The Global Status Of Green Electricity Tariffs

A Lower Carbon Futures Working Paper

Preface

This working paper looks at global markets for green electricity tariffs and encompasses all developed countries where the products are sold. The purpose of this paper is to provide a source of reference for those interested in taking a global view of markets for green electricity products. As well as the condition of markets in each country, any relevant state and non-state regulation is also outlined. Regions where the tariffs have been particularly popular are studied in greater depth than others where the tariffs may be more niche or newer to the market. This is not to suggest a bias towards certain case studies or countries, simply that there may be more of a story to tell in some rather than others. The paper is also limited to residential green source electricity products. There are some countries where businesses are able to purchase green electricity and residential consumers can't, such as Japan. Where relevant, any interaction effects between the two markets will be noted.

One theme which emerges from looking across all of the countries studied, is the lack of a consistent pattern between cases. There are considerable variations in regulation, consumer uptake and the type of retailers offering tariffs. Further analysis is needed in order to extrapolate what lessons can be learnt from these case studies, and to determine whether green electricity tariffs can be an effective way for consumers to support the development of renewable energy.

This working paper is written at a time of flux, where energy markets across the world are undergoing a transformation and are being disrupted by smart and distributed technologies. While the green electricity tariffs studied in this paper are primarily sold by retailers to consumers, there are a growing number of companies operating on a community and co-operative basis that may prove to be important in the future energy system. The case study looking at Australian experiences particularly reflects this, with some consumers choosing solar PV installations rather than a green electricity tariff.

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Please direct any correspondence to the author at scott.macdonald@oriel.ox.ac.uk.

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Introduction

Green electricity tariffs remain a relatively understudied mechanism for increasing the supply of renewables in the electricity mix. This introduction will explain the concept of green electricity tariffs, and will introduce a couple of the main themes in the current literature.

Most mechanisms to increase the amount of renewable energy being generated focus on the supply side of the industry, either subsidising generation through feed-in-tariffs or obliging energy companies to purchase a certain proportion of green electricity. There is another mechanism however which might provide a more sustainable and equitable solution, and which focuses on the demand side of green electricity. That mechanism is green tariffs sold to consumers. These products can support green electricity in two ways, either by creating a market for green electricity which then incentivises investment in renewables or by contributing to a an environmental fund. The tariffs also have other associated co-benefits for consumers such as greater engagement with electricity usage and increased energy literacy .

Arriving at a precise definition of Green Tariffs is problematic, as different countries have different types of products available. Sometimes this depends as much on the particular business models which happened to be successful as the regulatory regimes, which sometimes may encourage some types of product over others. There most broad way to categorise the products is between “green supply”, “green fund” (Lipp 2000) and “uncoupled carbon offset” types of products. Green supply products are where the electricity sold to consumers is matched to green electricity purchased by the retailer, usually averaged over a year to counter the problems of intermittency of some renewables. Green fund tariffs are those where the consumer may receive conventionally generated electricity, but a set amount per kWh goes to projects which support the development of renewables or help the environment more generally. The third type are uncoupled carbon offset products, this is where a company which is not the electricity retailer is paid to offset the carbon cost of the consumers’ electricity usage. This is different to other types of carbon offsetting as it is done in proportion to the consumers’ electricity usage, rather than in other arbitrary amounts. In practice, many products are a combination of the first two. This is partially because many jurisdictions, such as the UK and Ireland, only allow green supply products with an element of green fund to be classed as ‘green sourced tariffs’. In the author’s opinion a more important differentiation between product types is based on whether the retailer is vertically integrated and generates the energy they sell themselves or is just the retailer. It may be that retailers who also generate green electricity have greater levels of additionality, as the relationship between supply and demand of the green electricity are more closely coupled. In this paper a broad definition is used, given the wide variety of products available in the different marketplaces around the world.

There is also an ongoing issue regarding the accreditation of green electricity tariffs; what types of electricity count as renewables, how that electricity should be tracked and certified, and how tradable the tracking certificates should be across borders. There are ongoing debates about whether green electricity certificates should be traceable across the European Single Market, given some countries have a large proportion of green electricity and in others it needs to be subsidised heavily by bill payers.

There is also a wider issue regarding the extent to which a voluntary electricity tariff could ever provide enough support for renewables (Akcura 2013) and whether the types of green source products available on the market really lead to any more green electricity being sold (Gillenwater 2014). This is also related to the issue of the interaction between voluntary and mandatory schemes, especially when the electricity sold to consumers is subsidised by all other bill payers.

Useful terms

Below are definitions of some terms which will be used frequently in this working paper.

Deregulated electricity markets

See: liberalised electricity market. The term may be slightly misleading as ‘deregulated’ markets are often highly regulated by the energy regulator.

Eco-label

A label which can be applied to a product to certify certain environmental credentials. In the context of green electricity this usually means the product has been certified by either the government or a non-governmental organisation. In other markets the “Fair Trade” label for coffee or “MSC Certified” label for fish would be good examples of successful eco-labels.

Green electricity tariff

Mechanisms by which consumers can purchase green electricity as part of their tariff and in proportion to their usage.

Guarantee of origin (GO)

An EU wide system for the tracking of the sources of green electricity. The certificates are used to prove that green electricity sold to consumers is matched to green electricity that is generated. Some countries also have their own certification schemes, with other certificates also being created when green electricity is generated.

Hybrid market

A market which contains both a free market element and a regulated element, such as a default government set tariff.

Liberalised electricity market

Markets which have transitioned from a state owned monopoly to a private competitive market model.

Non-governmental regulation

Systems of voluntary regulation which are independent of government. In the context of green tariffs this mainly refers to voluntary labels or certification schemes.

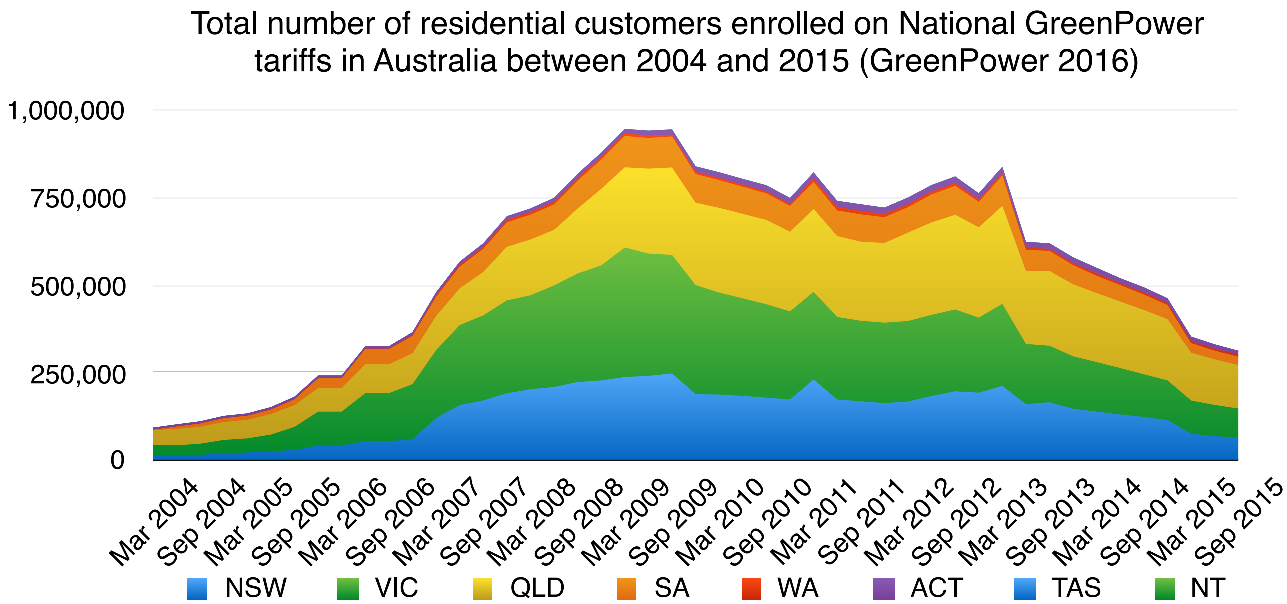
Specific regulation

This refers to regulation which is directly aimed at green tariffs, as opposed to general rules on disclosure or marketing which are applicable to the whole electricity market.

Australia

Retail Electricity Market Overview

As in other federal systems, retail markets in Australia are regulated at the state level. Since mid-2015 some states, Queensland, New South Wales, Australian Capital Territory, Tasmania and South Australia, have adopted the National Energy Customer Framework. These reforms were adopted to simplify the ways in which the state markets are regulated. In some states the government is partially responsible for controlling energy prices. In these states (Queensland, ACT and Tasmania) consumers are able to purchase a contract at a regulated electricity price that is set by the government. Switching rates are high across all states, but are noticeably higher in states that don't have government regulated pricing.



Green Electricity in Australia

Australia was one of the first countries to see significant amounts of renewable electricity sold to residential consumers on a voluntary basis. The primarily mechanism encouraging this was the National Green Power Accreditation Program. The Program accredits renewable electricity generators and certifies green retail electricity products. Since its founding in 1997 the program has been credited with growing renewable electricity generation by 8.6% (ISF 2015). This was particularly important before the government's Renewable Energy Target, supporting investment in new small and large scale renewables, was implemented and when options for consumers to support renewable energy were limited. The scheme has been available to consumers in all the territories where retail competition allows switching between energy suppliers. At its peak the program had over 945,000 residential customers buying green electricity, over 10% of eligible households.

As the figure above shows, in recent years the program has suffered from falling customer numbers and a gradual decline in the number of generators accredited under the scheme. This fall in subscribers has been attributed to a number of factors including a failure to keep consumers engaged with the brand and the increased popularity of rooftop solar PV as a more visible way of supporting the environment. A study by Hobman et al (2015) undertakes consumer research that backs this hypothesis up, finding that consumers are less likely to subscribe for green tariffs if they are already engaging in other energy efficiency behaviour or renewable energy generation. Mewton and Cacho (2010) also find that while it is possible that advertising campaigns for GreenPower can be a cost effective measure to promote renewables, any other government policies such as tax breaks would be less efficient than if the government intervened at the supply end through direct purchasing of renewables.

Regulation

Apart from the National GreenPower accreditation scheme there is no other specific regulation. One continuing issue for the green electricity market is that as the GreenPower scheme is voluntary, there is nothing to stop other companies offering tariffs which claim environmental benefits that are not accredited under the program. A competing label called ‘GoldPower’, which was established by Climate Friendly and supported by the WWF, invests in renewable energy from countries with no Kyoto target. These tariffs are cheaper than GreenPower, which only includes generation from renewables within Australia. There are also other companies which claim environmental benefits for their tariffs, which are not accredited under any eco-label and are cheaper to purchase.

Belgium

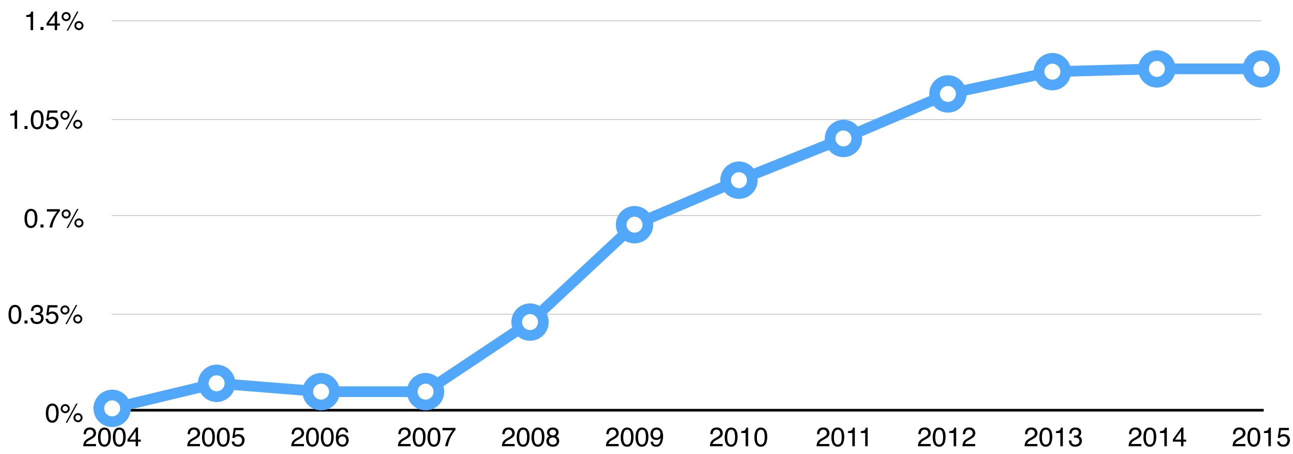
Retail Electricity Market Overview

The Belgian electricity market is regulated at the regional level, but in practice there are broadly similar regimes in place across the Flemish, Brussels-Capital and Wallonia regions. Across the whole country switching is among the highest in the EU, and is ranked in the top five on the perception of the ease of switching (EC 2013). Since 2012 the market has become more competitive, with more switching taking place. This is due to several factors including: revision of the energy law to increase the ease of switching, a campaign organised jointly with local communes to promote energy comparison, and the promotion of collective and joint energy purchasing (ENER Belgium 2016).

Green Tariffs in Belgium

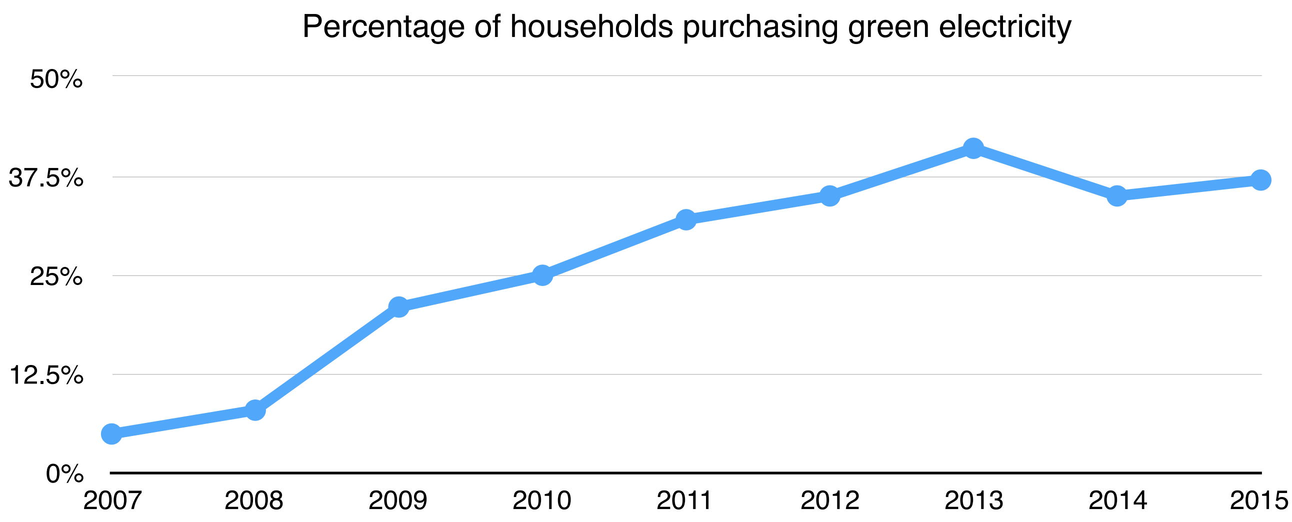
There are two main way to purchase green electricity as a consumer. The first is to join and then purchase electricity from a co-operative such as Ecopower. The co-operative invests in renewable energy capacity, which is then provided at a cost to consumers which is cheaper than conventional suppliers. Each month Ecopower submits guarantees or origin (GOs) to the regulator to prove the source of their energy. As the graph below shows, even though Ecopower has grown significantly since 2007, its market share is currently still only at 1.23% (VREG 2016).

Ecopower market share 2004-2015 by percentage of access points supplied



The second way is to purchase green power from a retailer who has purchased GOs for renewable energy. Suppliers are only able to label their electricity as ‘green’ if they have purchased enough corresponding GOs. It is unclear the extent to which there is environmental benefit in the second type of supplier, as there isn’t any differentiation between different types of GO. Green tariffs are offered by each of the main suppliers, with products that include both 100% green and lesser amounts. As the graph below shows, the number of households purchasing green electricity currently stands at 37%.

The increase in 2013 is due to an anomalous result in the market research which produced these figures. The regulator estimates a more correct figure to be 35%, which is equal to the years before and after.



Regulation of tariffs

Green electricity tariffs are regulated in Belgium. Suppliers are only able to label their electricity as 'green' if they have purchased enough corresponding guarantees of origin (GOs). It is unclear the extent to which the green tariffs have an environmental benefit in this scenario as there is no differentiation between different types of GO. Co-operatives such as Ecopower are also required to submit GOs to the regulator in order to prove the source of their electricity.

Canada

Retail Electricity Market Overview

As in the USA and Australia, electricity markets are multi-jurisdictional. Provincial and territorial governments are responsible for the majority of market regulation including resource management within their boundaries and the generation and transmission of electrical energy (CEA 2013). Only Ontario and Alberta have deregulated markets, so only those two will be considered in detail here. Ontario has a hybrid retail electricity market. This means that consumers can choose to purchase electricity from their local distributor, this is usually at a price that is centrally regulated. Alternatively, it is also possible for consumers to sign separate contracts with electricity retailers and enter into the free market. Like Ontario, Alberta also has a hybrid market. 44% of consumers in Alberta have switched from the Regulated Rate Option onto a competitive contract (MSA 2015).

Green Tariffs in Canada

There are many companies in both Ontario and Alberta which sell green electricity tariffs, due to a lack of data it is unclear how many consumers subscribe to each of these tariffs. As well as traditional green electricity tariffs, there are also several suppliers which sell 'uncoupled' energy products. These types of product allows consumers to proportionally offset the carbon emissions of their electricity supply, but without changing their current electricity provider or tariff. The largest of these is Bullfrog energy, which now supplies 10,000 individuals and 1,200 business with green electricity (Bullfrog Energy 2015). These tariffs may be a unique solution to allow consumers in states where there is no competition in electricity markets to purchase green electricity. As markets become more competitive it will be interesting to see if these is a shift towards more conventional green electricity products, evidenced perhaps by the recent move by Bullfrog Power to apply for an electricity retailing license.

Regulation of tariffs

There are two predominant voluntary eco-labels for green electricity, the EcoLogo and Green-E. EcoLogo is native to Canada whereas Green-E originated in the US and has since expanded. There is no specific regulation implemented by central government. In order to gain credibility most green electricity suppliers also undertake external auditing to ensure that the energy sold is from a green supply. There is also an important issue of cross-border trade with the US, as some green electricity sold in the US may be backed up by hydropower from Canada.

Denmark

Retail Electricity Market Overview

Households have been able to choose their electricity suppliers since 2003 (Bird et al. 2002). Denmark's retail electricity market has a relatively low level of consumer engagement and a switching rate of 7.2% in 2015 (Energinet.dk 2016) . In an attempt to solve this issue, from 1st October 2015 the electricity retail market has been changed to a supplier centric system and regulated prices were ceased (ENER, Denmark 2015). Regulated prices have previously been dominant in the market, with between 90% and 95% of consumers remaining on regulated tariffs in 2012.

Green Tariffs in Denmark

There are many different retailers offering a variety of different types of products. Details of the different types of products, and how they are regulated is below. Currently around 6% of households have subscribed to green tariffs. As of March 2016 there were fifteen green tariffs available on the market, some of which have price premiums as small as £25 (240 Danish Krone) a year.

Regulation of tariffs

There is specific and uniquely complex regulation for green tariffs in Denmark, with a regulator energienet.dk that administers and regulates the products (RE-DISS Denmark 2015). There are three possible types of product with six options in total (Bröckl 2011), see below. This does mean that there are several different types of products available on the market, and comparisons as a consumer looks to be difficult. One website does rank each of the products available by their environmental attributes (Ecological Council 2016). However, the methodology isn't fully explained and it is questionable how useful it would be to compare a product which only includes a monthly £1.70 contribution to a renewables fund to a product which is based on purchasing carbon offsets. There is no national eco-label for electricity. Instead each supplier has their own label, and even the Swedish Bra Miljöval label is in use to a minor extent.

Types of green electricity product available in the Danish market

1. CO2 reduction
    a. *Cancellation of CO 2 allowances or credits*
    b. *CO2 reduction from voluntary projects on a global scale*
2. Contribution to a renewable energy fund to promote further development
3. Guarantees of origin
    a. *From maximum 2 years old renewable energy*
    b. *From more than 10 year old renewable energy*
    c. *From renewable energy without age restriction*

Finland

Retail Electricity Market Overview

Consumers in Finland are able to freely select their retail electricity supplier and there is no regulation of prices by government. Switching and consumer engagement is about average across the electricity market as a whole, with 9.8% of consumers switching in 2014 (ENER, Finland 2015). No single supplier dominates the market, with the market share of the three largest suppliers at around 35-40%. The vast majority of households have smart meters, over 97% since 2013.

Green Tariffs in Finland

All consumers have been able to buy green electricity since 1998 (Salmela & Varho 2006). The market is highly varied and fragmented, with many competing products and labels. Some products are sold without any certificates or labels and some only feature one resource such as wind power. There is also a co-operative called Lumituuli which develops wind farms and sells the energy back to its shareholders. Currently it only has around 1200 shareholders, so it is far more niche than its Belgian counterpart Ecopower (Hast et al. 2015). On average green electricity is around 0–2% more expensive than standard electricity. However the cheapest green tariffs can be cheaper than standard tariffs. In 2010 8% of consumers were on green tariffs. This dropped to 2% in 2011 due to a change of criteria of the labelling scheme EKOenergy and changes in the labelling of hydropower products of the large company Fortum. While more accurate subscriber numbers are not yet available, EKOenergy believes it currently supplies 2-4% of households in Finland in 2015.

The share of hydropower in the overall energy mix is very high, so often consumers are supplied with green energy without specifically opting in. There is also an ongoing debate about the extent to which hydropower should be sold as green electricity, due to its possible environmental impact and its higher profitability compared to other technologies such as solar and wind.

Regulation of tariffs

There is both state and non-state governance of green electricity tariffs in Finland. One of the largest non-state certification bodies is EKOenergy, a pan-european labelling scheme that originated in Finland. Since its launch in 2012 the scheme has grown to cover the majority of European countries and in 2015 it accredited over 1 TWh of electricity (EKOenergy 2016). It is managed by the Finnish Association for Nature Conservation and energy can be labelled if the production meets certain environmental criteria. The label can be used by producers, suppliers or companies that buy eco labeled energy. Suppliers have to pay a set amount per kWh of energy sold to the EKOenergy Climate

Fund. In Finland these funds are used for projects such as river restoration in order to reduce the harmful effects of hydropower. For more on EKOEnergy see appendix ii.

France

Retail Electricity Market Overview

Since July 2007 consumers are able to freely switch between suppliers in France, as the market is fully liberalised. Consumer perception of the ease of switching is relatively high, slightly above the UK. Consumers can choose to either sign up to regulated prices, set centrally by government, or to a market where the rates are freely set by suppliers. The regulated market continues to be dominant with, as of 2014, 90% of consumers and 93% of consumption (ENER, France 2015). EDF is the dominant electricity supplier, with only one other supplier having a market share of over 5%.

Green Tariffs in France

Households are able to purchase green electricity from a variety of suppliers. Current enrolment is estimated to stand at around 1%. As in several other European countries, it is possible to purchase green electricity as part of a cooperative through ‘Enercoop’. As of mid-2014, Enercoop had 25,000 enrolled consumers (Enercoop 2016). This is significantly lower than it’s counterpart in Belgium, Ecopower, which has over double this amount in a much smaller market.

Regulation of tariffs

The regulator (CRE) has minimum standards for “green” products. Suppliers must hold sufficient guarantee of origin certificates to support the amount of renewables they sell to consumers. Only the original certification guarantees have value, they cannot be delivered separately from the electricity with which they are associated. While there was previously a domestic label, “Electricite Verte” (PWC 2009 p106), this now has been retired. The pan-european EKOenergy label has now launched in France, represented by Observ’ER.

Germany

Retail Electricity Market Overview

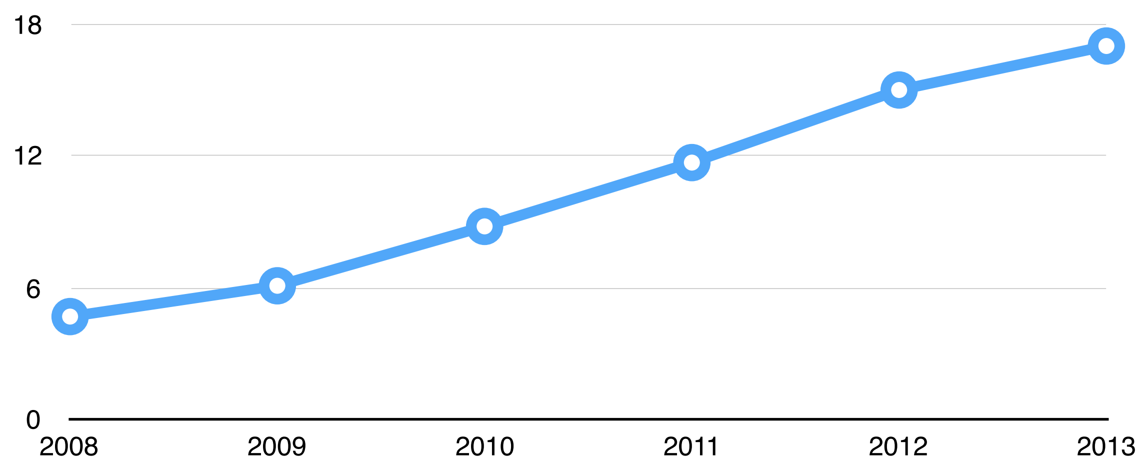
Germany has a competitive electricity market with over 1000 suppliers. Consumer prices are relatively high, due in part to the cost of supporting renewables and other taxes to support energy efficiency. In 2014 the volume-based supplier switching rate for households was 9% (Federal Network Agency 2015). Germany is notable for the large amount of renewables which have been installed in recent years. The cost of this has fallen mostly on consumers, with taxes, surcharges and levies accounting for 52% of electricity prices. While it has been previously suggested that this might limit the growth of the green electricity market (Bird et al., 2002), this doesn't seem to have been the case.

Green tariffs in Germany

A very large number of suppliers sell green energy. In 2013 17% of households purchased green electricity, with more recent data not being readily available due to an error in the regulator's data collection (Federal Network Agency 2015). The average price for green electricity, across 740 companies that provided data on tariffs, was €0.2875/kWh. This is €0.0738 per kWh more expensive than the alternative grey electricity supply. Though it is worth noting that the electricity price for green electricity has been decreasing. Other estimates place the size of the market at up to 21% (Gesternova 2015). There is a concern among some market commentators that the green electricity sold is obtained from Norwegian Hydropower rather than domestic generation, and hence that there may be little added environmental benefit.

Green electricity sales by number of household customers 2008 - 2013

(Source: Federal Network Agency 2015)



Regulation of Tariffs

While there isn't any specific regulation related to green products, they are covered by the general EU regulations concerning electricity labelling which require companies to disclose to end consumers the mix of their electricity supply. For more information on common EU labelling regulations, see the appropriate later section. There are several green electricity labels present in the market, one of which has been certified by the Europe wide EKOenergy label.

Republic of Ireland

Retail Electricity Market Overview

Households are able to switch electricity suppliers freely, with market regulations broadly similar to those in the UK. Electricity markets have been fully liberalised since 2011 and switching rates are 14% (CER Ireland 2015a).There appears to be very little competition in the market with only a handful of suppliers.

Green tariffs in Ireland

Currently there is only one residential green source product on the market, which is offered by the large retailer 'Electric Ireland'. In the third quarter of 2015 the company had 1.2 million customers and a 60.5% market share (CER Ireland 2016), though there is presently no data available regarding the number of subscribers to its green tariffs. It is estimated by the author[1] that around 2% of Electric Ireland's consumers have opted into its green tariff. This would mean that around 1.2% of consumers are subscribed to green tariffs.

Regulation of Tariffs

The Irish Commission for Electricity Regulation (CER) has recently announced plans to regulate Green Source products. This was mainly prompted by a need for increased consumer protection, as well as a likely response to similar changes in regulation made across Europe and in the UK in particular. The government has oped for a regulatory approach, with green Source Products now needing to be verified by the Single Market Electricity Operator (SEMO) (CER Ireland 2015b). The process will be overseen by the CER which will publish reports on the outcome of the verification process. Suppliers offering green source products will be required to allocate government (PSO) supported renewable generation equally amongst all their customers. It is unclear what impact this will have on the electricity sold by Electric Ireland. Though several months on from the decision paper they are still offering products, it is unclear whether this will continue in the future.

[1] Estimation is based on the market share of the supplier and the likely percentage of customers on the green tariff, based on similar suppliers in other jurisdictions.

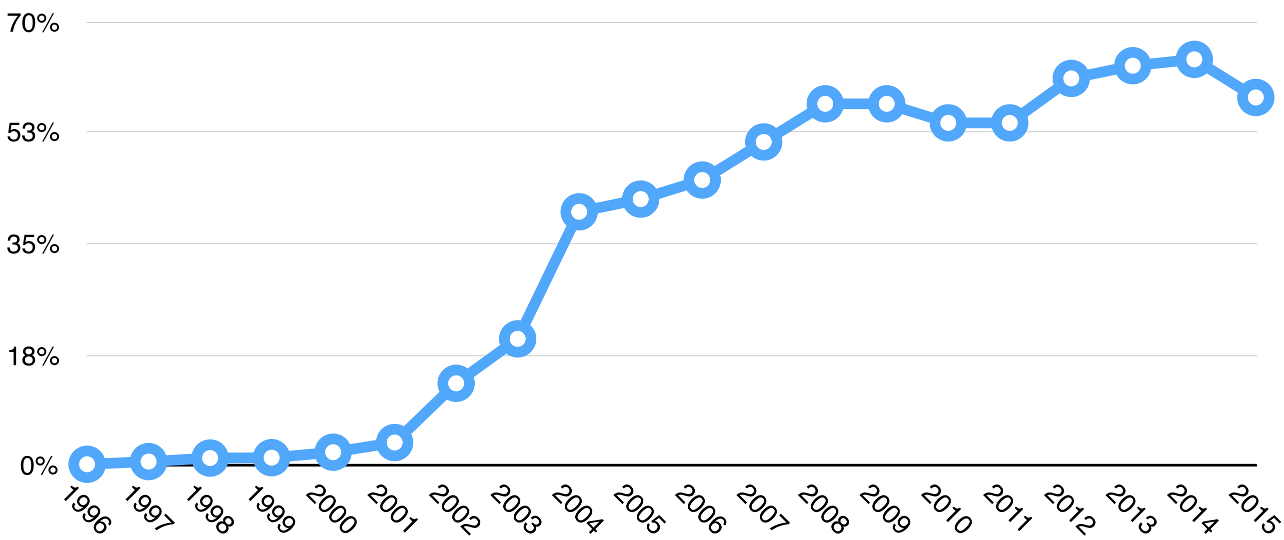
Netherlands

Retail Electricity Market Overview

The Netherlands has had liberalised electricity markets since 1998 and the process of liberalisation was designed specifically to encourage switching to green electricity tariffs (Van Rooijen 2006). Consumer switching rates are very high and in the past 10 years 55% of consumers have switched at least once (ACM 2014). A relatively low proportion of electricity generated is from renewables, only 10% in 2014 (Eurostat 2014), interesting given the very high proportion of households which have purchased green electricity tariffs.

Green Electricity Tariffs in the Netherlands

In the first half of 2015 58% of Dutch consumers had a green power contract for their electricity (ACM 2015). This is by far the highest recorded enrolment out of any country in the world, though it's six percent less than at the same time in 2014. The products are offered by many suppliers and are often sold at a very low price premium. There were a number of factors which have contributed to the success of the scheme in the Netherlands, which will be briefly outlined below.



Percentage of households purchasing green electricity 1996-2015
(% of households, various data sources)

The most important policy mechanism put in place to encourage the uptake of green electricity tariffs was the 1996 'ecotax'. This was a levy that was placed on all electricity usage and had the effect of increasing all energy prices for consumers (Linderhof et al 2003). Green electricity purchased by consumers was exempt from the tax, which made green electricity comparable to, or sometimes cheaper than, grey electricity. This was especially true after 2001 when the price increased from 2-3 to over 6 euro cents per kWh. The tax was phased out in 2005 and was replaced by a new feed in tariff, a more conventional supply side policy. The tax was very successful in increasing demand and engaging consumers but, as will be explored later, its affect on installed capacity was far less clear.

The liberalisation of electricity markets helped to encourage the adoption of green electricity in two main ways. First, the market for green electricity was opened before the market for grey electricity. This meant that many consumers' first experience of switching between retailers was in order to purchase green electricity. Second, and perhaps most importantly, was that retailers saw green characteristics as the main way to differentiate their product in the face of oncoming liberalisation (Hofman 2008). Because of this many retailers engaged in aggressive marketing campaigns to sell green electricity. These suppliers also partnered with NGOs such as the WWF to certify their electricity. The WWF also launched a campaign aimed at encouraging switching entitled 'Don't Let the North Pole Melt, Go for Green Electricity'. The campaign was large and was launched at a public event attended by 3000 volunteers who rolled out a 300 km long green ribbon along the Dutch coast line. There were also co-ordinated TV programs, volunteers giving out 250,000 flyers at train stations, and advertisements in national newspapers. The organisers claim that 20,000 new households purchased green electricity in the first three weeks of the campaign (WWF 2000).

The case study of the Netherlands is a model example of well marketed green electricity, robust support from government, and record enrolment rates. However, the actual impact on the installed capacity of renewables in the Netherlands may be less clear, with slow growth in generation from renewable sources. It has also become increasingly common for guarantee of origin certificates to be purchased from abroad, primarily from Norway where green energy is plentiful. This led to a situation where the majority of the green electricity that was being subsidised by the Dutch government was in fact being generated elsewhere. It was partly for this reason that the Ecotax exemptions were phased out by 2005.

Regulation

Green tariffs in the Netherlands are regulated on a voluntary basis, with most suppliers partnering with NGOs to provide certification of the tariffs they are offering. The voluntary Milieukeur label covers green electricity, though it also covers a large number of other products (such as both open field and covered crop blackberries), and uses a system that is backed up by GOs. There are some restrictions on what types of imported GOs can be included. Competing certification schemes such as Heir "real green power" or the 100% green anti-"sjoemelstroom" campaign run by WISE promote green electricity generated domestically with stricter regulations on additionality. There have been some concerns that the proliferation may reduce consumer understanding (ACM 2016).

New Zealand

Retail Electricity Market Overview

New Zealand has been reforming its electricity market to promote a competitive and efficiency electricity market since the 1980s (Ndebele & Marsh 2014). The switching rate for households is very high, with 20.2% of consumers switching supplier in 2014 (Keall 2015). It has also been previously estimated by other sources to be as high as 26%, the highest globally (VaasaEET 2013). The market is broken up regionally, with the number of suppliers available ranging from 9 to 21 in 2014 (NZ Electricity Authority 2016). There has also been a recent growth in smaller suppliers offering innovative products such as rates specifically aimed at electric vehicle owners. Many suppliers source a large percentage of their electricity from renewable sources, primarily hydro. Because of this, many consumers may be receiving a large proportion of their electricity from green sources without ever needing to opt into a green tariff. The electricity market is also characterised by a high level of vertical integration between generation and retail, with most consumers being able to associate their retailer with the main energy sources used to generate their electricity (Ndebele & Marsh 2014).

Green tariffs in New Zealand

Two large suppliers source their electricity directly entirely from renewables; Meridian Energy and Trust power. Together these two suppliers have a combined market share of 26%. One supplier also claims to be the only supplier to use 100% renewables, Ecotricity (not to be confused with the British supplier under the same name). This supplier is in the process of gaining certification under the carboNZero scheme, which is a carbon neutral business and product certification rather than explicitly a green source certification.

Regulation of green tariffs

There is no voluntary or government regulation of green source products (Smith 2015). Unlike other green source retailers across the world, the websites of the main retailers in New Zealand don't seem to be concerned about addressing concerns of the reliability of their electricity sourcing. This may explain to some extent, if consumers haven't been mislead in the past and generally trust the green electricity suppliers, why there is no additional regulation. Smith (2015) argues that the prevailing opinion is that electricity certification on a voluntary or compliance basis would not work in New Zealand given the high level of renewable electricity, the structure of the electricity industry, the dominance of wind in the future energy mix and the policy environment.

Portugal

Retail Electricity Market Overview

Due to the legacy of the previous monopolistic supply model and the only recent abolition of price regulation, the retail market continues to be concentrated and switching is relatively low (ERSE 2015). The three biggest companies in the liberalised market accounted for a total market share of 85% in 2013. In 2013 9.8% of consumers switched tariffs (EC 2013), a figure that has been steadily increasing over time since price regulation was abolished. Prices for consumers have also increased significantly in recent years, due to an increase in taxes and levies imposed by government to cover the costs of the liberalisation process and investment in renewables. Due to this government support, renewable energy represents a large percentage of generation in Portugal.

Green Electricity in Portugal

One large retailer, EDP, offers a green electricity tariff, which supplied 4000 households with green energy in 2015 (EDP 2015). This number has decreased since Q1 2011 when it was 5,664. The price premium is €0.0048/kWh.

Green Electricity regulation:

There is no specific regulation or labelling aimed specifically at green electricity sales. However, green tariffs are still included under the general disclosure regulations. All retailers are obligated to disclose the sources and environmental impacts of their electricity to customers. This is designed to facilitate consumer choice.

Slovenia

Retail Electricity Market Overview

Slovenia has had liberalised electricity markets since 2007, however it took a number of years before retail competition increased significantly. Unlike many other countries the market is dominated by many local suppliers, each of which is dominant in a specific area. This may have the effect that despite having a large number of suppliers, each with relatively small market shares, there is still little true competition. The switching rate is 9%, which has increased significantly since 2012 when GEN-I and Petrol entered into the household market segment and now have over 22% market share. Renewables make up a significant share of electricity generation, with 36% of the country's electricity generated from hydro power. Only 20% of electricity generation comes from thermoelectric power, with 37% coming from nuclear and the remaining 7% from other small scale renewables (Slovenian Energy Agency 2015).

Green Electricity Sales in Slovenia

All five regional incumbents offer their customers the possibility to buy green electricity (Zorić & Hrovatin 2012), however it is unclear the number of consumers which take up these tariffs. There is a brand of 'Blue Energy' started by the company HSE, which supplies electricity generated from hydro power . The blue energy offered by HSE has been certified by EKOenergy, the European eco-label founded in Finland. The price for 1 kWh of electricity from 'Blue Energy' programme is €0.00417 higher than the regular price. Part of the income from blue energy is collected in a fund for stimulation of R&D work and to fund new renewable capacity. Customers, under the blue energy scheme, are able to opt to have between 10% and 100% of their electricity from renewable sources (Buy Smart 2014). Households are also able to display the 'Blue Energy' stamp, however this seems to be more aimed at business users. Enrolment levels seem to be very low, with only 2000 subscribers across commercial and domestic subscribers.

Elektro Enerija, Slovenia's second biggest electricity supplier, also offers a green energy tariff under its 'Zelena Enerija' scheme (Elektro Energija 2016). This allows households to purchase 100% green electricity which is generated from small hydropower solar plants. There is a price premium of €0.001/kWh consumed. Some of the revenue also goes towards a fund which promotes renewables. The company does not disclose the number of consumers which have signed up to its green tariff.

Green Electricity regulation

There is specific government regulation concerning green tariffs. These primarily relate to disclosure and require retailers to disclose both the share and source of renewables in the standard electricity package as well as in the green package. As mentioned above, the ‘Blue Energy’ tariff conforms to the EKOenergy standard. This requires a higher level of disclosure and also places additional requirements onto the type of electricity sourced.

Spain

Retail Electricity Market Overview

Electricity markets have been liberalised since 2003, with all households eligible to choose their electricity supplier. From 1st April 2014 regulated pricing for 'small consumers' ended, and was made only available to vulnerable consumers and those which have not yet entered into a free market supply contract (CNMC 2015). The majority of consumers are still supplied under regulated tariffs and haven't opted into the free market. Competition continues to rise and an increasing number of consumers are switching away from the regulated tariffs. Switching rates are relatively high, with 11.75% of domestic consumers switching in 2014 (ibid p.36). Despite this increase in competition prices for consumers have increased significantly in recent years. There is some controversy about the scale of renewable energy being installed in Spain and the effect that it is having on consumer electricity prices.

Green electricity tariffs in Spain

Despite the controversy over green electricity subsidies there are several companies which are selling green electricity products. The large retailer EDP Energy counts for the majority of the green labelled electricity sold, which is matched with guarantees of origin (EDP 2015). Several small regional co-operatives such as Som Energia and Goiener also offer green tariffs, which are much smaller than others in Europe but are growing (Ines 2014). Based on available data from green electricity retailers in Spain, 4.4% of households are enrolled on green tariffs.

Regulation

There is no specific government regulation regarding the sale or labelling of green electricity in Spain. Sales of green electricity are subject to the same standards of conventional electricity, with labelling backed up by guarantees of origin.

Sweden

Retail Electricity Market Overview

Sweden has had a liberalised electricity market exposed to competition since 1996, with no price regulation (Olsen et al. 2006). It has relatively high levels of competition and consumer engagement, with 10.4% of customers switching electricity suppliers in 2014 (SEMI 2015). There is a very large number of suppliers, over 100. Consumers also benefit from an almost universal presence of smart meters, which may have the effect of increasing consumer interest and understanding of energy usage. The electricity generation mix is also predominantly low carbon. In 2014 8.7% was generated from conventional thermal sources, 41% from nuclear, 42% from hydro and 7.5% from wind (SCB 2015).

Green Electricity Market

Green electricity products are widely available in the marketplace, with around 50% of all suppliers offering green electricity tariffs. Green tariffs also make up the majority of product offerings, with 65% of the electricity tariffs registered with the electricity market regulator at the end of 2014 being green contracts (SEMI 2015). The latest consumer data available, from 2010, indicates that around 5% of households have signed up for green electricity tariffs and there doesn't seem to be much evidence that this has increased significantly (Bröckl et al 2011). While the Bra Miljöval scheme does not collect data on the number of consumers who purchase green power, in 2015 approximately 8TWh of electricity was sold under the label to domestic users, companies and government. This is equivalent to around 5% of total electricity consumption. This is relatively low compared to the number of green electricity products available. This may be explained by the low switching rates and consumers' reluctance to change electricity provider. There has also been no co-ordinated marketing campaigns aimed at promoting green energy labels.

Applicable Regulation

The main form of regulation for green tariffs in Sweden is voluntary, and based around the national Bra Miljöval eco-label. Only suppliers who provide a guarantee that their energy comes only from renewable sources are entitled by the Swedish Society for Nature conservation (SSNC) to market their electricity was eco-labeled electricity under the Bra Miljöval label. As well as requiring sufficient guarantees of origin, the label also has three types of additionality requirements. The tariffs must support energy efficiency improvements, fund environmental projects for hydro power and support investments into renewable energy.

Switzerland

Retail Electricity Market Overview

Electricity markets for households are still regulated. Initially liberalisation had been planned for 2014, but the date has been rescheduled several times. It is now expected to be in place by January 2018, though this may be subject to a referendum (Raemy 2015). Households currently purchase electricity from the local or regional supplier.

Green Electricity Market

Even though electricity markets are not yet liberalised, electricity retailers have been expecting it to take place for over a decade. One mechanism used by retailers to pre-empt the move to competitive markets has been to launch green electricity products (Hari, Karathanasis et al. 2008). This is perhaps similar to the experience in the Netherlands where companies competed on the basis of green supply rather than price. A large number of local and regional suppliers offer green electricity tariffs, some of which are certified under the Naturemade label . At most green electricity costs around 5 cents (€0.05) more per kilowatt than conventional electricity. In 2014 over 6.5% of the total volume of electricity sold in Switzerland was certified under the Naturemade 'basic' and 'star' labels (Naturemade 2014), however the percentage of this which is sold to domestic consumers is likely to be very small due to the lack of liberalisation in the marketplace and difficulty in signing up to the tariffs.

Applicable Regulation

The Naturemade label is the largest certification scheme for green electricity in Switzerland. It partners with both environmental NGOs such as the WWF and other external auditing bodies. Perhaps due to the large amount of hydropower installed, the scheme focuses on guaranteeing that renewables are sourced sustainably. Any additionality payments (the Ecological improvement fund) are aimed at ecology and the natural environment, rather than investing in more renewables. Only 45% of green source products are sold under the Naturemade label. There is also the TÜV SÜD standards and eco-label for green electricity which is available for consumers to purchase. While there is no specific government regulation for green tariffs, since 2005 there have been electricity disclosure rules backed up by a guarantee of origin system (FOE 2015).

United Kingdom

Retail Electricity Market Overview

Sales of green electricity products in the UK were made possible in 1999, after markets had been liberalised and consumers were able to switch between electricity providers (Boardman et al. 2006). Switching rates in 2015 were 8.8% (DECC 2016). Electricity prices are often a controversial subject in the UK, with the 'big six' electricity retailers systematically overcharging consumers (CMA 2015). In an attempt to rectify this problem through market mechanisms, currently government policy is to focus on improving switching rates through measures such as 24 hour switching times.

Green Electricity Market

The green electricity market in the UK has seen two distinct phases. The first phase, following liberalisation in 1999, saw both small and large electricity companies offering green electricity tariffs. The second phase, prompted largely by OFGEM's simplified tariff rules coming into force in 2014, saw the larger suppliers no longer offering green electricity products and the market dominated by small suppliers. This is still true today, with green electricity products being sold exclusively by a small number of niche retailers. Together they have an estimated market share of around 2% of all households.

Applicable Regulation

There have been three broad stages to the regulation of green electricity products in the UK. The first stage followed the first wave of liberalisation in 1999 and consisted of a scheme called Future Energy, which was set up and regulated by the Energy Saving Trust and backed by government (Lipp 2000). While it did accredit green tariffs, there were criticisms that they weren't 'green' enough. This was then followed by Friends of the Earth setting up their own league tables, which were subsequently stopped in 2004 due to lack of funding.

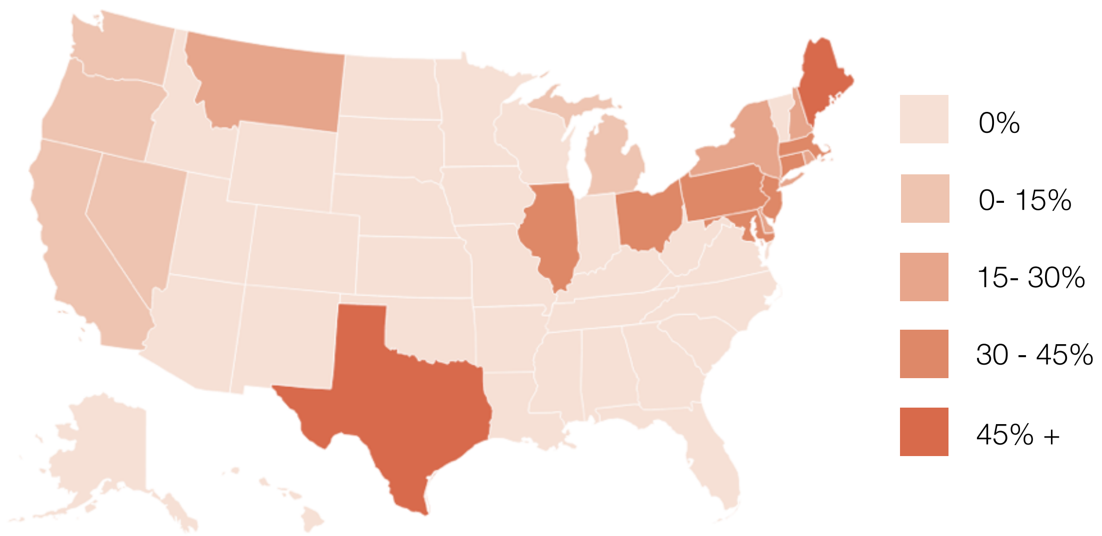
The second phase of regulation was another voluntary system called the Green Electricity Supply Certification Scheme. Under this system green electricity retailers were able to gain certification and were allowed to use the 'Certified Green Energy' label. The criteria were based on the 2009 OFGEM Green Supply Guidelines, which were incorporated into an agreed Rulebook. The scheme was closed in 2015 following the introduction of the third phase of regulation, OFGEM's direct regulation of Green Electricity products. The new regulations are compulsory for all retailers wishing to supply green source products to consumers in the UK. They set out a number of criteria relating to transparency, traceability and additionality (OFGEM 2014).

United States

Retail Electricity Market Overview

Given the large amount of variation between states in the USA, it is difficult to provide a simple overview of their electricity markets. This variation is outlined in the figure below which shows the proportion of consumers active in the market rather than on regulated pricing. It is clear to see that there is significant variation, with states such as Texas and Maine having reasonable levels of liberalisation, whereas others still have monopolistic models with no competition.

Share of Retail Sales from Retail Power Marketers
(Adapted from Borenstein and Bushnell 2015)



Texas has a competitive retail market for electricity and consumer switching rates are relatively high. It leads the nation in diversity of product offerings and number of providers, as well as in terms of facilitating consumer choice by promoting switching and simplifying consumer access to price information. As of September 2014, in the proportion of the state that permits competition, 90% of all customers had exercised their ability to switch providers (PUC Texas 2015).

Green Electricity Market

In Texas there were over 300 100% green source products available on the market. The most up to date data (EIA 2012) states that 11.86% of total consumers in Texas were purchasing renewable energy from a total of 34 utilities. In states where switching is lower, such as Connecticut, there are also schemes in place which allow consumers who are supplied by the monopolistic retailer to purchase green electricity through their current supplier (Kotchen 2011).

Applicable Regulation

As many be expected in this situation, there is no national system of government regulation for green tariffs. The most significant form of non-state regulation is the green-e scheme which has been operating since 1997, the accreditation badge for this is shown in appendix i. This scheme certifies green electricity tariffs and also provides marketing assistance. In 2014 over 836,000 customers purchased Green-e certified renewable energy, including 50,000 businesses (CRS 2014). In terms of volume of electricity purchased, residential Several states and cities also have their own green electricity switching campaigns, such as the Portland Bureau for Planning and Sustainability and the Connecticut Department of Energy and Environmental Protection.

Other countries with low enrolment

Czech Republic

Since the 1st of January 2006 all electricity customers have had the right to choose their supplier of electricity. A retailer called Nanoenergies seems to be the only retailer selling green electricity, with an estimated 0.07% of households enrolled. The brand builds trust with consumers by having itself audited annually by PWC to ensure that sufficient guarantees of origin are purchased to cover the amount of electricity they sell to consumers. This is perhaps similar to the Good Energy (UK) model. The company has a label that they allow consumers to use (shown in appendix i).

Estonia

The electricity market has been liberalised for all consumers since January 2013. All consumers pay a levy of around 10% of their electricity bills to support renewable energy. There is no specific government regulation regarding green electricity tariffs. It appears that only one supplier offers green electricity, Eesti Energy. The company also has an electricity label featuring a frog which consumers, particularly businesses, can use to show they purchase green electricity (shown in appendix i). The tariff appears to not be popular, out of a total of 583,991 households only 2042 had signed up under the scheme. Electricity prices for all consumers seem to be very low, so the difference in price between green and grey is not significant.

Italy

The electricity market in Italy is liberalised and consumers are able to freely switch suppliers. One supplier has a tariff certified by EKOenergy, but this is primarily aimed at businesses rather than domestic consumers. There are no specific minimum standards set out by government.

Poland

Consumers are able to choose their own electricity supplier. Switching rates have been increasing in recent years, particularly because of increased advertising activity by retailers. The market is split between a free unregulated market and a regulated market where prices are set by the Energy Regulatory Office. It is unclear if any retailers offer green electricity tariffs.

Common regulation across the EU

As well as the regulations in individual countries, there are also several elements which are common to all countries across the EU.

Guarantees of Origin and the European Energy Certificate System (EECS)

Guarantees of Origin are certificates awarded for every MWh of electricity generated. They can be used to track all types of electricity generation, but they are most commonly used to track the generation of renewables. The EECS is a harmonised Europe-wide system for handling and tracking the certificates, operated by the Association of Issuing Bodies (AIB) (EC *2009).* As well as providing the mechanism for fuel mix disclosure (below), guarantee of origin certificates are also widely used as the tracking mechanism for national regulations on green tariffs. This is true in the UK for example, where enough guarantee of origin certificates must be presented to the regulator to show enough green electricity has been purchased to cover the total amount sold to consumers. Some countries also have other forms of certificates, the UK has both Renewables Obligation Certificates as well as Levy Exemption Certificates, which overlap with the Guarantees of Origin and can lead to double selling.

Fuel mix disclosure

The tracking of electricity also facilitates fuel-mix disclosure. Since 2004 it has been EU policy that all consumers must be provided with a fuel mix disclosure statement from their electricity supplier. This was introduced in Directive 2003/54/EC (EC 2003), though many of the details of implementation such as the label format and energy types which are included are left to member states to determine. These requirements also provide a mechanism which allows consumers to know if they are purchasing green electricity and provides a very base level of regulation in some markets where products are not widely available.

Market liberalisation

The EU is broadly also responsible for the wave of market liberalisation which has spread over Europe. It has been the policy of the EU since the 1990s to move away from monopolistic supplies to consumers, and towards more competitive markets where consumers are free to switch between suppliers. This was originally introduced in Directive 96/92/EC (EC 1997) and has been strengthened by the second and third phases in Directives 2003/54/EC (EC 2003) and 2009/72/EC (EC 2009). This liberalisation has been one of the main drivers of green tariffs in the EU and has been responsible for allowing products to be offered in many new markets, particularly in Eastern Europe.

Appendix i - Certification Stamps

A selection of *certification stamps used by green electricity suppliers*

Czech Republic

Estonia

EKO Energy

Blue Energy

Green-e

Appendix ii - The EKOenergy label

The EKOenergy Label

The EKOenergy label is the the fastest growing certification scheme for renewable energy in the world. Since its launch in 2012 the scheme has grown to cover the majority of European countries and in 2015 it accredited over 1 TW/h of electricity (EKOenergy 2015). From its inception the project has been pan-european and multi-lingual, all coordinated from its secretariat in Finland.

The scheme has a number of components:

Transparency - Retailers are required to inform consumers and potential consumers about the origin of their EKOenergy labelled electricity. They need to disclose at least the country of origin and the technology.

Electricity Sourcing - Energy sold must not be sourced from generating stations in protected nature areas. Hydropower can only be included if it comes from power plants which have been approved by the EKOenergy board, after consulting local NGOs.

Additionality - At least 10 euro cents must be contributed to the EKOenergy climate fund per MWh of EKOenergy sold. This money is used to finance further investments in renewables.

Tracking - Only electricity which is tracked can be sold as EKOenergy, in Europe via the Guarantees of Origin system.

Verification - The quantities of EKOenergy sold by an electricity supplier, it's origin and the associated contribution to the EKOenergy fund are verified by an external independent auditor.

Appendix iii - The Green-e label

The Green-e Label

The Green-e label is North America's leading voluntary certification scheme and eco-label for renewable electricity. It has been operating since 1997 and in 2014 it reached 38 million MWh of sales. The scheme currently certifies 1% of the total U.S. electricity mix, with the majority of that going to commercial rather than residential customers. Due to the varying regulation across the USA it sells energy through three mechanisms.

1. Green Pricing Programs
2. Competitive Renewable electricity
3. Renewable Energy Certificates (RECs)

The scheme requires that all green sourced products undergo independent annual audits to ensure compliance with Green-e's environmental and consumer protection standards (Green-e. 2016). As well as solar and wind the scheme also allows generation from hydropower, biomass, biodiesel and fuel cells, though these latter four have strict criteria attached. Importantly the scheme only certifies 'new renewables', with limits on the ages of the generating stations. The tariffs sold can be from 25% to 100% renewable, though if a supplier offers a product less than 50% they must also offer a 100% renewable option. There are also mechanisms to allow renewables to be sold in 100% green 'blocks' in a minimum size of 100kWh/month. In order to eliminate double counting, the products sold must be comprised of eligible renewable generation over and above anything required by state or federal RPS requirements, legislation or settlement agreements. Renewable energy which has obtained tax or financial incentive payments are eligible, so long as these do not also require that the electricity generated be used or counted towards a mandated obligation or other policy. For a more complete description of the relevant criteria refer to version 2.8 of the Green-e Energy National Standard (Green-e 2016).

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