Transition Kerry's Sustainable Energy Community Roadmap

An Action Plan for County Kerry's Transition to 100% Renewable Energy Supply

Executive Summary

About the Study

This report was commissioned by Transition Kerry, a community initiative aiming to accelerate the change to a more resilient, more sustainable future for Kerry.

The study was undertaken by a consortium led by XD Sustainable Energy Consulting Ltd. and was supported by Kerry Local Authorities as well as North East Kerry Development Partnership and South Kerry Development Partnership with LEADER funding.

The overall objective of the study is to assist communities in Kerry to develop a strong, positive vision of its sustainable energy future and plan the journey for the transition of the county towards 100% renewable energy supply by 2030.

The specific objectives of the study were to:

- Define the energy balance (supply and demand), energy expenditure and energy-related CO2 emissions for the county for a baseline year (2008), against which energy efficiency and renewable energy targets for the county can be set;

- Review the energy infrastructure currently in place in the county and assess the potential renewable energy resource available within county Kerry's boundaries and offshore along its coastline;

- Model and compare different scenarios for the transition of the energy systems in Kerry towards 100% renewable energy supply, assessing their economic, social and environmental impacts;

- Analyse the framework for community participation in renewable energy development in Kerry and define a roadmap for community-based renewable energy co-operatives to become a key driver in the energy transition of the county.

Outputs from this study have already been utilised by Kerry County Council/Tralee Town Council as part of their Sustainable Energy Communities programme, and as part of the recent Covenant of Mayors funding proposal.

The study has also been brought to the attention of the Department of Communications, Energy and Natural Resources, in response to recent public consultation processes relating to energy regulation and policy development.

The study is intended to complement existing initiatives in the area of sustainable energy development in Kerry, and it is hoped that the study will stimulate wider discussion and community participation in the area.

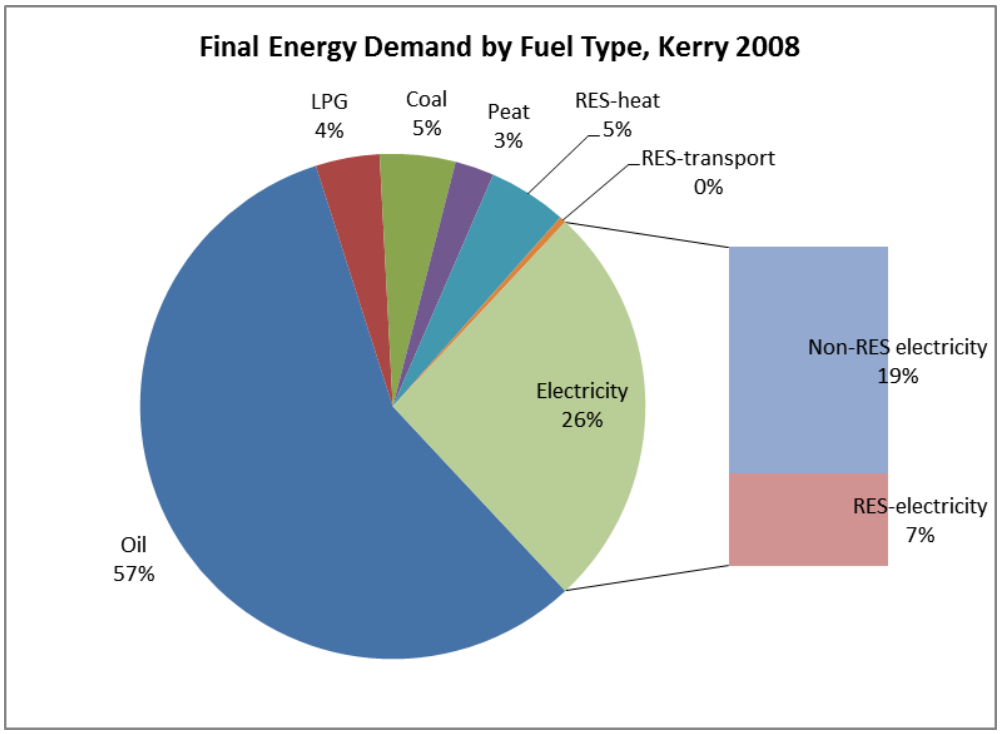
1. Energy and Emissions Balance in County Kerry – Where we are now.

The energy balance of the county was developed for **2008 as baseline year**, using a mixture of bottom-up data collected via surveys and 'top-down' data extrapolated from national statistics. This analysis breaks down energy demand by socio-economic sector and by fuel, and translates energy demand in related CO2 emissions and energy expenditure.

- **Energy expenditure is almost €470 million per year in Kerry, equivalent to approx. €3,230 per capita per year.**
- **The residential sector, spends €227 million on energy or an average of €4,300 per household per annum on energy and transport fuels.**
- **The total energy demand for the county was estimated at almost 4 TWh/year in 2008, equivalent to 345,000 tonnes of oil per annum.**

The study highlights a dangerous over reliance on oil in the county. Kerry is highly dependent on oil for more than half of its energy usage **(57%)**, mainly as a heating fuel and transport fuel. Solid fuels, traditionally a home heating staple, occupy a significantly higher share of energy demand in Kerry **(12%)** compared to national usage **(7%).** It is significant that all of these imported fuels, including oil, arrive into Kerry by road.

Electricity represents **26% (766 GWh/yr)** of the final energy usage, significantly more than the national share of electricity at **17%**.

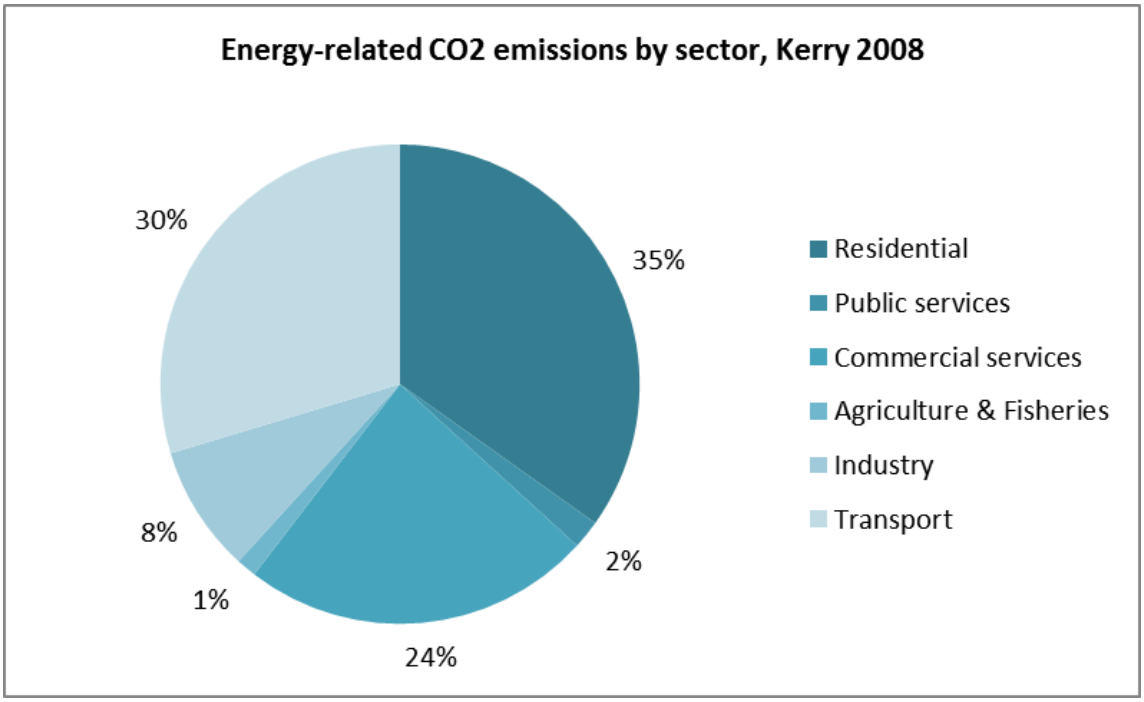


Locally produced renewable electricity contributes to c.**18%** of the county's electricity demand. Considering the national primary fuel mix of electricity consumed in Kerry that is not produced locally (including its own share of renewable electricity) in 2008, the carbon factor for the Kerry electricity mix is estimated at **0.47 kgCO2/kWh** compared to **0.55 kgCO2/kWh** at national level.

Despite the high levels of renewables in the mix, electricity is the main greenhouse gas emissions contributor in the county, which accounts for the fact that the grid electricity in Ireland has a high primary energy to delivered energy factor **(2.25 in 2008**) and is generated in a large part by coal and natural gas.

Overall energy usage in the county is responsible for the emission of 1.22 million tonnes of CO2 per year, equivalent to 8.8 tonne per person.

The average national average is approx. **11 tonnes** (Source SEAI). The social cost of energy -related CO2 emissions in the county is estimated at c. **€ 28 million** per year.



Households and services are the main contributors to energy-related CO2 emissions in Kerry, on account of their thermal energy usage but more importantly their high levels of electricity consumption.

Annual energy-related CO2 emissions in Co. Kerry 2008 (,000 tCO2/yr)

	Oil	*LPG*	*Coal*	*Peat*	*Nat. Gas*	Electricity	*Transport fuels*	***Total***
Residential	*148.509*	*13.771*	*57.544*	*36.364*	*0.000*	*169.139*	182.355	***607.7***
Public services	*5.893*	*0.091*				*17.544*	2.588	***26.1***
Commercial services	*21.174*	*23.469*	*0.505*			*243.558*	88.205	***376.9***
Agriculture & Fisheries						*16.537*	52.707	***69.2***
Industry	*53.579*		*7.551*			*43.571*	36.223	***140.9***
Total	***229.2***	***37.3***	***65.6***	***36.4***	***0.0***	***490.3***	**362.1**	***1220.9***

2. Renewable Energy Resources Potential – What We Have.

The study conducted a comprehensive assessment of the potential renewable energy resources available to meet Kerry's burgeoning energy demand.

The bulk of the resource lies with on-shore and offshore wind energy as well as wave energy, which together can potentially generate an amount of electricity equivalent to over 5 times the total final energy demand of the county.

The theoretical potential of biomass in the study area has been estimated at circa **2 TWh/yr** or **50 % of the final energy consumption in the area.** The potential consists primarily in woody biomass from forestry and energy crops (55% of total biomass). Grass silage together with other wet organic by-products of agriculture, municipalities and industry can be digested anaerobically for producing biogas **(0.9 TWh/y r potential)**.

Despite our weather, solar technologies have an energy potential of **1.2 TWh/yr**, or **over 30% of the county's final energy demand**. Geothermal heat pumps could also provide a substantial part of the thermal energy demand in the county and could play an important role as an energy storage technology.

The total figure of 42 TWh of renewable energy resource potentially available in the study area, including its adjacent offshore area, is approximately 10 times current energy demand.

3. Technological Pathways to 100% Renewable Energy Systems in Kerry

Where We Want To Go From Here…

The next step was to explore technological pathways for the transition of energy systems in Kerry to 100% renewable energy supply within the next 17 years.

To do so, we undertook a process of iterative modelling of a series of future energy system scenarios with EnergyPLAN, a modelling software developed by the University of Aalborg in Denmark. The model aims to optimise the technical operation of the overall energy system by integrating electricity, thermal and transport systems, while balancing supply and demand within the region. The model provides a series of technical, environmental and economic indicators on the basis of which these scenarios can be compared. 100% renewable energy scenarios were benchmarked against the 2008 baseline and against a business as usual scenario representing a continuation of the current national policy for renewable energy.

Future energy system scenarios were included for a 25% reduction in final energy use by 2030 through energy efficiency. Out of the modelling process, the following energy system transformation scenario emerges as the most advantageous for the county:

"By 2030, the county will be capable of becoming energy self sufficient on the basis of its own renewable energy resources. Households, businesses and industry in larger towns will be supplied renewable heat via district heating systems harnessing heat from wood-fired power stations, industrial processes and large solar arrays. Rural dwellers will have switched to heat pumps and solar heating systems, supplemented with wood stoves. In terms of electricity supply, wind energy will cover up to 45% of total energy requirements of the county. Solar power will also play a significant role in the electricity mix'.

Biomass is the other pillar of future renewable-based energy system scenarios, as a primary fuel to supply heat, electricity and transport fuels (50% of the overall primary energy requirement). Meeting future biomass fuel needs will require an ambitious programme of supply chain development to mobilise existing feedstock and create new sources with energy crop cultivation and energy specific forest management.

The energy system and its users will have a high degree of intelligence enabled by IT solutions, and will be capable of responding to intermittent renewable energy supply by adapting their energy usage, using battery storage in electric vehicles, storing heat with heat pumps, etc. Hydrogen production will also play a key role in balancing supply and demand within the county.

The technological transformation of the energy system of the county will require a **long-term investment plan which could total up to €1.8 billion**. However, the increase in capital cost will be largely compensated by the elimination of the county's fossil fuel expenditure – the bulk of which leaves the local economy.

Overall, the total annual economic costs of the recommended 100% renewable energy system in 2030 will be 15% higher than those calculated for the 2008 baseline scenario.

In addition, the local production of biomass fuels, the construction, operation and maintenance of the new energy infrastructure will result in the creation of up to **2700 new local jobs** compared to 2008.

Finally, the transition to renewable energy naturally results in CO2 emission reductions totalling **1 million tonnes** per year compared to 2008 emissions, worth potentially **€27 million** per year in carbon credits.

4. Community Participation in the Renewable Energy Transition

How We Will Make the Transition…

Our assessment of the barriers and opportunities for community participation in the renewable energy transition indicate that these are intrinsically linked with the centralised and monopolistic nature of the current energy system.

Other challenges and opportunities are inherent as to how community groups are organised, relying for the most part on volunteers, and how they compensate for limited financial resources with social capital. Given the radical transformation of the institutional, policy and infrastructural framework required by the transition, the models of community participation and pathways for the transition are still to be defined in Ireland.

Our recommendation is for community groups to adopt a co-operative business model for renewable energy project development, promoting local ownership and democratic and transparent business principles. The proposed roadmap for renewable Community Energy Cooperatives (**REScoops**) in Kerry articulates a process of capacity building, starting with accessible projects, before tackling larger developments and diversifications into other products and services. Outreach will play an important role in promoting community buy-in and in disseminating the **REScoop** model to other communities in the county.

Community Energy Cooperatives of this type are in use all over Europe, and even exist in other parts of Ireland, most notably in the Aran Islands and in Co. Mayo.

Finally, a review of the wider transition of the county's energy system indicates that it will require a full-scale mobilisation of human resources and capital, driven by a long -term multi-stakeholders partnership.

REScoops and other community groups should be pivotal in this revolution to make sure that local communities take full advantage of the opportunities it will present.

Study Funded by: