

The Energy Transition Process in a Rural Area: an Irish Case Study of becoming a Sustainable Energy Community

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ABSTRACT

Most commentators will agree that the net benefit of carbon is over. A paradigm shift is underway to retire the current carbon based energy system, and this energy transition to a low carbon world will be the most difficult challenge that this generation will face. In this paper the Sustainable Energy Community (SEC) Programme is introduced; this new network of Irish communities will become a driver in the current energy transition and is being championed by the Irish national energy agency, the Sustainable Energy Authority of Ireland. An SEC is a community in which everyone works together to develop a sustainable energy system for the benefit of the community. This is achieved by aiming, as far as possible, to be energy efficient; using renewable energy where feasible and also to embrace smart energy technologies. This research reports on the establishment of Erris, Co. Mayo as an SEC, and presents three years of data since their energy transition began in 2014. The literature highlights several SEC barriers. The SEC model addresses each of the barriers and directly addresses the problem that communities face due to the lack of sufficient capacity at the start of the energy transition process.

KEYWORDS

Energy transition, sustainable energy communities, low carbon, energy citizen.

INTRODUCTION

In this article we introduce a special type of initiative, namely the Sustainable Energy Community (SEC) Programme; this new network of Irish communities will become a driver in the energy transition. An SEC is a community in which everyone works together to develop a sustainable energy system for the benefit of the community. This is achieved by aiming, as far as possible, to be energy efficient; using renewable energy where feasible and embracing smart energy technologies. This study starts from the hypothesis that the implementation of an SEC offers a solution to the inevitable energy transition of the future. Exploring the transition potential of such communities enables us to also take a new perspective on sustainability transitions into account, focussing not only on the technological aspects, but also on the social aspects and the agents behind the transitions. It has implications for the local and wider economy and technical energy system, and it is becoming clearer that in areas where a receptive social and political renewable energy environment exists, these areas enjoy increased renewable energy deployment and maximise the benefits of doing so [1].

The contribution of this study is to investigate the energy transition potential of the SEC framework in rural areas in Ireland. The study should mainly uncover, if and under which conditions SECs provide favourable structures for initialising transition processes in rural areas.

Global Policy Context:

The Paris Agreement (COP 22) entered into force on 4th of November 2016, less than a year after it had been agreed by world governments in December 2015. It is considered to be a major step in advancing the international actions to avoiding dangerous and irreversible climate change. The key goals of the Paris Agreement can be summarised as:

- to hold the increase in the global average temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels,
- to enhance adaptive capacity, strengthen resilience and foster climate-resilient and low emission development and
- to make finance flows consistent with a pathway towards low greenhouse gas emissions and climate resilience development.

While it does not specify atmospheric greenhouse gas stabilisation values, the 2°C and 1.5°C temperature goals can be scientifically linked to such limits and in particular global emissions budgets for carbon dioxide. The Paris Agreement aims to tackle 95% of global emissions through 188 Nationally Determined Contributions (NDCs) which will increase in ambition over time [2]. Ireland’s contribution to the Paris Agreement will be via the NDC tabled by the EU on behalf of its Member States.

European Policy Context

The 2020 climate and energy package is a set of binding legislation to ensure the EU meets its climate and energy targets for the year 2020. The package sets three key targets:

- 20% cut in greenhouse gas emissions (from 1990 levels)
- 20% of EU energy from renewables
- 20% improvement in energy efficiency

Under the EU Directive 2009/28/EC member countries of the European Union are obliged to draft and submit to the European Commission National Renewable Action Plans (NREAPs) outlining pathway which will allow them to meet their 2020 renewable energy, energy efficiency and Greenhouse Gas (GHG) target reductions.

Table 1. Actual figures of EU 2020 targets

Measurement	2020 Target	Where Europe is at end 2016
Final Energy Consumption	20% reduction	Already achieved: in 2014 the FEC was only 1.6% above the 2020 target [3]
GHG Emissions	20% reduction	In 2015, already 22% below 1990 level [3]
Renewables in Final Energy Use	26%	In 2015, it was 16.7%
Energy Efficiency (Overall)	20% reduction in demand	On track to meet targets
Energy Efficiency (Public Sector)	33% reduction in demand	21% by 2015 [4]

National Policy Context:

Ireland's 2020 renewable energy target is to increase the share of final energy consumption made up of renewable energy sources (RES) to 16%. This target is broken into three key sectors with individual targets for each sector: 40% of electricity supply (RES-E), 12% of heating (RES-H), and 10% of transport (RES-T). Through the National Energy Efficiency Action Plan (NEEAP), Ireland has a national target of 20% energy savings in 2020 (relative to the 2001-05 average), complemented by an additional target of energy reduction in the public sector by 33% by 2020. The third National Energy Efficiency Action Plan in 2014 identifies measures that could reduce annual emissions of around 7.3Mt and save approximately 31,955GWh of energy by 2020. In a recent report from the SEAI, it is evident that we are not on target for 2020, and that a focussed effort will be required to meet these targets [4]. The actual figures are below in Table 2.

Table 2: Actual figures of Irelands 2020 targets and current levels [4].

Measurement	2020 Target	Where Ireland is at end 2016
Renewables in Final Energy Use	16%	9.1%
RES-E	40%	25.3%
RES-H	12%	6.5%
RES-T	10%	5.7%
Energy Efficiency (Overall)	20% reduction in demand	10% (Not legally binding)
Energy Efficiency (Public Sector)	33% reduction in demand	21% by 2015 [5]

ENERGY TRANSITIONS AND COMMUNITIES

What is a transition? From a societal perspective, it is a complex process of long term structural changes within society [6]. The transition concept tries to unravel the complex interaction patterns between individuals, organisations, networks and regimes within a societal context, and how over time, these can lead to nonlinear change in seemingly stable regimes. These complex changes can be viewed as multi-level, multi-phased and involved multiple actors. There are a lot of different factors, choices, strategic decisions and complexities that affect low carbon energy transitions [7]; there are multiple renewable technologies, each with particular applications, technological and infrastructural needs, and degrees of current and potential commercial viability and energy generation potential; there are many different scales that these technologies can be implemented at, from small local off-grid applications to major installations that supply the electricity needs of tens of thousands of people; there are environmental impact and public acceptance issues which can be problematic for particular projects in particular places; and there are powerful commercial and political interests that lobby against low carbon transitions and/or distributed renewable energy supplies.

Role of communities in the energy transition: According to the recent White Paper, (December 16th 2015) entitled *Ireland's Transition to a Low Carbon Energy Future*; the Irish Government has placed the citizen at the centre of the energy transition and signalled a call to communities in Ireland to become active agents in the low carbon transition [8]:

The ambitious energy transition outlined in this document requires the active engagement of Ireland's citizens, communities, businesses, academics and experts, and local and national State agencies. It will also require better public awareness of the nature and scale of the

challenges we face, and a robust consensus about the broad policy measures required to meet those challenges (page 17).

The citizen will be at the centre of Ireland's energy transition, which will be underpinned by policy and regulatory stability. New technologies, services, energy network architectures and community-based energy initiatives will emerge to facilitate and drive the energy transition. Community-level energy efficiency and RE projects, using a range of technologies, will play an important role in the energy transition.

Sustainable Energy Communities

A Sustainable Energy Community (SEC) is a community in which everyone works together to develop a sustainable energy system for the benefit of the community. This is achieved by: aiming, as far as possible, to be energy efficient; using renewable energy where feasible; and embracing smart energy technologies (REF??). The International Energy Agency (IEA) recommends that governments treat energy efficiency as the “*first fuel*” in their energy mix [2]. The most cost effective energy is the energy that is not used. IEA analysis demonstrates that energy efficiency has the potential to support economic growth, enhance social development, advance environmental sustainability, ensure energy system security and help to build wealth [9]. Romero-Rubio & Diaz [10] define SECs as organisations whose members are strongly involved in the planning and implementation of measures aimed at the rational use of energy, and the introduction of RES in the production, consumption and/or supply of electricity, thermal energy, mechanical energy or fuels. It is desirable, in addition to energy related measures, the SEC establish other measures aimed at the rational use of water and other local resource, such as recycling and valorisation of waste.

SEAI¹'s Sustainable Energy Communities Model

There are five steps to the Irish SEC Model once the community group is established and after interest in joining the SEC network has been expressed [11]. They are:

1. **Commit.** The first stage of the proposed model is to develop a community charter and sign a three year agreement with SEAI. SEAI have supports in place to develop a *Master Energy Plan*
2. **Identify.** The second stage is to commence the *Master Energy Plan with SEAI, and explore the options within the project*
3. **Plan.** This stage involves putting together a programme of activities based on the *Master Energy Plan*. An assessment of the core competencies that will assist the transition will be carried out. The resources and skills that have been identified following consultation with 24 community energy champions are: strong partnerships/local energy champions, integrated planning, strategic financing, energy efficiency, renewable energy, smart energy and sustainable transport.
4. **Take action.** This stage allows for deeper community engagement, and the implementation of “quick energy wins”. Communities also report on the on the energy saving measures adopted so far and assess these measures. There is a link in this stage of the SEC model to the existing SEAI “*Better Energy Community*” (BEC) Programme² that has operated since 2012. In 2017, the BEC provided €25m in direct funding to a total investment in energy efficiency is almost €100 million, supporting more than 700 direct and indirect jobs right across the country. This year's funding will provide for

¹ The Sustainable Energy Authority of Ireland (SEAI) was established in 2002, and its mission is to play a leading role in transforming Ireland into a society based on sustainable energy structures, technologies and practices.

² <https://www.seai.ie/grants/community-grants/> accessed September 13th 2017.

energy efficiency upgrades to more than 2,600 homes and almost 300 community and commercial facilities.

5. **Review.** The final stage is to assess the impacts and share the learnings throughout the network.

The process then repeats for the communities and further energy saving measures are adopted each year over the three year period. The funding and supports that are available are as follows:

Table 3: Actual figures of Irelands 2020 targets and current levels [4].

Year	Type of Support Available	Can include the following	Amount Available
Year 1	Energy Master Plan	Community Mentor: a mentor will be assigned (if needed) to each SEC. The mentor will support the energy charter, plan the proposed work development, and support the preparation of the Energy Master Plan.	€10,000 - €25,000
Year 1-3	Energy Competencies	Technical Advisors: there will be three panels put in place that will help the SECs to upskill on the core competencies identified in Stage 3 of the model. Panel 1: Partnerships/Energy Champion, Planning Panel 2: Strategic Financing Panel 3: Energy Efficiency, Renewables, Smart Energy, Sustainable Transport	€32,000- €128,000

SEAI will sign three year partnership agreements to support communities develop SECs. This partnership approach allows each SEC to provide local knowledge, time and people; whilst SEAI will assist with supports like skills development, funding and access to a technical support panel. There are now 101 communities signed up to the SEC programme nationally since the launch in early 2016, and rollout is ongoing. All eight of the Regional Authority regions are involved, and the SECs are a variety of structures and sizes.

The benefits derived from the SEC networks are:

- Social: 65% of SEC’s involved new partnerships across public, private and community sectors; these multi-stakeholder mechanisms are key to project delivery. Projects can address energy poverty and improve social wellbeing and cohesion.
- Economic: SEC initiatives produce financial savings due to reduced energy use and generate local employment. Innovative financing models can deliver sustainable, self-financing projects.
- Energy: SEC initiatives produce real energy savings with 100’s of GWh of savings contributing to energy policy at different scales.

BARRIERS TO SUSTAINABLE ENERGY COMMUNITIES

There are issues of capacity among community bodies, in terms of time, expertise (financial and technical) and bargaining skills – both in managing the funds, and in negotiating with what are often major multinational developers when wind farms and proposals for community benefits first come forward [12]. As a result, there is some evidence of increases use being made of intermediary bodies, such as local partnerships, development trusts and energy or council agencies, both in negotiating with developers about community benefits, and in

assisting or administering community. The levels of community acceptance increase if some/all of the following barriers are addressed [13] [14].

1. **Community Ownership:** The need for those who contribute to and accommodate community energy projects to also reap the financial and social benefits they can bring, such as job creation, financial rewards and improved security of supply appears to be a widely held stance which is almost universally supported in the literature [1] [15] [16] [17]. In areas of Mainland Europe, the concept of community ownership has proved successful at incentivising the use of medium to large scale wind energy installations. For instance, as much as 80% of Denmark's wind energy capacity is owned by some sort of community partnership [1]. Compare this to Ireland where there is currently only one community owned wind farm in Templederry, County Tipperary with a capacity of 3.9MW. There is currently 3025MW of installed wind capacity in Ireland [4]. This equates to 0.12%.
2. **Community/Stakeholder Engagement:** Citizen engagement is considered to be the best way to obtain public acceptance of energy systems [18]. Citizen engagement and social acceptance are composed of an attitude towards renewable technologies, and both are deemed essential in the transformation of the energy supply system [7] [15]. The complexities of community engagement with the energy issue have been earmarked for considerable focus in the coming year [8]. Wolsink [19] noted that factors such as emotional and cultural relationship between people and location play a highly significant part in the degree of acceptance in addition to economic factors.
3. **Overcome local mistrust.** The complexities of community engagement with the energy issue have been earmarked for considerable focus in the coming years [8]. However, the Irish policy approach to community energy projects is haunted by a legacy of tensions and mistrust on the part of the communities [20]. In the European context of a privatized and de-regulated energy market, "intermediary organisations" play an increasingly important role, operating between national governments, energy suppliers and energy consumers; "intermediaries" are broadly defined as groups that operate in the space between policy makers, energy providers and energy consumers. Energy Intermediaries have been the subject of extensive research and analysis through the "*Changing Behaviour*" project³. Backhaus [21] states that the innovative role of intermediaries in the energy and environmental sectors can be described as one of "bottom-up" policy implementers.
4. **Financial support:** The role of economics and project finance has a significant (arguably even divisive) impact when it comes to sustainable development and in particular renewable energy [1]. Each renewable energy technology has both performance and economic characteristics which make them suitable for some applications and not suitable for others. The cost of highly autonomous energy supply systems is both one of their main disadvantages and one of the main advantages [22]. The initial capital and installation costs of small scale renewables are typically high in relation to traditional, centralised energy supplies in terms of €/kW capacity installed. The renewable energy financial competitiveness has improved in recent years, due largely to decreasing production costs and higher efficiencies for RE, and increasing cost of fossil fuels.
5. **Access to technical expertise and knowledge:** Communities often experience issues such as a lack of time, expertise (both financial, technical and equipment) [1] [15] and bargaining

³ The full title of this EC FP7-funded project is 'Contextualising behavioural change in energy programmes involving intermediaries and policymaking organizations working towards changing behaviour'. For more information, please visit www.energychange.info.

skills – both in managing the funds, and in negotiating with what are often major multinational developers when wind farms and proposals for community benefits first come forward [12]. Small, highly localised bodies operating at community council scale may not, of themselves, be able to facilitate the delivery of large scale projects, or respond to the demands of diffuse communities of interest and anticipate the future generations of a locality.

CASE STUDY: The Erris Community: Becoming an SEC

Erris is located in the North West region of County Mayo. It covers an area of 850 km² and has a population of only 10,000 people, giving it the lowest population density in Western Europe (Erris is a similar size to Rome with a population of 2.5m). It is a small rural area with huge natural resource potential due to an abundance of wind, wave, solar, and seaweed. There is a strong community spirit that is evident in all aspects of daily life here. Údarás na Gaeltachta are responsible for the Economic, Social and Cultural Development of the Gaeltacht. They administer the Social Employment schemes in the Gaeltacht area, for example: the Rural Social Scheme, Tús and the Community Employment scheme⁴.

SEAI's Better Energy Community (BEC) Programme was initiated in 2012 as a pilot project with a budget of €3m; since then it has grown to a budget of €30m in 2017 supporting over €100m of energy efficiency projects throughout Ireland (see Figure 1 below). The BEC programme objective is to support project structures that can be easily replicated, and hope to showcase retrofit project models that can be implemented without SEAI support in the future. The International Energy Agency (IEA) recommends that governments treat energy efficiency as the “*first fuel*” in their energy mix [2]. Energy efficiency is the first option within the BEC model so it is following best practice with the IEA.

	2016	2012-2016
No of successful projects	37	298
Applications received	63	493
Homes	2050	12,400
Non-Domestic	405	1300
GW hrs of energy saved	67	306
SEAI Grants	€18 M	€85 M
Estimated project costs	€45 M	€170 M
Average Grant Support	41%	50%

Figure 1: BEC Overview 2012-2016.

Initiation of the BEC Programme:

⁴ There are approximately 2000 people employed nationwide of which there are 150 in Erris and 100 associated community groups.

Since 2014, Údarás na Gaeltachta has engaged with the BEC process. Throughout this period, almost €3m has been invested in energy efficiency and renewable energy upgrades throughout the Gaeltacht resulting in over €500,000 worth of energy savings. The community of Erris in Co Mayo has engaged in energy saving measures since 2014 including the following: installation of energy efficient upgrades for buildings in the area (including all types of insulation, fabric upgrades, heating upgrades); adoption of renewable energy technologies (photo voltaic (PV) cell arrays to produce electricity, solar hot water panels, heat pumps, electric vehicles, wind turbines); distributive generation (microgrid demo site to include PV/wind); and smart grid technologies (smart meters, intelligent building controls). See Table 4 below.

Table 4: BEC Project measures 2014-2016.

Year	Projects completed
2014 14 Community Groups	2 electric vans for local “Meals on Wheels” 2 x 7kW PV arrays 10 buildings insulated 9 buildings heating system upgrades 7 buildings LED lighting 28 Quantum storage Heaters
2015 10 Community Groups	Western Care (Adults with Intellectual Disabilities) 3 building upgraded Irish Wheelchair Association 11kW PV array 6 National Schools retrofitted (link to publication?) Micro grid incorporating 11 kW PV, 6 kW battery, 3 x Glen Dimplex storage heaters
2016 50 home owners in energy poor homes	Doors and windows replaced LED lighting replacements Attic, cavity, internal and external insulation New heating systems Solar hot water systems €19,000 per year saved overall with an average of €380 per house

This bottom up approach is working with real energy savings outlined in Table 5 below.

Table 5: BEC financial figures 2014-2016.

Year	Cost for energy retrofitting	Structure of Funding	KWhs Saved	Electrical Savings per year (15c/kWh)	Thermal Savings per year (5c/kWh)
2014	€340,163	50% SEAI BEC 40% Community Gain Fund 10% Community Groups	194,143	€29,121.45	n/a
2015	€385,729	50% SEAI BEC 40% Community Gain Fund 10% Community Groups	323,624	€48,543.60	n/a
2016	€402,777	80% SEAI BEC 20% Home Owners	373,470	n/a	€18,673.50

CONCLUSIONS

The SEC model addresses each of the barriers and directly addresses the problem that communities face due to the lack of sufficient capacity at the start of the energy transition process. The SEC model also helps communities that may be at a disadvantage during the grant application process due to difficulties in completing the lengthy application form, engaging with stakeholders, and splitting their time between remunerative work and spending unpaid

volunteer time on the application. The community development literature encourages networking between communities with established communities and start-ups (mentoring service); and between communities and other partners to share skills and resources; running workshops using established community energy producers' experience and knowledge; providing information about external resources (finance equipment, training); and development officer services. The SEC model incorporates all of these activities (see Table 6 below).

Table 6: SEC barriers and the Irish SEC model

Barriers to Overcome	Irish SEC Model
Community Ownership	Ownership (Community Charter and Master Plan)
Community/Stakeholder Engagement	Addressed throughout the entire process Bottom up approach, grassroots approach SECs are community led, community ran and community focussed 3 year partnership agreements in place
Overcome local mistrust.	Addressed throughout the entire process Community mentors in place SECs are community led, community ran and community focussed 3 year partnership agreements in place
Financial support	Addressed throughout the entire process Financial support: (look at funding available in Table 3) Access to Expertise: technical mentors are available throughout Core competency Skills development
Access to technical expertise and knowledge	Addressed throughout the entire process Access to Expertise: technical mentors are available Core competency Skills development

The benefits derived from the SEC Partnership Agreement are:

- It enables the community group to access technical supports to guide the group through a structured process of identifying and carrying out sustainable energy initiatives in their community
- It means that the community group will be eligible to apply for dedicated SEAI funding to realise their sustainable energy ambitions
- It provides the community group with the opportunity to share knowledge and insight and to meet with other members who are carrying out a diversity of energy efficiency projects.

The SECs will also have access to the dedicated SEC network. This is a support framework designed to enable a better understanding of how communities use energy and to save energy across all sectors. The core purpose is to catalyse a national movement across the country, and the advantages of becoming a member include access to the knowledge, learning from site visits, seminars, events and case studies.

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