions
- Further education institutions
- Public sector training providers
- Private providers of education and training
- A wide range of State Agencies
- Local Government
- Professional and technical representative bodies
- Civil society organisations
- Individual members of society

Under current economic conditions, it is necessary that the recommendations proposed should not only provide good value for money, but should also propose to incur additional costs for the public purse, for industry or for individual members of society only where these are necessary to achieve important policy objectives, and are proportionate to the value of these objectives.

Many of the recommendations do not require additional resources. They are about: Reshaping existing provision of education and training to meet the needs of the sustainable future and highlighting areas where educational institutions and training providers, many of which are constantly looking for new opportunities, can develop new provision to again meet the needs of the sustainable future.

Some of the recommendations require additional resources. It is important that the actions proposed under these recommendations be understood as being a necessary component of wider investments in physical infrastructure, physical plant and equipment, IT systems and behavioural change, rather than as competing for the limited funds already earmarked for education and training in the budget of the Department of Education and Skills.

When a private business makes a major investment in new equipment, or a new IT system, it typically treats the cost of training associated with the investment as a necessary part of the cost of the investment, rather than as a purely current cost that has to come out of its recurring training budget. In the same way, where incremental resources are required to finance investment in training related to energy efficiency, renewable energy, transportation or public sector investments, these should be seen as a necessary (and in most cases modest) price to pay for providing the skills

required to optimise the economic and social benefits to be derived from investing billions of euro.

Logically, where incremental funding is required for education and training associated with a major programme of investment, the Government Department responsible for, or involved in, the investment should be responsible for providing the additional funding, even if it is channelled through institutions that are the responsibility of another Government Department.

#### **4.4.2 Training for the Unemployed**

FÁS is the principal body directly involved in training for the unemployed with some Skillnets being active in the area as well. There are also initiatives in the further and higher education sectors designed to take people who are unemployed back into education. The current Labour Market Activation Programme is intended to bring more providers of education and training into provision for the unemployed.

FÁS provision for the unemployed already targets the skills needed for retrofitting of existing residential property, providing substantial numbers of unemployed people from the construction trades the skills they need to undertake retrofitting work.

**Recommendation 1:** Education and training providers moving into provision targeted on the unemployed should take account of the great variety of skills needs that arise from the Green New Deal. Amongst the areas that deserve attention are:

- Energy management for businesses.
- Green procurement, carbon accounting and carbon management.
- Technician and engineering skills for renewable energy.
- Sustainable development.
- Skills for water and waste water infrastructure.
- Biodiversity and Green Infrastructure skills for parks and other public lands.
- Specialist construction skills relevant to infrastructure such as Metro North.

**Recommendation 2:** The Department of the Environment, Heritage and Local Government and Comhar SDC should work with IBEC and other business representative organisations to develop a programme of graduate placements focused on sustainability and environmental management. The programme should include a system of mentoring for participants and might possibly lead to the award of a Masters level qualification analogous to that available to participants in the Export Orientation Programme supported by the Department of Enterprise, Trade and Innovation. Where there are already existing graduate schemes in place in the field of sustainability it is important that these be maintained and strengthened.

#### **4.4.3 Recommendations on Research and Education**

One of the emerging and positive findings from this research is that the Irish education sector is already responding on many different fronts to the skills demands posed by the Green New Deal. Key among the developments already underway are:

- Adapting existing courses in areas including civil engineering, building services engineering, construction studies, architecture, mechanical and production

- engineering to place a greater emphasis on energy efficiency and (in some cases) on deployment of renewable energy technologies.
- New courses, at levels from 6 to 9 in the National Framework of Qualifications, in areas including wind energy, broader renewable energy technologies, energy management and environmental management, with some of these courses being ab-initio courses designed for students first entering college, and others being add-on or masters qualifications designed to enable students with an existing higher education qualification to specialise.
  - A significantly increased level of provision in electrical engineering.
  - Research in electricity generation and distribution.
  - Research in ocean energy.
  - Cross-disciplinary research in transport studies.

**Recommendation 3:** Research funding bodies should continue to grow the volume of research currently taking place in Green New Deal related areas, most notably in the energy field, as a means to drive the availability of people with very high levels of skill and knowledge in these domains.

A number of higher education institutions are using sustainability and renewable energy as guiding themes for future development. Comhar SDC welcomes this and encourages other institutions to focus on sustainability in their future planning.

**Recommendation 4:** The following specific areas have been identified under this research where additional new provision should be developed in higher education. These include:

- Transport studies (cross-disciplinary - engineering/economics/social sciences).
- Environmental management.
- Economics of sustainability.
- Options in computing degrees to specialise in IT systems for renewable energy, electricity network management and environmental management.
- Courses integrating biodiversity with horticulture/agriculture/forestry to provide professional level skills to implement the Green Infrastructure agenda.
- Integrating carbon accounting and carbon management into business, engineering and applied science qualifications where this fits with the theme of the qualification.

New provision in these areas should be achieved through a combination of modifications to existing courses, new undergraduate qualifications, specialist add-on qualifications at Institutes of Technology, and taught masters and postgraduate diploma courses.

There is a need to integrate sustainability throughout the education system, including at primary and secondary level. In Ireland, the Department for Education and Skills has responsibility for developing a national strategy for Education for Sustainable Development. While a consultation has been held around a draft, the National Strategy has not yet been published.

In the UK, the Higher Education Academy is running an Education for Sustainable Development (ESD) Project, to help institutions and subject communities develop curricula and pedagogy that will give students the skills and knowledge to live and work sustainably. There is a need for a similar initiative in Ireland.

**Recommendation 5:** Ireland should implement the United Nations Education for Sustainable Development agenda through a National Education Strategy for Sustainable Development. This should be led by the Department of Education and Skills and carried out in partnership with key stakeholders such as Comhar SDC, the Higher Education Authority, the Irish Universities Association, the Institutes of Technology Ireland and the Higher Education Training Awards Council.

There is a need to re-examine the suite of apprenticeships currently available in the context of the skills requirements associated with the Green New Deal. In many cases, the requirement will be to rebalance existing programmes to place a greater emphasis on areas that are growing in importance. These include:

- Wall insulation (new build and retrofitting) for blocklayers and plasterers.
- Heating controls and renewable energy technologies for electricians and plumbers.
- Skills in energy management and possibly even some business skills relevant to retrofitting for craftspeople likely to get involved in domestic retrofitting.
- Electric vehicles for mechanics.
- Energy efficiency for fitters.

As many Green New Deal construction jobs can be delivered most efficiently by people whose skills cut across traditional craft boundaries, the possibility of introducing new multidisciplinary apprenticeships should be considered.

**Recommendation 6:** FÁS should take account of the changing skills needs in a range of craft occupations that arise from developments in the Green New Deal when updating apprenticeships. FÁS should consider the possibility of introducing new multidisciplinary apprenticeships.

At further education level, there is a need to bring the principles of biodiversity into horticulture and related qualifications, and into relevant community employment initiatives, in order to build the hands-on skills needed to implement the Green Infrastructure agenda in parks and on other publicly-owned lands, and in order to equip those working in horticulture in the private sector to take proper account of biodiversity in their work.

**Recommendation 7:** A sustainable development initiative should be pursued jointly by Comhar SDC, as the body taking the lead on the Green Infrastructure Agenda, FETAC and the main Further Education providers active in areas relevant to the Green New Deal agenda, to bring a sustainability perspective and biodiversity content into the descriptors behind relevant further education and training qualifications, and in order to implement these in course delivery.

Under current economic and funding conditions, it will be difficult for higher education institutions to fund investment in resources, including equipment and software licenses, required to establish and expand provision relevant to areas of the Green New Deal.

**Recommendation 8:** The Department of Education and Skills should provide a modest fund to assist higher education and further education institutions in financing equipment and software licenses needed to introduce or expand educational provision in disciplines relevant to the Green New Deal. The fund should be allocated on a competitive basis and part should be ring-fenced for further education, to balance the greater experience of higher education institutions in competitions for funding.

The education sector should be a major provider of courses for those in employment, whether for people studying part time on their own initiative, or for businesses, business groups and others commissioning courses for industry.

**Recommendation 9:** Education institutions should provide part time and flexible learning study options in courses relevant to the Green New Deal where feasible.

#### 4.4.4 Recommendations on Training for Industry

The main responsibility for continuing education and training for people in employment lies with their employers. The proper role of the State is limited to offsetting market failures in areas where this is important for policy reasons. In the case of industries in which small and medium enterprises (SMEs) have a significant presence, this can be to help overcome the tendency of smaller companies to under-train. In the case of fast-emerging industries, it can be to speed the creation of the education and training services that these industries need.

Both of these justifications for intervention are relevant to substantial segments of private businesses that will be involved in delivering the Green New Deal. This is why it is reasonable that the State should assist private businesses through mechanisms such as financial support for training networks. However, the logic for public intervention in continuing education and training is much less compelling where the main players are large, well resourced and/or already highly capable. Such businesses are typically capable of identifying their own skills and training needs accurately, and of sourcing the education and training interventions they require reasonably efficiently.

**Recommendation 10:** It is important that businesses active in Green New Deal related areas should place a high priority on providing the training and education their people need to optimally meet their skills needs. This may involve making use of any of a wide range of learning strategies, including:

- Provision of classroom-based training.
- Provision of hands-on and on-the-job training.
- Support for participation in part-time education.
- Use of e-learning and blended learning services.
- Participation in less formal approaches to learning, including conferences, business networks, mentoring, site visits and other such strategies.

Where available and relevant, businesses should participate actively in industry training networks.

The Department of Enterprise, Trade and Innovation should take a lead in ensuring that there is a structure in place to provide training for each industry sector that will play a substantial role in the delivery of the Green New Deal.

Since the establishment of Skillnets, industry training networks have proven to be a practical and successful mechanism for enabling Irish industry sectors (and business groups organised along other lines too) to meet their own training needs. It is particularly useful in sectors with significant numbers of small and medium enterprises that have difficulty in identifying and sourcing all the training they need independently at an affordable cost. The Wind Skillnet has proven the worth of this

approach in building the capability of one major industry on which the Green New Deal relies.

The industry network model enables businesses to cooperate in securing the training they need by part-funding the administrative costs and the direct costs of provision. While this imposes a cost on the public purse, this cost is often minor relative to the scale of the public interest in developing the industry.

There are proposals from participants in existing networks involving industry and civil society organisations to establish regional bases for sustainability training. A Sustainability Training Network Scheme could support one or more such bases on a pilot basis. If the results were sufficiently positive, they could seek more permanent funding from another source.

**Recommendation 11:** In each industry sector where developing employee and management skills is important to implementing the Green New Deal, where the industry is well equipped to take a lead in its own development, and where other suitable mechanisms for provision are not already available, the Department of Enterprise, Trade and Innovation should ensure that resources are available to establish and operate an industry training network.

The decision to provide resources to a network should be based on the need for training in the industry sector to progress the transition to sustainability in Ireland and on the capability of the proposed network to deliver on meeting this need. It should not depend on the outcome of competition with industry networks pursuing other goals. To allow this, a new Sustainability Industries training network scheme should be established, analogous to the Finuas financial services industries training network scheme. Networks funded under the new scheme would continue to operate independently of each other, in keeping with arrangements under existing training network schemes, although under policy guidelines set by the Department of Enterprise, Trade and Innovation. Value for money considerations suggest that, as with the Finuas scheme which funds four networks, the Sustainability Industries training network scheme should be managed by Skillnets.

Sustainability industry sectors in which networks are required include, but are not necessarily limited to:

- Wind and ocean energy (currently covered by the Wind Skillnet)
- Biomass energy (existing application to Skillnets)  
and possibly:
- Sustainable supply chain (carbon accounting, carbon management, developing, marketing and selling sustainable products and services)
- Smart transport
- Residential energy efficiency
- Industrial and commercial energy efficiency
- Microgeneration and small scale renewables
- Water and waste water management and technologies
- Electric vehicles
- One or more of a range of export-oriented green enterprise areas such as ocean energy technologies, or sustainable information technologies

Industry training networks are suited to arranging for the delivery of a wide variety of forms of training, from seminars and short courses up to major qualifications accredited by HETAC or FETAC.

Where there is an important gap in provision in a fast-developing Green New Deal activity, where an interested State Agency (such as SEAI or FÁS) is substantially better positioned than the industry itself or an education or training provider to develop and promote training to bridge the gap, it is desirable that the Agency should do this.

In many cases, the requirement will be limited to developing the training, and getting involved in approving and quality assuring providers, with the ongoing costs of provision being paid by businesses participating in the training. In cases where the training forms part of a strategy to improve capabilities rapidly, there may be a case for a part of the cost of training to be covered by the Agency.

**Recommendation 12:** There is an identified training need for entrepreneurs and managers of companies involved in residential retrofitting for energy efficiency to raise the standard of management, so as to ensure that all businesses registered to undertake work of this nature are capable of:

- Providing sound and comprehensive advice to householders.
- Delivering projects to a consistently high standard, both in technical terms and in terms of customer satisfaction.
- Operating efficiently with a minimum of rework.
- Marketing and selling energy efficiency services to householders.

As the Sustainable Energy Authority of Ireland (SEAI) plays a central role in developing the residential energy efficiency retrofitting industry, it should have responsibility for ensuring that this gap in provision is bridged.

**Recommendation 13:** SEAI also has a central role in promoting micro-generation and residential and commercial renewable heat and CHP, so it should also have responsibility for ensuring that any gaps in provision for the sector are bridged.

FÁS has a history of bridging gaps in training provision for industry in the environmental skills area, by developing courses for which the costs of direct provision are covered by participants. This has arisen partly because many of the skills required are related to construction, and FÁS has a long history of involvement in construction industry training. Amongst other areas, FÁS is a key provider of training in skills relevant to water and waste water.

**Recommendation 14:** The existing stock of FÁS environmental courses for industry should continue to be kept available and FÁS should continue to respond when it identifies gaps in environmental training provision that it is the best equipped to bridge.

Heavy investment in new transport infrastructure involving tunnelling, notably Metro North, will lead to a requirement for significant numbers of construction workers with relevant skills.

**Recommendation 15:** FÁS and the Rail Procurement Agency should cooperate on identifying the tunnelling-related construction skills that will be required for Metro North, and on devising and delivering courses to enable Irish construction workers to take these jobs.

#### 4.4.5 Recommendations on Education and Training for the Public Service

Some of the major skill development requirements that arise from the Green New Deal relate to the public service. Key areas include:

- Cross-disciplinary skills in transport policy
- Green procurement
- Carbon accounting
- Carbon management
- Energy management
- Economics of sustainability
- Green infrastructure environmental management

It may be feasible to address part of the skills requirement through recruiting suitably skilled and qualified people from outside the public service, but it will be necessary to develop most of the skills through education and training for people already employed in the sector.

It is usual for education and training interventions for public servants to be funded by their employer. While public servants use a wide range of providers of education and training services, the Institute of Public Administration and the Civil Service Training and Development Centre are centrally important in this area.

The following are the main areas of education and training required:

- Green procurement for public servants involved in specifying goods, infrastructure and services to be procured, and for those involved in procurement.
- Carbon accounting for public servants who will work in carbon accounting.
- Carbon management for senior managers, and for those involved in specifying goods, infrastructure and services.
- Economics of sustainability for those in a wide range of policy-making roles
- Green infrastructure environmental management for those involved in the management of public lands, in planning and in areas of policy relevant to Green Infrastructure including, inter alia, agriculture, forestry, waterways, transport, environmental management and enforcement.
- Economics and social sciences of transport for local authority engineers and transport planners.

Most of the skills requirement should be addressed through training courses designed specifically for public service employees, and delivered either through internal training resources or through contracted education or training providers. As much of the training required will be similar across different Government Departments, Local Authorities, agencies and other bodies, it is desirable that similar training be delivered to all these groups. Individual training courses should accommodate employees of different parts of the public sector where feasible, as diversity among participants is likely to improve learning.

**Recommendation 16:** The Department of the Environment, Heritage and Local Government should take a lead in consulting with other Government Departments as to how the skills requirement relating to the Green New Deal and the public sector should be achieved and what bodies should take the lead in specifying, designing and organising the delivery of appropriate training.

**Recommendation 17:** Education and training courses designed specifically for public sector employees, including those provided by the Institute for Public Administration (IPA) and the Civil Service Training and Development Centre, should be adapted to include modules on Green Procurement, Carbon Accounting, Carbon Management, the Economics of Sustainability and/or the Management of Green Infrastructure where these topics fit with the theme of the course.

**Recommendation 18:** Part of the skills requirement should be addressed through external sources of education and training, accessible also to businesses and to individuals working in the private sector, including, inter alia:

- Masters level courses.
- Courses provided by professional bodies such as Engineers Ireland, the Irish Institute for Purchasing and Materials Management (IIPMM) or the Marketing Institute of Ireland.
- Further education courses in areas such as Landscape Horticulture.
- Courses provided by FÁS and other State Agencies in topics such as Energy Management.
- Courses provided by vendors of relevant technology.

#### **4.4.6 Recommendations on the Role of Civil Society Organisations, Including Professional Bodies**

Civil society organisations, including professional bodies and business organisations, are well positioned to provide for a significant part of the education and training requirements of the Green New Deal. Professional bodies have an important role in the continuing professional development of their members, both in terms of setting standards, and in providing a part of the education and training required to meet those standards.

Ireland's main business representative bodies are active in training, both directly and in some cases through sponsoring industry training networks. Civil society organisations concerned with sustainability and the environment are also active in delivering training and other learning opportunities, some of which are relevant to the Green New Deal.

**Recommendation 19:** Professional and business bodies should continue to develop and deliver education and training for their members (and where appropriate for others) in areas relevant to the Green New Deal, in areas including the following:

- Energy efficiency, renewable energy and energy management.
- Green procurement, carbon accounting and carbon management.
- Environmental management for Green Infrastructure.
- Legislation and regulations.

Much of this provision will involve short courses. As cost of provision will often be a barrier, State Agencies interested in promoting training for businesses in these areas, and in a position to support a part of the costs, should consider partnering with professional and business bodies as a part of their strategies.

**Recommendation 20:** Civil society organisations concerned with sustainability and the environment should continue to be active in education, training and informing the public on aspects of the Green New Deal relevant to their missions. They have a particularly important role to play in contributing to awareness raising and in organising integrated initiatives in community areas or regions. This includes working with groups such as resident associations to advance various sustainable development schemes. Such efforts should be supported, including the provision of resources where appropriate. To the extent that their role extends into operating as training networks for environmental businesses, they should be eligible to sponsor Sustainability Industry Training Networks.

#### 4.4.7 Awareness Raising

Awareness has a critically important role to play in the successful delivery of the Green New Deal. For example, awareness among householders, farmers and other individuals will impact on the rate at which existing homes are retrofitted for energy efficiency, on the adoption of microgeneration and domestic/commercial renewable heat technologies, on the behavioural aspects of the delivery of sustainable mobility and on the implementation of parts of the Green Infrastructure agenda. Awareness among public servants and businesses is equally as crucial and deserving of the same amount of attention.

There is a good case for co-ordination on awareness raising between bodies involved in delivering the Green New Deal. This includes making various actors aware of existing tools that are available and how to make best use of them. Comhar SDC is well positioned to take a lead in mapping out how this should be achieved in consultation with its stakeholders.

**Recommendation 21:** Comhar SDC, in consultation with its stakeholders, should take a lead in developing a strategy for awareness raising in relation to the Green New Deal. The objective is not so much to increase the volume of awareness raising activity, as to highlight key messages, and to identify cost efficient ways of delivering these messages largely within existing resource constraints, and taking advantage of the high level of connection between the Comhar SDC stakeholder group and the wider population of individuals, businesses and public service employees.

#### 4.5 Short-term Priorities

Under current budgetary and economic circumstances, it is necessary to take advantage of tight resource constraints when making recommendations. Fortunately, a large part of the requirement is for measures to reshape existing provision, or to leverage existing resources to provide different courses than at present, and does not inherently require significant additional expenditure.

Key and urgent areas of action required that will require additional expenditure are as follows:

- Action to improve management and professional-level technical skills within energy efficiency retrofitting businesses
- Action to guarantee the availability of resources to form and continue industry training networks in areas of industry required to deliver on Green New Deal priorities

- Action in the public service to deliver the skills required for Green Procurement, Carbon Accounting, Carbon Management and Energy Management
- Action to deliver education, training and graduate placements for the unemployed to work in roles in industry that will progress the Green New Deal
- Growing higher education research in key relevant areas
- Further investigation on specialist skills in tunnelling to ensure that Irish construction workers can benefit from jobs in projects such as Metro North that involve substantial tunnelling work

There is also a need to develop new and modified provision in a number of areas, and it is hoped that most of the costs of doing this can be absorbed by the relevant providers, as a normal part of the process of updating courses and devising new courses. Key areas of action include the following:

- A higher education “Education for Sustainable Development” initiative
- Developing new provision in higher education in a number of specific disciplinary areas
- Updating apprenticeships and devising multidisciplinary apprenticeships
- Updating relevant courses, such as in Landscape Horticulture, at Further Education colleges
- Further developments in Continuing Professional Development and other provision by business, professional and civil society organisations

#### **4.6 Future Work**

In Ireland, new sustainable development policy measures that will affect skills requirements are being announced from month to month. Providers of education and training are continually announcing new courses and other new initiatives. New investments in research are being announced frequently. As the territory is moving so fast, any report prepared now can only be based on a snapshot of the situation as it is as of the time of writing.

The following are some of the topics covered by the report where much firmer information about factors that will materially affect estimates of demand for skills is likely to emerge within a relatively short period of time. It may be appropriate to undertake future policy research in some or all of these areas:

- The international policy literature on green jobs and green skills is maturing in ways that will make it possible to identify policy measures and skills development responses that represent something like best international practice.
- In retrofitting of existing residential properties, the accumulated records of Building Energy Assessments should soon reach the point where an analysis can produce much better founded estimates of the scale of work that needs to be done, and hence of the volume of skills required to do it. International (and possibly Irish) experience with initiatives to promote retrofitting, such as Pay-as-You-Save, will increase to the point where it should be possible to make much more reliable estimates of the rate at which householders can be persuaded to invest in their homes in this way, again making it possible to improve estimates of skills requirements.
- In renewable energy, the future of onshore wind in Ireland is quite well mapped out up to 2020, although uncertainty about the timing of the development of new wind farms gives rise to uncertainty about patterns of demand for construction skills over the period. The future of offshore wind, bioenergy and ocean energy is

much less certain, but should become clearer over the next year or two, making it possible to be more certain about future skills requirements. The complexities of bioenergy are such that there will be a need for significant work on identifying skills needs once the industry's future can be mapped out.

- The broad skills requirements in transforming the National Grid are fairly clear, but, as experience accumulates with leveraging what is learned into technology businesses, the exact skills requirements of doing this will become clearer.
- In sustainable mobility, electric vehicles are very early in their life cycle. Experience with sales and deployment of infrastructure over the next two years will increase certainty over the rate at which they will be adopted into the future.

Substantial numbers of new courses are being established to meet skills needs relating to the Green New Deal. It might be appropriate to undertake a review of provision once these have been in operation for a period. In addition, there will be a need to review the implementation of the Green New Deal over time. It will be important to review skills and training aspects of the Green New Deal as a part of this more general review.

## Glossary of Terms

**Direct Employment:** The number of people employed directly in an area. Where direct employment is referenced in this report, it should be understood as referring to the full-time equivalent level of employment. Because some employment will be part time or seasonal, or differ in other ways from full time, the number of individuals employed may be higher.

**Indirect Employment:** The number of people employed in supplying goods and services to an area with direct employment. As with direct employment, this should be read as referring to full-time equivalents.

**Induced Employment:** Numbers employed as a consequence of consumer spending by people employed directly and indirectly.

**Job-Years:** A job-year represents the employment equivalent of employing a person for one year. Thus, for example, 100 job years might represent employing 200 people for 6 months, 100 for one year, 10 for 10 years, or five for 20 years.

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## Appendix 1: Workshop Participants

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Claire McKeown	UK SDC N.I.
Shirley Gallagher	SysPro
Pat Barry	Irish Green Building Council
Devyn Olson-Sawyer	Nicer Training
Jonathan Healy	Forfas
Mark Bennett	Dublin City Council
Paul Killeen	UCD
Kevin Greene	DoEHLG

## Appendix 2: Quantitative Analysis

### 2.1 Volume of Skills Required in Retrofitting of Existing Residential Property

The Department of the Environment, Heritage and Local Government has estimated that the €130m budgeted for residential energy efficiency retrofitting in the current year will support approximately 6,000 jobs. Taking account of the private spending by householders that the public spending will leverage, and assuming that there is enough retrofitting activity undertaken under the scheme in 2010 so that the full budget is spent, this jobs estimate is roughly consistent with our own calculations.

However, there is significant uncertainty about the future:

- Statistics on the existing housing stock are not good enough to estimate reliably how big a job there is to be done nationally. Available estimates differ from each other mainly on the number of homes that ideally require external or internal wall insulation. It is possible to construct estimates based on the age profile of the housing stock, how construction standards changed over time, data on wall insulation from The Irish National Survey of Housing Quality 2001-2002, and assumptions about how many homes have been retrofitted with wall insulation since 2001-2002. However, there is considerable uncertainty about the extent to which older homes recorded as having wall insulation in the National Survey require further insulation work, and there is also uncertainty about the quality of the wall insulation in buildings of a variety of ages. The true position should become clearer as more Building Energy Ratings (BERs) are undertaken, and as the detail of the BERs is analysed.

A rough analysis based on Sustainable Energy Authority of Ireland estimates, and on various complementary assumptions, suggests that perhaps 340,000 homes require external or internal wall insulation. A report by the Institute of International and European Affairs suggests approximately 630,000<sup>20</sup>.

- We do not yet have a reliable fix on how quickly it is realistic to expect to be able to retrofit the housing stock. An estimate of 20 years, for example, would require roughly half the labour in each year that would apply to an estimate of 10 years.

In recognition of this uncertainty, we have prepared a number of scenarios for future employment in improving the energy efficiency of the existing housing stock. These scenarios:

- Make different assumptions as to the size of the job to be done nationally and how fast it can be done;
- Assume that employment in the area is roughly 4,500 as of the end of 2009, and will average 6,000 in 2010 as discussed earlier;
- Make explicit assumptions about the average inflation-adjusted cost of each type of job that needs to be done and the share of this to be accounted for by labour costs; and

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<sup>20</sup> "Jobs, Growth and Reduced Energy Costs: Greenprint for a National Energy Efficiency Retrofit Programme", IIEA, 2009.

- Assume that the inflation-adjusted cost of labour over the period will be in line with the current average cost of labour in the construction sector as measured by the Central Statistics Office<sup>21</sup>.

Figure 8 presents worked estimates of the number of job-years required<sup>22</sup> to undertake each of the main types of energy efficiency intervention for a high estimate of the total wall insulation requirement and a lower estimate of the requirement.

Figure 9 converts these estimates into averages based on the national retrofitting requirement being achieved over 10, 12, 15 or 20 years.

	Number of Installations Required (000)	Cost per Installation	Total Cost (€m)	% Labour	Spend on Labour (€m)	Construction Labour Cost per Employee per Annum (€)	Job-Years Required
<b>High Estimate of Insulation Requirement</b>							
Basic Works (draftproofing, attics etc.)	470	€1,500	€705	80%	€564	€45,600	12,368
Heating Controls & Efficient Boiler	1,000	€2,800	€2,800	50%	€1,400	€45,600	30,702
Cavity Wall Insulation	63	€1,200	€76	60%	€45	€45,600	995
Internal Insulation	120	€9,000	€1,080	60%	€648	€45,600	14,211
External Insulation	510	€20,000	€10,200	60%	€6,120	€45,600	134,211
<b>Total</b>							<b>192,486</b>
<b>Lower Estimate of Insulation Requirement</b>							
Basic Works (draftproofing, attics etc.)	470	€1,500	€705	80%	€564	€45,600	12,368
Heating Control & Boiler	1,000	€2,800	€2,800	50%	€1,400	€45,600	30,702
Cavity Wall Insulation	63	€1,200	€76	60%	€45	€45,600	995
Internal Insulation	90	€9,000	€810	60%	€486	€45,600	10,658
External Insulation	250	€15,000	€3,750	60%	€2,250	€45,600	49,342
<b>Total</b>							<b>104,065</b>

**Figure 8 Estimates of Job-Years Required to Complete National Retrofitting Requirement under Two Estimates of the Requirement**

<sup>21</sup> Cost of labour includes both pay and non-pay costs.

<sup>22</sup> A job-year represents the employment equivalent of employing a person for one year. Thus, for example, 100 job years might represent employing 200 people for 6 months, or 100 for one year, 10 for 10 years, or five for 20 years.

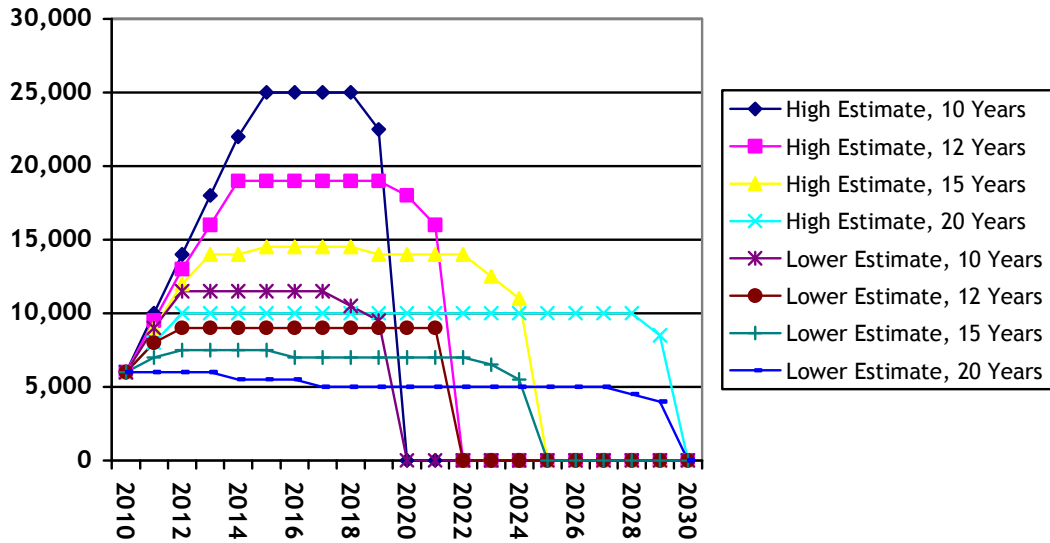
	Job-Years Required	Average over 10 Years	Average over 12 Years	Average over 15 Years	Average over 20 Years
<b>High Estimate of Insulation Requirement</b>					
Basic Works (draftproofing, attics etc.)	12,368	1,237	1,031	825	618
Heating Controls & Efficient Boiler	30,702	3,070	2,558	2,047	1,535
Cavity Wall Insulation	995	99	83	66	50
Internal Insulation	14,211	1,421	1,184	947	711
External Insulation	134,211	13,421	11,184	8,947	6,711
<b>Total</b>	<b>192,486</b>	<b>19,249</b>	<b>16,040</b>	<b>12,832</b>	<b>9,624</b>
<b>Lower Estimate of Insulation Requirement</b>					
Basic Works (draftproofing, attics etc.)	12,368	1,237	1,031	825	618
Heating Control & Boiler	30,702	3,070	2,558	2,047	1,535
Cavity Wall Insulation	995	99	83	66	50
Internal Insulation	10,658	1,066	888	711	533
External Insulation	49,342	4,934	4,112	3,289	2,467
<b>Total</b>	<b>104,065</b>	<b>10,406</b>	<b>8,672</b>	<b>6,938</b>	<b>5,203</b>

**Figure 9 Average Employment Levels Under Various Assumptions about Time Period over which the National Retrofitting Requirement is Undertaken**

Depending on the scenario, the average number of employees required varies between 5,200 (which is somewhat less than the current requirement of 6,000 in 2010) and 19,250.

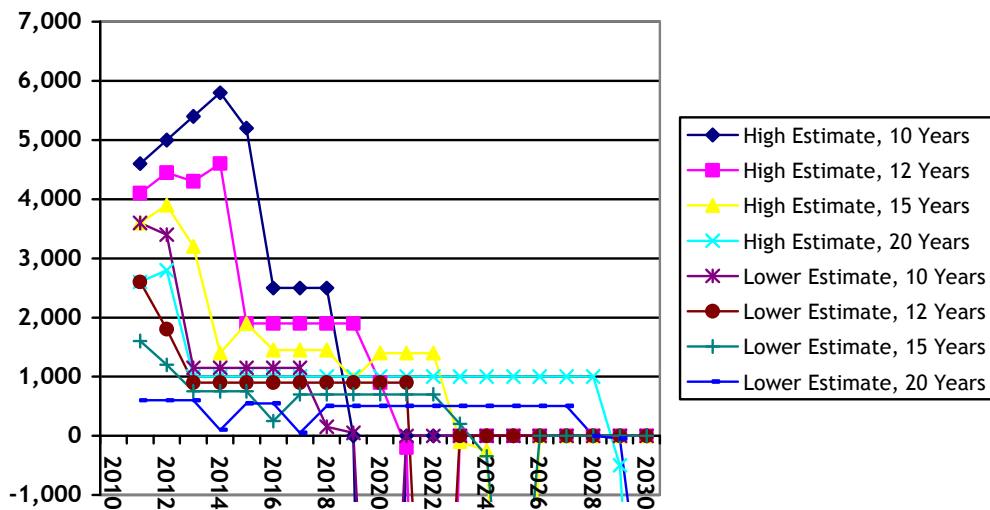
Under all of the scenarios, insulation accounts for more than half of all the employment. While most of this may be undertaken full time by people working for firms specialising in retrofitting, much of the work in the area of heating controls and high efficiency boilers may be undertaken by heating-gas-plumbing specialists and electricians who combine it with other work.

Figure 10 looks at how employment in energy efficiency retrofitting of residential property might vary over time under each scenario, taking account of the fact that it takes time to ramp employment up, and that employment is likely to tail off before the end of the period covered by each scenario, before dropping close to zero. At one extreme, employment rises to 25,000 in the scenario based on the high estimate of need and tackling it over 10 years. At the other extreme, the level of employment expected for 2010 is more than enough to tackle the lower estimate over 20 years.



**Figure 10 Employment in Energy Efficiency Retrofitting of Residential Property Under Eight Scenarios**

Figure 11 converts these employment scenarios into projections of demand for people. Demand has two components – a requirement for people that arises from growth in numbers employed (calculated by subtracting employment in the previous year from employment in the current year) and a requirement for people to replace those who leave this area of construction work. The projections assume that 10% of those working in the area have to be replaced each year, in addition to the requirement driven by growth in the numbers employed.



**Figure 11 Projections of Annual Demand for Workers to be Recruited into Energy Efficiency Retrofitting of Residential Property Under Eight Scenarios**

Completion of the requirement for retrofitting is reflected by the appearance of negative demand in Figure 11.

From the perspective of planning to train construction workers to work in retrofitting for energy efficiency, it would seem prudent to assume that the requirement will be at most 2,000 to 3,000 per annum, until greater clarity emerges as to the scale of the requirement and the pace at which it will be possible to address it.

## 2.2 Volume of Skills Required in Renewable Energy

In order to project skills requirements, we looked at the Irish and international literature to identify benchmark relationships between installation of power capacity and labour requirements. Most jobs fall into one or other of the following four areas:

- Products
- Construction and installation
- Operation and maintenance
- Growing and harvesting

It is important when making projections to distinguish between the four areas:

- Jobs in operation and maintenance and in growing and harvesting should continue to exist for as long as the renewable energy installations continue to be used.
- Construction and installation only exist at the development stage. Employment is only continuous if there is a continuous flow of development work.
- Substantial employment in renewable energy products (beyond the R&D and piloting stage) only occurs to the extent that manufacturing is undertaken within the country. Once markets mature, these products are traded internationally, so employment is driven by the competitiveness of the national industry, rather than by local demand conditions.

In wind energy, the main literature that we have found useful in developing benchmarks relating generating capacity to jobs consists of the US Department of Energy 20% Wind Energy by 2030 study and the Irish Wind Energy Association and Deloitte Jobs and Investment in Irish Wind Energy Study. When the relationships between generating capacity and jobs (direct and indirect) that emerge from the US Department of Energy study are applied to projections on the installation of wind energy capacity in Ireland on a like-for-like basis, the divergence from the findings of the IWEA/Deloitte report is minor. The IWEA report encompasses both direct employment in wind energy and employment that would be classified in the US Department of Energy study as indirect.

The projections of wind energy capacity used here are based on data published by EirGrid, including projections of Gate 3 connections over the period 2010 to 2023, published January 2010.

The main findings are as follows.

- Products (primarily wind turbines) are imported, so that, aside from some turbines for microgeneration, production does not produce jobs in Ireland. There is no specific reason to expect that jobs will move to Ireland from existing centres of production.
- By far the largest share of employment that can be confidently projected in wind energy relates to construction and related activities such as planning and financing. Patterns of employment will be highly sensitive to the timing of installations.
- There will be a moderate amount of continuing employment in operation and maintenance of wind energy installations.

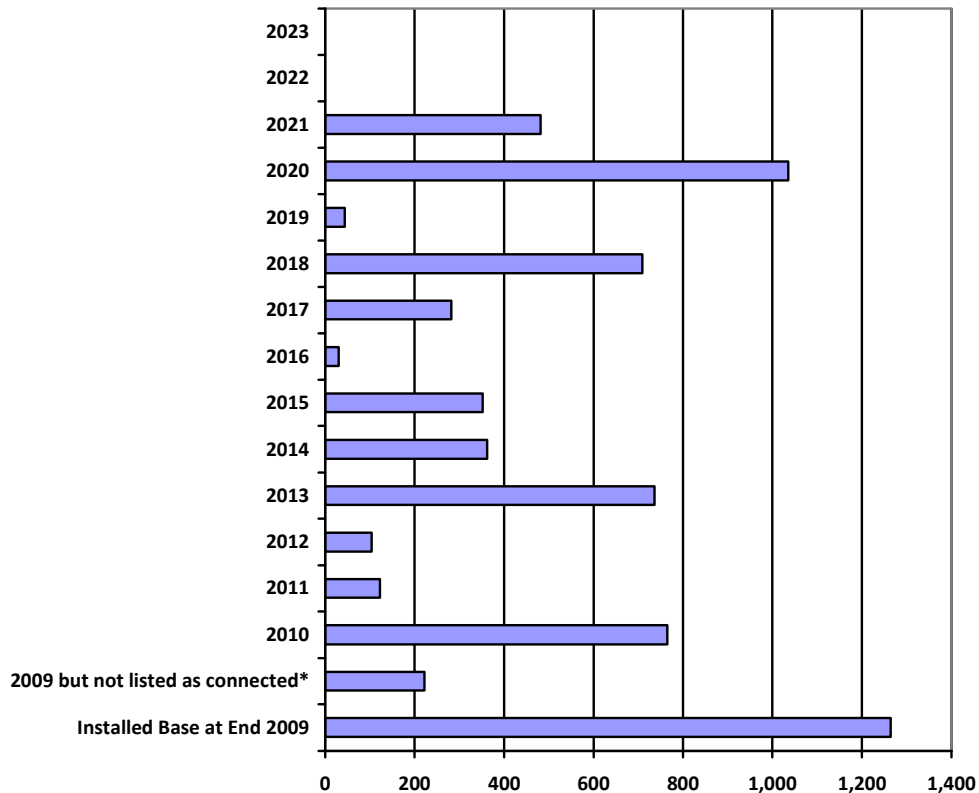
In the US Department of Energy study, the relationship between wind power installation and jobs works out approximately as follows:

- Product manufacturing– 1,830 direct job-years per new GW installed.
- Construction – 3,852 direct job years per new GW installed.
- Indirect employment associated with manufacturing and construction – 5,409 job-years per GW manufactured/installed.
- Operations – 262 direct jobs per GW in the installed base, made up of 98 in operations and maintenance, and 164 in other areas.
- Indirect employment associated with operations – 129 jobs per GW in the installed base.

The modelling that follows is based on these relationships, adjusted as follows:

- In line with the observations above, product manufacturing employment is assumed to be zero, as wind turbines and other products used are imported.
- The component of indirect employment associated with construction is assumed to be 3,667 per new GW installed, accounted for by Irish-sourced construction supplies, equipment, site engineering services etc.

The results differ from IWEA/Deloitte projections, but this appears to be mainly because the model is based on plans for future connection of windfarms to the grid that were not available when the IWEA report was published, rather than because of any important divergences in the underlying analysis. A review of EirGrid data shows connections to the grid for wind energy installations scheduled as set out in Figure 12.

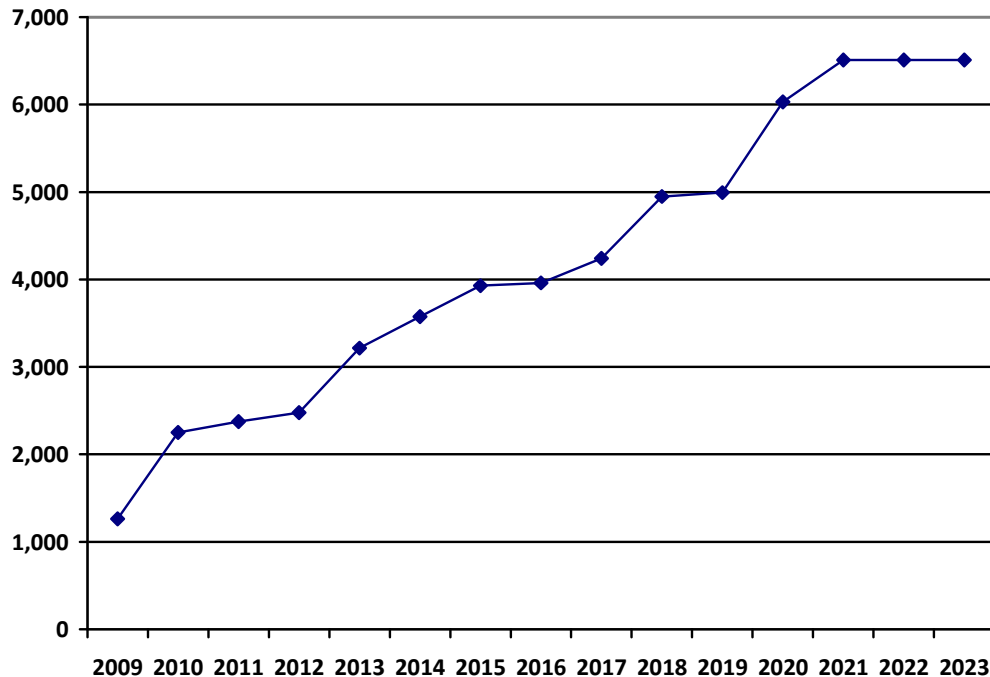


**Figure 12** Connections of Wind Power Capacity to Grid Currently Scheduled by Year (MW)

\* A number of wind farms for which connection to the grid was scheduled in 2009 were not listed among the wind farms connected as of the end of the year.

Source: Analysis of EirGrid listings

Figure 13 shows how wind capacity will develop if all wind farms are connected as scheduled (with outstanding wind farms from 2009 assumed to be connected in 2010).



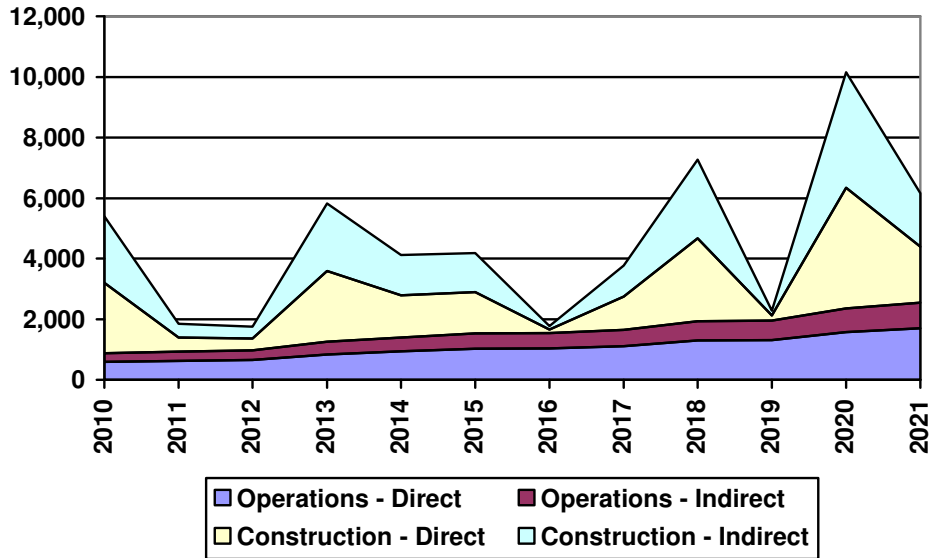
**Figure 13 Wind Generating Capacity (MW) Projected based on Grid Connection Schedules**

Source: Analysis of EirGrid listings

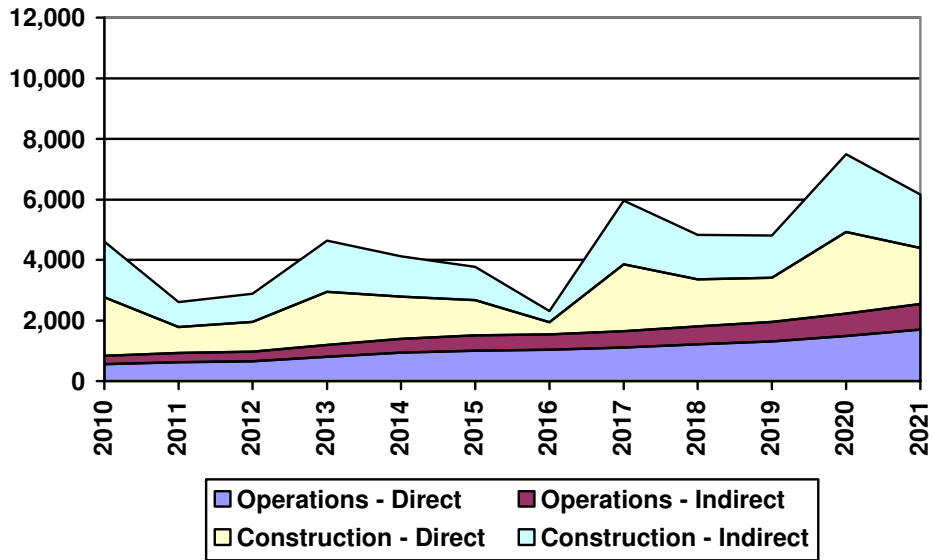
In projecting employment on the basis of generating capacity, it is necessary to make assumptions as to when works take place. Two scenarios are presented:

- The base scenario makes the simplifying assumption that construction and installation works are undertaken in the year of commissioning. The works for wind farms scheduled to have been connected in 2009 are assumed to be substantially complete as of the start of 2010, even if they have not been brought on line as of that date. Many of the wind farms due to be brought on line in the early months of 2010 are also assumed to be largely complete, and a proportion of the works associated with a major offshore wind farm is also assumed to be complete.
- The smoothed scenario assumes that construction works are scheduled to smooth out demand for wind farm construction to some extent. With very substantial capacity due to come on line in some years, and very little in others, there is potential for firms specialising in this type of construction work to swing between having too much and far too little work. Commercial considerations are

likely to motivate some wind farm developers to bring forward works for some projects, and to possibly delay others for short periods.



**Figure 14** Projections of Direct and Indirect Wind Power Employment Under Base Scenario



**Figure 15** Projections of Direct and Indirect Wind Power Employment Under Smoothed Scenario

Under both scenarios, significant employment in wind farm construction will only continue past 2021 if significant additional wind generating capacity is installed, bringing the renewable share of Irish electricity generation well past the current 40% target.

Uncertainty as to developments in ocean energy in Ireland over the period to 2020 makes for greater uncertainty as to the volume of skills required. However, it is possible to develop a scenario based on the national target of 500MW of generating capacity being installed by 2020.

Wave energy and tidal energy technologies are relatively immature, making it uncertain what technologies will eventually turn out to be most viable, and adding to uncertainty about the levels of employment they will generate.

- The 2005 Ocean Energy in Ireland report<sup>23</sup> projected 1,200 direct jobs-years in manufacturing and installation per GW of wave energy capacity manufactured and installed, and that operations and maintenance would generate 320 direct jobs per GW installed.
- A 2009 report from World Wildlife Fund Australia and Carnegie Corporation projected 2,000 direct jobs-years in manufacturing and installation per GW of wave energy capacity manufactured and installed, and that operation and maintenance would generate 140 direct jobs per GW installed.

Given that Irish manufacturing industry has a presence in wave and tidal technologies, and given that there are as yet no dominant international players in these technologies, it is reasonable that a scenario on the sector's future should assume that wave and tidal generating equipment installed in Ireland to 2020 will be developed and manufactured within the country.

Figure 16 presents a scenario for employment in ocean energy, based on the premise that 500MW of wave capacity is deployed over the period to 2020, and that the employment that this generates is in line with the assumptions in the Ocean Energy in Ireland report. A small additional allowance has been made for staffing the product development and piloting activities currently underway. Manufacturing and construction employment is assumed to lead operating employment by a year.

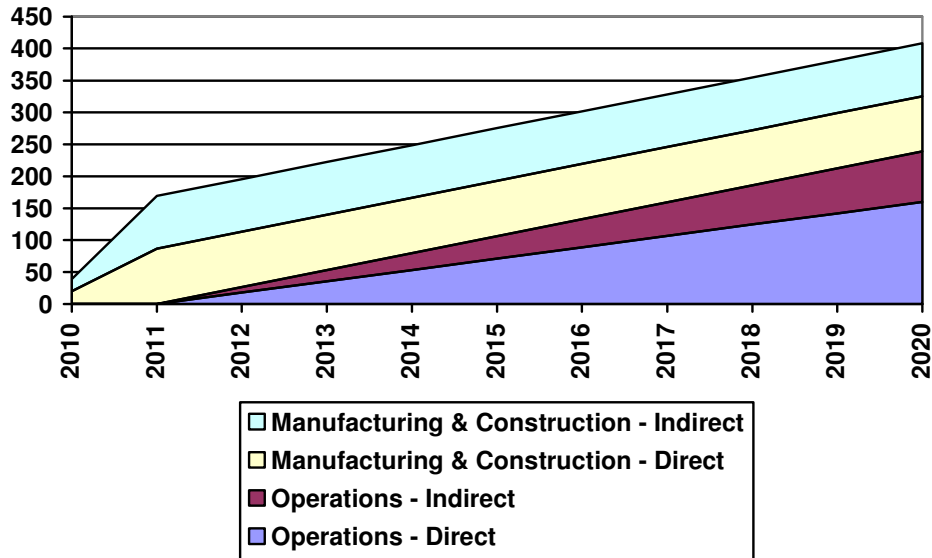
If the WWF/Carnegie report is a better reflection of reality, then employment in manufacturing and construction will be higher than in the scenario, and that in operations and maintenance will be lower.

In addition, the scenario makes allowances for indirect employment, based on the assumption that the relationship between direct and indirect employment for ocean energy will be similar to that for wind energy.

If the Irish businesses producing ocean energy generating products are successful, or if inward investment in manufacturing ocean energy products is attracted to the country, then it is possible that a significant export industry could emerge over the period to 2020. In this case, employment in manufacturing could rise to a level much higher than in the scenario.

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<sup>23</sup> Department of Communications Marine and Natural Resources, Marine Institute and Sustainable Energy Authority of Ireland



**Figure 16 Projections of Direct and Indirect Ocean Power Employment Under Scenario**

As with ocean energy, there is considerable uncertainty as to the path that biomass energy will take in Ireland over the period to 2020. As with ocean energy, there are targets in place that point towards scenarios that can be explored.

During 2009, Sustainable Energy Authority of Ireland published Energy Forecasts for Ireland to 2020.

This report saw projected that total energy consumption for heat would reach 5,718ktoe (66.5TWh) in 2020, and that total energy consumption for transport would reach 5,913ktoe (68.8TWh). On current trends, it saw renewables providing 205ktoe (2.38TWh) of heat and 179ktoe (2.1TWh) of power for transport.

Targets from the White Paper on Energy, 2007 point towards considerable higher consumption:

- 12% of heat should come from renewable sources by 2020. Based on SEAI's Energy Forecasts, this should require about 8.0TWh per annum. Most or all of the biomass would be likely to come from the island of Ireland.
- 30% of fuel at the three peat power plants should be from co-firing with biomass by 2020. Analysis from UCD's Energy Research Centre<sup>24</sup> shows peat stations producing 2.6TWh per annum if run at full capacity, but probably being run at less than this capacity. A central scenario shows them being run at 1.4TWh per annum. 30% of this is 0.4TWh per annum. If operating at 38% efficiency, this is equivalent to using 1.1TWh of heat per annum. Again, most or all of the biomass would be likely to come from the island of Ireland.

<sup>24</sup> [http://www.esri.ie/research/research\\_areas/energy/energy\\_conference\\_1510200/ESRI\\_-\\_Peat\\_in\\_Ireland.pdf](http://www.esri.ie/research/research_areas/energy/energy_conference_1510200/ESRI_-_Peat_in_Ireland.pdf)

- 800 MW of electric power should come from combined heat and power (CHP) plants by 2020. However, as the majority of heat from CHP can be utilised<sup>25</sup>, the simplifying assumption is made that biofuel consumption in CHP can be taken as falling within the wider target of 12% heat from renewable sources.
- 10% of transport fuels to come from biofuel by 2020. In addition, the Renewable Energy Directive, 2009 expects that 10% of liquid fuel should be from biofuels by 2020. If 10% of all transport fuel is to come from renewable sources, this would amount to 6.9TWh by 2020. However, depending on developments in production of biofuel within Ireland, it is possible that a large share of this would be imported.

A 2007 UK study (Thornley et al) on the employment impacts of biomass power plants<sup>26</sup> provides a useful starting point for estimating the possible employment impact of biomass energy within Ireland. It finds that each plant generates an average of 1.27 man-years employment per GWh of electricity produced.

Averaging across different types of fuel, about 17% of the man-years come during the construction phase and the remainder during the operation phase.

On the assumption of 40% efficiency in electricity generation (other than in CHP), and that the average labour content associated with processing biomass for other uses is broadly similar to that in electricity generation, this suggests approximately 0.51 man-years per GWh of heat generated, or 510 man-years per TWh.

About 10% of employment reflected in the total is employment induced in the local economy, but this has to be excluded here for consistency with the rest of the report. Therefore, we are looking at employment of approximately 460 job-years per TWh, about 382 of which are associated with plant operation, growing, harvesting and transport of fuel and with businesses supplying operations.

Calculations in the study appear to be based on a 25 year plant lifetime, so constructing and manufacturing the equipment for the capacity to produce 1TWh per annum should take approximately 2,000 man-years<sup>27</sup>.

Estimates of jobs potential from other countries are quite diverse, apparently reflecting differences in biomass sources, in technology, and probably also differences as to the types of jobs included in totals. The Norwegian BioEnergy Association estimates 300 jobs per TWh per annum, based on forestry resources. A report for the Federation of Swedish Farmers estimates 600-700 jobs per TWh per annum produced from wood residues. A frequently-reproduced table attributed to Delcio, 2007 estimates 733 to 1,067 jobs per TWh from "traditional biomass (wood)".

In this wider context, the estimates of job numbers per TWh derived from the UK study are unexceptional. Given that there is, in any case, considerable uncertainty about the path that biomass energy will take in Ireland, in terms of volume, biomass source and technology, it seems reasonable to use these estimates in constructing scenarios for future employment in biomass energy in Ireland.

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<sup>25</sup> There are heat losses associated with generation, and not all of the heat produced may always be used, but the size of the error it introduces to the analysis here should not be material.

<sup>26</sup> Thornley P, et al. Quantification of employment from biomass power plants. *Renew Energy* (2008), doi:10.1016/j.renene.2007.11.011

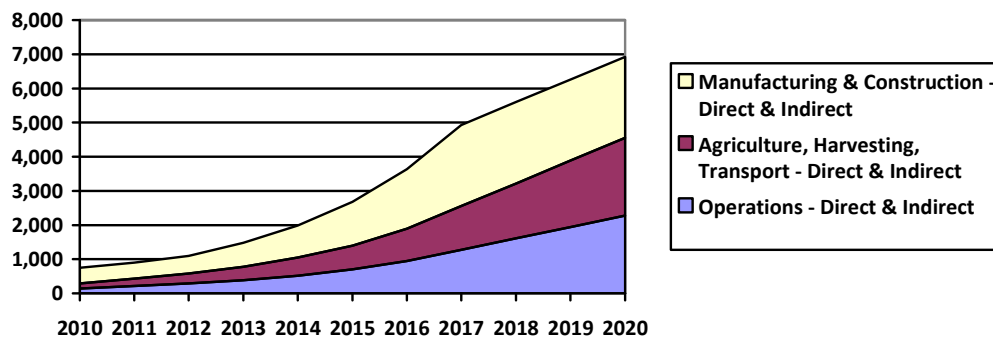
<sup>27</sup>  $460 \times 17\% \times 27 = 1,955$ .

Figure 17 presents a scenario for jobs under which:

- 12% of Ireland's heat requirement in 2020 (8TWh per annum) is satisfied using Irish-produced biomass;
- 30% of fuel at the three peat fired generating stations comes from co-firing with Irish-produced biomass, requiring 1.1TWh of heat; and
- 4% of Ireland's transport fuel requirement comes from Irish-produced biomass (equivalent to 2.8TWh), with the remaining 6% of fuel targeted to be from renewable sources being imported.

The scenario assumes that 75% of the total man-years involved in construction and manufacturing are reflected in employment within Ireland, with the remainder being reflected in manufacturing of equipment overseas for use in Irish biomass-using plants. As the three peat fired generating stations already exist, they are not factored into the manufacturing and construction job totals.

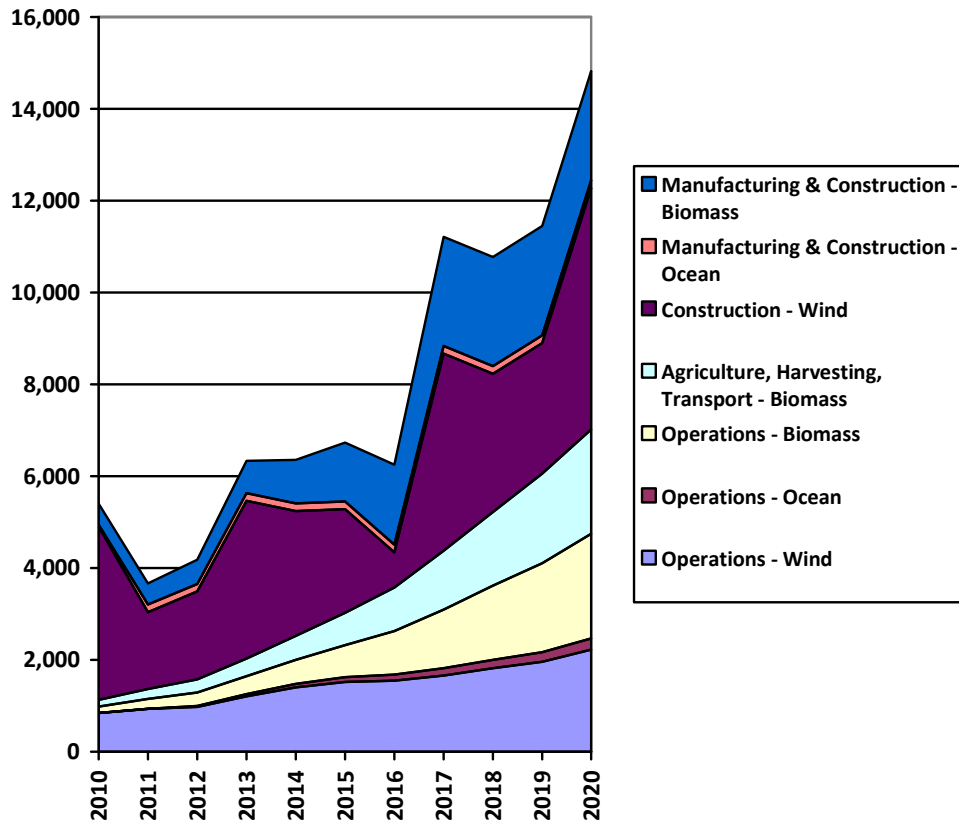
The manufacturing and construction jobs total for 2020 assumes that additional biomass capacity continues to be developed after the various targets for 2020 have been met. If new capacity did not continue to be added, then manufacturing and construction jobs would fall close to zero.



**Figure 17 Projections of Biomass Power Employment Under Scenario**

It is important that this scenario should be read as no more than a broad indication of the jobs potential that exists, with considerable uncertainty as to what the actual outcome will be. While it is based directly on Irish Government targets, biomass energy is still early in its development in Ireland, and it is not yet clear what path it will take.

Figure 18 presents summary totals of numbers employed directly and indirectly under the smoothed wind energy, the ocean energy and the biomass energy scenarios. The numbers in each area include both direct and indirect employment).



**Figure 18 Summary of Employment Under Wind (Smoothed), Ocean and Biomass Energy Scenarios**

	Operations - Wind	Operations - Ocean	Operations - Biomass	Agriculture, Harvesting, Transport - Biomass	Construction - Wind	Manufacturing & Construction - Ocean	Manufacturing & Construction - Biomass
2010	841	0	143	143	3,770	39	463
2011	928	0	217	217	1,674	169	463
2012	969	27	290	290	1,910	169	521
2013	1,198	53	389	389	3,434	169	701
2014	1,398	80	521	521	2,719	169	946
2015	1,516	106	701	701	2,256	169	1,282
2016	1,548	133	945	945	767	169	1,742
2017	1,658	159	1,278	1,278	4,293	169	2,376
2018	1,814	186	1,610	1,610	3,008	169	2,376
2019	1,952	212	1,943	1,943	2,851	169	2,376
2020	2,226	239	2,275	2,275	5,263	169	2,376

Figure 19 converts these employment scenarios into projections of demand. The projections take account of the likelihood that there will be some flow out of employment in each area. It is assumed that 3% of those working in each area have

to be replaced each year, in addition to any requirement driven by growth in the numbers employed.

Variations in the rate of growth in wind capacity cause demand for additional employees in wind operations to vary.

Wind power construction employment is omitted from the chart because volatility in activity in the area causes large flows of people in and out of the area, even under the smoothed scenario. The size of these flows is very sensitive to the timing of construction work, and the extent to which the industry succeeds in smoothing activity out over time.

The pattern of demand for people to work in manufacturing and construction activity relating to biomass reflects an assumed initial rapid ramp up in activity in the area, which eventually levels off in 2018, with activity in 2019 and 2020 being at the same level as in 2018.

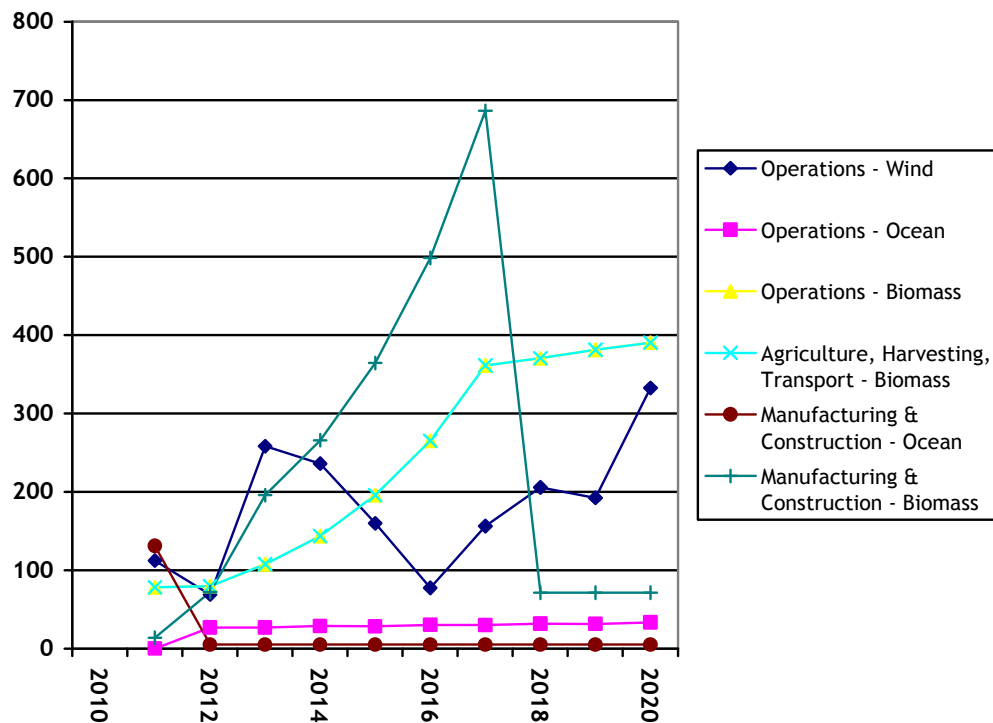


Figure 19 Projections of Demand for Workers in Renewable Energy

## About Comhar Sustainable Development Council

Comhar Sustainable Development Council<sup>28</sup> (Comhar SDC) was established in 1999 as the forum for national consultation and dialogue on all issues relating to sustainable development. Its terms of reference are to:

- Advance the national agenda for sustainable development
- Assist in devising suitable mechanisms for sustainable development
- Advise on the implementation of these mechanisms
- Contribute to the formation of a national consensus in these regards

Comhar SDC works in three-year cycles and began its fourth term in January 1<sup>st</sup> 2009 under the Chairmanship of Professor Frank Convery.

Comhar SDC is comprised of 25 council members who are drawn from five pillars: the state sector, the economic sector, environmental NGOs, social/community NGOs and the professional/academic sector. The broad representation allows Comhar SDC to arrive at informed and balanced conclusions.

Comhar SDC is supported by a full-time secretariat, which undertakes evidenced based policy analysis and research, and is based in the Irish Life Centre, Lower Abbey Street, Dublin 1. Comhar SDC publishes its reports, opinions, and other products, using a range of relevant means for their dissemination, including electronic media.

For further information about the work of Comhar Sustainable Development Council please contact:

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Website: [www.comharsdc.ie](http://www.comharsdc.ie)

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<sup>28</sup> Previously the National Sustainable Development Partnership; the name was changed in 2006.