



BioPAD



Bioenergy Proliferation and Deployment





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Preface

The BioPAD project aims to improve our understanding of the links between supply and demand by looking at supply chains for a variety of bioenergy fuels and different ways of converting these fuels into sustainable energy. Understanding the supply chains and the ways bioenergy moves from fuel source to energy provision will help the establishment of robust and efficient supply services which can match local demand.

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RASRLES Policy Toolkit

Summary

Significant developments have taken place in European energy policy since 2000, driven by increasing concern about global warming, and the effect of rapidly increasing energy prices on competitiveness and security of supply in the European Union (EU).

The European Commission has risen to the challenges, proposing a range of policies to address them. While there have been concerns, for example by some member states regarding some of the policies, overall the proposals by the European Commission are sound. They correctly reflect the energy challenges faced by the world today, and their implementation will bring global benefits. In particular, the Commission's goals in the field of energy and environment are highly ambitious, but pursuing them will be necessary not only to ensure the EU contribution to the mitigation of climate change, but also to send a global signal that meaningful action can and ought to be taken now. To ensure that the very ambitious targets are being achieved in a balanced manner, it will be necessary to ensure regular reviews and constant tracking of the implementation of the whole policy package, not just of individual policies within it. The Commission will need to make sure that a suitable review mechanism is being established to this end. The biannual Strategic Energy Reviews of EU energy policy conducted by the Commission could serve as this mechanism.

The National Renewable Energy Action plans have now been agreed and have been implemented under Article 4 of Directive 2009/28/EC. Member States set out the sectoral targets, the technology mix they expect to use, the trajectory they will follow and the measures and reforms they will undertake to overcome the barriers to developing renewable energy. Each member state has an overall target for Renewable Energy, which has been sub-divided into electricity, heat and transport fuels. The overall target is binding, but how the individual sectors contribute to achieving that target is the responsibility of each country.

History of EU Energy Policy

General

The European Union (EU) is a political and economic community with supranational and intergovernmental features. It is more than just a federation of countries, but not a federal state. It is a new type of structure that does not fall into any traditional legal

category. Its political system is historically unique and has been constantly evolving over more than 50 years.

It is now composed of twenty eight member states, with together about 550 million inhabitants, and a GDP of around EUR 13 trillion. The origin of the European Union (as it is known today) was the European Coal and Steel Community (ECSC), founded in 1951 by the Federal Republic of Germany, France, Italy and the Benelux countries (Belgium, the Netherlands and Luxembourg), and which expired in 2002.¹ These six countries formed the European Economic Community (EEC) through the Treaty of Rome, which was signed in 1957 and took effect on 1 January 1958. They also formed the European Atomic Energy Community (Euratom), which continues to exist alongside the EU.

The name of the EEC was changed to the European Community (EC) under the Maastricht Treaty in 1992, which also included the *Treaty on the European Union* (hereafter called EC Treaty). Since then, the EU consists of three pillars:

- The European Community (EC) pillar;
- The Common Foreign and Security Policy (CFSP) pillar; and
- The Police and Judicial Co-operation in Criminal Matters (PJCC) pillar.

All EU energy legislation is based on the EU Treaties (including Euratom), since the creation of the Union. A European coal policy existed under the European Coal and Steel Community (ECSC) from 1952 until 2002, when the ECSC expired. In nuclear policy, the EU has a clear remit only through the Euratom Treaty of 1957. In 1955, the Messina Declaration by European Heads of State and Government called for more abundant energy at a cheaper price to be put at the disposal of the European economies.

Energy policies on EU level and an integrated internal energy market would enhance energy security in the EU, should lead to better prices due to more competition and also provide political leverage vis-à-vis the energy exporters, once the EU manages to “speak with one voice”. In spite of these advantages, the community institution’s competence to act was limited in the first decades of European integration. The 1960s were characterised by a focus on the nation state level. A push towards energy cooperation was triggered by the oil crises in 1973/74.

As a consequence, in 1974 the “Council Resolution concerning a new energy policy strategy for the Community” was passed, which was shortly after enhanced with energy goals for 1985. With this the Council not only emphasised the added value of close coordination among Member States to tackle energy problems, but also adopted guidelines concerning energy supply (promotion of nuclear energy, hydrocarbon and solid fuels in the Community; diversification) and energy demand (using energy more nationally).

Acknowledging the sensitivities regarding some aspects of energy policy in member states, EU energy policy actions have respected, and will continue to respect, two principles: first, that member states are ultimately responsible for their national energy mix; and secondly, that indigenous energy resources are a national, not European, resource. Notwithstanding this, member states have in the past accepted legally binding, although non-enforceable EU targets for specific energy sources, such as renewables, and are negotiating legally binding, enforceable, national targets within the framework of the draft Renewables Directive. Importantly, the EU has for more than a decade agreed legal provisions for the opening-up of energy networks within the internal energy market and encouraging cross-border collaboration, interconnection and energy flows.

Over the following years the issue of environmental protection became more prominent in Europe, but this did not yet translate into European legislation, especially as climate change was not yet high on the agenda. Advancement of common energy policies usually came via economic routes, though this changed slightly with the inclusion of environmental protection into the Single European Act in 1987. The focus, however, still lay on economic objectives, such as the completion of the Internal Energy Market. This tendency was underlined when the Commission failed in their attempt to include a separate energy chapter into the “Treaty of Maastricht” in 1992. Several Member States, especially those that had fairly high own reserves, vetoed this proposal as they did not want to give away autonomy in that field. The vague “measures in the spheres of energy” that were included, did not make effective foundations for legislation, and the reference to grids was too specific for general energy legislation. The progress made, namely the directives on the electricity and gas internal market¹⁰ (1996 and 1998) were based on internal market and environmental regulations of the Treaties. Neither the “Treaty of Amsterdam” (1999) nor the Treaty of Nice (2003) brought major advances for a common energy policy. Therefore the important energy regulation in the years after, such as the Renewables Directives (2001 and 2003) and the introduction of emissions trading in 2005 were based on environmental regulation (Art. 175 (1)EC).

It wasn't until March 2007 that EU heads of state and governments endorsed the first EU “energy action plan”. Following a series of discussions over the previous years, the Commission’s “An energy policy for Europe” strategy marks the beginning of a more integrated European energy policy, which gained considerable momentum since then. The action plan laid out the three major challenges for European energy policy, which form the core of the common energy policy till today: sustainability, security of supply, and competitiveness. In order to reach these goals the commission also laid out quantifiable targets. Only two months later the reply came in form of the Council Conclusions. In its “action plan 2007-2009” the Council adopted (and slightly altered) many of the Commission's proposals, among them the famous – and catchy – “20/20/20” targets, which defined European energy policy in recent years. These targets refer to three 20% goals, to be reached until 2020:

- A reduction in EU greenhouse gas emissions of at least 20% below 1990 levels (to be increased to 30% in the event that other industrial countries and economically more advanced developing countries also contribute adequately)
- 20% of EU energy consumption to come from renewable resources and
- 20% reduction in primary energy use compared with projected levels, to be achieved by improving energy efficiency.

The plan included a range of other working areas, most prominently the completion of the internal market for gas and electricity, issues concerning security of supply, internal energy policies and energy technologies. The Council invited the Commission to come forward with proposals in order to regulate the respective areas.

Supply

The EU energy economy will become increasingly reliant on energy imports – with import dependence reaching 64% in 2020 and 67% in 2030 in business as usual (BAU) projections, up from slightly more than 50% at present. Dependence on oil imports continues to be highest, reaching 95% in 2030. Dependence on gas imports would rise substantially, from 58% at present to 84% in 2030. Similarly, solid fuel supplies would increasingly be based on imports, reaching 63% in 2030 (up from just under 40% today).

The development of the EU energy mix has been relatively stable during the last fifteen years, even though there has been a significant difference in the development of the energy mix in the new EU member countries. In 1990 the EU countries used much more coal and lignite (27%) compared to present levels (17%). The share of oil remained stable during that period. Coal and lignite have been switched mainly to natural gas (18 to 25%), renewables (4 to 7%), and nuclear (12 to 14%). The major energy source used in the EU today is oil with a share of more than one-third (36%). The second most important source is natural gas (25%) followed by solid fuels (17%), nuclear energy (14%) and renewable energy sources (7%).

The EU has had a long-standing policy to promote renewables, and the European Council of March 2007 decided on a renewable energy supply (RES) target of 20% for 2020. The Commission has published proposals to move to 20% renewables in final consumption by 2020, with a specific target of 10% of liquid fuels to be supplied by biofuels. There has been some increase in the share of renewable energy over recent years and this trend is expected to continue, but under currently implemented policies, the renewables share in final energy demand rises by 4 percentage points between 2005 and 2020, reaching 12.5% in 2020. Achieving the 20% RES target for 2020 will therefore require strong additional policies, and these were proposed by the European Commission on 23 January 2008. They will be supported by policies on energy efficiency and CO₂ reduction, which should

lead to lower energy demand and encouragement of low carbon energy, making it easier to achieve the renewables production target. Raising the contribution from renewables is expected to help contain the demand for gas.

Demand

Between 1990 and 2005, primary energy consumption grew by 10% in the EU27 showing a strong decoupling from the GDP growth of 35% over the same period; energy intensity (primary energy demand per unit of GDP) improved at a rate of 1.4% per annum. In the same period, energy-related CO₂ emissions decreased by 2.5%, implying a significant improvement in the carbon intensity (−0.8% per annum in 1990 to 2005) of the EU27 energy system. The changes in the fuel mix since 1990 in combination with the restructuring of the former centrally planned economies were the key driver for this improvement.

The rapid decline of solid fuel consumption by 133 Mtoe, or 30%, between 1990 and 2005 was the cause for the slight decrease of CO₂ emissions in the European Union. Other, cleaner energy sources correspondingly increased their contribution to balance supply. Increased natural gas supply provided most of the growth, rising by 51%, from 295 Mtoe to 445 Mtoe between 1990 and 2005, while renewables grew by about 39%, from 28 Mtoe to 39 Mtoe. Nuclear energy rose by 25% from 207 Mtoe to 260 Mtoe and oil increased its contribution by 7% from 626 Mtoe to 670 Mtoe. These developments led to a significant shift in the structure of primary energy consumption towards more use of natural gas, nuclear and renewables to the detriment of solid fuels (−10 percentage points) with oil almost keeping its share.

Key Policy Instruments

Austria

Mechanism 1 – Green Electricity Act (“Ökostromgesetz”)

The Austrian Green Electricity Act came into force on 1 January 2003 and established a system of nationwide tariff support for renewable (“green”) energy and Combined Heat and Power (“CHP”) installations. The main aims are as follows:

- to raise the proportion of electricity produced in installations from renewable energy sources to achieve the national target of 78.1% by 2010
- to promote renewable energy sources and achieve market maturity for new technologies

- to support existing combined heat and power (“CHP”) plants for public district heating and to ensure the continued operation and modernisation of such plants
- to raise the proportion of electricity produced by specific small hydropower plants (maximum capacity of 10 MW) to at least 9%.

The Green Electricity Act obliges the so-called “Green Electricity Settlement Centre” (“Ökostromabwicklungsstelle”) to purchase green electricity from eligible generators at a fixed feed-in tariff price (“Einspeisevergütung”). The Green Electricity Settlement Centre allocates the purchased electricity to the electricity traders, who are obliged by law to buy the allocated electricity at a fixed transfer price (“Verrechnungspreis”).

The difference between the feed-in tariff for electricity and the fixed transfer price is raised by a metering fee expressed as a lump sum per metering point (which consumers have to pay per metering point - Zählpunktpauschale”). The amount of the fee depends on the grid level to which the consumer is connected but is independent of his actual consumption. The fee is fixed by law and amounts to 15,000 € per annum for connection to the high voltage net levels 1 to 4, 3,300 € to level 5, 300 € to level 6 and 15 € to level 7. This differentiation was introduced in order to arrive at a tenable distribution of the burden between households on the one side and industrial consumers on the other side. The levy is fixed at a level to allow about 38% of the overall financing to be covered by the levy.

Operators of renewable energy sources, save electricity from hydro power plants with a maximum capacity of more than 10 MW, animal meal, spent lye, sewage sludge and waste (with the exception of waste with a high biogenic share), operators of existing and modernised combined heat and power plants for public district heating supply and medium sized hydro power plants.

Mechanism 2 – Austrian Act on Emissions Allowance Trading

(Emissionszertifikatengesetz – EZG)

The Austrian Act on Emissions Allowance Trading (EZG) was introduced by the government in 2004, implementing Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC. The main goal of the Act is the establishment of a greenhouse gas emission-trading scheme to provide a cost-effective reduction of greenhouse gas emissions.

Mechanism 3 – Climate and Energy Fund (“Klima- und Energiefondsgesetz”)

The climate and energy fund is endowed with €500 million for the period of 2007 to 2010. It was established with the aim of contributing to the cost-efficient attainment of the energy goals of the Austrian government by supporting initiatives in the areas of climate protection and sustainable energy supply. The support will be concentrated in three main areas: research and development of sustainable environmental technologies and climate research; the promotion of projects in the area of public and commercial transport; and the promotion of sustainable energy technologies.

Belgium

Mechanism 1 – Tradable Green Certificates (TGC's)

Belgium is a Federal State, in which Regions (Flemish Region, Walloon Region and Brussels-Capital Region) are in charge of the protection of the environment. In response to the promotion of renewable energy sources, each Region and the Federal State has developed a Green Certificate Mechanism. This mechanism is built on the following principles:

- The regional or federal regulation authority issues a certain amount of TGC's to “green producers”, based on the quantity of electricity produced from Renewable Energy Sources (RES). It is to be pointed out that, in Brussels and Wallonia, the issuing of TGC's is conditional on the saving of a certain quantity of CO₂ in comparison with the CO₂ emissions for conventional production in a modern benchmark facility.
- The regional legislations have fixed annual quotas applicable to suppliers (e.g. in Wallonia, 8% in 2008). This means that each supplier must send the Regulator the number of green certificates that corresponds to the number of MWh supplied to its end clients, multiplied by the quota. If the supplier does not adhere to the quota, it receives a penalty for each missing TGC. Suppliers have then to purchase enough TGC from green producers in order to avoid the penalty; this creates the market for green certificates. The market price of TGC is therefore less than that of the penalty.
- In order to sustain the security of investments, regional (and federal) legislations have provided that TSO and/or DSO's must purchase TGC's at a fixed price, generally depending on the energy source.
- The support mechanism (issuing of TGC and/or purchase obligation at a fixed price) is valid for a certain period of time, depending on the Region and on the renewable energy source.
- The price of TGC's is passed on the consumers. However, industrial consumers benefit from certain exemptions.

Mechanism 2 – Installation premiums

There are a large number of installation premiums provided in Belgium in order to promote the production of electricity from RES. Those premiums differ from one to another according to different criteria:

- the public authority who grants it (Region, commune);
- the renewable energy source (solar, wind); and
- the nature of the producer (firm or particular).

Mechanism 3 – Offshore wind

The Federal State has created a specific support mechanism for the production of electricity from off-shore wind farms: (i) within the mechanism of TGC's, the TSO has an obligation to purchase green certificates issued to the producer at the amount of 107 €/MWh for the first 216 MW generated and 90 €/MWh for the remainder of generated MW; this obligation applies for a duration of 20 years; (ii) for each concession, the cable connecting the wind farm to the transmission grid is financed by the TSO, to a maximum amount of €25 million for the installation of a minimum of 216 MW; (iii) the legislation provides for a mechanism which guarantees that investments granted by the holder of the concession will be passed to the end consumer, even if the project is abandoned or interrupted (for a reason other than the fault or the gross negligence of the holder of the concession).

Mechanism 4 – Part exemption to the “Federal contribution”

A federal contribution is owed by the end consumers in order to finance the public service obligations and the costs related to the functioning of the Federal Regulation Authority. This contribution is paid to the supplier who returns it to the commission or regulation. The contribution is in particular intended to finance (totally or partially): (i) the “denuclearization” of some nuclear sites; (ii) the functioning costs of the Federal Regulator; (iii) the guidance and the social aid for the supply of energy to the most deprived inhabitants; (iv) the federal policy for reduction of greenhouse gases, etc.

The proportion of electricity from RES supplied to consumers is exempted from the duty related to the costs of the denuclearization and for the federal policy for the reduction of greenhouse gases.

Mechanism 5 – Tax exemptions

The tax legislation provides for several exemptions for RES installations, e.g.:

- 6% VAT (instead of 21%) for the installation of PV Panels or windturbines;
- Tax reduction for all investments in energy savings or RES;
- Exemption to the “real estate prepayment” (précompte immobilier) on the installation of PV panels.

Czech Republic

Mechanism 1 – Implementing Act No.180/2005

Act No. 180/2005 on the promotion of the production of electricity from renewable energy sources entered into force on 1 August 2005. The Czech Republic committed itself to produce 8% of the total gross national electricity consumption from renewable energy sources in 2010. The share of electricity generation currently provided by renewable energy is 4.9% (as of 1 January 2007).

Mechanism 2 – Support Mechanisms under the Act

Access to the grid:

The entitlement to connect energy production facilities from renewable energy sources to the electricity system.

Reducing investment risk:

The Act provides the following incentives: The guaranteed return on each unit of electricity produced for a period of 15 years from the date it is brought into service. The investor has a choice between the two following support systems:

(i) minimum purchase price, under which all electricity produced can be sold to the operator of the relevant distribution system, or (ii) green bonuses (which supplements the market price for electricity), under which electricity produced from renewable sources can be placed on the single market for electricity. The level of purchase prices for already operating facilities/installations is maintained for a period of 15 years. A maximum 5% year-on-year reduction in purchase prices for new facilities/installations.

Tax incentives:

The income from generation of electricity from renewable energy sources (e.g. small hydro-electric power plants with an output of up to 1 MW, wind-powered electricity generating stations, heat pumps, solar-powered facilities, plants for biogas and wood-gas production etc.) in the first calendar year of their operation and in the five years

immediately following is tax-exempt. There are also real estate tax exemptions for renewable energy sources and the imposition of specific taxes for electricity from non-renewable sources.

Others

The State Programme for the Promotion of Energy-Saving and the Use of Renewable Energy Sources.

The support from the structural funds of the European Union.

France

Pursuant to the European Directive on the promotion of electricity produced from renewable energy sources, the share of electricity produced from renewable energy sources should represent 21% of electricity consumption by 2010. France has centred its renewable energy sources approach on feed-in tariffs on the one hand, and a tendering procedure on the other.

Mechanism 1 – Creation of wind power development areas.

In order to aggregate wind farms and to avoid their dispersion, the creation of wind power development areas was decided in 2005 (Article 37 of Law n° 2005-781 of 13 July 2005). This new legal framework system enables wind farms to benefit from the power purchase obligation for the projects located in areas set up by local authorities. The municipalities submit a request for permission to create wind power development areas (Zones de développement aérien) to the concerned department "Préfet" (local State authority), who then consults the neighbouring municipalities prior to any decision. Their adoption is subject to three conditions: wind potential, grid connection possibilities and landscape protection (listing buildings and protected locations).

Mechanism 2 – Power Purchase Obligation and Feed-in Tariffs

The power purchase obligation is the main incentive element of the French government energy policy. "Electricité de France" and Non Nationalized Distributors (Article 23 of Law n°46-628 of 8 April 1946) are bound to buy the energy produced from renewable energy sources at a fixed price, provided production installations are connected to power grids and that the producers fulfil conditions. Firstly, power production is limited to 12 MW per site (Decree n°2000-1196 of 6 December 2000), except for wind energy. In the latter case

wind farms located in wind power development areas may not exceed or be lower than installed power defined by the local authorities.

Feed-in tariffs apply to renewable energy sources, and are calculated to improve private investments. Thus, total prices are equivalent to normal remuneration of funds invested by the producer. Furthermore each producer is assured that what is produced will be sold at a fixed price.

Feed-in tariffs are defined by a statutory order from the Minister of Economy, Industry and employment for each technology. Currently, tariffs have been introduced for wind energy, small hydro, photovoltaic energy, biomass and biogas, and electricity from Combined Heat and Power (CHP) and waste incineration.

Mechanism 3 – Tax incentives.

The French government also introduced tax incentive measures in favour of renewable energy, such as:

- Tax credits of 50%
- Reduction of 5.5% VAT for residential energy equipment using renewable energy sources
- Subsidies up to 40% granted for biomass heating plants.

Mechanism 4 – Pluriannual Investment Programme

The Minister in charge of energy policy shall establish every two years a forecast of needs for electricity generation capacity, called “Pluriannual Investment Programme” (PPI), in order to ensure the necessary matching of electricity supply and demand. This document takes into account the national target for Renewable Energy Sources determined by the European Directive. The PPI’s main target is to identify the best investments for electricity production, by considering energy supply security. PPI lays down objectives for the development of production means in France for each energy source and production method. PPI will be published as a governmental decree and transmitted to Parliament.

Mechanism 5 – Call for Tender.

The French government may also launch calls for tender, which should then be organised by the Regulator (CRE: Energy Regulation Commission). This system has existed since 2000 and allows the Minister in charge of energy policy to react if the PPI’s goals have

not been achieved. Many calls for tender have already been launched since 2003 as regards different energy sources (biomass, biogas, onshore and offshore wind turbines)

‘Appels d’offres’

The support through tenders is particularly suited to renewable sectors having any of the following specifications:

- Need for strong steering because of the risk ‘conflicts of use’ (as is the case for large scale biomass)
- Scarcity of the propitious areas (as is the case for the offshore wind)
- Protection for the information regarding the costs
- Challenge for technology demonstration and industrial development.

When the objectives in terms of installed capacity set by the electric PPI (multi-year investments) are not met, the Minister of Energy has the ability to launch tenders to develop new production capacities. The specifications of the tender is in the Official Journal of the European Union (OJEU) and the candidates have a minimum of six months between the publication of the specification and the deadline to submit the tenders with the Regulatory Commission of Energy (CRE). Then, it is in charge of instruction offers.

In the case of electric renewable energy, feed-in tariffs (hydro, biomass, biogas, onshore wind, PV building integrated) or tenders (offshore wind, photovoltaic ground) are used to estimate costs production, because these plans are calibrated to cover the incremental cost compared to market prices.

Tenders for the renewable electricity production launched since 2003 have concerned:

- in 2003: the construction of biomass plants (17/12/03)
- in 2004: the construction of offshore wind farms (11/02/04) and onshore wind farms (23/04/04)
- in 2006: the construction of biomass plants (09/12/06)
- in 2009: the construction of biomass plants (06/01/09) and the construction for PV plants (18/07/09)
- in 2010: the construction of biomass plants (27/07/10) and onshore wind farms with the storage plan for overseas and Corsica (09/11/10)
- in 2011: the construction of offshore wind farms (05/07/11) and PV installations of more than 100kWc (simplified tenders between 100 and 250kWc (13/07/11) and usual tenders above 250kWc (30/07/11)).

For biomass: tenders called BCIAT (Biomasse Chaleur Industrie Agriculture Tertiaire – Heat biomass for industry/agriculture/tertiary). These tenders are national, annual and concern biomass installations of large scale (heat production above 1,000 toe/year).

109 projects developed in 5 years thanks to the BCIAT: 5 tenders launched since 2008 have supported 109 projects for biomass energy for a total production of 585,000 toe/year and a total installed power of 1,150 MWth, i.e. a reduction of 1.5 million tonnes of CO₂ per year.

In 2013, there were 38 projects that have been selected and were working for a heat production from biomass above 150,000 toe/year.

Mechanism 6 – National round tables (Grenelle Environnement, for instance)

In October 2007, France's Environment Round Table was organised by the Minister of Ecology and Sustainable Planning and Development. For the first time, the Round Table brought all the civilian and public service representatives together around the discussion table, creating 5 colleges: State, Unions, employers, NGOs and local authorities.

Different objectives have been laid down during the Grenelle Environnement, such as:

- Consumption of 30 to 50% renewable energy in the French overseas departments and Territories by 2020;
- Research into second-generation biofuels.
- R&D program relating to the geological capture and storage of CO₂.
- Plan for energy-efficient and low-input farming.
- Carbon balance assessments of all administrative departments and a 20% improvement in energy efficiency.
- Compulsory inclusion of environmental clauses in the public procurement French code.
- Study on the introduction of a climate energy tax.

Germany

Mechanism 1 – Renewable Energy Sources Act (Erneuerbare-Energien-Gesetz – EEG)

The backbone of the German renewable energy support mechanism is the Renewable Energy Sources Act (Erneuerbare-Energien-Gesetz – EEG). The EEG supports the production of electricity from wind and water-power, solar radiation, biomass and sewage gas combustion and geothermic energy. The EEG guarantees each plant operator a fixed tariff for electricity generated from these renewable energy sources.

The tariff depends (among other things) on the type and capacity of the installation and the year of its commissioning.

The EEWaermeG (Erneuerbare-Energien-Waermegesetz) has been enacted on 01/01/2009. It has driven forwards the expansion of renewable energy technologies in the field of energy efficiency (heating & cooling) for buildings and it has been developed in addition to the Erneuerbare-Energien-Gesetz (EEG), which has been developed for electrical power generation only.

- The Act does not differentiate between technologies that generate emissions and that are emission free. (Especially with regards to Particulate Matter). - Most critiques relate to an extension of the legislation in 2012, which not only accounts for “heating”, but for both “heating & cooling” measures.
- An obligation to use renewable energy technologies to buildings, which should be modernised, has not been introduced on a countrywide level yet (But in some cases another legislation has been introduced on state-level, which takes account of this, for example in Baden Wuerttemberg in the “EWaermeG” legislation)

Guaranteed Tariff

The locally responsible transmission system operator is under a legal obligation to pay to the plant operator the guaranteed tariff for a period of – in general – 20 calendar years (and for the year the plant was taken into operation). The fee depends on the tariff that is applicable in the year of commissioning and for most cases remains fixed during the 20 years that follow commissioning. The later a plant is put into operation the lower the fee that is paid to the operator (so-called “degression”).

The EEG differentiates between different sources of renewable energy. Different tariffs and degression rates apply to each renewable energy source. For a plant that is commissioned in 2008, generally the following rates apply:

- Photovoltaic energy: 35.48 – 48.98 €cent/kWh
- Biomass energy: 7.91 – 16.83 €cent/kWh
- Geothermal: 7.16 – 15.00 €cent/kWh
- Sewage gas: 6.16 – 7.22 €cent/kWh
- Offshore wind energy: 8.92 €cent/kWh
- Onshore wind energy: 5.07 – 8.03 €cent/kWh
- Water energy: 3.54 – 9.67 €cent/kWh

Grid Connection

According to Section 4 EEG the transmission system operator who is located closest to a renewable energy plant is obliged to connect the plant to the system and to purchase all electricity produced by the plant and to pay the guaranteed tariff. The plant operator generally bears the costs related to the connection and has to pay – as the case may be – an annual fee for the operation of the connection facilities to the grid system operator.

Due to the high costs for connecting an offshore wind farm to the grid, an exemption applies for such wind farms.

According to Section 17 para. 2a of the German Energy Industry Act (Energiewirtschaftsgesetz – EnWG), the local transmission system operator is obliged to build and operate the grid from the transformer station of the offshore wind farm, to the technically and economically best connection point of the next transmission or distribution grid. As a consequence, the grid connection regime for offshore wind farms differs significantly from the regime for onshore wind and other renewable energy plants.

The German Federal Government submitted a bill for a new EEG which will, among other things, amend the current tariffs. For example, the guaranteed tariff for electricity produced by photovoltaic installations commissioned later than 1 January 2009 decrease with an elevated yearly degression of 8%.

As another example, the remuneration for electricity generated by offshore wind energy turbines is very likely to be increased considerably. For a period of 12 years starting from the date of commissioning the guaranteed tariff shall amount to 12 €cent/kWh and 14 €cent/kWh if the plants are commissioned no later than 31 December 2013. The period for which this tariff is guaranteed may be extended by 0.5 months for each full nautical mile beyond 12 nautical miles seawards and by 1.7 months for each full metre of water depth exceeding 20 metres. The tariff degression shall only commence as of 1 January 2015 and shall amount to 5% per year.

Mechanism 2 – Renewable Energy Heat Act (Erneuerbare-Energien-Wärmegesetz – EEWärmeG)

In addition to the EEG, the German Federal Government submitted a bill for a Renewable Energy Heat Act (Erneuerbare-Energien-Wärmegesetz – EEWärmeG) which is currently debated in Parliament. The draft supports the expansion of renewable energy in heat production with the main target that by 2020, 14% of the total production of heating, hot water, cooling and process heat shall be generated from renewable energy, such as solar radiation, biomass, geothermic energy or waste heat.

Firstly, the bill introduces a general obligation for all owners of new buildings to cover a certain extent of their heat energy demand from renewable energy sources. Alternatively, it allows owners to take other measures to decrease their energy consumption, e.g. the installation of highly effective insulation. The federal states are entitled to extend the obligations to existing buildings. Secondly, the Federal Government provides financial aid for the use of renewable energy sources technology. According to the bill, the Federal Government will allocate up to 500 Mio. Euro annually for the support of renewable energy sources in heat production.

Finally, the bill facilitates the development of district heating networks. Pursuant to the bill, local authorities are entitled to impose an obligation to use district heating in order to protect the climate and natural resources.

Hungary

General

Enhanced utilisation of renewable energy sources is one of the chief concerns of the governmental energy policy, as stated in the government's energy strategy and adjoining action paper. At present the electricity generated from renewable sources amounts to approximately 8% of total consumption, which already exceeds the 3.6% commitment made towards the EU to be fulfilled by 2010. Pursuant to the Directive of the EU, the longer term goal of Hungary is to achieve a 13% share target of renewable energy sources in the final energy demand by 2020.

As of 1 January 2008 a completely new electricity regulation is in force in Hungary, further liberalising the electricity sector and setting forth a novel regime for supporting renewable electricity generation.

Mechanism 1 – Mandatory off-take vs. Green Certificates.

The new electricity regulation has introduced the regime of mandatory off-take to support investment in the field of renewable electricity generation. Pursuant to the regime, a substantial part of the electricity generated by renewable sources must be taken off by the Hungarian state-owned TSO (Mavir) at state-set prices, which, whilst being calculable, are generally also more favourable than market-determined prices.

Traders, including universal service providers, power generating companies and electricity importers must purchase from the TSO electricity generated by renewable energy sources according to a fixed percentage of their total electricity turnover/consumption. The take-off prices are defined according to the type of

renewable source and whether the licence permitting the sale of electricity under the mandatory off-take regime was issued before or after the effective date of the new regulation and the time of generation (i.e. peak, off-peak and deep valley periods). These are amended each year in accordance with the CPI as measured by the Hungarian Statistical Office. The renewable sources currently subject to the regime are wind and solar energy, and electricity generated by cogeneration or from biomass, although these latter two are subject to severe restrictions.

Even though off-take prices are stipulated by law, the actual entitlement for a plant to sell electricity in the mandatory offtake regime is awarded by the Hungarian Electricity Office (HEO), a body supervised by the Minister of Economy and Transportation. In such a licence the HEO defines the annual amount of the generated electricity and the time period under which it is subject to mandatory off-take.

Pursuant to the applicable law, the HEO mainly takes into account at its decision the business plan of the generator and the return on investment, therefore, any state-aid or other subsidy (including surplus of emissions allowances generated by the project, if relevant), shall be notified to the HEO, which shall adjust the amount and timeframe accordingly. Pursuant to the new legislation, the regime of mandatory off-take is not set in stone. Under the electricity Act the government is entitled in the future to implement a so-called green and cogenerated certificate system instead of the current mandatory off-take regime. Under the green certificate system, renewable electricity would be sold at market prices, but in order to finance the additional costs of renewables and to ensure that the desired amount is indeed generated, all consumers (or producers) would be obliged to purchase a certain number of green certificates according to their overall consumption (production). Thus, these would be market-based instruments, similar to emission allowances under the EU-ETS.

Mechanism 2 – Wind energy

According to non-confirmed expert opinions and industry experts, Hungary has a potential of over 1,000 MW of wind energy, nevertheless only 330MW have been licenced so far by the HEO, and of those only about 65MW have been implemented to-date. The remaining licensed capacity is under various phases of development. Wind energy is also subject to the above described mandatory off-take scheme.

The main reason of this rather low amount is that the HEO and the TSO believed that this is the highest wind generation capacity that will not disturb the capacity of the Hungarian grid. Presumably, further licences will only be awarded by the HEO once some technical constraints are overcome, e.g. new balancing power stations are put into operation.

According to the currently applicable law, further licences will be offered to developers based on open tendering, the rules of which shall be defined in the future. Although not much is known as yet about such rules, calls for tender will be publicised on a European level.

Biomass and geothermal energy.

Hungary has a great potential both for biomass and geothermal energy, although these sources are not yet exploited to the utmost possible level. The energy produced from biomass plants represents the largest share of electricity produced from renewable energy sources, in 2004 it accounted for over 60% of all renewable energy production, showing an annual 116% growth rate between 1997 and 2004. Biomass power plants may be subject to the mandatory off-take regime, provided they meet with certain efficiency indicators.

Geothermal energy has unfortunately been used very rarely so far, although Hungary is rich in easily accessible thermal waters. In some areas it is used for district heating.

Italy

Mechanism 1 – The Green Certificates (GCs)

The EU directive 2001-77-EC on the promotion of electricity produced from renewable energy sources (RES) has set the target for Italy to generate 22% of electricity from renewable sources by 2010.

In order to encourage the development of renewable energy, electricity suppliers and electricity importers shall supply or import a percentage equal to 2% (increased every year by 0.35%) of the supplied or imported energy that is to be produced from renewable energy sources. Each Green Certificate proves that as much as 1MWh has been produced from a renewable source. The Green Certificate shall then be bought by the GSE (Gestore Servizi Elettrici), a State company set up for the purpose of providing incentives to suppliers producing renewable energy.

Until 31 December 2007 every plant producing renewable energy was entitled to be granted a GC for every MWh produced for as long as 8 years. Due to the unsatisfactory objectives achieved, since 1 January 2008 suppliers of renewable energy will be granted the GCs for as many as 15 years. The GCs shall then be sold to the GSE, which will buy them back at a price set every year by the GSE itself according to the relevant Government guidelines (in 2007 it was equal to 13,749 € /MWh).

Mechanism 2 – The Energy Account.

An alternative way of providing incentives is available to producers of photovoltaic renewable energy only. The reason for the peculiar rules applying to photovoltaic energy is the geographic position of Italy, which makes this particular legislation appropriate.

Originally introduced in 2005, the so-called ‘Energy Account’ has been significantly amended every year until 2007. Decree 283/2003 and the relevant implementing rules provide for a mechanism through which the producers of a photovoltaic plant can rely on two different and cumulative incentives. On the one hand the energy produced from a photovoltaic plant can be sold to the GSE and to third parties (i.e. electricity grid local administrators), additionally, the GSE pays to the producers of photovoltaic electricity a price called “Incentive Fare” (Tariffa Incentivante) for as many as 20 years. It has been calculated that the average price for building a photovoltaic plant is likely to be paid off by the combined effect of the energy sold and the Incentive Fare in as long as 10 years in the North regions and in 7 years in the South.

According to the current legislation, the incentives shall no longer be available when the overall national production of photovoltaic energy has reached the amount of 1,200 MW. However those who have been granted the Incentive Fare before such threshold has been reached will continue to benefit from it for 20 years from the day it was granted.

Netherlands

In September 2007 the Dutch government issued a new policy document, entitled the Clean and Efficient programme: New Energy for Climate Policy. The ambitious new climate and energy targets for 2020 are:

- to reach a share of renewable energy of 20% by 2020
- to reduce greenhouse gas emissions by 30% compared to 1990 levels
- to achieve a rate of energy efficiency improvement of 2% per year.

The Dutch government has formulated a set of measures that will enable the Netherlands to reach these climate and energy targets. The Clean and Efficient Programme contains a set of measures for each economic sector and for Dutch citizens, such as market incentives, standards, temporary financial incentives and innovation.

Mechanism 1 – Incentives under the New Energy for Climate Policy

For the energy sector the following measures have been highlighted:

- As of April 2008 a new subsidy scheme will come into force for renewable energy: the Promotion of Sustainable Energy Production Decree (Besluit stimulerend duurzame energieproductie). The government has earmarked funds for this scheme to stimulate the production and innovation of renewable energy.
- To achieve the target for the reduction of greenhouse gas emission (- 30% in 2020), the Dutch government wants to expand the system of emissions trading. The European Emissions Trading Scheme is the main mechanism for determining the contribution of the energy sector.
- Coal can be used in a climate-neutral way with carbon capture and storage. Therefore “clean fossil fuel” can be used as a transitional technology on the way to renewable energy production. The government is preparing agreements with operators of new coal-fired power stations concerning reduced CO₂ emissions. New coal-fired power stations will be constructed in such a way that they will be able to capture CO₂ and store it underground. From 2015 onwards large reductions will have to be achieved in these new power stations.
- Attempts are made to realise one or two large demonstration projects for Carbon Capture and Storage (CCS). As soon as the technology for CCS has been sufficiently developed, it needs to be made mandatory on a European level for all new power stations.

Mechanism 2 – The Promotion of Sustainable Energy Production Decree (Besluit stimulerend duurzame energieproductie)

The SDE provides grants to investors for projects involving renewable electricity, renewable (green) gas and combined heat and power (CHP). This subsidy scheme provides for a closed, manageable system in which a maximum budget is set each year for the issuing of new grants. On a yearly basis the subsidy-eligible categories will be decided on. These categories are selected on three criteria: cost effectiveness, future prospects and innovative capacity.

The subsidy-eligible categories are: Land-based-wind power, small-scale solar photo voltaic installations, biogas production, waste incineration, smallscale biomass with the exception of liquid biomass.

The discussion on sustainability plays an important role regarding the biomass options. Liquid biomass is not included because at the moment no sufficiently developed

certification system exists. The category on CHP is not yet regulated. The financial resources available for the SDE are going to increase from 10 million € in 2008 to approximately 336 million € structurally in 2014. As a result the budget for this period will be almost 1.4 billion €. Land-based wind power is seen as the most cost-effective option. Therefore new wind power equivalent of 500 MW is to be made eligible for subsidy in 2008. This amounts to at least 200 to 300 new wind turbines.

Solar photovoltaic power and offshore wind farms score high on two of criteria mentioned before: future prospects and innovative capacity. In 2009 the offshore wind farms were added to the subsidy-eligible categories of the SDE.

Mechanism 3 – CO₂ capture and storage (CCS)

The CATO programme can be regarded as the Dutch national research programme on CO₂ capture and storage and it is implemented by a consortium of Dutch companies, research institutions, universities and environmental organisations. The aim of CATO is to identify whether and how CCS can contribute to a sustainable energy system in the Netherlands, from an economical, technical, social and ecological point of view under which conditions this option could be implemented in the energy system.

In the forthcoming years, the Dutch government will make a decision about major demonstration projects for CCS. The Dutch government wants to locate two of the 12 major demonstration projects desired by the EU for an electricity power station with CCS by 2015 or as early as possible. The authorities and market parties are working together to realise the two demonstration projects within the framework of the EU programme. The government will make financial resources available for the further development of CCS and other preconditions will be adapted in order to remove obstacles to CCS.

Mechanism 4 – Heat

Almost a third of Dutch energy consumption involves heat. The majority involves low temperature heat which can be supplied by renewable sources, like environmental heat or geothermal heat, and residual heat. The Dutch government will develop an active heat policy that provides the necessary incentives. The possibility of a stimulation programme will be explored.

Mechanism 5 – Tax deduction for investments in energy-saving equipment and renewable energy

As of 1997 the Energy Investment Allowance tax relief programme (EIA) gives a direct financial advantage to Dutch companies that invest in energy efficient equipment and renewable energy sources. In 2008 companies can deduct 44% of the annual investment costs for energy-saving equipment, such as purchase costs and production costs, from their fiscal profit up to a maximum of 111 million € per year. An 'Energy List' determines which type of equipment qualifies for this programme.

Spain

Renewable energy regulation.

The renewable energy sector in Spain is supported by a stable regulatory framework that has been strengthened over the years. In 1994, the Spanish government passed a Royal Decree 2366/1994 which provided renewable energy producers with premiums, regulated the requirements and procedures to qualify for the Special Regime and regulated the conditions for the delivery of energy. In 1997, the Spanish government passed the Electricity Sector Act, which established a target that 12% of electricity comes from renewable energy sources by 2010.

Mechanism 1 – Purchase tariffs for energy from renewable sources

Fixed tariff

The price is set at 73.2 € per MWh for wind during the first 20 years plus complements. The tariff and complements are annually updated by the CPI less 0.25% until 2012 and by the CPI less 0.50% thereafter.

Under the market price plus premium compensation scheme, Special Regime generators may choose to sell energy at the price determined by the pool price of the market where the energy is sold or at the price established by contract, in both cases with an additional premium, if applicable.

The price is also set at the pool/bilateral contract price, plus a premium, plus compliments. The premium that a generator receives is based on a reference premium defined in Royal Decree 661/2007 that is fixed by the government and is limited by a cap and floor which is also fixed by the government and which varies depending on the technology. The CPI updates the reference premium and complements annually and until 2012 0.25% will be deducted, following which time 0.50% will be deducted.

The premium received by a generator varies depending upon the pool/bilateral price, the floor and the cap:

- Price + Reference Premium < Floor. Generator will receive as a premium the difference between the floor and the pool/bilateral price.
- Floor < Price + Reference Premium < Cap. Generator will receive the entire reference premium as a premium.
- Cap—Reference Premium < Price < Cap. Generator will receive as a premium the difference between the cap and the pool/bilateral price.
- Price > Cap. Generator will receive the pool/bilateral price and no premium.

The amount of the additional premium varies based on the price of the energy on the market in such a way that the facilities are never compensated at a level below the established lower limit or above the established upper limit. The owner of the facility will always receive the full market price, so if the market price is above the upper limit that is established then a premium is not received (but there is no obligation to return any portion of the market price received; that is, there are no “negative premiums”).

Updating of tariffs, feed-in-tariffs and complements.

Royal Decree 661/2007 contemplates the annual updating of tariffs, premiums and complements based on certain references. For most facilities (including, among others, solar, wind and hydro) the references are updated annually and are increased by the CPI less 0.25% until December 31, 2012 and by the CPI less 0.50% thereafter.

Revision of tariffs, premiums, caps, floor and complements.

Mechanism 2 – Tax measures

The fuel tax exemption currently in place is applied specifically to biofuels. There is a reduction on corporate income tax for renewable energy investments. A Legislative and fiscal framework of local laws has been established to govern the promotion of renewable energies.

Mechanism 3 – Heat

RES-H is supported through the new Technical Buildings Code which this applies to all new buildings and renovations and includes an obligation to use solar thermal energy to meet 30-70% of domestic hot water demand. The assumed volume of hot water demand and the geographical location of the building determines the exact percentage that applies. Investments in RES-H are eligible for investment subsidies of 36.4% of the total cost.

Mechanism 4 – Subsidies

Different Administrations grant subsidies to promote renewable installations.

UK

Mechanism 1 – The Renewables Obligation (RO)

The UK Government has an aspirational target to generate 20% of electricity from renewable sources by 2020. The Renewables Obligation is the UK Government's main mechanism for encouraging the development of renewable energy by requiring that electricity suppliers source a rising percentage of the electricity they supply from renewable sources.

Under the Renewables Obligation Order 2006 (applicable to England and Wales only), the level of the Obligation is fixed and is intended to rise to a maximum level of 15.4% in 2015/16, after which it will remain at that level until the Obligation ceases in 2027. Suppliers can meet their obligation by presenting Renewables Obligation Certificates (ROCs - one ROC is awarded per MWh of electricity produced) or, alternatively, by making a fixed financial payment (known as the “buyout price” – fixed at £33.24 (41?)/MWh for 2006/07) which rises with inflation each year, or by combining these two methods.

Originally renewable generators (other than excluded facilities such as certain large hydro plants) were granted 1 ROC per MWh of output. The Government has now banded the RO going forward for the benefit of certain emerging technologies (such as offshore wind, solar energy and wave power) that will receive more ROCs/MWh. More established technologies will receive less than 1 ROC/MWh.

Mechanism 2 – Climate Change Levy & Levy Exemption Certificates (LECs)

The UK Government also introduced the “Climate Change Levy” (CCL) which is an environmental tax levied on the supply of electricity which is payable by commercial end-users of electricity. However, to encourage the generation of electricity from renewable sources, the Climate Change Levy Regulations introduced an exemption from the CCL for electricity supplied in the UK that is generated from renewable sources. For every MWh of electricity generated from renewable sources and which is to be consumed in the UK, Ofgem will issue a LEC to the relevant generator who can then sell them on to electricity suppliers. The ultimate consumers will then be exempted from the CCL to the extent that they consume electricity from renewable sources.

Mechanism 3 – Carbon Capture

In its Energy Bill issued in January 2008, the UK Government set out a draft regulatory regime for Carbon Capture and Storage (CCS) projects to enable the carrying out of a first commercial scale CCS project in the UK by 2014. The Government also set out in the same bills some draft provisions to modernise the decommissioning of offshore renewable energy installations. The UK Government is willing to fund up to 100% of the additional cost of CCS for a demonstration project.

Mechanism 4 – Heat

The Renewable Heat Incentive (RHI) is the world's first long-term financial support programme for renewable heat. The RHI pays participants of the scheme that generate and use renewable energy to heat their buildings. By increasing the generation of heat from renewable energy sources (instead of fossil fuels), the RHI helps the UK reduce greenhouse gas emissions and meet targets for reducing the effects of climate change.

There are two parts to the RHI:

- Domestic RHI – launched 9 April 2014 and open to homeowners, private landlords, social landlords and self-builders
- Non-domestic RHI – launched in November 2011 to provide payments to industry, businesses and public sector organisations

Mechanism 5 – Various sources of funding.

Sources of funding include the Government's Technology Programme, the Carbon Trust's Applied Research Programme and Technology Acceleration Activities, and the EU's Framework Programme for Research and Technical Development. In addition, a large number of funding sources are available for community, agricultural and micro-generation renewable initiatives.

RASLRES policy toolkit

The Key Policy Instruments, outlined in the previous section, are a sample of the range of initiatives that have been used across the EU, over the last 10 years to incentivise or obligate markets to move towards a renewables future.

This section is a summary of the appropriateness of using those measures, specifically in the bioenergy sector. Several extraneous factors should be taken into account, when policy measures are being considered for the bioenergy sector.

- The maturity of the market in the country/region.
- The extent and nature of the natural resource, which is being incentivised or increased.
- The duration of the measure (Too many measures are introduced at short notice, with short delivery windows)
- Is the measure time bound, or is it related to a delivery target?
- The need to provide a long term policy horizon. Many biomass options involve a change in the nature of land use and will only be effective if the landowner/farmer can see that the measure will be effective for the period which reduces his decision risk.
- The implications of the measure. Does it only address only one part of the supply chain? If so, are supplementary measures required?

Mechanism	Appropriate for Biomass	Appropriate for liquid biofuels	Appropriate for energy crops	Appropriate for forestry	Early stage market support	Late stage market support	Suitable for renewable heat	Suitable for Renewable Electricity	Targeted/Issue specific	Encourages additional supply/product	Encourages additional demand	Obligation	Incentive
Green Electricity Act					X	X		X		X		X	
Emission Trading Allowance												X	
Tradable Green Certificates	X	X	X	X		X		X		X			X
Climate and Energy Fund	X	X	X	X	X					X	X		X
Installation premiums	X	X	X	X	X	X	X	X	X	X			X
Tax exemptions	X	X	X	X	X	X	X	X	X	X	X		X
Power Purchase Obligation	X	X	X	X	X	X		X			X	X	
Feed-in Tariffs	X	X	X	X		X		X			X		X
Call for Tender	X	X	X	X	X	X	X	X	X	X	X		X
National round tables	X	X	X	X	X				X		X		X
Mandatory off-take	X	X	X	X	X	X		X		X		X	
Sustainable Energy Production Decree	X	X	X	X	X		X	X		X			
Subsidies	X	X	X	X	X	X	X	X	X	X			X
Renewables Obligation	X	X	X	X		X	X	X		X		X	
Renewable Heat Incentive	X	X	X	X		X	X				X		X



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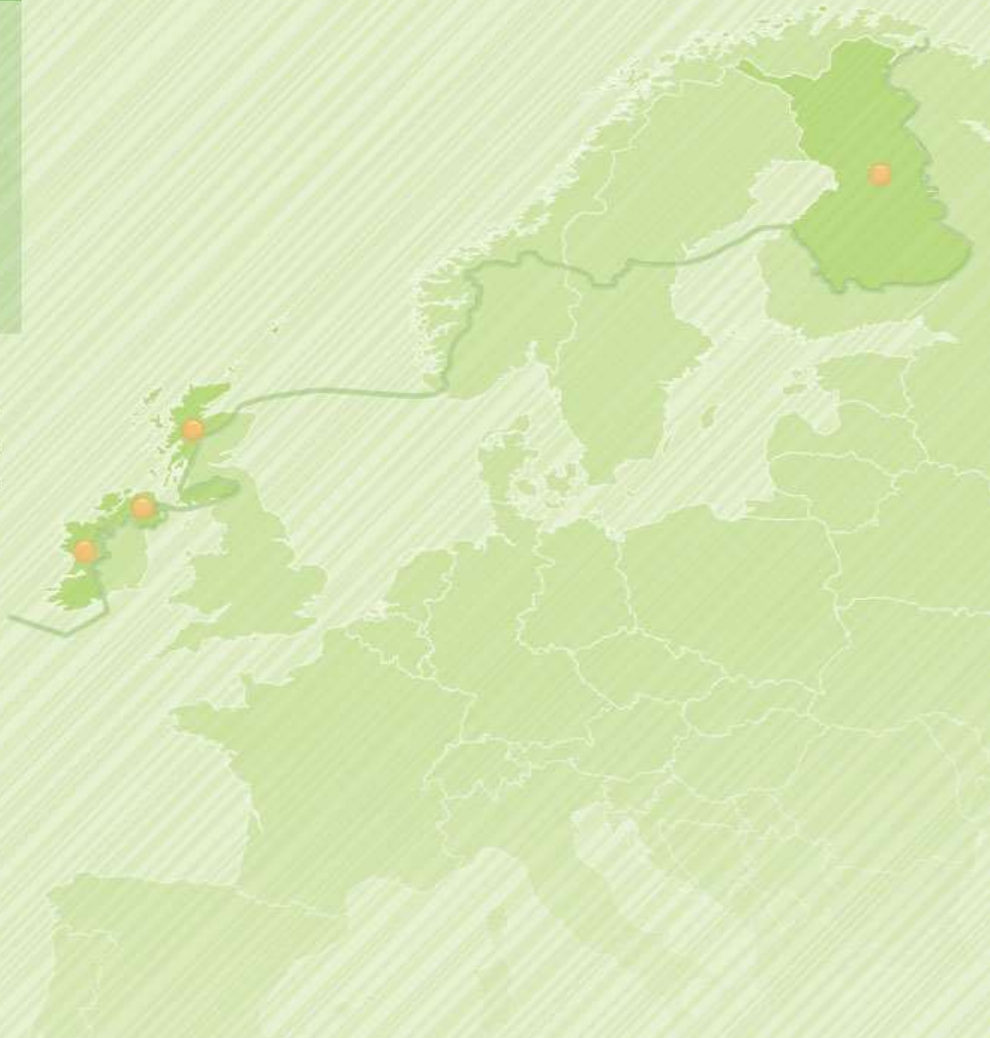
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BioPAD is promoting the wider use of bioenergy and developing applications targeting the whole process from supplying fuel to producing energy.

The project is led by the Western Development Commission (Republic of Ireland) and brings together partners from Northern Ireland (Action Renewables), Scotland (Environmental Research Institute) and Finland (Finnish Forest Research Institute, Metla).

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