Northern Periphery and Arctic Programme
2014–2020

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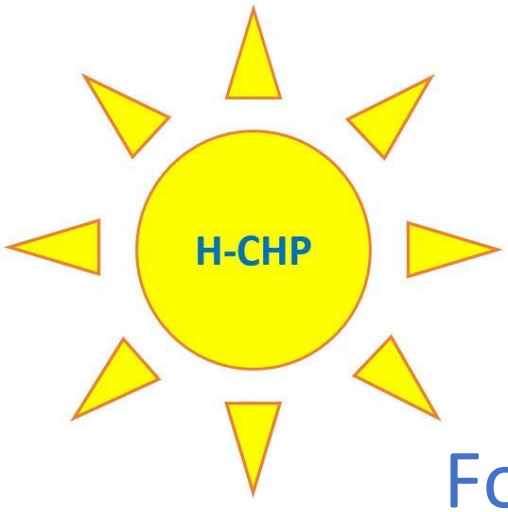

Fostering energy-secure communities through promotion of renewable energy and energy efficiency

NORTHERN PERIPHERY AND ARCTIC PROGRAMME
2014-2020

Abstract

A report on the regulations of each country of the NPA area, in respect to micro-CHP installations, complete with a description of EU regulations, national regulations and available grants/funding, relating to renewables and energy efficiency (Priority Axis 3).

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Glossary

Acronym	Definition
BEIS	Business, Energy and Industrial Strategy
CHP	Combined Heat and Power
CPI	Consumers Prices Index
ct	cent
DECC	Department of Energy & Climate Change
DKK	Denmark Currency
ERDF	European Regional Development Fund
EU	European Union
EUR	European Union Currency
GBP	United Kingdom Currency
GD ORB	Green Deal Oversight and Registration Body
ISK	Iceland Currency
kW	kilowatt
kWh	kilowatt hours
kWth	kilowatt thermal
MCS	Microgeneration Certification Scheme
MVA	Mega Volt Ampere
MWh	megawatt hours
NHRHISR	Northern Ireland Renewable Heat Incentive Scheme Regulations
NIRHI	Northern Ireland Renewable Heat Incentive
NOK	Norway Currency
NPA	North Periphery and Arctic
NVE	Norwegian Water Resources and Energy Directorate
RE	Renewable Energy
RES	Renewable Energy Sources
RES-C	Renewable Energy Sources-Cooling
RES-H	Renewable Energy Sources-Heating
RES-H/C	Renewable Energy Sources-Heating and Cooling
RHI	Renewable Heat incentive

RHISR ..... Renewable Heat Incentive Scheme Regulations

RPI ..... Retail Prices Index

SEK ..... Sweden Currency

Abstract

The main purpose of this document is to list, for each country in the Northern Periphery and Arctic programme, every relevant regulation, decree, law and eventual subsidies/grants/funding schemes in respect to CHP (Combined Heat and Power) installations.

The research has been focused on Biomass (i.e. scrap lumber, forest debris, wood pellets, etc.) and Biogas (type of biofuel that is naturally produced from the decomposition of organic waste) as fuel types for possible micro-CHP installations listing, where available, all the steps the customers would have to follow to obtain the aforementioned bonuses for their newly planned system.

It has to be noted that every one of these regulation/decrees/etc. is dedicated to plant-sized CHP production facilities, and not to micro-CHP household facilities. Nevertheless, they are a good starting point to analyse the response of various governments, companies and ministries regarding this kind of energy production/management process.

The examination process will be accompanied by detailed simulation charts which illustrate, practically, how the funding and grants affect the final consumer, in terms of expenses per year, for a total of ten years of payments, in Euro currency.

Introduction

The Northern Periphery and Arctic 2014-2020 forms a cooperation between 9 programme partner countries. The NPA 2014-2020 is part of the European Territorial Cooperation Objective, supported by the European Regional Development Fund (ERDF) and ERDF equivalent funding from non-EU partner countries.

Despite geographical differences, the large programme area shares a number of joint challenges and opportunities that can best be overcome and realised by transnational cooperation. It is the programme's vision is to help to generate vibrant, competitive and sustainable communities, by harnessing innovation, expanding the capacity for entrepreneurship and seizing the unique growth initiatives and opportunities of the Northern and Arctic regions in a resource efficient way.

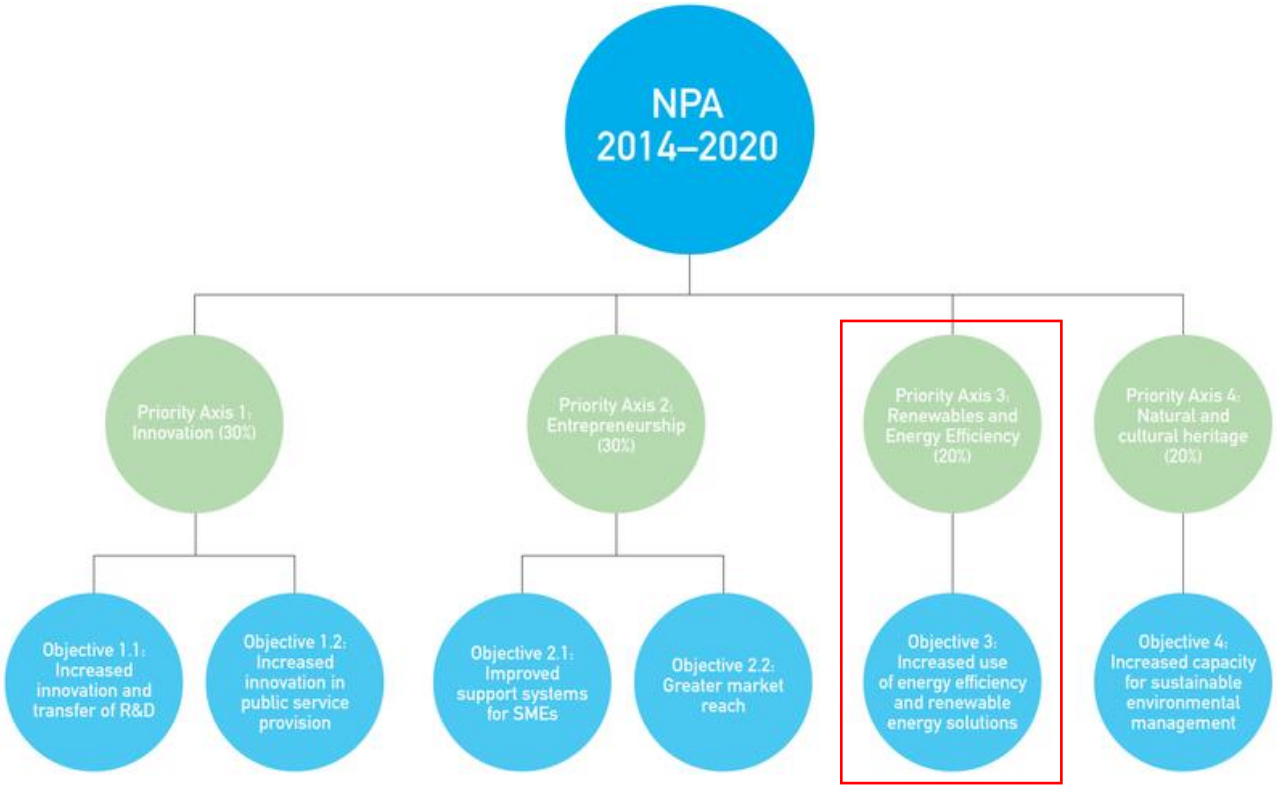

Figure 1: NPA Programme Priority Axes (NPA INTERREG 2014)

The main interest of this research paper is to shed light on all the various regulations that each one of the involved countries has in respect to CHP installations.

It has to be noted that every one of them is dedicated to plant-sized CHP production facilities, and not to micro-CHP household facilities. Nevertheless, they are a good starting point to analyse the

response of various governments, companies and ministries regarding this kind of energy production/management process.

Every nation examination will be accompanied by detailed simulation charts which illustrate, practically, how the funding and grants affect the final consumer, in terms of expenses per year, for a total of ten years of payments.

The Simulated CHP System

As anticipated in the previous section, to have a good grasp of all the involved laws and regulations regarding potential CHP installations in the various countries, a system simulator has been set up - utilizing Microsoft™ Office365™ Excel™ - which is able to recreate the paying conditions based on the available funds and grants starting from few data.

In particular:

- The Installed Power (in kW);
- The Average Yearly Energy Requirement (in kWh);
- The Maintenance Costs (put at an average EU price of 300 €/year);
- The Fuel -Biogas or Biomass- cost.

Whit this basic information, the simulator is able to calculate the monetary conditions a potential CHP installer/customer will have to face if he or she decides to build such a system.

Below, two examples of a simulated CHP installation, starting with Biogas as a fuel:

Installed Power	3	kW												EUR/GBP rate	0,89		
Fuel	Biogas			Biogas	0,06	€		Annual Fuel Price	1080	€				EUR/NOK rate	9,57		
Equip. Price	7000	€		Biomass	0,07	€		Avg. Maint. Costs	300	€/year				EUR/SEK rate	10,44		
Year Energy C.	18000	kWh												EUR/ISK rate	123,98		
														EUR/DKK rate	7,46		
	Initial Cos	Second	Third	Fourth	Fifth	Sixth	Seventh	Eight	Ninth	Tenth		Total					
Denmark	7864	1164	1164	1164	1164	1164	1164	1164	1164	1164		18340	€	16323	£	136816	DKK
Finland	7180	480	480	480	480	480	480	480	480	480		11500	€	10235	£	11500	€
Norway	8080	1380	1380	1380	1380	1380	1380	1380	1380	1380		20500	€	18245	£	196185	NOK
Sweden	8008	1308	1308	1308	1308	1308	1308	1308	1308	1308		19780	€	17604	£	206503	SEK
Great Britain	7682	982	982	982	982	982	982	982	982	982		16522	€	14705	£	14705	£
N. Ireland	7367	667	667	667	667	667	667	667	667	667		13372	€	11901	£	11901	£
Greenland	8080	1380	1380	1380	1380	1380	1380	1380	1380	1380		20500	€	18245	£	152930	DKK
Faroe Islands	8080	1380	1380	1380	1380	1380	1380	1380	1380	1380		20500	€	18245	£	152930	DKK
Svalbard	8080	1380	1380	1380	1380	1380	1380	1380	1380	1380		20500	€	18245	£	196185	NOK
Iceland	4580	1380	1380	1380	1380	1380	1380	1380	1380	1380		17000	€	15130	£	2107660	ISK
R. of Ireland	8080	1380	1380	1380	1380	1380	1380	1380	1380	1380		20500	€	18245	£	20500	€

Figure 2: Biogas Simulation Example

And then, with Biomass as a fuel:

Installed Power	3	kW											EUR/GBP rate	0,89		
Fuel	Biomass			Biogas	0,06	€		Annual Fuel Price	1260	€			EUR/NOK rate	9,57		
Equip. Price	7000	€		Biomass	0,07	€		Avg. Maint. Costs	300	€/year			EUR/SEK rate	10,44		
Year Energy C.	18000	kWh											EUR/ISK rate	123,98		
													EUR/DKK rate	7,46		

	Initial Cos	Second	Third	Fourth	Fifth	Sixth	Seventh	Eight	Ninth	Tenth	Total					
Denmark	8044	1344	1344	1344	1344	1344	1344	1344	1344	1344	20140	€	17925	£	150244	DKK
Finland	7900	1200	1200	1200	1200	1200	1200	1200	1200	1200	18700	€	16643	£	18700	€
Norway	8260	1560	1560	1560	1560	1560	1560	1560	1560	1560	22300	€	19847	£	213411	NOK
Sweden	8188	1488	1488	1488	1488	1488	1488	1488	1488	1488	21580	€	19206	£	225295	SEK
Great Britain	7603	1036	1036	1036	1036	1036	1036	1036	1036	1036	16929	€	15067	£	15067	£
N. Ireland	6910	210	210	210	210	210	210	210	210	210	8800	€	7832	£	7832	£
Greenland	8260	1560	1560	1560	1560	1560	1560	1560	1560	1560	22300	€	19847	£	166358	DKK
Faroe Islands	8260	1560	1560	1560	1560	1560	1560	1560	1560	1560	22300	€	19847	£	166358	DKK
Svalbard	8260	1560	1560	1560	1560	1560	1560	1560	1560	1560	22300	€	19847	£	213411	NOK
Iceland	4760	1560	1560	1560	1560	1560	1560	1560	1560	1560	18800	€	16732	£	2330824	ISK
R. of Ireland	8260	1560	1560	1560	1560	1560	1560	1560	1560	1560	22300	€	19847	£	22300	€

Figure 3: Biomass Simulation Example

As a reminder, the simulated system has been pre-set to the following conditions:

- Installed Power: 3 kW;
- Average Yearly Energy Requirement: 18000 kWh;
- Maintenance Costs: 300 €;
- Fuel Cost – Biogas: 0.07 €/kWh – Biomass: 0.06 €/kWh.

However, every variable can be adjusted as the users' desire, to better reflect the particular condition(s) in which they are in. All the produced simulated data are for ease of reference only.

Guide to Sunburst Charts

To explain in the best possible way the relationship between the yearly payments and the amount of money needed to be paid, a particular chart has been used in this research, the sunburst.

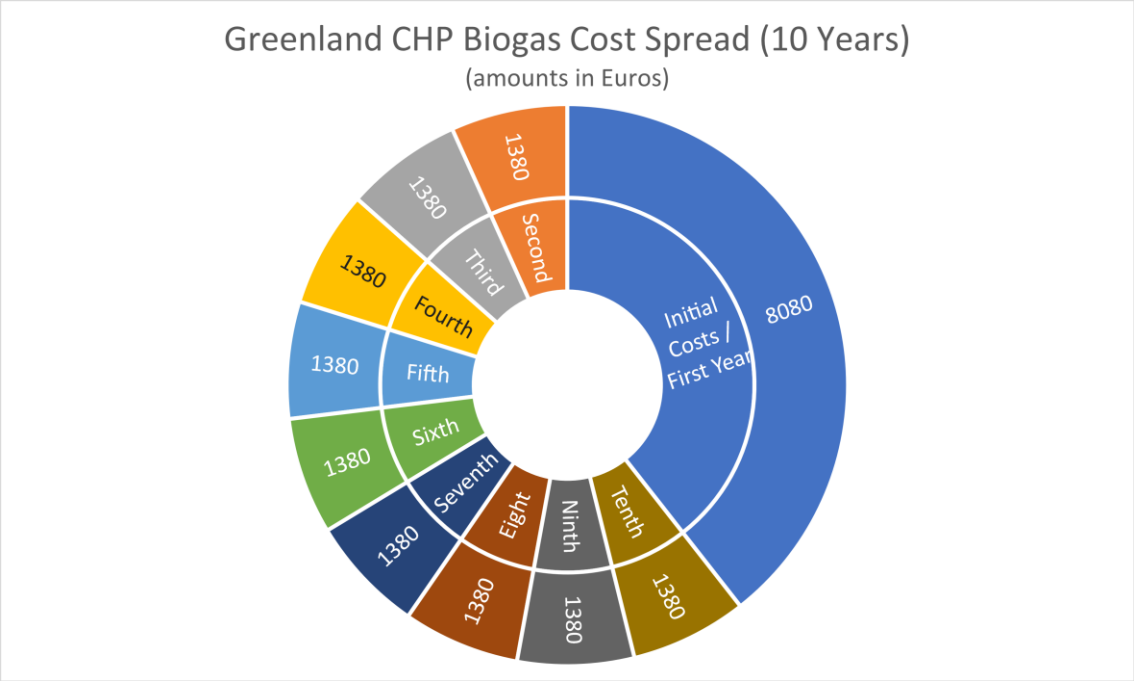

Figure 4: Sunbrurst Chart Example

As it can be seen, every diagram (like the one above) which explains the simulation for a CHP installation for each country is divided into two main rings:

- The inner one shows the period of the payments, divided into ten sections, one for each year of the simulation;
- The outer one instead, shows the amount of the payments, again divided into ten sections;
- Finally, the colours will match for each period/amount relationship, giving at a single glance an immediate view of the actions of grants and subsidies for a particular nation.

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Figure 5: Denmark Map

Denmark

In Denmark there are various plans which include subsidies dedicated towards potential CHP installations, mainly focused on using biogas as a fuel.

Means of Support

Summarising, it is possible to distribute them into two different categories. The production of heat from renewable energies is subsidised through various support schemes and investment aids.

1. *Tax regulation mechanism* – In Denmark, there are different taxes on the production, processing, possession, receipt and dispatch of fossil fuels for heating. Renewable energy sources are exempt from these taxes;
2. *Price based mechanism.* The use of biogas for heating purposes is supported through a direct premium tariff.

Employable Technologies

All renewable energy technologies are exempt from the tax obligation. Only biogas is eligible for the price-based mechanism.

Statutory Provisions

All of this is under the following statutory provisions:

- *Act 1118/2014* (Lov om energiafgift af mineralolieprodukter m.v. – Act on the Energy Tax on Mineral Oil Products etc.);
- *Act 1292/2010* (Lov om afgift af stenkul, brunkul og koks m.v. – Act on the Taxes on Coal, Lignite and Coke);
- *Act 321/2011* (Lov om kuldioxidafgift af visse energiprodukter - Act on the Carbon Dioxide Tax on Certain Energy Products);
- *VE-Lov* (Lov om fremme af vedvarende energi No. 1288/2016 – Law on the Promotion of Renewable Energy).

Analyzing the previous two points in more depth:

1) Price-based mechanisms (Premium tariff for biogas)

There is support for the use of biogas for heating purposes through a direct premium tariff for gigajoule of used biogas (§ 43 d VE-Lov).

Eligible Technologies

The Eligible Technologies are concentrated around the usage of Biogas as a fuel.

Bonuses Amount

The amount of the dedicated bonuses is included in two tariffs, paying the total sum to the eligible persons:

- DKK 26 (€ 3.5) per gigajoule biogas (§ 43 d par. 2 VE-Lov);
- DKK 10 (€ 1.34) per gigajoule biogas (§ 43 d par. 2 VE-Lov).

Addressees

The addressees are persons using biogas for heating purposes are eligible for the tariff (§ 43 d par. 2 VE-Lov).

Procedure

The Process Flow will follow the subsequent pattern, under the control of Energinet.dk (§ 50 a par. 2 VE-Lov), which is the competent authority:

- Registration. Persons applying for receiving the tariff have to register at Energinet.dk and provide the authority with the necessary information (§ 50 a par. 3 VE-Lov);
- Decision. Energinet.dk shall decide on the right and the amount of the grant (§ 50 a par. 4 VE-Lov).

Degression

A degression is put into action for each one of the two tariffs:

- As of 01.01.2013, the tariff amounting to DKK 26 per GJ of biogas will be annually:
  - Decreased, in case the price of natural gas in a previous year is higher than the basis price of DKK 53.20 per GJ, by the amount of this difference;
  - Increased, in case the price of natural gas in a previous year is lower than the basis price of DKK 53.20 per GJ, by the amount of this difference (§ 43 e par. 1 VE-Lov);
  - As of 01.01.2016, the tariff amounting to DKK 10 per gigajoule biogas will be annually decreased by DKK 2 (€ 0.27) and will cease by the end of 2019 (§ 43 e par. 3 VE-Lov).

Distribution of Costs

The costs will be distributed as such: the Danish state will bear the costs of the premium tariff (§ 43 e par. 7 VE-Lov).

2) Tax regulation mechanism

There are different taxes are levied on the production, processing, possession, receipt and dispatch of fossil fuels for heating purposes, for example the energy tax on mineral oil products, taxes on coal, lignite and coke or the carbon dioxide tax on certain energy products. Renewable energy sources are exempt from these taxes, as they are not classed as taxable in the specific regulations.

Eligible Technologies

All renewable energy generation technologies are eligible for tax exemption (including CHP-based ones with Biogas or Biomass as fuels).

Bonuses Amount

The amount of tax relief is equal to the tax rate entitled persons are exempt from.

Addressees

The addressees of this mechanism are related to the fact that heating from renewable sources is exempt from these taxes. Companies producing, processing, possessing, receiving or dispatching renewable energy products are exempt from paying tax.

Procedure

The Process Flow is put under the supervision of the Danish Ministry of Taxation, which is the competent authority.

Distribution of Costs

The costs of all the tax reliefs will be borne by the state.

Possible CHP Installation Simulation

An example installation of 3 kW, with a 7000 € equipment cost, and 18 MWh of yearly energy consumption, will have this cost spread over ten years (amounts in Euros):

Initial Costs / First Year		Second Year	Third Year	Fourth Year	Fifth Year	Sixth Year	Seventh Year	Eight Year	Ninth Year	Tenth Year
Biogas	7864	1164	1164	1164	1164	1164	1164	1164	1164	1164
Biomass	8044	1344	1344	1344	1344	1344	1344	1344	1344	1344

Table 1: Denmark Biogas/Biomass Simulation Results

Charting the results with Biogas Fuel:

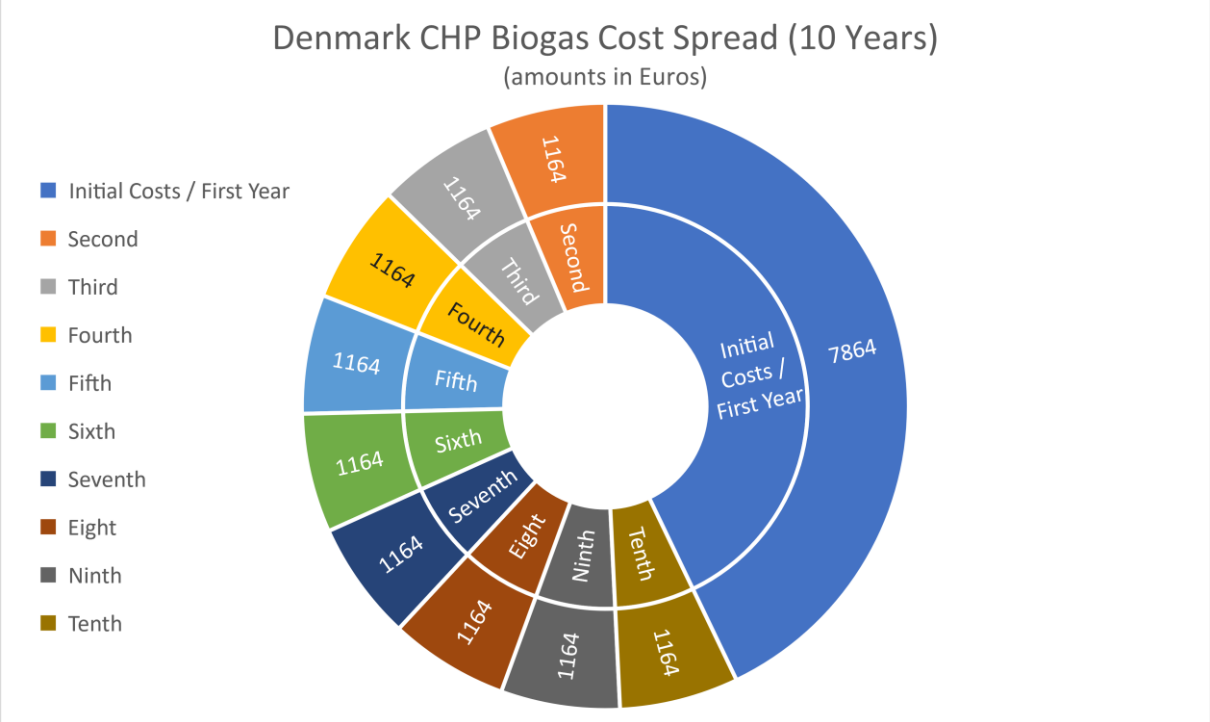

Figure 6: Denmark Biogas Cost Spread Chart

And with Biomass Fuel:

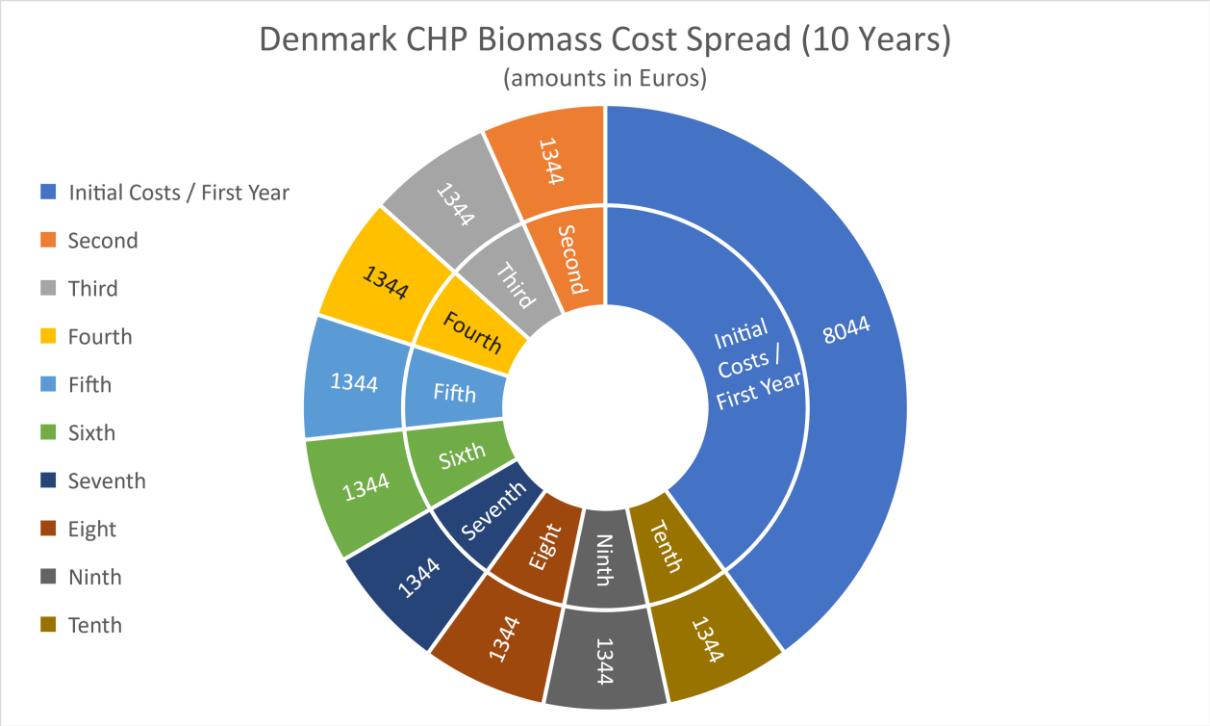

Figure 7: Denmark Biomass Cost Spread Chart

Figure 8: Faroe Islands Map

Faroe Islands

Faroe Islands have different support schemes, both subsidies and tax regulation mechanisms. No one of them is dedicated to potential CHP installations.

Possible CHP Installation Simulation

An example installation of 3 kW, with a 7000 € equipment cost, and 18 MWh of yearly energy consumption, will have this cost spread over ten years (amounts in Euros):

Initial Costs / First Year		Second Year	Third Year	Fourth Year	Fifth Year	Sixth Year	Seventh Year	Eight Year	Ninth Year	Tenth Year
Biogas	8080	1380	1380	1380	1380	1380	1380	1380	1380	1380
Biomass	8260	1560	1560	1560	1560	1560	1560	1560	1560	1560

Table 2: Faroe Islands Biogas/Biomass Simulation Results

Charting the results with Biogas Fuel:

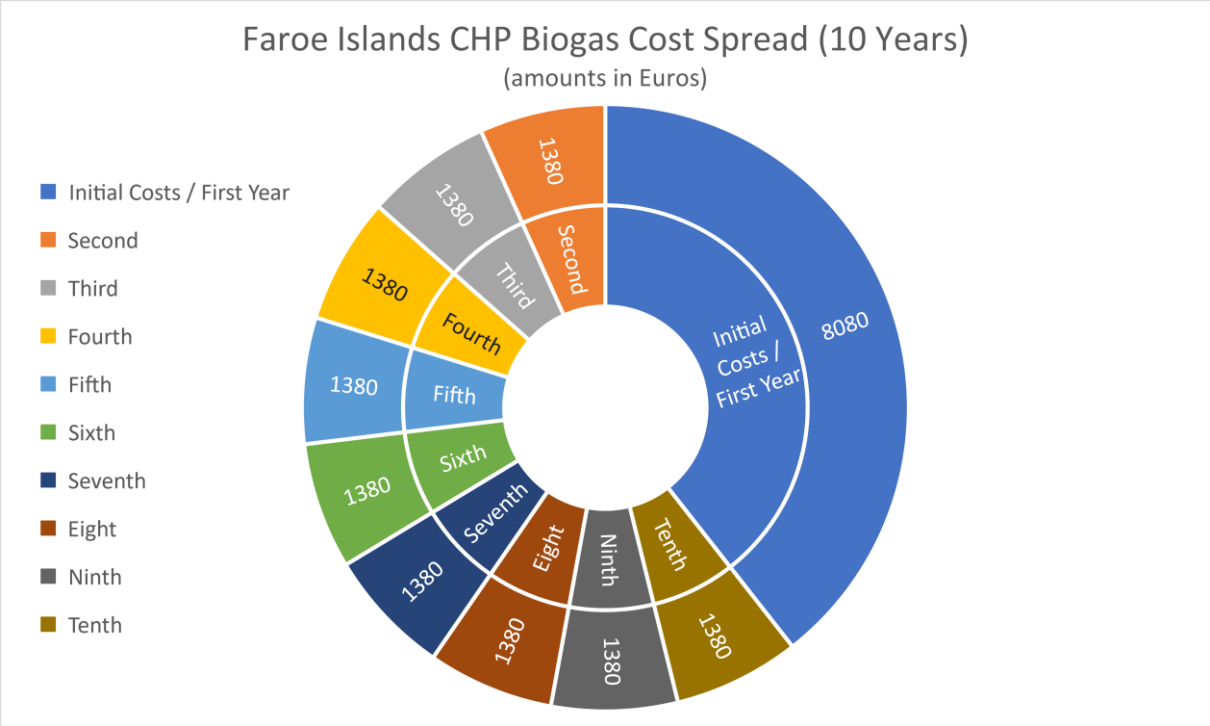

Figure 9: Faroe Islands Biogas Cost Spread

And with <u>Biomass Fuel</u>:

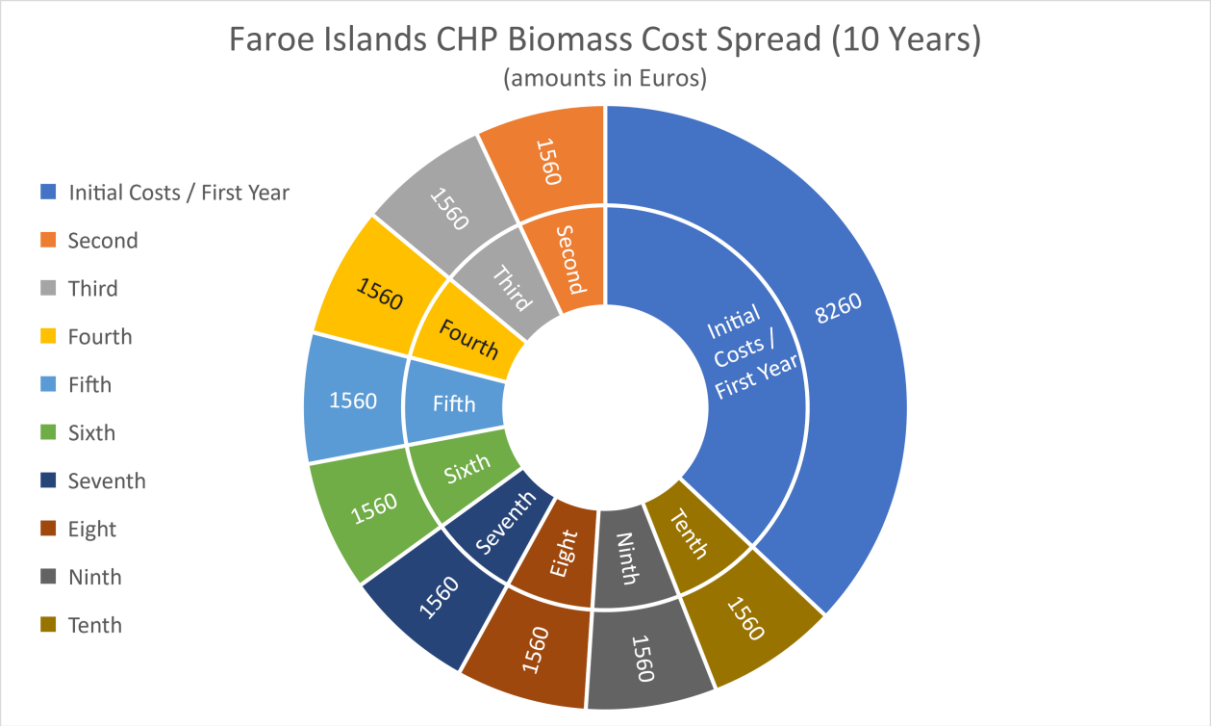

Figure 10: Faroe Islands Biomass Cost Spread

Figure 11: Finland Map

Finland

In Finland there are various plans which include subsidies dedicated towards potential CHP installations.

Means of Support

Summarising, it is possible to distribute them into three different categories. The production of heat from renewable energies is subsidised through various support schemes and investment aids.

1. A fixed *"Heat bonus"* is paid for heat produced by CHP plants working on biogas and wood fuel;
2. *Investment supports* are available for the construction of production facilities using renewable energies;
3. *Investment support* is available for farmers to support the construction of heat plants working on renewable energy.

Employable Technologies

The involved technologies are related to the heat produced by CHP plants working on biogas and wood fuel. In case of other support schemes, subject to certain conditions, all RE technologies may be eligible.

Statutory Provisions

All of this is under the following statutory provisions:

- *Act No. 1396/2010* (Laki uusiutuvilla energialähteillä tuotetun sähkön tuotantotuesta – Act on the Production Subsidy for Electricity Produced from Renewable Energy Sources);
- *Decree No. 1397/2010* (Valtioneuvoston asetus uusiutuvilla energialähteillä tuotetun sähkön tuotantotuesta – Regulation on Production Subsidy for Electricity Produced from Renewable Energy Sources);
- *Decree No. 241/2015* (Valtioneuvoston asetus maatilan investointituen kohdentamisesta – Government Decree on the Allocation of Farm Investment Aid);
- *Regulation No. 1063/2012* (Valtioneuvoston asetus energiatuen myöntämisen yleisistä ehdoista – Government Decree on General Conditions for Granting Energy Aid).

Analyzing the previous three points in more depth:

1) Price-based mechanisms ("Heat bonus" for CHP plants)

The cogeneration of heat and electricity is promoted by giving CHP plants working on biogas and wood fuel the right for an increased fixed "heat bonus". The granting of the support is subject to certain conditions.

Eligible Technologies

The Eligible Technologies are CHP plants working on biogas or wood fuel. In addition, the plant must be located in Finland or in Finnish waters and be connected to the grid (§ 7 Act No. 1396/2010). CHP plants must meet certain requirements according to the technology employed (see below) (§26 Act No. 1396/2010).

Respectively, CHP plant working on biogas is eligible for an increased "heat bonus" if the following conditions are met:

- The plant must produce both electricity and usable heat;
- The plant must achieve an efficiency rate of at least 50%, or even 75% if the capacity of the generators is equal to or exceeds 1 MVA (§ 10 Act No. 1396/2010);
- And also, Wood fuel plants are eligible for an increased "heat-bonus" if they meet the following conditions:
  - The plant must produce both electricity and usable heat;
  - The plant must achieve an efficiency rate of at least 50%, or even 75% if the capacity of the generators is equal to or exceeds 1 MVA (§ 11 Act No. 1396/2010).

Electricity generated by a wood-chip plant may be eligible for an increased "heat bonus" if the plant includes a pulverized coal boiler that uses wood-chips for fuel

Bonuses Amount

The amount of the bonuses dedicated to the two different fuels are the following:

- Biogas: the bonus is fixed at € 50 per MWh for CHP plants working on biogas (§26 Act No. 1396/2010);
- Biomass: The bonus is fixed at € 20 per MWh for CHP plants working on wood fuel (§26 Act No. 1396/2010).

Addressees

The addressees, the Entitled Parties, are energy producers who produce heat and energy in a CHP plant working on biogas or wood fuel.

Procedure

The Process Flow will follow the subsequent pattern, under the Ministry of Economic Affairs and Employment, and also the supervision of the Energy Authority (§4 Act No. 1396/2010), which are the competent authorities:

- *Advance notification.* Within one month of the decision to install a plant, the electricity producer using biogas and wood fuel in CHP plant shall inform the Energy Authority about his plans and about the technical specifications of the plant (including heat utilization, plant efficiency and total capacity) in writing (§ 13 Act No. 1396/2010):
- *Application.* A given producer shall apply to the Energy Authority for the "heat bonus". All applications except applications regarding wood-chip plants must be submitted before the plant starts commercial operation. The application must contain certain information specified by law (§ 14 Act No. 1396/2010):
- *Allocation of support.* The Energy Authority awards the "heat bonus" if the applicant meets the formal and technical requirements (§ 26 Act No. 1396/2010).

Distribution of Costs

The costs will be distributed as such: The Energy Authority pays the bonuses (§ 29 Act No. 1396/2010). These costs are covered by the state budget (§ 2 Act No. 1396/2010).

2) Subsidy I (State grant for investment in RES)

What has been called "the energy aid" is a state grant for investments in RES production facilities and research projects related to it.

Grants are available for projects, which promote the use or production of renewable energies, advance energy efficiency and reduce the environmental effects caused by energy production and use (§3, §5 Decree No. 1063/2012).

At least 25% of the projects' financing must come from non-governmental funds. Energy aid may be granted to companies, municipalities and other communities.

Eligible Technologies

According to the Ministry of Economic Affairs and Employment, all technologies are eligible for grants (including CHP-based ones with Biogas or Biomass as fuels).

Grants are available for investments in renewable energy generation facilities and to conduct research related to different environmental and energy projects, such as energy audits, analysis of the new methods and development of services (§3 Decree No. 1063/2012).

The projects need to either promote the use or production of renewable energies; advance energy efficiency and energy saving or reduce the environmental effects caused by energy production and use (§5 Decree No. 1063/2012).

Among other costs, the costs for preparation, administrative planning and employment are eligible for subsidies (§ 10 Decree No.1063/2012).

Bonuses Amount

The amount of the bonuses depends on the aim of the project in question. The support allocated to investments in renewable energy production facilities can make up to 30% of the project's overall cost but can increase up to 40% in case the project involves the use of new technology.

The support allocated to research can make up to 40% of the project's total cost (§7 Decree No. 1063/2012).

A company or entity receiving the subsidy has to finance at least 25% of the total project costs from non-state funding (§ 5 Decree No. 1063/2012).

Addressees

The addressees can be divided in:

- *Entitled party*: The entities entitled to subsidies are companies, municipalities and communities ("Yhteisö"). Support cannot be allocated to farms, housing corporations, residential properties and construction projects benefitting from other state aid measures.
  If the project is done in cooperation between several companies, municipalities or communities, the support will be allocated to the entity, which has the role of the coordinator (§ 6 Decree No. 1063/2012).
  According to the Ministry of Economic Affairs and Employment, both private organisations and legal entities like strategic alliances, federations, associations and foundations are eligible;
- *Obligated party*: Responsible body is Ministry of Economic Affairs and Employment or The Centre for Economic Development, Transport and the Environment (ELY Centre).
  The Ministry of Employment and Economy is responsible for investment projects where costs exceed € 5,000,000 and for research projects with costs beyond € 250,000. The Ministry equally deals with projects using new technologies.
  Other project applications are dealt by the Centre for Economic Development, Transport and the Environment (§4 Decree No. 1063/2012).

Procedure

The Process Flow will follow the subsequent pattern, under the Ministry of Economic Affairs and Employment, which is the competent authority:

- *Application for subsidy.* Applications shall be submitted to the regional Centre for Economic Development, Transport and the Environment (ELY Centre), where most of the project's activities take place (§ 8 Decree No. 1063/2012);
- *Selection.* Applicants are selected by the ELY Centre according to certain criteria. The Centre has some degree of freedom in the decision-making process. However, if the costs of the project exceed € 5,000,000 (in case of investments into renewable energy generation technologies) or € 250,000 (in case of research projects) or if the project aims to take up a new energy production technology, the selection is done by the Ministry of Economic Affairs and Employment (§ 4 Decree No. 1063/2012);
- *Allocation of subsidies.* Subsidies are awarded to the selected projects;
- *Project implementation.* According to the Ministry of Economic Affairs and Employment, applicants are informed of the decision concerning the subsidy and of the requirements for project implementation, which are a prerequisite for receiving energy aid;
- *Payment of the subsidy.* Support is paid after the start of the project based on the application and actual cost documents. The subsidy is paid either in one or several parts based on the decision allocating the support. Projects that include leasing or partial payments, can be paid in one part after the completion of the project (§ 12 Decree No. 1063/2012).

Distribution of Costs

The costs will be distributed as such: The Energy Authority will pay the bonuses (§ 29 Act No. 1396/2010). These costs are covered by the state budget (§ 2 Act No. 1396/2010).

3) Subsidy II (Investment support for farmers)

Decree No. 241/2015 states the conditions for the allocation of investment support for farmers, which can be used for the construction of heating facilities working on renewable energies.

The support can be allocated for the construction, expansion or renovation of heating facilities used for agricultural production. The condition for the allocation of the grant is that the plant needs to work on either waste, aerothermal, geothermal, solar thermal, biomass or any other renewable source.

Eligible Technologies

The only specification regards eventual Biogas installations: Support is eligible for new biogas plant, which produces biogas from biomass with a purpose of heating or other energy. Biomass in this case is considered raw material growing on the farm or the by-products, organic waste and sewage sludge from sparsely populated areas.

Heating facility and biogas plant are eligible for only the part it uses heat or energy for its own use. At least 10 per cent of the total energy production has to be used for producing heat (Decree No. 241/2015 §16).

Addressees

The support scheme is addressed to farmers. (§1 Decree No. 241/2015).

Procedure

The Process Flow will be regulated by the Ministry of Agriculture and Forestry, and also by the Centre for Economic Development, Transport and the Environment, which are the competent authorities.

Distribution of Costs

The costs will be distributed according to Decree No. 241/2015, which indicates that all the expenses are borne by the state (§19 Decree No. 241/2015).

Possible CHP Installation Simulation

An example installation of 3 kW, with a 7000 € equipment cost, and 18 MWh of yearly energy consumption, will have this cost spread over ten years (amounts in Euros):

Initial Costs / First Year		Second Year	Third Year	Fourth Year	Fifth Year	Sixth Year	Seventh Year	Eight Year	Ninth Year	Tenth Year
Biogas	7180	480	480	480	480	480	480	480	480	480
Biomass	7900	1200	1200	1200	1200	1200	1200	1200	1200	1200

Table 3: Finland Biogas/Biomass Simulation Results

Charting the results with Biogas Fuel:

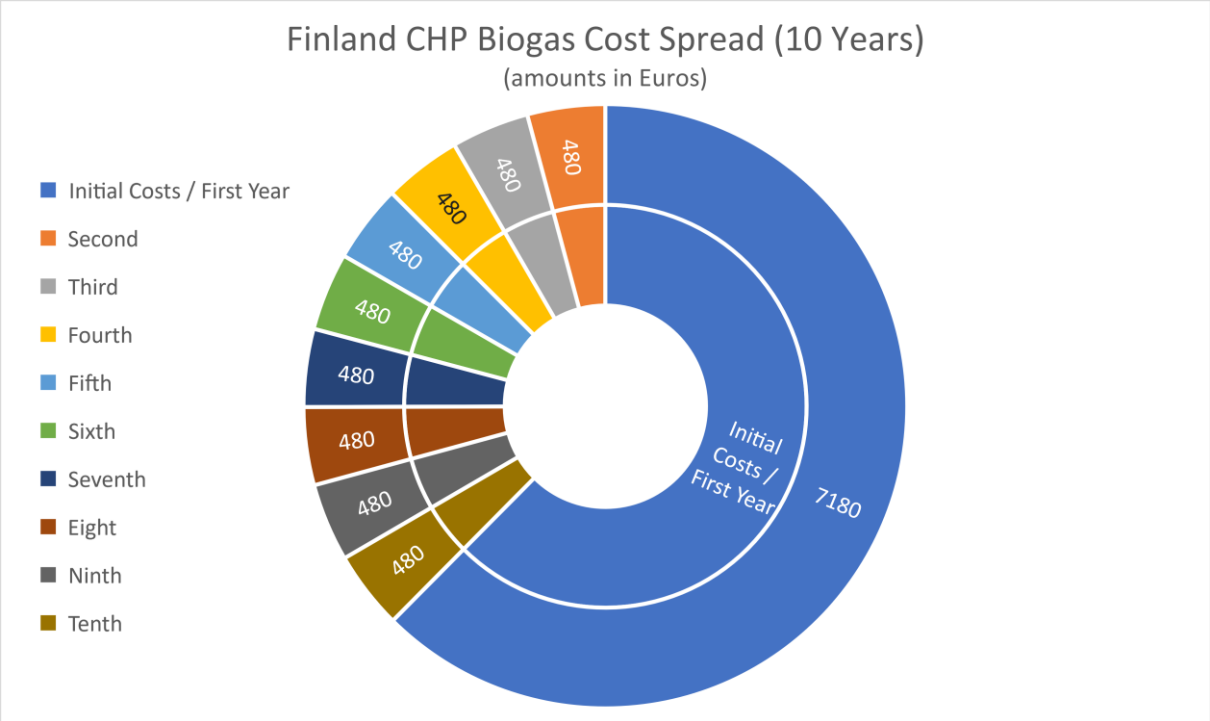

Figure 12: Finland Biogas Cost Spread

And with Biomass Fuel:

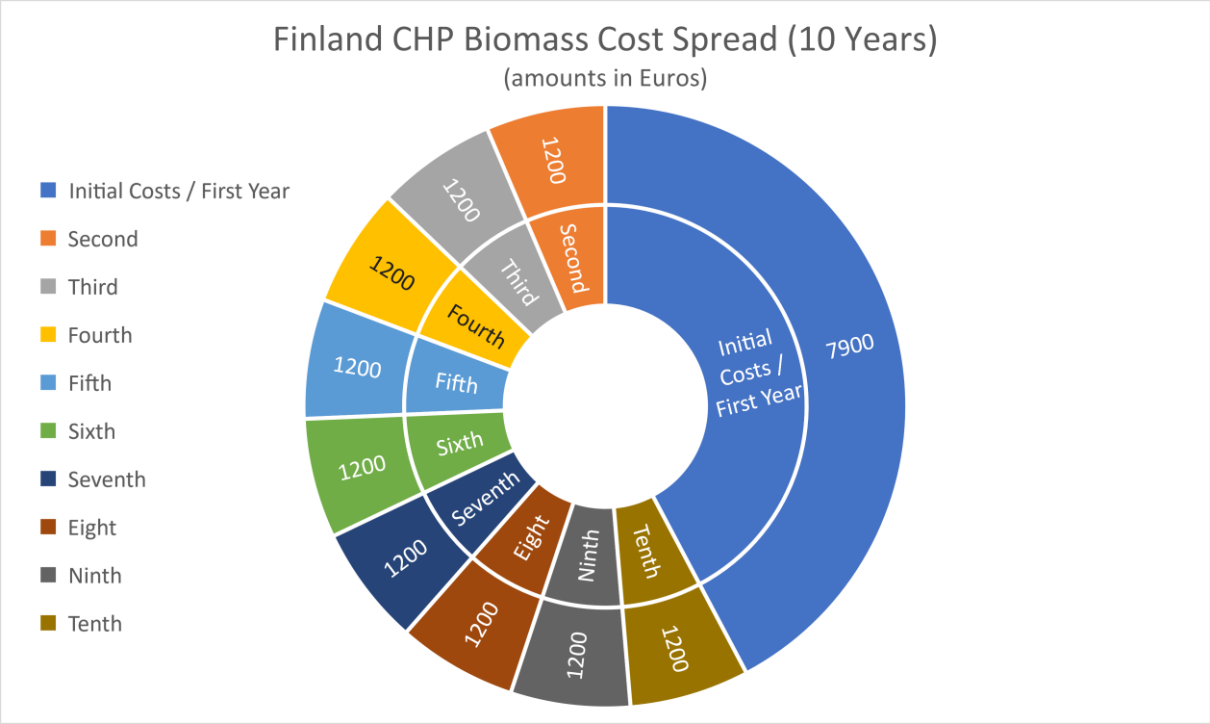

Figure 13: Finland Biomass Cost Spread

Figure 14: Greenland Map

Greenland

Greenland has various support schemes, both subsidies and tax regulation mechanisms. No one of them is dedicated to potential CHP installations.

Possible CHP Installation Simulation

An example installation of 3 kW, with a 7000 € equipment cost, and 18 MWh of yearly energy consumption, will have this cost spread over ten years (amounts in Euros):

	Initial Costs / First Year	Second Year	Third Year	Fourth Year	Fifth Year	Sixth Year	Seventh Year	Eight Year	Ninth Year	Tenth Year
Biogas	8080	1380	1380	1380	1380	1380	1380	1380	1380	1380
Biomass	8260	1560	1560	1560	1560	1560	1560	1560	1560	1560

Table 4: Greenland Biogas/Biomass Simulation Results

Charting the results with Biogas Fuel:

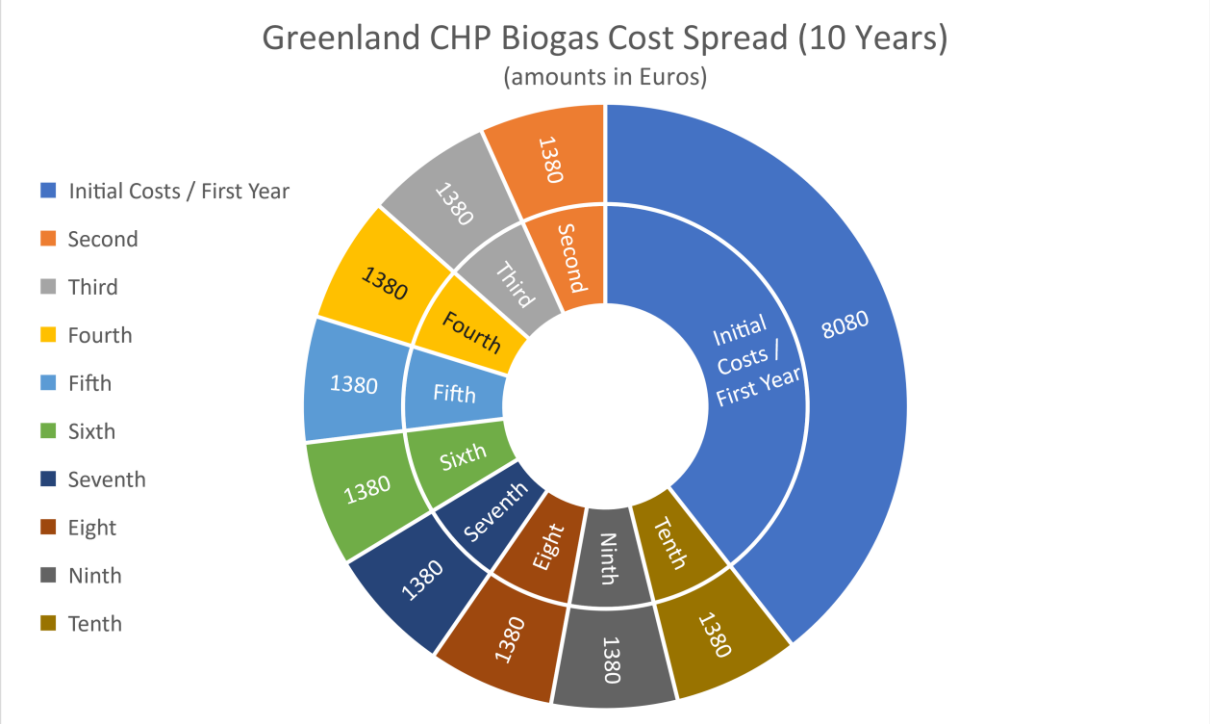

Figure 15: Greenland Biogas Cost Spread

And with Biomass Fuel:

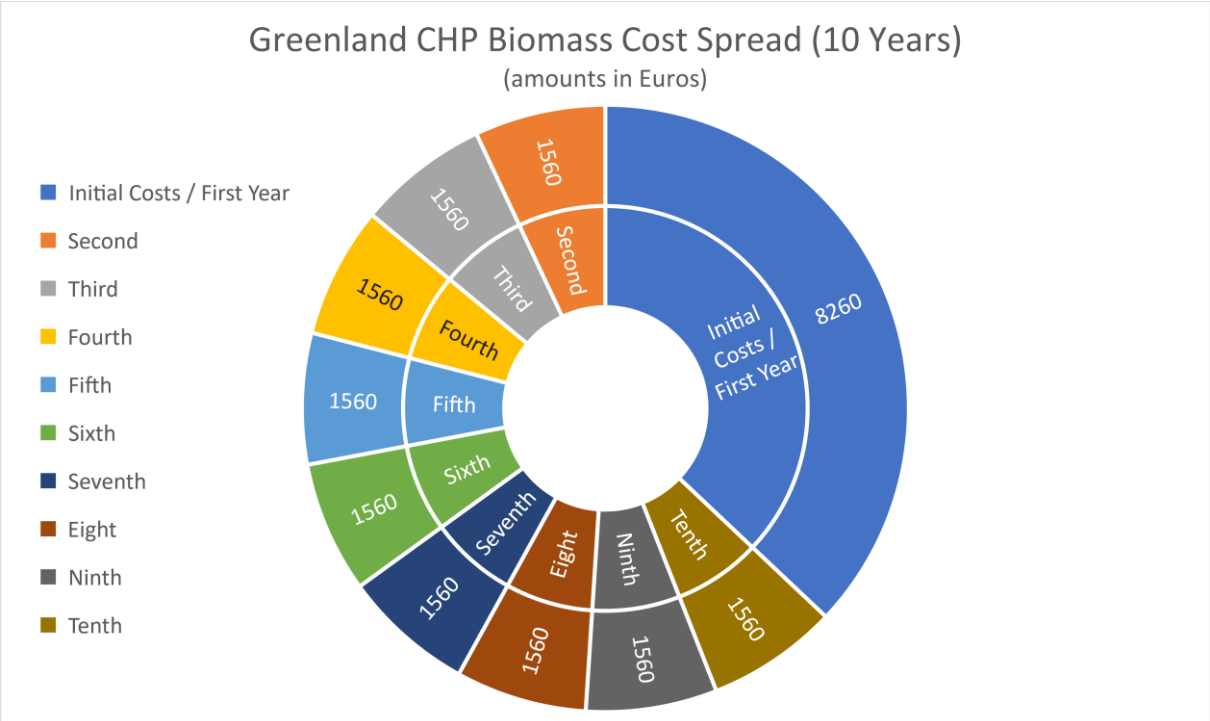

Figure 16: Greenland Biomass Cost Spread

Figure 17: Iceland Map

Iceland

Iceland has a main subsidy scheme, also dedicated towards potential CHP installations.

Means of Support

The state-owned National Energy Fund grants subsidies for measures that aim to reduce the use of fossil fuels. Among other aims, it supports the exploitation of domestic energy sources instead of fossil fuels (art. 8 Act No. 87/2003).

Employable Technologies

The involved technologies are related to what The National Energy Fund offers (grants) to promote the exploitation of domestic energy sources, among others renewable energy sources (including Biogas and Biomass), but especially geothermal energy (art. 8, Act No. 87/2003).

Bonuses Amount

The amount of the bonuses dedicated to any kind of eligible technology is the following: they shall not exceed 50% of the estimated costs of a given project (art. 8 Act No. 185/2016).

Addressees

The addressees can be divided in:

- *Entitled party*: Icelandic citizens and other persons holding the right to produce energy from domestic resources. According to the Act No. 34/1991 on Investments in Business Enterprises by Non-Residents, only Icelandic institutions are given energy exploitation rights for the non-domestic use of waterfalls and geothermal energy (art. 4 Act No. 34/1991);
- *Obligated Party*: The National Energy Fund, which is owned by the state of Iceland (art. 8 Act No. 87/2003).

Procedure

The Process Flow will follow the subsequent pattern, under the National Energy Fund, the Minister of Industry, Energy and Tourism, and also the supervision of the National Energy Authority and the National Energy Council (art. 1 Act No. 185/2016), which are the competent authorities:

- Applicants submit their applications to the National Energy Fund (electronic form). Applications must include a detailed explanation on the nature and purpose of the project as well as a cost estimate and a financing plan (art. 9 Act No. 185/2016);
- Immediately after the application deadline, all applications will be submitted to the National Energy Council. After having been reviewed, the applications will be sent to the National Energy Authority, which is supposed to give comments on the documents. Having received the comments, the National Energy Council will discuss and decide upon the applications (art. 9 Act No. 185/2016);
- At the end of this process, the Council will express its decisions to the Minister of Industry and Commerce (art. 9 Act No. 185/2016);
- The Minister of Industry and Commerce is supposed to make the final decision. Then both the National Energy Fund and the applicants are notified so that the grants can be paid out (art. 9 Act No. 185/2016);

- National Energy Fund grants will be paid out in three equal payments (art. 10 Act No. 185/2016);
- The first payment will be made at the beginning of project implementation (art. 10 Act No. 185/2016);
- The second payment will be made when the grantee deems the work on the project half-finished and sends a statement or progress report stating so to the National Energy Fund (art. 10 Act No. 185/2016);
- The third payment shall be made after the grantee has submitted a final report on the project (art. 10 Act No. 185/2016).

Distribution of Costs

The costs will be distributed as such: The National Energy Fund draws revenue from

- Interest income from the Fund's savings;
- Annual state budget appropriations (art. 4 Act No. 185/2016).

Possible CHP Installation Simulation

An example installation of 3 kW, with a 7000 € equipment cost, and 18 MWh of yearly energy consumption, will have this cost spread over ten years (amounts in Euros):

Initial Costs / First Year		Second Year	Third Year	Fourth Year	Fifth Year	Sixth Year	Seventh Year	Eight Year	Ninth Year	Tenth Year
Biogas	4580	1380	1380	1380	1380	1380	1380	1380	1380	1380
Biomass	4760	1560	1560	1560	1560	1560	1560	1560	1560	1560

Table 5: Iceland Biogas/Biomass Simulation Results

Charting the results with Biogas Fuel:

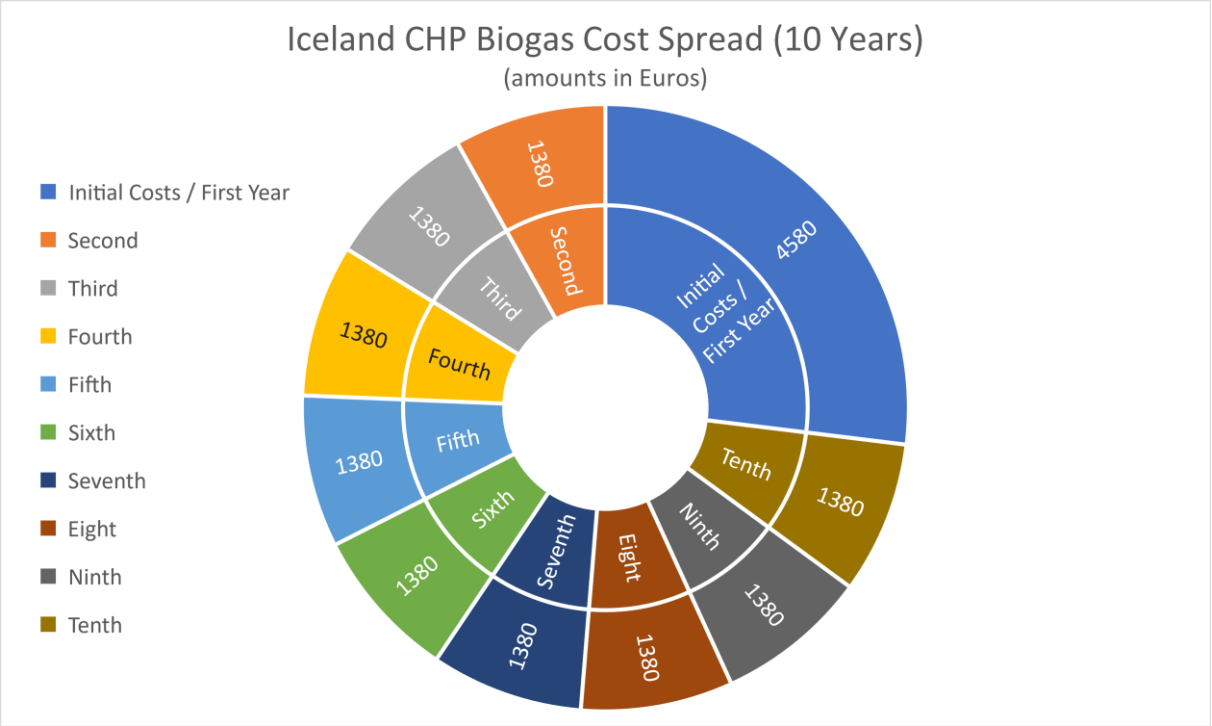

Figure 18: Iceland Biogas Cost Spread

And with Biomass Fuel:

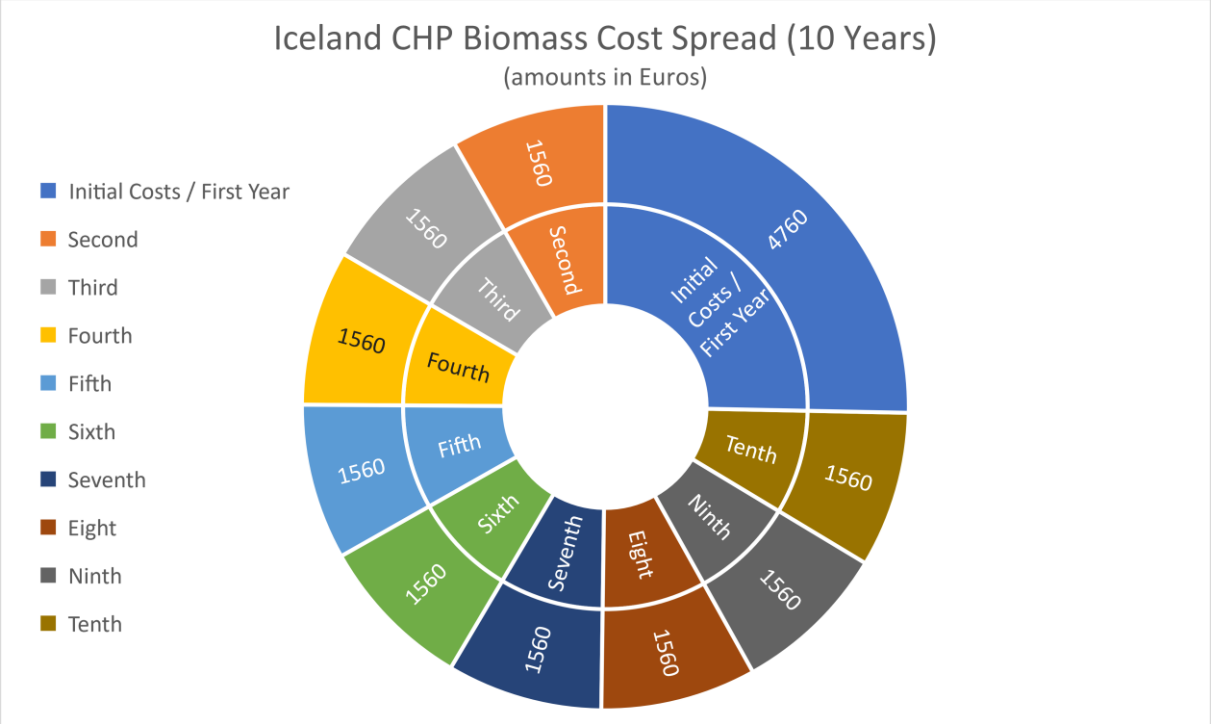

Figure 19: Iceland Biomass Cost Spread

Figure 20: Norway Map

Norway

Norway has a quota system support scheme, also dedicated to electricity production via potential CHP installations.

Means of Support

The system itself is so described: *the main incentive for the use of renewable energy is a quota system in terms of quota obligations and a certificate trading system.*

The Electricity Certificates Act obliges electricity suppliers and certain electricity consumers to prove that a certain quota of the electricity supplied by them was generated from renewable sources. Such proof shall be provided by means of tradable certificates allocated to renewable energy producers. Sweden and Norway introduced a common electricity certificate market on 1 January 2012.

Employable Technologies

The involved technologies are related to all renewable energy generation technologies. Every one of them is eligible for the incentives applicable in Norway.

Statutory Provisions

All of this is under the following statutory provisions:

- *Electricity Certificates Act* (Lov om elsertifikater);
- *Electricity Certificates Regulation* (Forskrift om elsertifikater).

The Electricity Certificates Act obliges electricity suppliers and certain electricity consumers to annually acquire renewable energy certificates in due proportion to their electricity sales and their consumption by a set date. Furthermore, the act stipulates the conditions under which owners of renewable energy generation plants may acquire electricity certificates.

Eligible Technologies

The eligible technologies for the quota system are, in general, all, including both Biogas and Biomass related ones (§ 7 No. 2 Electricity Certificates Act).

The following conditions must be met:

- The construction or the production capacity expansion of a plant must have started after 7 September 2009 (§ 8 par. 1 Electricity Certificates Act). Hydro-power plants are exempt from this obligation;
- Plants commissioned after 31 December 2020 are not eligible under the quota system (§ 8 par. 4 Electricity Certificates Act);
- Plants for which a government investment grant was received shall only be eligible if the received investment grant was paid back prior to or on 30 April 2012 (§ 8 par. 4 Electricity Certificates Act);
- Plants must be built in accordance with the licensing terms or comply with the conditions for exemption from licensing (§ 9 par. 2 Electricity Certificates Regulation).

Bonuses Amount

The amount of the quotas for the period from 2016 to 2035 have been set as follows (§ 17 Electricity Certificates Act), with the level of quota corresponding to the amount of electricity sold or consumed in any given year, multiplied by the quota obligation for that year (§ 18 par. 1 Electricity Certificates Act):

Obligation Period	Quota obligation per MWh of electricity sold or consumed
2016	0.119
2017	0.137
2018	0.154
2019	0.172
2020	0.197
2021	0.196
2022	0.196
2023	0.195
2024	0.193
2025	0.186

2026	0.174
2027	0.156
Obligation Period	Quota obligation per MWh of electricity sold or consumed
2028	0.131
2029	0.109
2030	0.090
2031	0.072
2032	0.054
2033	0.036
2034	0.018
2035	0.009

Table 6: Norway Quotas Amount 2016-2035

Furthermore, Norwegian law does not define a procedure for changing the quota levels. To change the quota levels, it will be necessary to amend the act governing the quota obligation.

There is also the peculiarity of issuing one certificate for every MWh of renewable electricity produced, regardless of the generation technology employed (§ 10 par. 1 Electricity Certificates Act).

A quota obligation fine is put into action if the persons or the entities that fail to satisfy their quota obligation (§ 21 par. 1 Electricity Certificates Act). Every certificate an obligated person/entity fails to present carries a fine of 150% of the weighted average certificate value in Sweden and Norway during the period between 1 April of the previous year and 31 March of the given year. The amount of the fee shall be published by NVE every year by 1 June (§ 37 par. 3 Electricity Certificates Regulation).

According to the NVE, the average certificate price in 2014 amounted to NOK 0.017-0.021 per kWh (€ct 0.18-0.22 per kWh).

Addressees

The quota obligation applies to the following addresses (§ 16 Electricity Certificates Act):

- Companies supplying electricity to consumers;

- Electricity consumers who use electricity they produced;
- Electricity consumers who purchase electricity on the Nordic electricity market or have entered into a bilateral agreement.

Procedure

The Process Flow will follow the subsequent pattern, under the Norwegian Water Resources and Energy Directorate (NVE), and also the supervision of Norwegian transmission grid operator (Stattnett), which are the competent authorities:

- *Issue of electricity certificates*:
  - Applications must be directed to the supervising authority, the Norwegian Water Resource and Energy Directorate (NVE) (§ 6 Electricity Certificates Regulation);
  - The NVE authorises the plants (§ 6 Electricity Certificates Regulation);
  - The electricity generated is measured and reported to the account management authority Stattnett (§ 9 Electricity Certificates Act);
  - The account management authority assigns electricity certificates (§ 10 par. 2 Electricity Certificates Act);

- *Calculation of quota obligation*:
  - Those obliged to satisfy a quota shall register with the supervising authority no later than two weeks after having started to supply or use electricity (§ 19 par. 1 Electricity Certificates Act);
  - By 1 March every year, the obligated persons shall declare to the account management authority the relevant amount of electricity generated/used during the last calendar year and the number of green certificates to be issued. The account management authority reports this information to the supervising authority (§ 20 par. 1 Electricity Certificates Act);
  - An obligated party shall, by 1 April, possess the defined amount of valid electricity certificates (§ 20 par. 2 Electricity Certificates Act);
  - The account management authority validates the electricity certificates.

- *Quota obligation fine*:
  - If an obliged party fails to satisfy the quota obligation, it shall pay a fine (§ 21 par. 1 Electricity Certificates Act).

- *Information to end-users*:
  - An obligated party must provide its end-users with specific information on the costs arising from the quota obligation and general information about the quota system, including the level of quota in the given year.

Eligibility Period

The Eligibility Period ends after 15 years from the initial support date (§ 10 par. 3 Electricity Certificates Act).

For plants that were commissioned before the Electricity Certificates Act entered into force (2012), the eligibility period will be reduced by the plant's previous period of operation (§ 10 par. 3 Electricity Certificates Act).

Electricity certificates will be issued for all electricity produced by 31 December 2035 (§ 4 Electricity Certificates Act).

Where a plant operator is not able to generate electricity due to unforeseen disruptions or where other events related to the transmission or distribution of electric energy prevented him from receiving green certificates over a period longer than 30 days, the NVE may, on request, extend the eligibility period by the time in which the plant operator did not receive electricity certificates. However, electricity certificates will not be issued for electricity generated after 31 December 2035 (§ 13 Electricity Certificates Regulation).

International Applicability

There is also the establishment of an International Certificate Trade, where, according to the Norwegian Water Resource and Energy Directorate (NVE), Sweden and Norway introduced a common electricity certificate market on 1 January 2012.

Electricity certificates issued in accordance with Swedish law may be used to fulfil the quota obligation in Norway (§ 5 Electricity Certificates Regulation).

Distribution of Costs

The costs, according to the Norwegian Water Resource and Energy Directorate, will be borne by the consumers. Also, electricity suppliers will pass on the costs arising from the quota obligation to the consumers by adding a surcharge to the electricity bill. Since the introduction of the Swedish-Norwegian common certificate market, the costs of the quota obligation have been shared by electricity consumers in both countries.

Possible CHP Installation Simulation

An example installation of 3 kW, with a 7000 € equipment cost, and 18 MWh of yearly energy consumption, will have this cost spread over ten years (amounts in Euros):

	Initial Costs / First Year	Second Year	Third Year	Fourth Year	Fifth Year	Sixth Year	Seventh Year	Eight Year	Ninth Year	Tenth Year
Biogas	8080	1380	1380	1380	1380	1380	1380	1380	1380	1380
Biomass	8260	1560	1560	1560	1560	1560	1560	1560	1560	1560

Table 7: Norway Biogas/Biomass Simulation Results

Charting the results with Biogas Fuel:

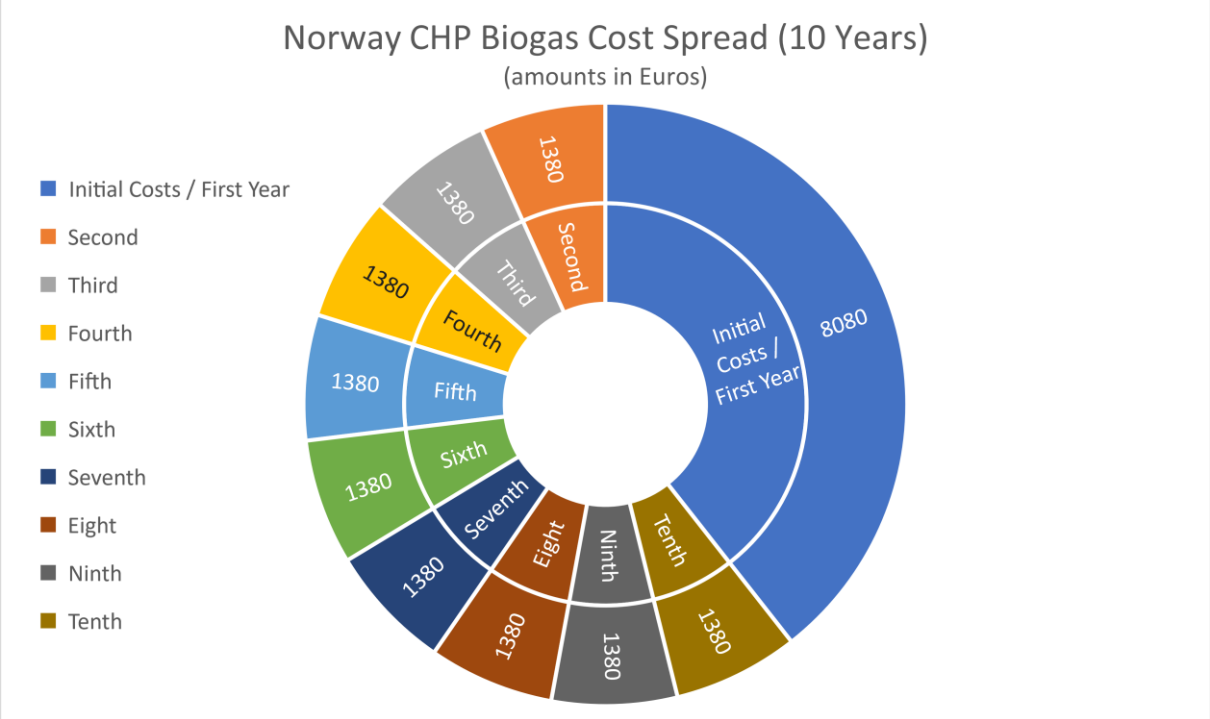

Figure 21: Norway Biogas Cost Spread

And with Biomass Fuel:

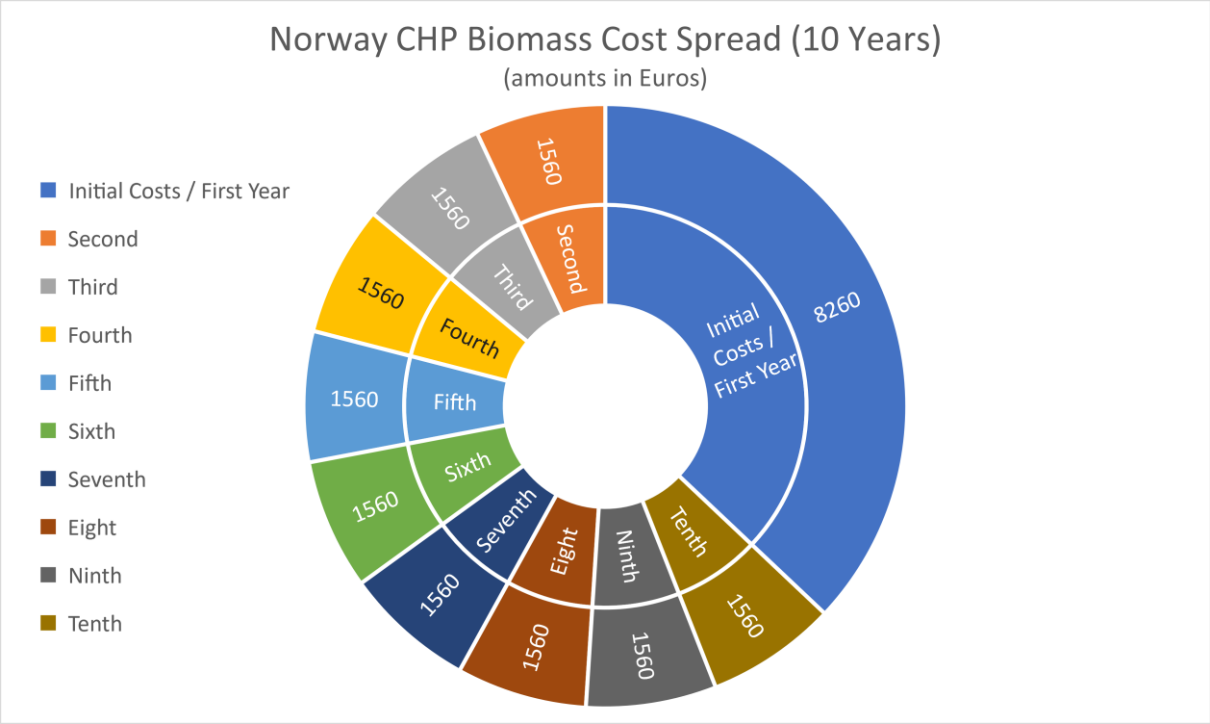

Figure 22: Norway Biomass Cost Spread

Figure 23: Republic of Ireland Map

Republic of Ireland

Ireland has integrated a REFIT (Renewable Energy Feed-In Tariff) which includes subsidies dedicated towards potential CHP installations.

Means of Support

Summarising, the Renewable Energy Feed-in Tariff (REFIT) schemes supported various renewable electricity generation technologies until 31 December 2015. The entities entitled to the feed-in tariff were those suppliers that purchased electricity from renewable sources from generators with whom they had entered into a commercially negotiated REFIT Power Purchase Agreement (PPA). This regulatory system incentivised the generation of electricity from renewable sources.

Employable Technologies

Ireland first announced the REFIT scheme in 2006 to promote the construction of wind energy, biomass and hydro plants.

The scheme, now called 'REFIT 1' to distinguish it from the other schemes, obtained state aid clearance in 2007 and allowed new applications to be accepted until 31 December 2009.

Subsequently, two new schemes (REFIT 2 and REFIT 3) obtained state aid clearance and were opened in 2012 for new applications. REFIT 2 covered small and large scale onshore wind plants, small hydro installations (≤ 5MW), and biomass landfill gas plants whereas REFIT 3 covered only biomass technologies.

Both schemes covered new projects built and operational between 2010 and 2015. The closing date for applications for REFIT 2 and REFIT 3 was on 31 December 2015.

Statutory Provisions

All of this is under the following statutory provisions:

- ERA (Electricity Regulation Act 1999);
- REFIT 1 (Renewable Energy Feed-in Tariff 2006);
- S.I. No. 158/ 2012 (Sustainable Energy Act 2002 (Section 8(2) Conferral of additional functions - Renewable Energy) Order2012);
- REFIT 2 (Renewable Energy Feed-in Tariff 2012);
- REFIT 3 (Renewable Energy Feed-in Tariff 2012);
- S.I. No. 483/2014 - European Union (Renewable Energy) Regulations 2014.

Analyzing the previous point in more depth:

In Ireland, electricity from renewable sources was promoted through a feed-in-tariff scheme. As of January 2016, there is no support scheme available for renewable energies, pending the introduction of a new support scheme in the coming months.

In the framework of the REFIT schemes, the entities entitled to the feed-in tariff are those suppliers that purchase electricity from renewable sources from generators with whom they have entered into a commercially negotiated REFIT Power Purchase Agreement (PPA).

There are three REFIT schemes, establishing guaranteed support prices for various sources of energy, i.e. minimum prices for each category of electricity (5.1 REFIT 1, REFIT 2, and REFIT 3). The original scheme, known as REFIT 1, only had state aid clearance to accept new applications until 31 December 2009.

After that date, no new applications have been accepted under REFIT 1, although projects were granted time extension to become operational. In 2012, two newer schemes (REFIT 2 and REFIT 3) received state aid clearance and were open for new applications.

REFIT 2 covered onshore wind (small and large scale), hydro (small scale), and biomass landfill gas (4.1 REFIT 2) whereas REFIT 3 covered the biomass categories of anaerobic digestion, biomass CHP, biomass combustion and biomass co-firing (4.1 REFIT 3).

Project developers under REFIT 1 were allowed to apply to transfer their projects to REFIT 2 or REFIT 3 if they met the terms and conditions of these schemes. The closing date for applications for REFIT 2 and REFIT 3 was 31 December 2015.

A new renewable energy support scheme is expected to be introduced in 2017-2018. The public consultation on the new scheme is about to be opened.

Eligible Technologies

REFIT 1, 2 and 3 are closed for new applications. REFIT 2 offered support for onshore wind, small hydro and biomass landfill gas, whereas REFIT 3 offered support for biomass categories including anaerobic digestions, biomass CHP, biomass combustion and biomass co-firing.

- Biogas: Eligible (under REFIT 2 and REFIT 3). Landfill gas is eligible under REFIT 2 (5.1 REFIT 2) and anaerobic digestion is eligible under REFIT 3 (5.1 REFIT 3);
- Biomass: Eligible (under REFIT 3). The exempt biomass must be certified with sustainability certification according to Chapter 3 § 1b Act No. 2010:598.

Bonuses Amount

The amount of payment is based on a reference price (5.1 REFIT 1, REFIT 2, and REFIT 3). According to the table provided in REFIT 2 and REFIT 3, the reference prices for each technology category since 2014 are as follows (prices in €ct per kWh):

Biogas:

- Landfill gas: €ct 8.56 per kWh (5.1 and 5.2 REFIT 2);
- Anaerobic Digestion (CHP, up to and including 500 kW): €ct 15.7 per kWh (5.1 and 5.2 REFIT 3);
- Anaerobic Digestion (CHP, exceeding 500 kW): €ct 13.66 per kWh (5.1 and 5.2 REFIT 3);
- Anaerobic Digestion (non-CHP, up to and including 500 kW): €ct 11.55 per kWh (5.1 and 5.2 REFIT 3);
- Anaerobic Digestion (non-CHP, exceeding 500 kW): €ct 10.5 per kWh (5.1 and 5.2 REFIT 3).

Biomass:

- CHP from biomass (up to and including 1.5 MW): €ct 14.7 per kWh (5.1 and 5.2 REFIT 3);
- CHP from biomass (exceeding 1.5 MW): €ct 12.6 per kWh (5.1 and 5.2 REFIT 3);
- Biomass combustion using energy crops: €ct 9.98 per kWh (5.1and 5.2 REFIT 3);
- Biomass combustion for all other biomass: €ct 8.91 per kWh (5.1 and 5.2 REFIT 3).

Addressees

The addressees are the following:

Entitled party. The persons entitled were the electricity suppliers that have concluded a Power Purchase Agreement (PPA) with an eligible renewable generator. Renewable generators were eligible if they had been accepted by and received a "letter of offer" (7.3 REFIT 2 and REFIT 3) from the Department of Communications, Energy and Natural Resources (DCENR). In order to receive the letter of offer, the applicant (a developer of new renewable generation) was obliged to provide the following evidence to the Department (7.4 of REFIT2):

- a proof of planning permission for the proposed new renewable generation plant;
- the grid operator's connection offer;
- the indicative date of construction.

In the case of CHP technologies, another requirement had to be fulfilled (7.4 REFIT 3):

- developers must demonstrate that their projects meet the High Efficiency CHP standard under the Directive 2004/08/EC and have been certified by the Commission for Energy Regulation (CER).

Obligated party. The electricity consumer is obliged to pay the REFIT costs through the PSO under the relevant legislation. The CER (Commission for Energy Regulation) calculated and certified the PSO related to the REFIT and is responsible for the ex-ante calculation and ex post correction of amounts payable to suppliers, i.e. the CER provided an estimate which could be adjusted later.

Procedure

The Process Flow will follow the following steps under the Department of Communications, Energy and Natural Resources, which is the competent authority in administering the REFIT schemes and processing the REFIT applications. The energy regulator (CER) was responsible for the calculation and certification of the PSO REFIT payments:

- Until its phase-out on 31 December 2015, new renewable electricity producers had to apply to the Department of Communications to be accepted into the REFIT schemes. Amongst other documents, they had to supply proof of grid access as well as planning permission. Within 60 working days of receipt of a letter of offer, they could enter into a REFIT Power Purchase Agreement (PPA) with a licensed supplier (9.10 REFIT 2 and REFIT 3).

Degression

A degression is put into action for the REFIT tariffs:

The Department of Communications, Climate Change and Environment annually adjusts the reference prices by the increase, if any, in the consumer price index (5.2 REFIT 1, REFIT 2, and REFIT 3).

Cap Introduction

State aid clearance for REFIT 1 was for 400 MW of new renewable generation (4.1 REFIT 1). State aid clearance for REFIT 2 was for 4000 MW of new renewable generation in the onshore wind, biomass landfill gas and small hydro categories (4.1 REFIT 2). REFIT 3 covered 310 MW of certain biomass-related categories, divided as follows: 15 MW of anaerobic digestion (including AD CHP), 170 MW of biomass CHP, and 125 MW of biomass combustion (including biomass co-firing with peat) (4.1 REFIT 3).

Eligibility Period

Until its phase-out on 31 December 2015, the eligibility to the REFIT scheme was limited to the following conditions:

- Limited eligibility period. The duration of support was limited and depended on the term of the individual Power Purchase Agreement (PPA); however, the term of the agreement could not exceed a period of 15 years (8.1 REFIT 1, REFIT 2, REFIT 3). The PPA included the purchasing terms, such as the price and the minimum amount of electricity to be purchased. For REFIT 1 the support could not extend beyond 2027 (1.3 REFIT 1 in conjunction with art.7 (4) (a) ERA) and for REFIT 2 and 3 beyond 2032 (art.7 (4) (b) ERA);
- Premature termination. An applicant could withdraw the project from the schemes (REFIT 2 and REFIT 3) and leave the PPA for the open market by giving a notice (12 months prior to the date of the withdrawal) to the Minister of Communications, Energy and natural Resources and the supplier (8.7 REFIT 2 and REFIT 3).

Distribution of Costs

The costs of the tax relief are divided between the Consumers and the Plant Operators:

- Consumers: The REFIT schemes were funded through the Public Service Obligation (PSO) and charged to all electricity consumers via a surcharge on the electricity bill (6.1 REFIT 2 in conjunction with s.39 ERA). Thus, the consumers bore the costs of the support system, which were included in the electricity prices;
- Plant Operators: The CER calculated and certified the PSO REFIT payments and was responsible for the ex-ante calculation and ex post correction of amounts payable to suppliers. Anyone in receipt of REFIT payments should be listed in the annual REFIT statutory instrument (6 REFIT 2 and REFIT 3). The payments were sent to the suppliers by the transmission system operator (EirGrid).

Possible CHP Installation Simulation

An example installation of 3 kW, with a 7000 € equipment cost, and 18 MWh of yearly energy consumption, will have this cost spread over ten years (amounts in Euros):

	Initial Costs / First Year	Second Year	Third Year	Fourth Year	Fifth Year	Sixth Year	Seventh Year	Eight Year	Ninth Year	Tenth Year
Biogas	8080	1380	1380	1380	1380	1380	1380	1380	1380	1380
Biomass	8260	1560	1560	1560	1560	1560	1560	1560	1560	1560

Table 8: Republic of Ireland Biogas/Biomass Simulation Results

Charting the results with Biogas Fuel:

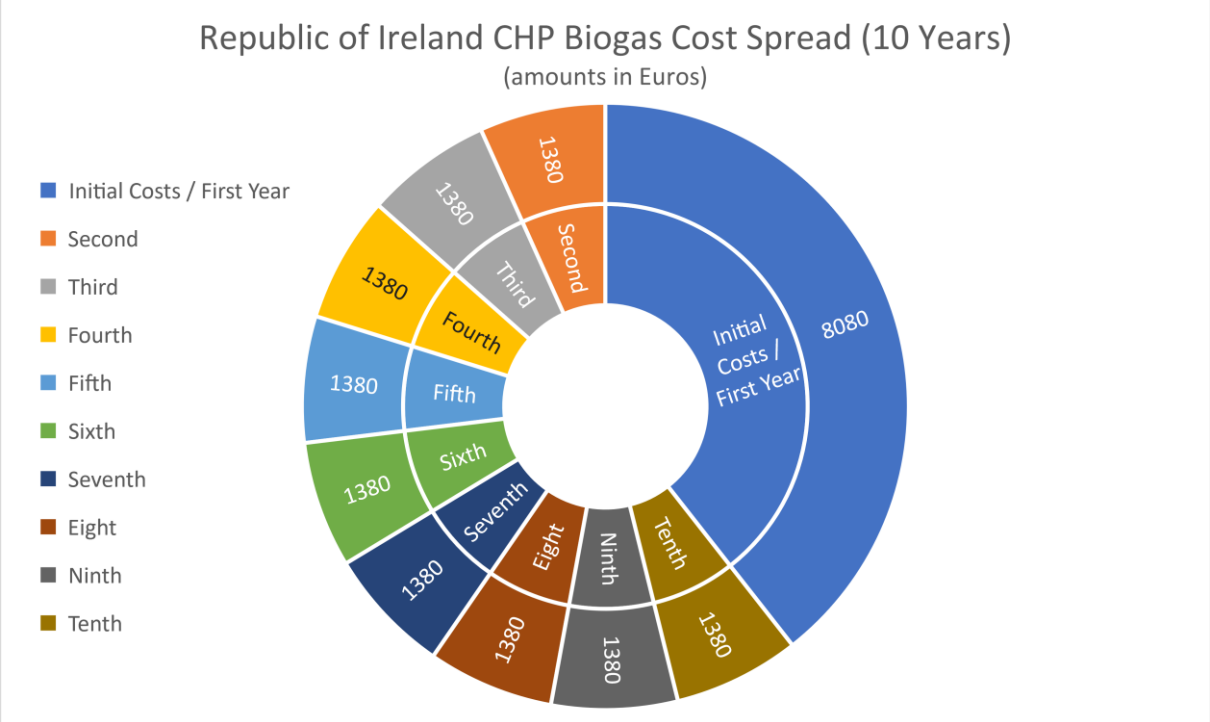

Figure 24: Republic of Ireland Biogas Cost Spread

And with Biomass Fuel:

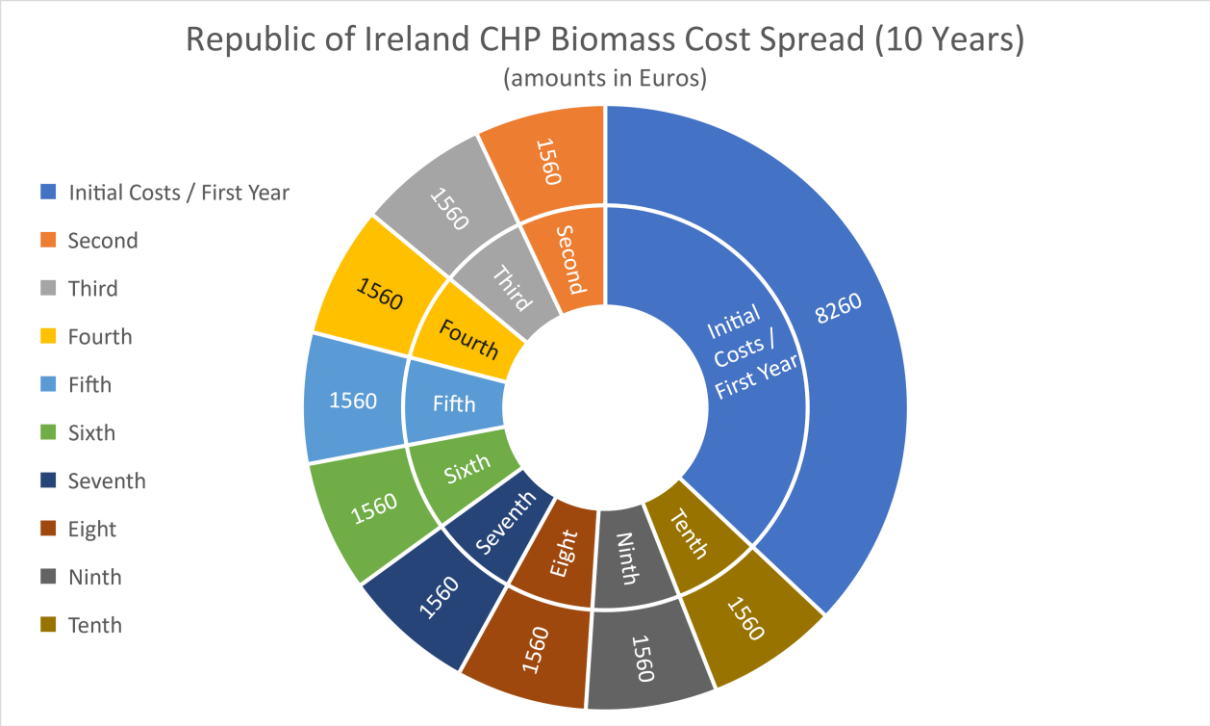

Figure 25: Republic of Ireland BIomass Cost Spread

Figure 26: Svalbard Map

Svalbard

Svalbard has different support schemes, both subsidies and tax regulation mechanisms. No one of them is dedicated to potential CHP installations.

Possible CHP Installation Simulation

An example installation of 3 kW, with a 7000 € equipment cost, and 18 MWh of yearly energy consumption, will have this cost spread over ten years (amounts in Euros):

Initial Costs / First Year		Second Year	Third Year	Fourth Year	Fifth Year	Sixth Year	Seventh Year	Eight Year	Ninth Year	Tenth Year
Biogas	8080	1380	1380	1380	1380	1380	1380	1380	1380	1380
Biomass	8260	1560	1560	1560	1560	1560	1560	1560	1560	1560

Table 9: Svalbard Biogas/Biomass Simulation Results

Charting the results with Biogas Fuel:

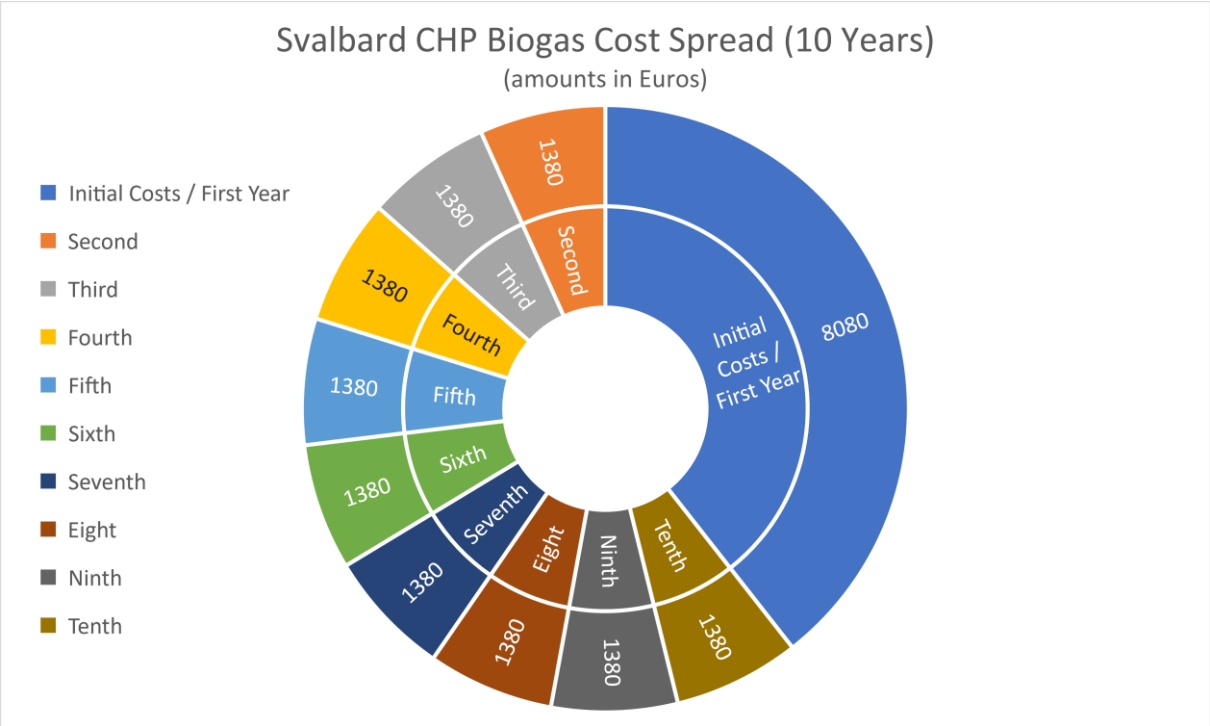

Figure 27: Svalbard Biogas Cost Spread

And with Biomass Fuel:

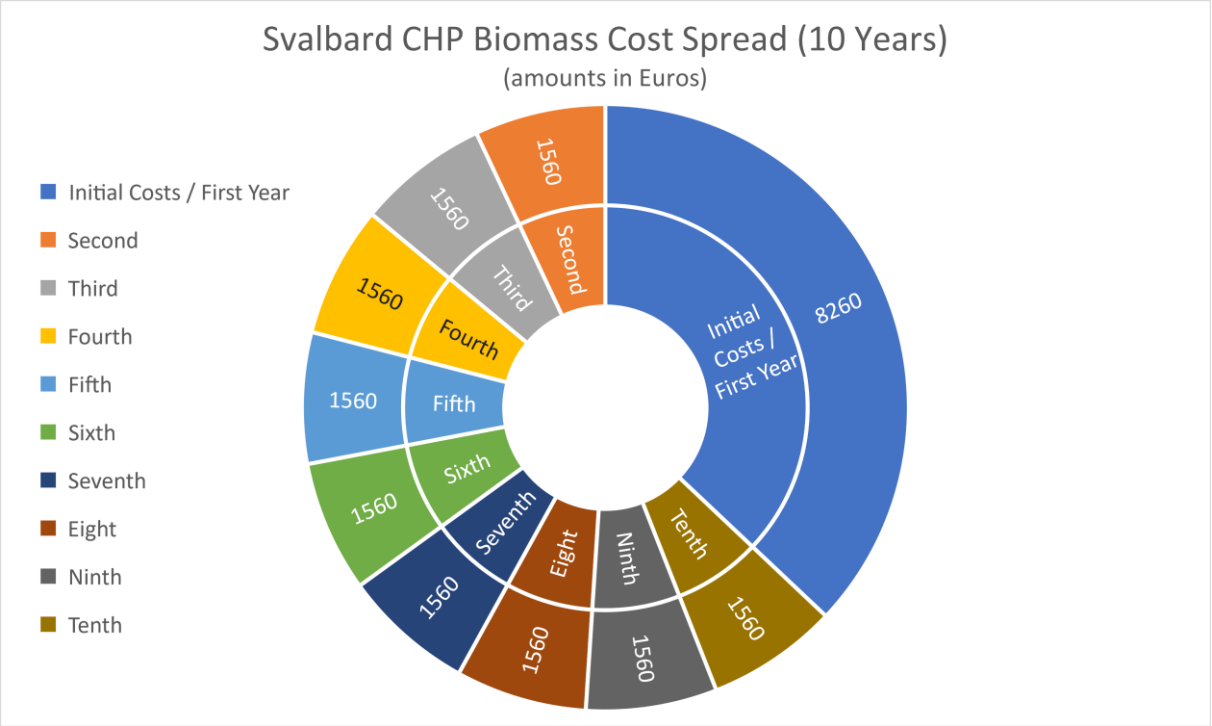

Figure 28: Svalbard Biomass Cost Spread

Figure 29: Sweden Map

Sweden

Sweden has various plans which include subsidies dedicated towards potential CHP installations.

Means of Support

Summarising, it is possible to distribute them into three different categories. The production of heat from renewable energies is subsidised through various support schemes and investment aids.

- *Tax reductions for households*. Act No. 2009:194 sets rules for the tax-deduction of RES-related installation works in households. The installation of renewable energy devices and the replacement of conventional heating sources with renewable ones may be deducted from tax;
- *Energy and carbon dioxide taxes*. In Sweden, energy and carbon dioxide taxes are levied on the supply, import and production of fossil fuels for heating purposes. Renewable energy sources are exempt from these taxes;
- *Nitrous oxide tax*. The producers of heat are obliged to pay a tax according to their nitrous oxide emissions. Heat producers using renewable energy sources are exempt from this obligation.

Employable Technologies

The involved technologies are all included and related to renewable energies usage.

Statutory Provisions

All of this is under the following statutory provisions:

- *Act No. 2009:194* (Lag om förfarandet vid skattereduktion för hushållsarbete - Act on the Tax-Deduction Process for Installation Works in Households);
- *Act No. 1994:1776* (Lag om skatt på energi - Act on the Energy Tax);
- *Act No. 1990:613* (Lag om miljöavgift på utsläpp av kväveoxider vid energiproduktion - Act on Environmental Charges on Nitrous Oxide Emissions from Energy Generation);
- *Act No. 2010:598* (Lag om hållbarhetskriterier för biodrivmedel och flytande biobränslen - Act on sustainability criteria for biofuels and bioliquids.

Analyzing the previous three points in more depth:

1) Tax regulation mechanism I (Tax reductions for household works)

There are no subsidies or grants related to potential CHP installations in this mechanism.

2) Tax regulation mechanism II (Energy and CO2-tax)

Energy and carbon dioxide taxes are levied on the supply, import and generation of fossil fuels for heating purposes. Renewable energy sources are exempt from these taxes.

Eligible Technologies

All renewable energy generation technologies are eligible for tax exemption. Renewable energy sources other than biomass and biogas are not physical sources (fuels) used for generation of heating, so they are not covered under the energy tax. Biomass and biogas are explicitly excluded from the tax (Chapter 6a § 2b Act No. 1994:1776). In particular:

- Biogas: Eligible. The exempt biogas must be certified with sustainability certification according to Chapter 3 § 1b Act No. 2010:598;
- Eligible. The exempt biomass must be certified with sustainability certification according to Chapter 3 § 1b Act No. 2010:598.

Bonuses Amount

The amount of subsidy is equal to the amount of taxes entitled persons are exempt from.

Addressees

The addressees are the following:

Heating from renewable sources is exempt from these taxes. Suppliers, importers and producers of heating generated from these products are exempt from paying the taxes (Chapter 4 § 1 Act No. 1994:1776)

Procedure

The Process Flow will follow the regulations established by The Swedish Tax Authority, which is the competent party.

Distribution of Costs

The costs of the tax relief will be borne by the state (Chapter 1 § 1 Act No. 1994:1776).

3) Tax regulation mechanism III (Nitrous oxide tax)

The producers of heat are obliged to pay a tax according to their nitrogen oxide emissions (§ 1 Act No. 1990:613). Heat producers using renewable energy sources are exempt from this obligation.

Since renewable energy sources do not produce nitrogen oxide emissions, they are exempt from the tax.

Bonuses Amount

The amount of subsidy is equal to the amount of taxes entitled persons are exempt from. The fee is SEK 50 per full kilogram of nitrogen oxides (§ 5 Act No. 1990:613).

Addressees

The support scheme is addressed all renewable installations, which are exempt from these taxes. Producers of renewable heating products are exempt from the tax (§ 4 Act No. 1990:613).

Procedure

The Process Flow will be regulated by The Swedish Environmental Protection Agency (Naturvårdsverket) (§ 6 Act No. 1990:613), which is the competent authority, and it will follow the subsequent scheme:

- The taxable event occurs when nitrogen oxides are emitted in a heat production unit (§ 4 Act No. 1990:613);
- The accounting period for the levy is the calendar year (§ 8 Act No. 1990:613);
- Persons subject to the levy must register with the Environmental Protection Agency (§ 8 Act No. 1990:613);
- The declaration must be submitted to the Environmental Protection Agency by no later than 25 January of the year following the emissions (§ 10 Act No. 1990:613);
- The levy must be paid by 1 October (§ 11 Act No. 1990:613).

Distribution of Costs

The costs of the tax exemptions will be borne by the state (§ 1 Act No. 1990:613).

Possible CHP Installation Simulation

An example installation of 3 kW, with a 7000 € equipment cost, and 18 MWh of yearly energy consumption, will have this cost spread over ten years (amounts in Euros):

Initial Costs / First Year		Second Year	Third Year	Fourth Year	Fifth Year	Sixth Year	Seventh Year	Eight Year	Ninth Year	Tenth Year
Biogas	8008	1308	1308	1308	1308	1308	1308	1308	1308	1308
Biomass	8188	1488	1488	1488	1488	1488	1488	1488	1488	1488

Table 10: Sweden Biogas/Biomass Simulation Results

Charting the results with Biogas Fuel:

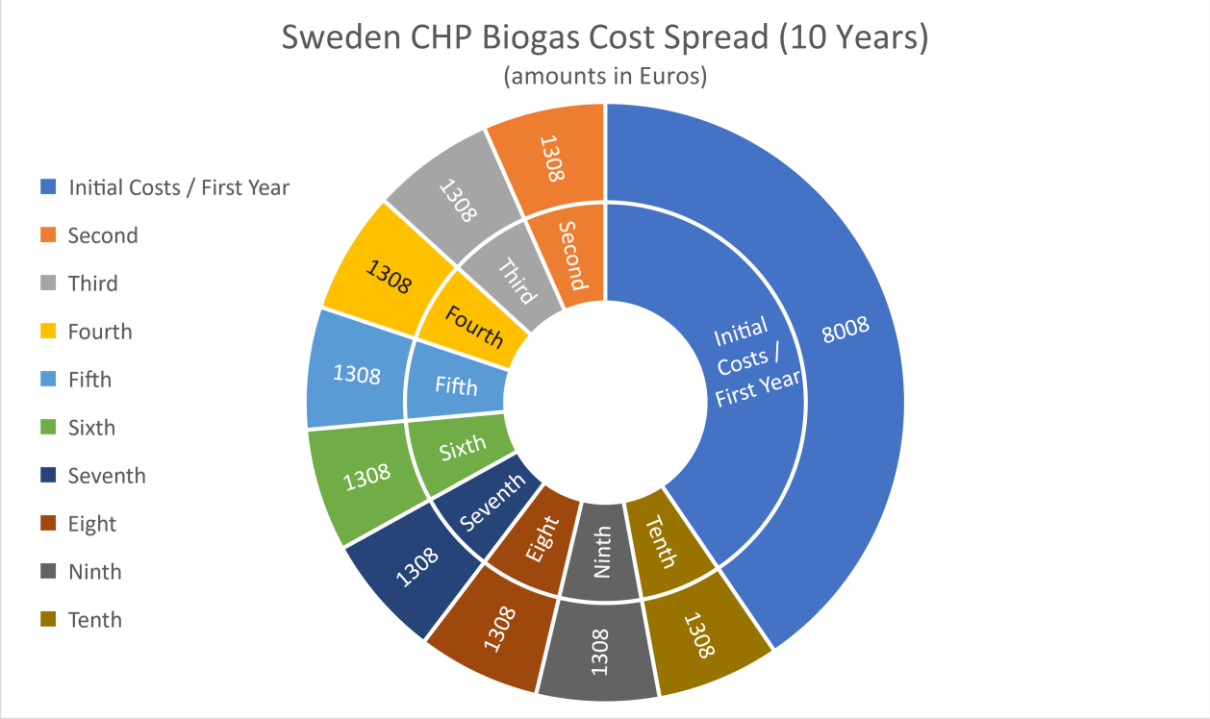

Figure 30: Sweden Biogas Cost Spread

And with Biomass Fuel:

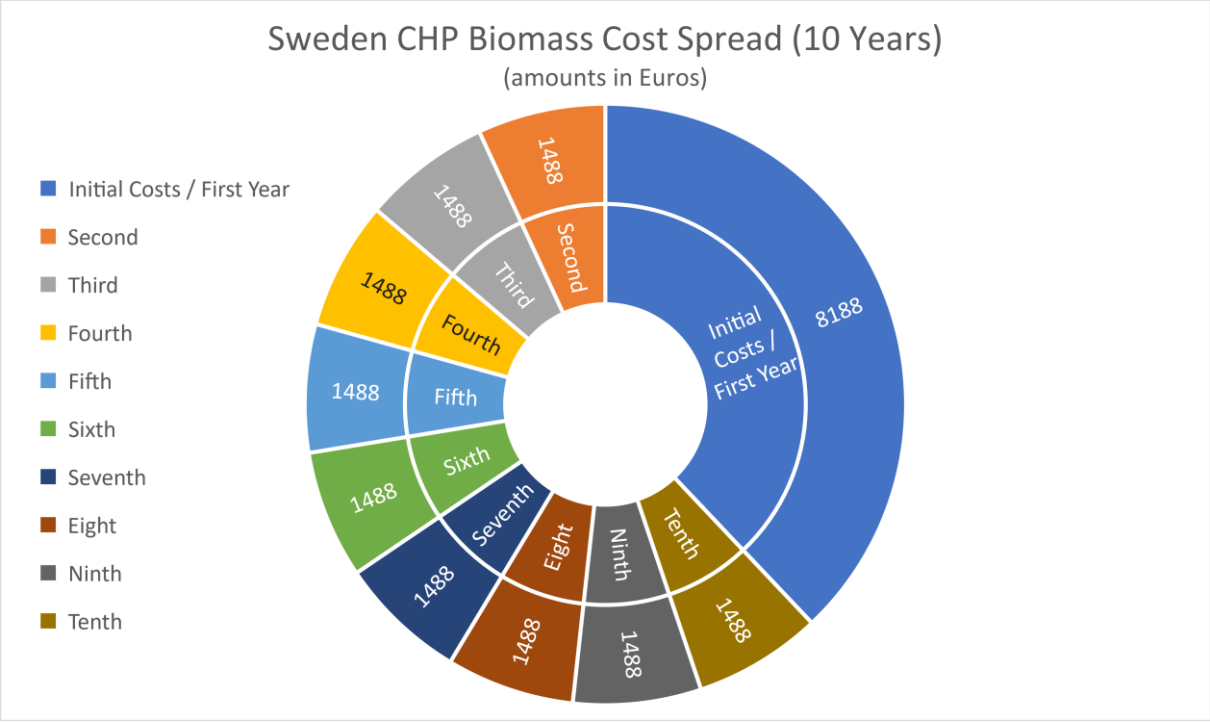

Figure 31: Sweden Biomass Cost Spread

Figure 32: United Kingdom Map

United Kingdom (Great Britain and Northern Ireland)

In Great Britain and Northern Ireland there are various plans which include subsidies dedicated towards potential CHP installations.

Means of Support

Summarising, it is possible to distribute them into three different categories. The production of heat from renewable energies is subsidised through various support schemes and investment aids.

1. *The Renewable Heat Incentive (RHI)* is the main instrument for funding RES-H sources in the United Kingdom by supporting RES-H installations with a fixed amount per kWth produced.

   The scheme consists of two parts: The Non-Domestic RHI (UK) and the Domestic RHI (UK and Northern Ireland until 2016). While the Non-Domestic RHI provides payments to industry, businesses and public sector organisations, is the Domestic RHI open to homeowners, private landlords, social landlords and self-builders.
   In addition, the Department for Business, Energy & Industrial Strategy (BEIS) plans to introduce changes to the Non-Domestic/ Domestic Renewable Heat Incentive (RHI) scheme Regulations that came into effect in September 2017. Further amendments are expected until the end of 2017;
2. *Green Deal*. Under this scheme home and business in Great Britain owners may obtain a loan for 45 energy-efficiency measures specified in the Green Deal (Qualifying Energy Improvements) Order 2012 and pay off the loan through their energy bill.

Employable Technologies

All technologies used for heat generation from renewable energy sources are eligible.

Statutory Provisions

All of this is under the following statutory provisions:

- *RHISR 2011* (The Renewable Heat Incentive Scheme Regulations 2011, No. 2860);
- Domestic RHISR 2014 (The Domestic Renewable Heat Incentive Scheme Regulations 2014, No. 928);

- *NIRHISR 2012* (The Renewable Heat Incentive Scheme Regulations (Northern Ireland) 2012, No. 396);
- *EnA 2011* (The Energy Act 2011, c. 16);
- Green Deal Order 2012 (Green Deal (Qualifying Energy Improvements) Order 2012, No. 2105);
- *Green Deal Framework Regulations 2012* (The Green Deal Framework (Disclosure, Acknowledgment, Redress etc.) Regulations 2012, No. 2079).

Analyzing the previous three points in more depth:

1) Price-based mechanisms (Non-Domestic Renewable Heat Incentive (RHI))

The Non-Domestic Renewable Heat Incentive (RHI) is a scheme targeted at supporting non-domestic RES-H installations with a fixed amount per kWth produced which is payable for 20 years. The payment is provided to industry, businesses and public sector organisations.

The scheme was launched in November 2011 in Great Britain. In Northern Ireland, the Northern Ireland Renewable Heat Incentive (NIRHI) was launched in November 2012 and is suspended for new application since 29 February 2016.

Furthermore, the Department for Business, Energy & Industrial Strategy (BEIS) has published a response to its consultation on changes to the Non-Domestic Renewable Heat Incentive (RHI) scheme. The changes to the Scheme Regulations announced in the consultation response came into effect in September 2017 and further amendments ae expected until the end of 2017.

Eligible Technologies

The Eligible Technologies are differentiated: Aerothermal (only in Northern Ireland), Hydrothermal, Biogas, Biomass, Geothermal and Solar thermal are eligible technologies, provided the installations are used in a building for heating a space, water or for carrying out a process or used otherwise than in a building for cleaning or drying (on a commercial basis) (art. 3(2) RHISR 2011). Producers of biomethane should be paid also when the purpose is injection in the gas grid (art. 3(3) RHISR 2011; art. 3(2) NIRHISR 2012).

If not otherwise indicated in the "Amount" part (see below), plants must have been commissioned on or after 15.07.2009 (art. 12(1)(a) RHISR 2011); in NI on or after 01.09.2010 (art. 12(1)(a) NIRHISR 2012).

CHP plants using these sources may also be eligible. In any case, CHP plants using these sources are not eligible if they are accredited under the Renewable Obligation Order 2015, the Renewables Obligation (Scotland) Order 2009, or the Renewables Obligation (Northern Ireland) 2009, or is /has at any time since its accreditation been a "qualifying CHP station" as defined in Art. 2 of the Renewable Obligation Order 2015 (art. 39C RHISR 2011; art 9 NIRHISR 2012).

Plants must also comply with the technical requirements related to metering and steam measuring outlined in Part 2, Chapter 3 of the RHISR 2011 or respectively Part 2, Chapter 3 of the NIRHISR 2012.

In particular, with CHP fuels:

- Biogas: Eligible. Biomethane injection (all capacities in Great Britain and Northern Ireland) and biogas combustion (all capacities in Great Britain and less than 200 kWth in Northern Ireland). (art. 11 RHISR 2011; art. 11 NIRHISR 2012). In addition, in Great Britain CHP plants have to be new plants and have to be commissioned on or after 04.12.2013 (Art. 9 RHISR 2011);
- Biomass: Eligible (solid biomass). For plants under 45 kWth certification and accreditation under the Microgeneration Certification Scheme (MCS) is required (art. 5 RHISR 2011). No capacity limitations are imposed, though capacity impacts on the tariff level in Great Britain. In Northern Ireland the capacity is limited to 1,000 kWth (art. 5(b) NIRHISR 2012). In Great Britain, plants that have submitted their applications for accreditation on or after 24/09/2013, should additionally obtain environmental permits or an RHI emission certificate (art. 5(1)(d) RHISR 2011 as amended on 23.09.2013).
  Solid biomass contained in waste (in Great Britain) and solid biomass and municipal solid waste (in Northern Ireland) is also eligible (art. 6 RHISR 2011; art. 6 NIRHISR 2012). In Great Britain, CHP plants using solid biomass alone or solid biomass, solid biomass contained in waste in combination with each other or any other source of energy are eligible provided combustion unit is new and was first commissioned as part of CHP system on or after 04.12.2013 (art. 9 RHISR 2011). In Northern Ireland, CHP plants using biomass are eligible if they use solid biomass contained in municipal solid waste (art. 9 NIRHISR 2012).

Bonuses Amount

The amount of the bonuses is published in Schedule 3 of the RHISR 2011 and updated regularly on the website of the Gas and Electricity Markets Authority (Ofgem) For Northern Ireland amounts are published in Schedule 3 of the NIRHISR 2012 and updated on the website of the Department of Enterprise, Trade and Investment (DETI):

- Biogas - Tariff rates from 20 September 2017:

  In Great Britain (Tariff rates from 20 September 2017):

  - Biomethane injection (first 40,000 MWh): p 3.2 (€ct 3.55) per kWth;
  - Biomethane injection (next 40,000 MWh): p 1.89 (€ct 2.09) per kWth;
  - Biomethane injection (remaining MWh): p 1.45 (€ct 1.61) per kWth;
  - Small biogas combustion (less than 200 kWth): p 2.88 (€ct 3.2) per kWth;
  - Medium biogas combustion commissioned on or after 04/12/2013 (200 kWth and above and less than 600 kWth): p 2.26(€ct 2.5) per kWth;

- Large biogas combustion commissioned on or after 04/12/2013 (600 kWth and above): p 0.86 (€ct 0.95) per kWth.

In Northern Ireland (Tariff rates until 18 November 2015):

- Biomethane (all capacities) and biogas combustion (less than 200kWth): p 3.3 (€ct 3.96) per kWth.

- Biomass - Tariff rates from 20 September 2017:

In Great Britain (Tariff rates from 20 September 2017):

- Small commercial biomass (solid biomass including solid biomass contained in waste) (less than 200 kWth):
  - First 12 months: p 2.96 (€ct 3.28) per kWth;
  - Afterwards: p 2.08 (€ct 2.3) per kWth;
- Medium commercial biomass (200 kWth and above and less than 1MWth):
  - First 12 months: p 2.96 (€ct 3.28) per kWth;
  - Afterwards p 2.08 (€ct 2.3) per kWth;
- Large commercial biomass (1MWth and above):
  - First 12 months: p 2.96 (€ct 3.28) per kWth;
  - Afterwards p 2.08 (€ct 2.3) per kWth;
- Solid biomass CHP systems (commissioned on or after 04/12/2013): p 4.29 (€ct 4.76) per kWth.

In Northern Ireland (Tariff rates until 18 November 2015):

- Capacities below 20 kWth: p 6.8 (€ct 8.16) per kWth;
- Capacities between 20 kWth and above up to but not including 100 kWth: p 6.5 (€ct 7.5) per kWth;
- Capacities between 100 kWth and above up to but not including 1,000 kWth: p 1.5 (€ct 1.8) per kWth.

Addressees

The addressees, the Entitled Parties, are the owners of accredited non-domestic RHI installations (art. 3(2) RHISR 2011; art. 3(2) NIRHISR 2012).

Procedure

The Process Flow for the Non-Domestic RHI will follow the subsequent pattern, under Ofgem for England, Wales and Scotland and the Department of Enterprise, Trade and Investment (DETI) for Northern Ireland, which are the competent authorities:

- The applicant provides a written application for accreditation complete with the documents and information requested in Schedule 1 of the RHISH 2011 or respectively Schedule 1 of the NIRHISR 2012 (art. 22(2) RHISR 2011; art. 22(2) NIRHISR 2012). For biomethane injection a registration instead of an application is required. Application for registration has also to be submitted in written alongside with the documents and information specified in Schedule 1 of the RHISH 2011 or respectively Schedule 1 of the NIRHISR 2012 (art. 25(2) RHISR 2011; art. 25(2) NIRHISR 2012);
- The authority checks the presented information and may require some additional pieces or provide an inspection on site (art. 22(3-4) RHISR 2011; art. 22(3-4) NIRHISR 2012);
- If the Authority believes the application is correct and the installation is eligible, the Authority will accredit the installation by including it in a registry, notifying the applicant and providing a statement of eligibility indicating accreditation date, applicable tariff, process and timing for meter readings, details of the frequency and timetable for payments and tariff lifetime / end date (art. 22(6) RHISR 2011; art. 22(6) NIRHISR 2012);
- The applicant may apply for a preliminary accreditation of a RES-H installation which has not yet been commissioned. The Authority must not grant preliminary accreditation if in its opinion RES-H installation is unlikely to generate heat for which periodic support payments may be paid (art. 26 (1-2) RHISR 2011; art. 26 (1-2) NIRHISR 2012).

Degression

A degression is put into action for both Great Britain and Northern Ireland:

For Great Britain prices are adjusted according to the relevant measure of inflation, i.e.

- the retail prices index, if the tariff start date is earlier than 1st April 2016;
- the consumer prices index, if the tariff start date is on or after 1st April 2016 (art. 37(11) RHISR 2011).

For Northern Ireland Prices are adjusted yearly (every 1 April) according to the percentage increase or decrease in retail prices for the previous calendar year (art. 36(7) NIRHISR 2012).

Eligibility Period

There is an eligibility period of 20 years (art. 37(1) RHISR 2011; art. 36(1) NIRHISR 2012).

Distribution of Costs

The costs will be funded from the general government spending, as stated on the website of the Department for Business, Energy and Industrial Strategy (BEIS).

2) Price-based mechanisms (Domestic Renewable Heat Incentive)

The Domestic Renewable Heat Incentive (RHI) is a scheme targeted at supporting domestic RES-H installations (biomass only boilers, biomass pellet stoves, air source and ground source heat pumps as well as flat plate and evacuated tube solar thermal panels) with a fixed amount per kWth produced.

The payment is provided to homeowners, private landlords, social landlords and self-builders and is payable for 7 years. The scheme was launched in Great Britain on 9 April 2014. In Northern Ireland, a domestic RHI scheme was launched on 8 December 2014 and closed to new applications on 29 February 2016.

Furthermore, the Department for Business, Energy & Industrial Strategy (BEIS) has published a response to its consultation on changes to the Domestic Renewable Heat Incentive (RHI) scheme. The changes to the Scheme Regulations announced in the consultation response are expected to come into effect in April September 2017 and further amendments ae expected until the end of 2017.

Eligible Technologies

The Eligible Technologies are differentiated: Aerothermal, Hydrothermal, Biomass, Geothermal and Solar thermal are eligible technologies provided they meet technology specific requirements described below. In addition, RES-H installation needs to be first commissioned on or after 15.07.2009 (art. 7 Domestic RHISR 2014).

In particular, with CHP fuels:

Biomass: boilers and stoves are eligible. To be eligible boilers must use a liquid to provide space heating and must be designed and installed to use solid fuel. Stoves need to be designed and installed to use wood pellets and use a liquid filled heat exchanger, enclosed with the system. Moreover, both boilers and stoves have to provide heating to a single eligible property or to both a single eligible property and any related property and need to comply with air quality requirements specified in Schedule 1 of the Domestic RHISR 2014 (art. 4 Domestic RHISR 2014).

Bonuses Amount

Regarding the amount of the bonuses, the tariffs are calculated on a quarterly basis and published by Ofgem each year by 15th March, 15th June, 15th September and 15th December respectively (art. 33(2) Domestic RHISR 2014). Tariff rates for the period from 20 September 2017 are provided below (see the "Amount" section).

For Biomass fuel in particular, boiler and stoves are under the regulation listed in p 6.54 (€ct 7.26) per kWth (Schedule 5 Table 1 Domestic RHISR 2014).

Addressees

The addressees, the Entitled Parties, are owners/occupants of the property the domestic RHI installation heats (art. 10 Domestic RHISR 2014).

Procedure

The Process Flow will follow the subsequent pattern, under the supervision of Ofgem, which is the competent authority:

- Microgeneration Certification Scheme (MCS) certification. Prior to applying for the Domestic RHI the RES-H installation must be certified under MCS. Inclusion of a RES-H installation on the MCS register demonstrates that it is installed in accordance with a relevant installation standard or a standard which is equivalent to a relevant installation standard (Schedule 4 Part 1 art. 1(h) Domestic RHISR 2014);
- Energy Performance Certificate. Prior to applying for the Domestic RHI property applicant needs to obtain an Energy Performance Certificate which is issued as part of the Green Deal Assessment (Schedule 4 Part 1 art. 1(i) Domestic RHISR 2014);
- Application for accreditation. Applicants have to apply for the accreditation of the RES-H installation within 12 months of the commissioning date of the installation (date shown on the MCS certificate) if the installation was commissioned on or after 09.04.2014. If the RES-H installation was commissioned before 09.04.2014 then the application for accreditation has to be submitted within 12 months counted from 09.04.2014 (art. 17 (4) Domestic RHISR 2014);
- Accreditation. If the Authority believes the application is correct and the installation is eligible, the Authority will accredit the installation by including it in a registry, notifying the applicant and providing a statement of eligibility indicating accreditation date, applicable tariff, process and timing for meter readings, details of the frequency and timetable for payments and tariff lifetime / end date (art. 21 Domestic RHISR 2014).

Degression

A degression is put into action, where prices are adjusted yearly (every 1 April). More specifically, applications submitted before 1 April 2016 have their tariffs adjusted in line with the Retail Prices Index (RPI).

Applications submitted on or after 1 April 2016 have their tariffs adjusted in line with the Consumer Prices Index (CPI). (art. 32(2)(b)(ii) Domestic RHISR 2014). The subsequent tariff for a financial year is the tariff applicable to the accredited domestic plant immediately prior to the end of the previous financial year, adjusted by the percentage increase or decrease in the RPI/ CPI for the year ending on 31st December immediately preceding the commencement of the financial year to which the subsequent tariff relates, the resulting figure being stated to two decimal places and rounded (art. 37(2) Domestic RHISR 2014).

Cap Introduction

For this scheme there is the introduction of a Cap. Annual Heat Demand Limits are introduced (art. 29(2)-(5) Domestic RHISR 2014). The Annual Heat Demand Limits cap payments for new entrants to a particular level of annual renewable heat demand. Consequently, when heat demand is greater than these values plant operators will not receive RHI payments for heat output over these limits. For biomass boilers, which provide space heating, and/ but not heating for domestic hot water, the deemed annual heat generation is (since 20 September 2017):

- the heat demand for space heating specified in the relevant Energy Performance Certificate for that property; or
- 25,000 kWh.

For heat pumps, which provide space heating, and/ but not heating for domestic hot water, the deemed annual heat generation is (since 20 September 2017):

- The result of the formula A=(1-1/B); or
- The result of the formula C=(1-1/B).

Where:

- A, is the heat demand for space heating (and water heating) specified in the relevant EPC for that property;
- B, is the seasonal performance factor for the heat pump; and
- C, is 20,000 kWh in the case of an air source heat pump, or 30,000 kWh in the case of a ground source heat pump.

Eligibility Period

The Eligibility Period is 7 years (art. 26(2) Domestic RHISR 2014).

Distribution of Costs

The costs will be covered by from the general government spending, as stated on the website of the Department of Energy and Climate Change (BEIS).

3) Loan (Green Deal)

Green Deal is an incentive scheme for energy-efficiency improvements in buildings. The scheme is applicable in England, Wales and Scotland. Under the scheme home and business owners (further property owners) may obtain a loan for the measures specified in the Green Deal (Qualifying Energy Improvements) Order 2012 and pay off the loan through their energy bill.

The amount of the loan and repayment rate is provided for in the contract concluded between the property owner and the Green Deal provider authorized by the Secretary of State (Green Deal Finance Plan).

According to the Department for Business, Energy and Industrial Strategy (BEIS), the expected financial savings from the measure to be installed cannot be less than the cost of repayment over the term of the Green Deal Plan (the so called "Golden Rule" of Green Deal). The government is no longer funding the Green Deal Finance Company and there is currently a discussion of updating the programme.

Eligible Technologies

The Eligible Technologies are differentiated: the schedule of the Green Deal (Qualifying Energy Improvements) Order 2012 provides for a list of 45 qualifying measures under Green Deal scheme. Among other measures air, ground and water source heat pumps, biomass boilers, and solar thermal are eligible for the loan.

In particular, with CHP fuels:

Biomass: boilers are eligible (sec. 1(4)(b) EnA 2011 in conjunction with Schedule of the Green Deal (Qualifying Energy Improvements) Order 2012).

Bonuses Amount

Regarding the amount of the loan depends on the energy-efficiency measure to be implemented and is specified in the Green Deal Plan signed by the property owner and the Green Deal Provider (sec. 5(2)(a)(i) EnA 2011; sec. 29-32 Green Deal Framework Regulations 2012).

Addressees

The addressees, the Entitled Parties, are homeowners and businesses willing to carry out energy-efficiency improvements specified in the Schedule of the Green Deal (Qualifying Energy Improvements) Order 2012.

Procedure

The Process Flow will follow the subsequent pattern, under the supervision of The Green Deal Oversight and Registration Body (GD ORB), on behalf of the Secretary of State, which are the competent authorities:

- *Assessment.* A Green Deal Assessor carries out an assessment of the property in which the energy-efficiency measure is to be implemented and produces a Green Deal Advice Report, where energy-efficiency improvements are recommended to the property owner as well as potential savings on energy bills, that will result from the measure, if installed and likely costs for the installation work (sec. 4 EnA 2011);
- *Granting of the loan.* Upon receipt of the Green Deal Advice Report, the property owner selects a Green Deal Providers who will carry out and fund the improvements and signs a Green Deal Plan, which is a contract between the property owner and the Green Deal Provider (sec. 5 EnA 2011);
- *Installation of improvements.* The Green deal provider will select a Green Deal installer, which will be responsible for the installation of the energy-efficiency measure (sec. 7 EnA 2011);
- *Repayment of the loan.* The cost of the energy-efficiency improvements is paid back over time through the electricity bill (sec. 23, 24 EnA 2011).

Eligibility Period

The Eligibility Period, according to the DECC, repayment period may be the lifetime of the measure or a “pay-back” period specified in the Green Deal Plan and can last up to 25 years.

Distribution of Costs

The costs will be covered mainly from the Green Deal Finance Company (GDFC), a consortium of private companies, which was formed by the government. Seed money for the scheme comes from the government.

Possible CHP Installation Simulation (Great Britain)

An example installation of 3 kW, with a 7000 € equipment cost, and 18 MWh of yearly energy consumption, will have this cost spread over ten years (amounts in Euros):

Initial Costs / First Year		Second Year	Third Year	Fourth Year	Fifth Year	Sixth Year	Seventh Year	Eight Year	Ninth Year	Tenth Year
Biogas	7682	982	982	982	982	982	982	982	982	982
Biomass	7603	1036	1036	1036	1036	1036	1036	1036	1036	1036

Table 11: Great Britain Biogas/Biomass Simulation Results

Charting the results with Biogas Fuel:

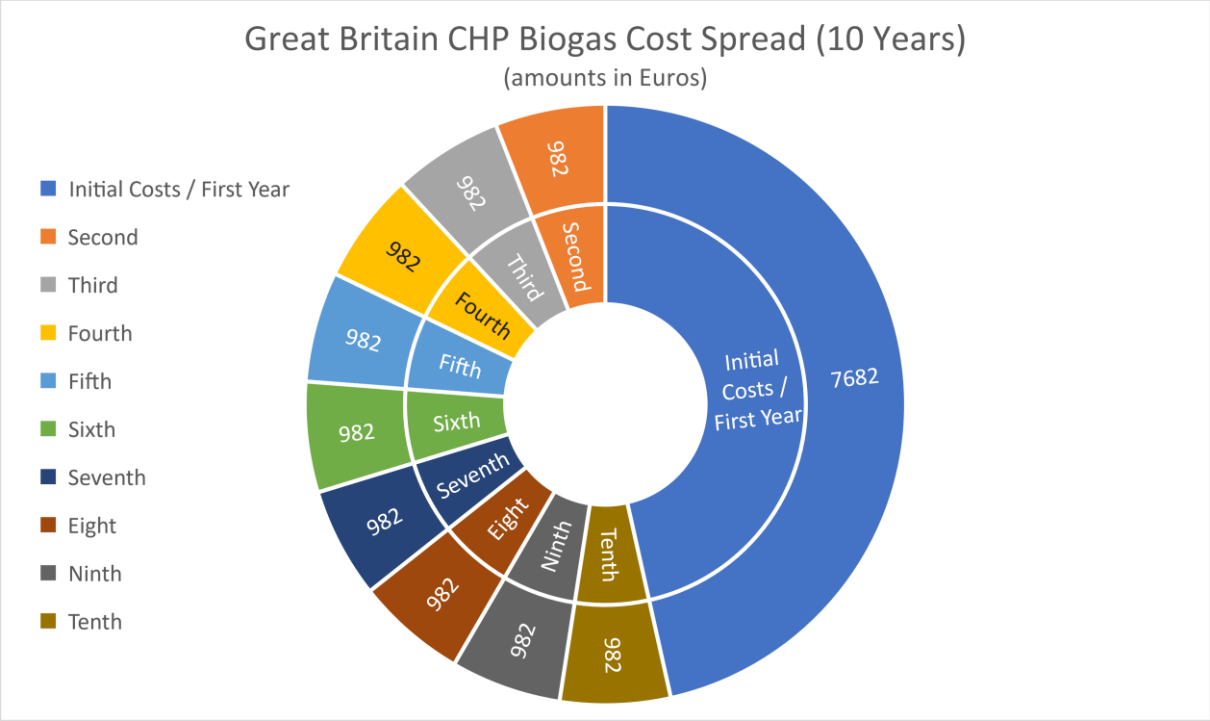

Figure 33: Great Britain Biogas Cost Spread

And with Biomass Fuel:

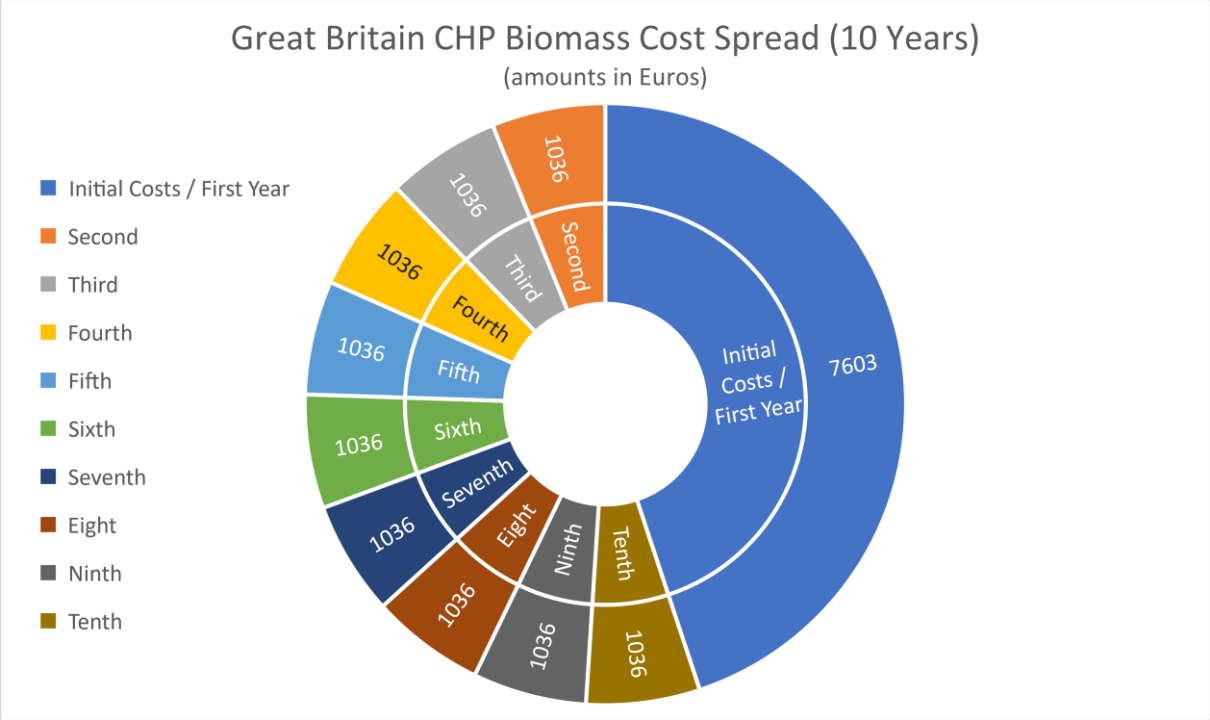

Figure 34: Great Britain Biomass Cost Spread

Possible CHP Installation Simulation (Northern Ireland)

An example installation of 3 kW, with a 7000 € equipment cost, and 18 MWh of yearly energy consumption, will have this cost spread over ten years (amounts in Euros):

	Initial Costs / First Year	Second Year	Third Year	Fourth Year	Fifth Year	Sixth Year	Seventh Year	Eight Year	Ninth Year	Tenth Year
Biogas	7367	667	667	667	667	667	667	667	667	667
Biomass	6910	210	210	210	210	210	210	210	210	210

Table 12: Northern Ireland Biogas/Biomass Simulation Results

Charting the results with Biogas Fuel:

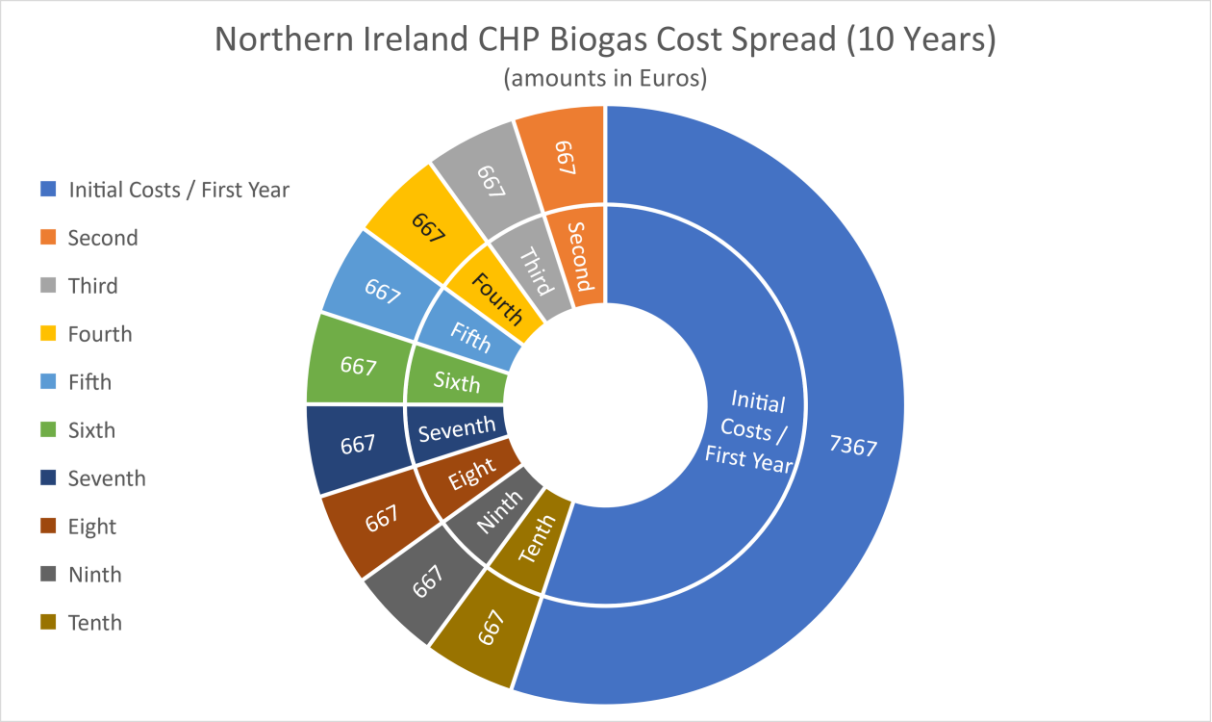

Figure 35: Northern Ireland Biogas Cost Spread

And with Biomass Fuel:

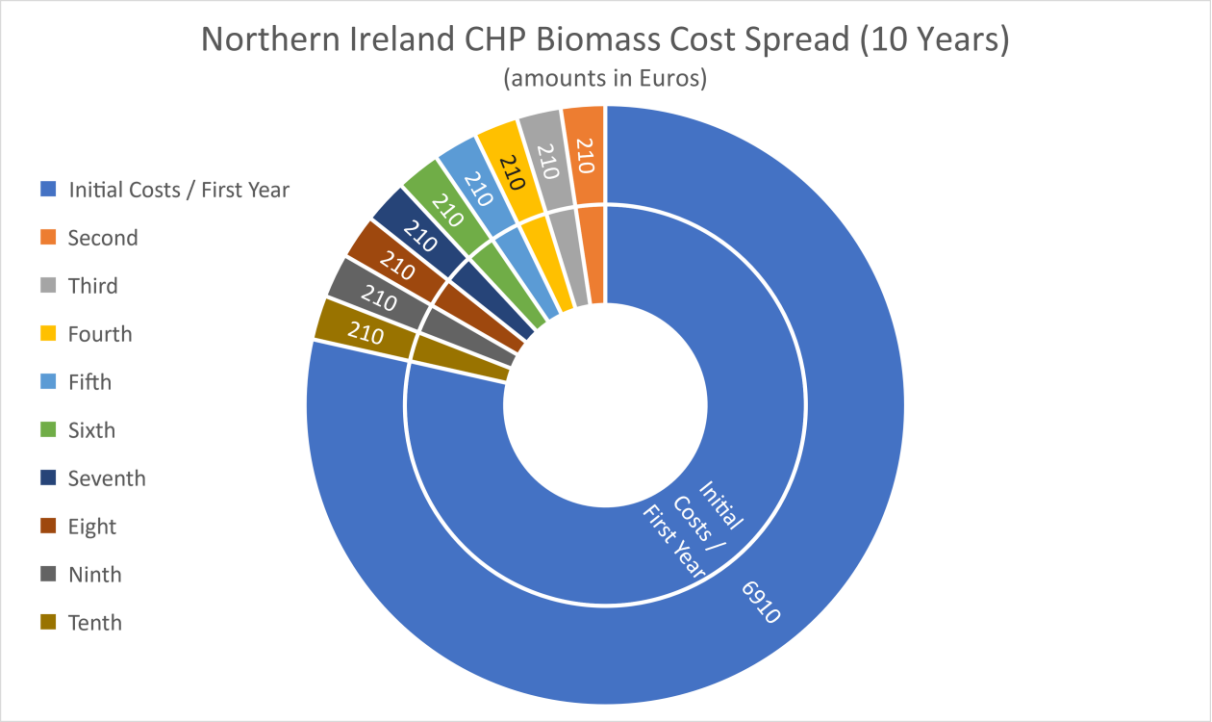

Figure 36: Northern Ireland Biomass Cost Spread

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Conclusions

In conclusion, for the aforementioned 3 kW power installed CHP system, with 18 MWh yearly required power, this is the cost spread for all the countries in the NPA area, using Biogas as a fuel:

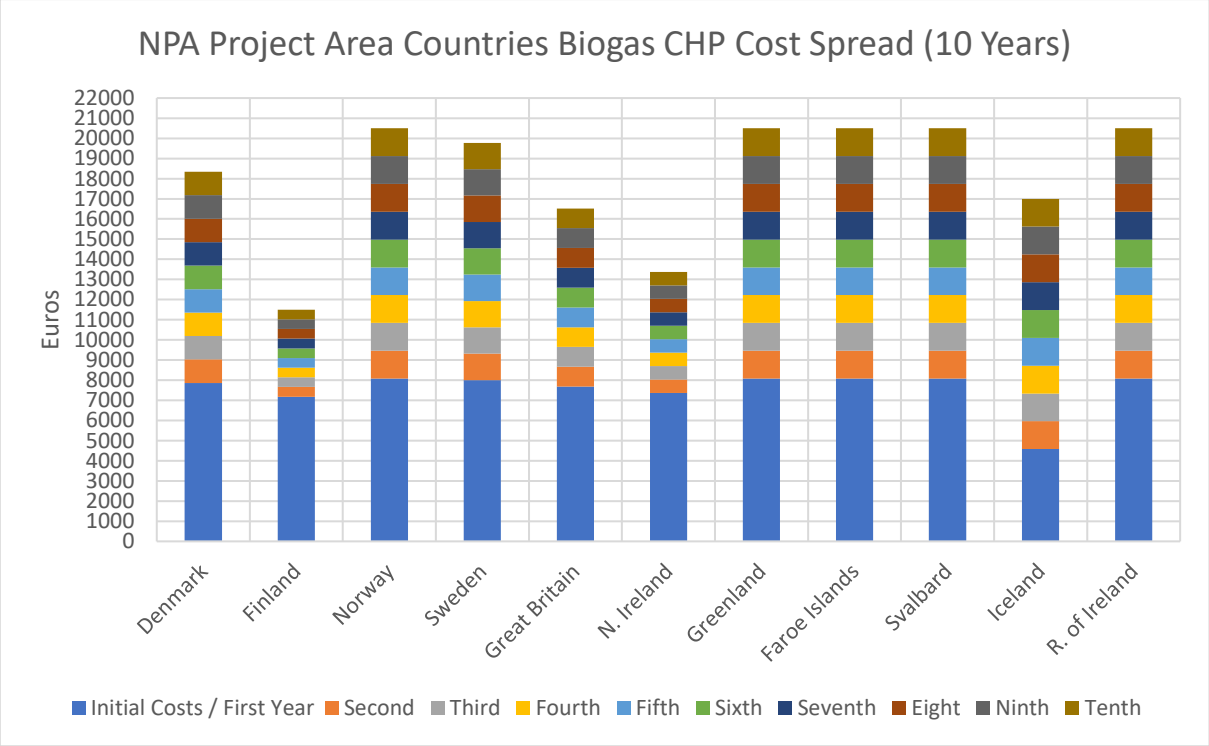

Figure 37: NPA Area Countries Biogas Cost Spread

And using Biomass as a fuel, instead:

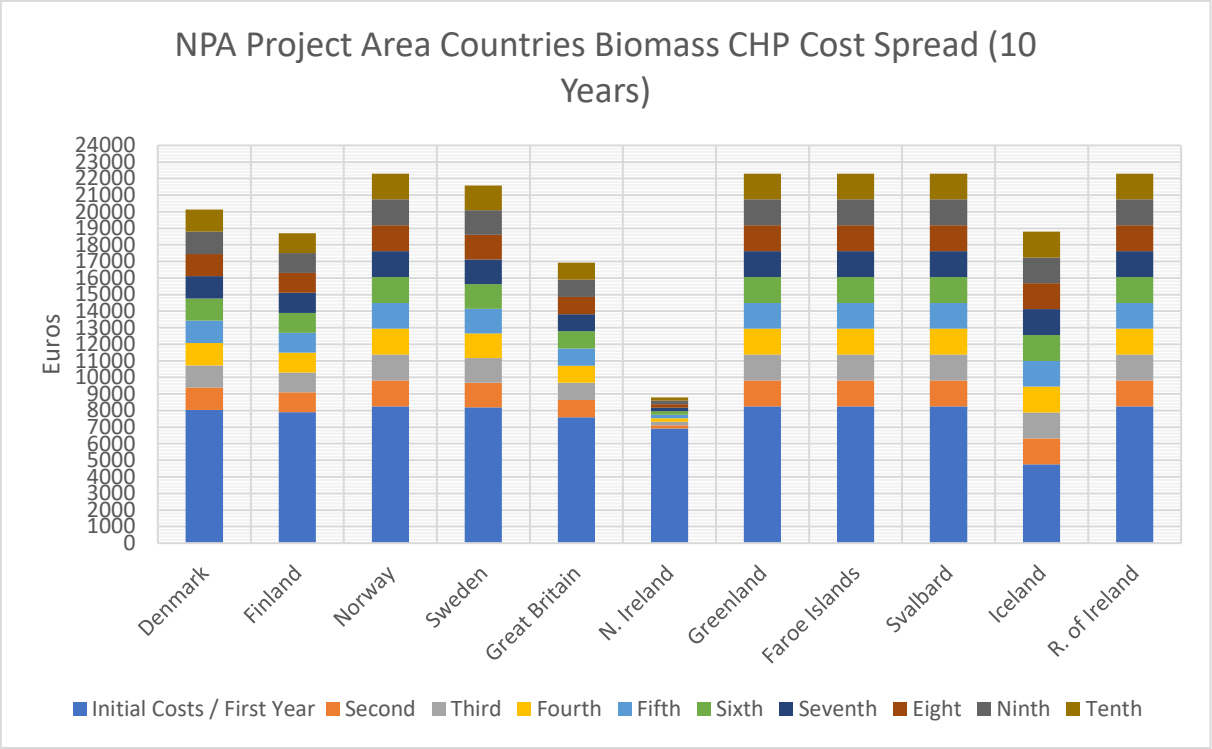

Figure 38: NPA Area Countries Biomass Cost Spread

The following table and charts illustrate instead the totals for each country for the simulated 10 years, always in regards of both CHP fuels (amounts in Euros):

Denmark	Biogas: 18340 € Biomass: 20140 €
Faroe Islands	Biogas: 20500 € Biomass: 22300 €
Finland	Biogas: 11500 € Biomass: 18700 €
Great Britain	Biogas: 16522 € Biomass: 16929 €
Greenland	Biogas: 20500 € Biomass: 22300 €
Iceland	Biogas: 17000 €

	Biomass: 18800 €
Northern Ireland	Biogas: 13372 € Biomass: 7832 €
Norway	Biogas: 20500 € Biomass: 22300 €
Republic of Ireland	Biogas: 20500 € Biomass: 22300 €
Svalbard	Biogas: 20500 € Biomass: 22300 €
Sweden	Biogas: 19780 € Biomass: 21580 €

Table 13: NPA Area Countries Totals

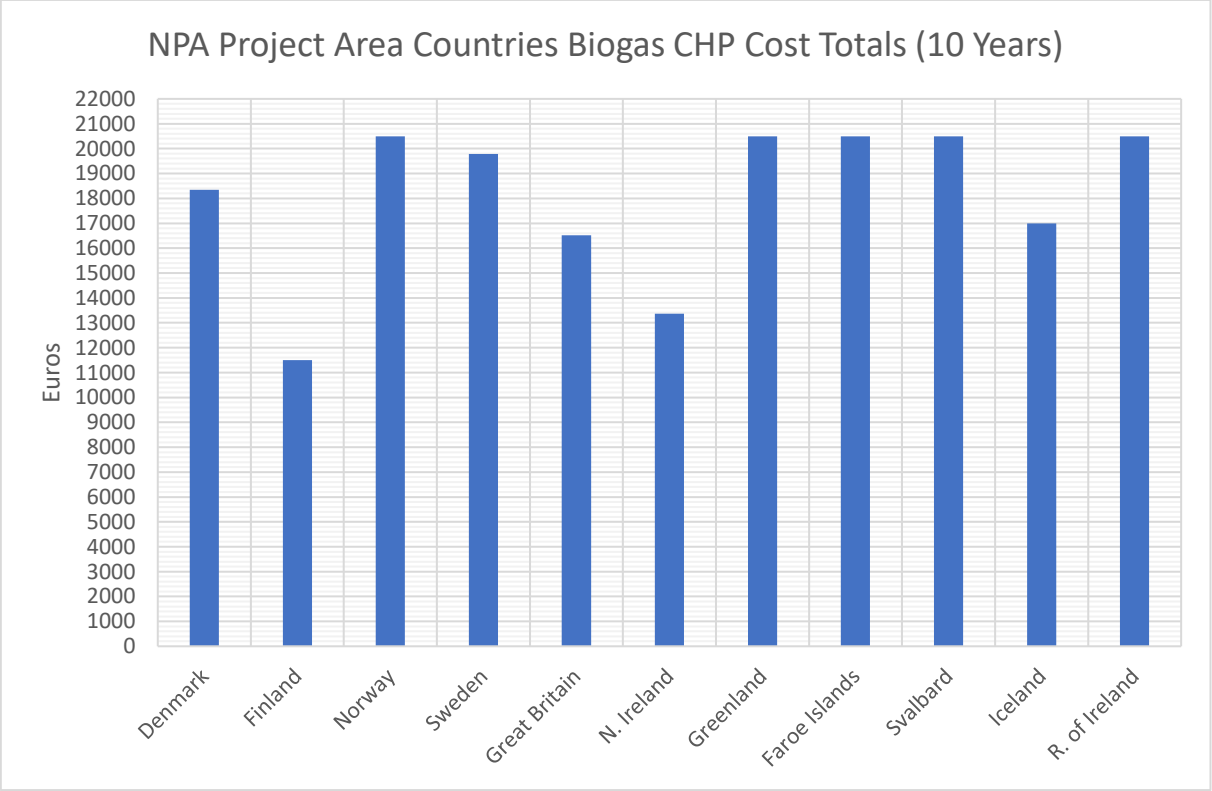

Figure 39: NPA Area Countries Biogas Totals

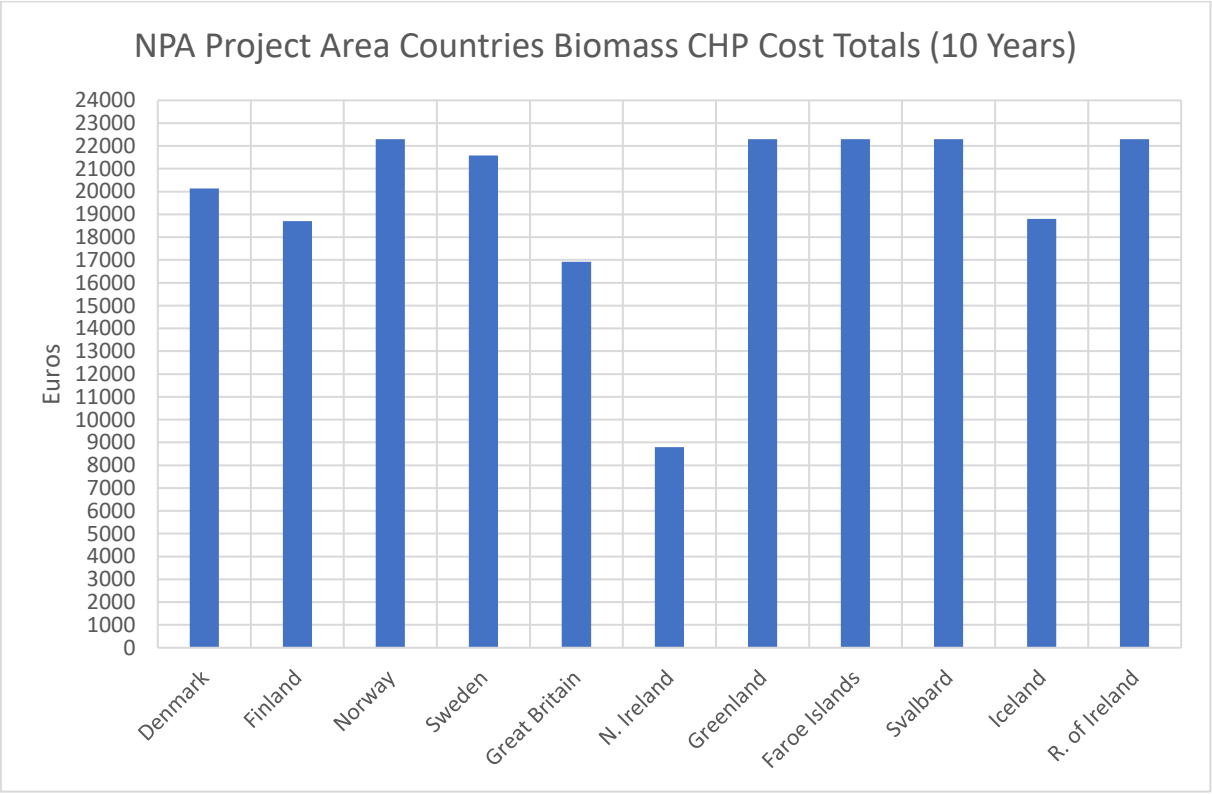

Figure 40: NPA Area Countries Biomass Totals

It is clear to see that some countries have better conditions than others, in particular, the United Kingdom appears the one to have the best situation regarding to Biomass fuel usage, followed by an almost equal Finland and Iceland.

Regarding Biogas usage, instead, Finland has definitely the better regulations for the final customers, followed by the United Kingdom.

A special note goes towards Iceland, where the laws permits a fifty percent grant on the initial project specified expenses, lowering the initial cost to start the building of the CHP system in their country.

As specified in *The Simulated CHP System* paragraph, at the beginning of the report, all the produced simulated data are for ease of reference only. This is because the market conditions, the regulations, the available grants and used prices could change in the future, thus modifying the overall result of the simulator.

However, they are enough accurate to depict the actual situation for the countries in the NPA area regarding the usage of CHP fuels such as Biogas and Biomass, which are summarized in the following table.

	CHP Regulations	Employable Tech	Grants/Funding
Denmark	Tax Regulation Mechanism Price Based Mechanism	All Renewables Biogas	3.5 € / GJ Biogas
Faroe Islands	None	-	None
Finland	Heat Bonus Investment Supports	Biogas Wood Fuel	50 € / MWh Biogas 20 € / MWh Wood 30-40% Project Cost
Great Britain	Renewable Heat Incentive Green Deal	Biogass Biomass	Tariff Rates (12 Months)
Greenland	None	-	None
Iceland	Subsidies	Biogas Biomass	50% Project Estimated Costs

	CHP Regulations	Employable Tech	Grants/Funding
Northern Ireland	Renewable Heat Incentive	Biogass Biomass	Tariff Rates
Norway	Quota System Support	All Renewables	Quotas
Republic of Ireland	None	-	None
Svalbard	None	-	None

Sweden	Tax Reduction Energy/Carbon Taxes Nitrous Tax	None All Renewables All Renewables	None Equal to Exempt Tax 4.75 € / kg NOx

Table 14: NPA Area Countries Regulations/Tech/Funding Summary

After reading and analysing the entire report, it is the natural conclusion that the approach for every nation has to be different and well thought, putting into consideration all the relevant regulation which applies to the desired and planned CHP system, being a 1 kW one or even a 5 kW one.

This concludes this description on the regulations of each country of the NPA area, in respect to eventual CHP installations, complete with a description of EU regulations, national regulations and available grants/funding, relating to renewables and energy efficiency (Priority Axis 3).

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References

All the relevant information about laws, regulations, grants and funding for each country of the NPA area that has been used to compile this report has been provided by the *RES LEGAL Europe* website (http://www.res-legal.eu/) with its extensive database dedicated to the regulations on renewable energy generation.

All the countries' maps are taken from the Wikimedia archives (https://commons.wikimedia.org/).

NPA INTERREG (2014) 'Priority Axes'. Available from <http://www.interreg-npa.eu/about/priority-axes/> [22th August 2018]

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