



COGENERATION OBSERVATORY
AND DISSEMINATION EUROPE

European Summary Report on CHP support schemes

a comparison of 27 national support mechanisms

CODE project report

European Summary

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CODE project

The Cogeneration Directive

The Cogeneration Directive 2004/08/EC outlines an enabling policy framework for the European Union to expand the deployment of cogeneration in Member States. The Directive was passed by the European Parliament in 2004 and encourages the use of cogeneration in the production of heat and power as a successful and well developed technique delivering primary energy savings. The background policy objectives in 2004 were security of supply and energy savings. The climate agenda which has grown in importance since 2004 has added further impetus to the wider use of cogeneration. Cogeneration is a highly energy efficient, technologically mature approach to generating electricity and providing useful heat. It is a key enabler for improving the efficiency of electricity production from fossil fuels.

One of the main achievements of the Cogeneration Directive has been to codify for Europe what is meant by high efficiency cogeneration. Any plant now carrying this status will in operation save a minimum of 10% primary energy compared to separate production of heat and electricity based on the same fuel. Using the framework of the Cogeneration Directive, promoting cogeneration to meet additional electricity needs gives a Member State a quantifiable primary energy saving per unit of electricity generated.

The CODE project

The CODE project was established in October 2008 by COGEN Europe under the EU's Intelligent Energy Europe (IEE) programme. The objectives of CODE are to have stakeholders in the sector independently monitor the implementation of the Cogeneration Directive and to use stakeholder input to assess the progress being achieved through Member State initiatives. The project runs until 2011 and will report in sequence on 1) the identified European potential for cogeneration; 2) the barriers and support mechanisms for cogeneration existing across the Member States; 3) best practise and progress in Member States; and 4) a draft CHP roadmap for Europe.

Executive summary

The WP3 financial comparison of five projects across all member states has documented the considerable existing policy which impacts CHP in Europe today. It has also shown that much of the legislation in place does not in fact result in a positive financial stimulus for cogeneration. The use of the IRR approach also highlights the substantial relative differences in returns which can be expected across capacity sizes of projects and the potential absolute impact of the details of sale or use of the electricity generated in the process.

The analysis shows that growth in CHP can be triggered through different support approaches in member states however successful approaches share the characteristic of lowering the return period to below a specific threshold. In the case of the currently modelled projects, and assumptions, this threshold is 3 years. Using the best case example of Flanders which uses a market mechanism of green certificates to stimulate investment, it is clear that project development and implementation can follow rapidly.

The IRR work also shows that suitable support mechanisms and an attractive IRR are not of themselves sufficient to trigger market growth. Substantial non-financial barriers in terms of market access, permitting, authorisation delay and barriers to entry exist for new entrants wishing to invest in the cogeneration sector. The best case practise also highlights the need for consistent long-term policy strategy around CHP and clear communication and outreach on its benefits.

1. CHP installed capacity in Europe in 2008

The map in figure 1 illustrates the percentage of total electricity generated in each Member State in CHP mode. Countries in dark green use over 30% of cogenerated electricity those in pale yellow use less than 5% cogenerated electricity. The average penetration level across Europe is 11%.

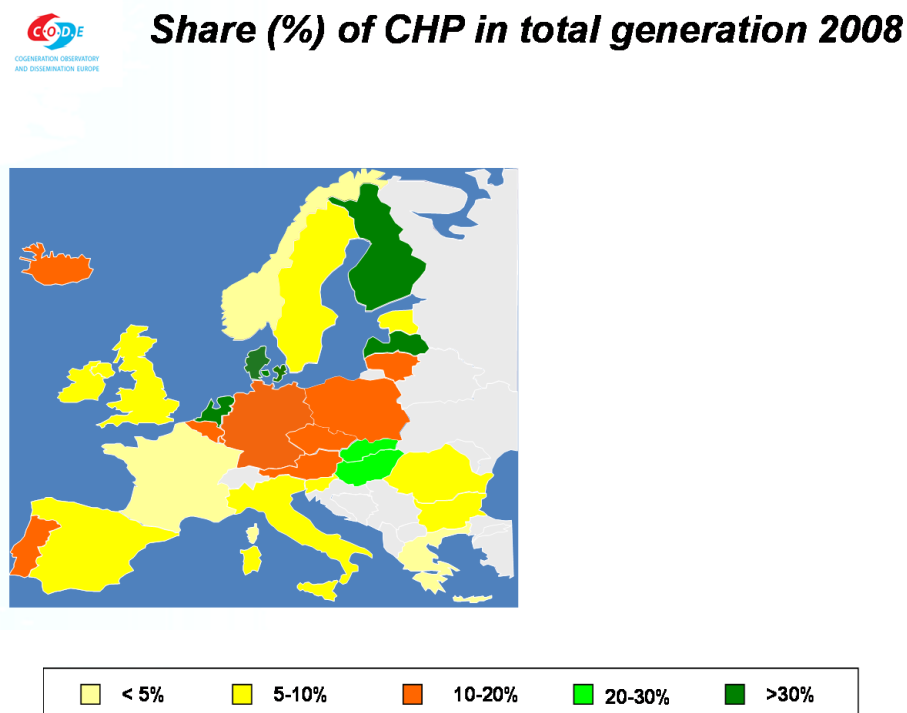


Figure 1 Map showing the percentage of CHP electricity in the delivered electricity by EU Member State

The European Commission analysis (2010) of the growth of the total installed CHP capacity in Europe between 2004 and 2008 shows that growth was 0.5% per annum on average. However the average masks a wide variation across member states in CHP activity. The CHP Directive was passed by the European Parliament in 2004 and finalisation of the Directive at the EU level took until the end of 2007. Given the time required for legislation to be translated from the European level into Member State law, there are only a few countries where national legislation arising from the CHP Directive in the years 2004 to 2008 can be gauged to be directly effective on the market. The period 2004-2008 saw only a few Member States really increase their CHP capacity above what could be considered as “business as usual” driven largely by basic economic growth factors and normal replacement cycles. The Belgian region Flanders stands out in this period as a region with exceptional growth in cogeneration installations. From 2000 to 2004 CHP grew in Flanders at roughly 2% per annum. Between 2004 and 2008 it grew at a level of over 20% per annum. In the Netherlands in the same period there were 500MW per year of new cogeneration added and all in the greenhouse sector. Elsewhere there were pockets of growth largely stimulated by bio-energy support mechanisms. Flanders is the subject of the case study later in this text.

2. WP3 CODE Project: description of the work carried out

In WP3 of the CODE project comparisons of Member States approaches to support has been modelled through calculation of the IRR of a group of common CHP applications (see Annex 1)

Five projects were modelled:

Notional Electrical capacity	50kWe	1MWe	1MWe	12MWe	66GW
Primary generator	Gas engine	Gas engine	Diesel engine	Coal turbine	CCGT
Typical use	Community site	commercial Installation, power space heating and hot water		Industrial sites with need for high grade heat (steam)	

Table 1 The five standard projects used in the CODE project to compare the effects of Member State support on the IRR of cogeneration projects

The 50 kW application is the type of CHP to be found in a small school building. The 1 MWe applications included both gas and diesel fuel to allow for regional variations. At 1 MW this unit could be found for example in a commercial installation powering space heating and hot water. The 12 MWe unit could provide the process heat of an industrial application for CHP where the heat is provided as high grade steam to an industrial process a sizeable brewery or a small district heating scheme.

2007 was selected as a reference year, as the most recent year which the project could analyse and for which more reliable statistical data are available. The analysis, therefore, represents a snapshot in time, and at a point where the CHP Directive was still in the process of implementation rather than fully implemented.

WP3 looks at a range of fossil fuel support mechanisms but did not cover bio-energy. Reliable data on bio-energy plants for CHP are only beginning to emerge in 2010. An increased focus on the sector has been promoted through the Renewables Directive and Member States have been asked to submit National Renewable Energy Plans which include biofuel for both heat, power and heat and power applications. Reliable bio-energy information on fuel costs particularly and on the very few plants in operation in the reference year of 2007 was not available and considered too project specific to be useful in a general discussion. A bio-energy example was therefore not included in this analysis.

The same 5 theoretical CHP projects were compared across all Member States. By using a consistent analysis approach across all Member States and including the existing support mechanisms and costs in the calculations, the CODE project team gained insight into both the effectiveness of Member State support mechanisms under general economic conditions and whether support mechanisms are sufficient to stimulate market activity or whether other aspects also play a significant role in the growth of CHP.

The analysis compares the overall financial impact of different mechanisms estimating the potential financial impact under the assumed standard conditions. The analysis compares a base case IRR and payback in years with a supported case showing the effects of the various Member State support mechanisms which apply (table 2). The 5 standard scenarios provide a “level playing field” for EU-wide comparison with a single set of assumptions used and applied to all Member States. A key assumption in the modelling is that all electricity produced by the plant (50 kW-12 MW) is used on site except in the case of the 66 MW unit where 60% of the electricity produced is assumed to be exported. This means that the significant additional financial impact (either positive or negative as can be the case in reality) of sales of electricity is missing from the IRR calculation. In practise most units of the 1 MW scale, which were analysed were sited in locations with relatively high electricity supply prices. The export value (without support) is often very low in the Northern Region. As a result, the modelled assumptions tend to give particularly high IRRs to CHP plant which may not be reflected in reality.

Allowing for the model’s basic assumptions, certain common features emerge among those member states which have been successful in promoting CHP and which can be traced back to actual effect on the market. These features require further examination and refinement but they are a useful first indicator in assessing existing and planned support mechanisms.

There is no regulatory risk assumed in the IRRs. The CODE project team did not try to estimate how individual project investments might be effected by perceived uncertainties generated by uncertainties in regulation and support. In general, regulatory risk is a significant additional cost on an investment further compressing the period for what is considered an acceptable pay back. The closeness of the remaining modelled financial performance to actual financial assessment by a potential plant operator will depend heavily on the mode of operation of the plant concerning electricity use and sales and to any other of the fundamental standard project assumptions. The IRR calculations are illustrative of the relative effect of support mechanisms between plant sizes in one country and between different countries and not the absolute effect in a Member State in 2007.

Internal Rate of Return (IRR) without benefits					
Base case					
	50kWe	1MWe	1MWe	12MWe	66MWe
Austria	23.80%	42.79%	66.82%	21.03%	20.26%
	2.6	1.4	0.9	3.2	3.2
Bulgaria	0.00%	0.00%	0.00%	8.59%	0.00%
	-7.4	26.9	-1.2	7.6	-14.2
Cyprus			0%		
			-4.3		
Czech Rep	5.71%	9.86%	-0.49%	18.08%	8.45%
	7.4	4.7	7.4	3.7	6.3
Denmark	0.00%	16.75%			53.44%
	11.2	3.1			1.1
Estonia	0.00%	0.00%	0.00%		0.00%
	107,5	117,6	-8,6		-158,7
Finland	2.60%	27.89%	11.26%	19.98%	22.57%
	6.3	2	3.9	3.3	2.8
Flanders	2.55%	13.91%		28.54%	12.32%
	8.9	2.6		2	4.2
France	2.67%	1.93%			11.58%
	10.2	11.7			5.4
Germany	17.43%	79.20%	71.34%		34.26%
	3.4	0.7	0.7		1.7
Greece	0.00%	17.60%	0.00%		
	17.5	2.8	11		
Hungary	0%	0%	0%	5,70%	1,86%
	1.248,7	44,5	-12,6	7,3	9,6
Ireland	0.00%	10.63%	0.00%		
	-23.1	4.5	-5.7		

Internal Rate of Return (IRR) with benefits					
Supported					
	50kWe	1MWe	1MWe	12MWe	66MWe
Austria	23.80%	69.29	66.82	21.03%	20.26%
	2.6	0.8	0.9	3.2	3.2
Bulgaria	0.00%	11.17%	0.00%	12.71%	18.70%
	-7.4	6.2	-1.2	5.8	4
Cyprus			0%		
			-4.3		
Czech rep	0%	0%	0%	21.53%	9.20%
	-58.1	72.2	69.3	3.6	6
Denmark	0.00%	16.75%			53.44%
	11.2	3.1			1.1
Estonia	0.00%	12.97%	0.00%		0.00%
	14.3	5.8	16.2		-158.7
Finland	2.60%	27.89%	11.26%	19.98%	22.57%
	6.3	2	3.9	3.3	2.8
Flanders	12.91%	47.58%		51.17%	22.16%
	4.4	1.3		1.1	2.6
France	25.30%	52.90%			76.41%
	2.7	1.2			0.7
Germany	29.77%	98.49%	82.77%		37.19%
	2.2	0.6	0.6		1.6
Greece	2.92%	26.33%	0.00%		
	11.4	1.8	7.2		
Hungary	0%	6,72%	0%	16,61%	9,58%
	42,8	5,5	10,4	3,9	5,8
Ireland	0.00%	10.63%	0.00%		
	-23.1	4.5	-5.7		

	50kWe	1MWe	1MWe	12MWe	66MWe
Italy	10.05%	29.08%	0.00%		23.03%
	5.4	1.8	-3.3		2.7
Latvia	0%	1.13%	0%		2.77%
	18,0	7,5	16,3		9,2
Lithuania	0%	0%	0%		-6,62%
	19,7	16,2	-263,6		16,9.0
Luxembourg	26.59%	51.94%	48.34%		46.00%
	2.3	1.1	1.2		1.3
Malta			0%		
			-1		
Netherlands	-0.29%	16.09%			2.45%
	13.1	4.1			8.2
Poland	0.00%	0.00%	0.00%	13.52%	1.52%
	15.6	9.5	12	4.6	9.9
Portugal	0.00%	2.40%	2.35%	25.62%	-9.49%
	80.4	4	4	1.8	6.9
Romania	2.87%	0.00%			0.00%
	12.6	5.4			-24.8
Slovakia	9.24%	17.73%	21.08%	25.46%	8.13%
	6	3.4	2.8	2.7	6.4
Slovenia	0%	0%	0%		9.01%
	192.3	-124.6	54.3		6
Spain	23.63%	30.91%	-7.00%		18.51%
	3	2.2	30.4		3.8
Sweden	0.00%	0.00%	49.04%		15.25%
	-45.1	12	1.3		4
UK	-4.34%	13.44%		9.08%	11.99%
	8.6 yrs	3.5 yrs		6.1 yrs	4.8 yrs

	50kWe	1MWe	1MWe	12MWe	66MWe
Italy	19.73%	57.94%	43.45%		54.08%
	3.4	1.2	1.1		1.1
Latvia	0%	1.13%	0%		6.14%
	18,0	7,5	16,3		7,3
Lithuania	0%	14,48%	9,17%		24,16%
	12,9	3,8	4,7		2,8
Luxembourg	26.59%	51.94%	52.12%		46.00%
	2.3	1.1	1.2		1.3
Malta			0%		
			-1		
Netherlands	6.12%	34.52%			7.98%
	8	2.4			6
Poland	4.36%	14.87%	13.23%	14.92%	22.23%
	8.1	3.8	3.9	4.3	3.1
Portugal	0.00%	2.40%	2.35%	25.62%	-9.37%
	80.4	4	4	1.8	6.9
Romania	5.62%	16.73%			20.79%
	10	3.4			3.6
Slovakia	15.35%	36.21%	32.80%	30.34%	24.54%
	4.4	2.2	1.9	2.3	2.8
Slovenia	19.98%	13.52%	14.15%		19.93%
	3.6	4	3.7		3.4
Spain	30.75%	37.73%	8.05%		23.84%
	2.3	1.9	7		2.9
Sweden	0.00%	0.00%	49.04%		15.25%
	-45.1	12	1.3		4
UK	1.24%	24.87%		12.36%	16.21%
	6.8 yrs	3.4 yrs		5.7 yrs	3.9 yrs

Table 2 Internal Rate of Return (IRR) without and with benefits

3. Overview of CHP support mechanisms across Europe

In 2007 there was a wide range of support mechanisms for CHP operating across Europe. Member States generally favoured some form of special tariff on electricity supplied to the grid (Feed-in Tariff: FiT), a generation bonus on the total electricity generated in CHP mode or fuel related tax concession. These forms of support aimed at providing working capital on an ongoing basis to support cogeneration revenue, reducing the risk of the investment by indicating a level of guaranteed return. This approach is particularly successful when the time horizon for the support is clear and sufficiently long term to cover the near term life of the plant. Some sort of capital grant or allowance targeted at growing particular capacity sizes of CHP is also a preferred approach but selectively applied and less wide spread. Capex support is effective particularly for smaller applications, where investment costs tend to be higher and more variable. The main methods of support are covered in Figure 2 below under the headings: tax, FiT (incl generation bonus), Certificate Scheme, Capital grant. The “Other” category of support contains a range of detail and added complexity to these schemes which is not considered to be centrally motivating for the sector. The “Other” category also contains support mechanisms for bio-energy (see Annex 2).

Country	Tax support	Feed in tariff	Certificate scheme	Capital grant	Other
Austria		√			√
BE - Flanders	√		√		√
Bulgaria		√			√
Cyprus					√
Czech Republic		√			√
Denmark					
Estonia					√
Finland				√	√
France		√			√
Germany		√			√
Greece	√	√			√
Hungary		√			√
Ireland				-	√
Italy	√	√		√	
Latvia		√			√
Lithuania		√			√
Luxembourg	√				√
Malta	√				√
Netherlands	√	√		√	√
Poland			√		
Portugal				√	√
Romania		√		√	
Slovakia		√			
Slovenia		√			√
Spain	√	√			√
Sweden				√	√
United Kingdom	√	√		√	

Figure 2: Overview of support CHP support mechanisms for fossil fuel based CHP in the European Union in 2007.

4. Overview of CHP support mechanisms and taxes

Austria:

Legal framework: Austrian Federal Law on the Promotion of CHP (KWKG-Gesetz), issued by National Council on the 8th August 2008, entered into force on the 9th August 2008 and 23rd February 2009 respectively.

Policy approach: Fossil fuel CHP is supported in Austria through a generation based FiT, the 'übersicht-einspeisetarife'. The FiT applies to CHP of 2 MW and below. There is no support for fossil CHP of over 2 MW.

Belgium:

Legal framework: There is a law on the promotion of CHP issued by the Flemish government (7th July 2006), a law on the promotion of CHP issued by the Walloon Region (30th November 2006) and a law on the promotion of CHP issued by the Brussels Region (6th May 2004).

Policy approach: Support for CHP in Flanders is accrued through a number of different mechanisms. The capital costs of CHP are supported through an Ecological premium and tax reduction which significantly reduces the investment cost. The CHP certificate can be traded for the duration of the plant life and is calculated based on the emissions saved. These two support mechanisms account for the majority of the support in Flanders. For smaller scale CHP, there are payments made to reflect the reduction in grid losses from decentralised generation. At the federal level, there is also tax reduction for CHP.

Bulgaria:

Legal framework: Energy Act of Bulgaria created in 2003 and amended in 2006.

Policy approach: Financial support is in the form of a FiT paid on all generated electricity. Ahead of a proposed legislation to provide a system for Green Certificates, the support schemes available for CHP in Bulgaria is based on a mechanism of mandatory purchase of electricity for preferential prices. There are two funds supporting cogeneration projects: one set up by the Bulgarian state and a second one is called the Energy Efficiency Fund and the main donor is the World Bank. FiT paid on all generated electricity has a marked effect on all plants where the support is available.

Cyprus:

Legal framework: Law on the Promotion of Cogeneration and Heat (2006)

Policy approach: A new grant scheme for investment subsidies for CHP is expected to be adopted in Cyprus. The previous scheme (2006) offered subsidies for cogeneration up to 30% of eligible investment costs for enterprises and biomass-fired CHP. The Energy Authority of Cyprus defines the purchase tariffs for cogenerated electricity which are linked to the fuel price.

Czech Republic:

Legal framework:

- Energy Act No, 458/2000 Coll.
- Public notice No, 439/2005 Coll.
- Decree on electricity market rules and other conditions No,541/2005 Coll.

Policy approach: Since 1st January 2006 a new support scheme has been introduced for CHP units, based on a feed-in premium on top of the market price of electricity for cogenerated electricity paid by network operators (distribution or transmission). The premiums are divided into three categories according to the installed electric capacity: up to 1 MWe, 1 MWe to 5 MWe and above 5 MWe. The premium is higher if producers sell electricity only in peak time. Producers can sell electricity to the market or use it themselves. The system of price regulation is controlled by the Energy Regulatory Office (not as state aid).

Denmark:

Legal framework: Electricity Supply Act and Heat Supply Act.

Policy approach: There is no governmental support for fossil fuel CHP in Denmark

Estonia:

Legal framework: Amendments to the Electricity Market Act (1 May 2007).

Policy approach: New support scheme implemented in 2007 with FiT for CHP using renewable energy sources and other units of efficient cogeneration replacing boiler houses with capacity up to 10MWe. Two options are available:

1. Purchase obligation with feed-in tariff; or
2. Subsidised tariff (premium)

The support will be provided for CHP facilities with capacity less than 100 MW, CHP units using peat, waste or shale gas and CHP units replacing old boiler houses with capacity up to 10 MWe. There is support for fossil CHP units up to 10MWe. Relatively low feed-in tariffs make new renewable investments very difficult. A voluntary mechanism involving green energy certificates was also created by the grid operator in 2001.

Finland:

Legal framework: Law on the excise taxation of specific fuels 30.12.1996/1260.

Policy approach: Investment support for biomass based CHP plants. No fossil fuel support.

France:

Legal framework: Consolidated Cogeneration law: Arrêté du 31 juillet 2001 consolidé au 23 août 2005.

Policy approach: A two part feed in tariff one part paid on total electricity generation and a second tranche paid on electricity exported to the grid only. No capital grant or tax based supports available.

Germany:

Legal framework:

- CHP Law (unofficial consolidated version on the basis of the Federal Law Gazette published on 25.10.2008)
- CHP Law – changes from 21.08.2009. The changes mainly concern the clarification that belong to the eligible consumers leaving the heat network Law to accelerate the development of high voltage electricity network
- Erneuerbare-Energien-Gesetz (EEG)
- Erneuerbare-Energien-Wärmegesetz (EEWärmeG)
- Energiesteuergesetz
- Stromsteuergesetz

Policy approach: The main support for CHP in Germany is a stepped FiT in which the first kWh generated in a given year are rewarded at a higher level than subsequent generation. The result of such a mechanism is that fixed costs can be accounted for during the initial run time and therefore the investment presents less of a risk for developers. The model used here is unable to reflect the value of this feed in tariff design as it smoothes value over total annual generation.



Picture 1 Siemens SGT-400 Gas Turbine generator (14 MW) set in Cogeneration application at Psyttalia - Sewage Treatment Plant - Greece

Greece:

Legal framework:

- Law on Generation of Electricity using RES and High-Efficiency CHP and Miscellaneous Provisions (2006)

- Law on Promotion of CHP and other Provisions (2009)
- Ministerial Decree on Methodology for calculating the co-generated electricity from high efficiency CHP (2009)
- Law on Acceleration of the development of RES for handling climate change and other provisions (2010)

Policy Approach:

The FiTs are differentiated according to the location of the CHP unit. They also apply for biomass power plants. A CHP plant running on biomass cannot combine these tariffs, i.e. they remain the same. There is support for small scale CHP. Investment subsidies are available within the framework of the Development Act. They vary, but they can reach 55 % (especially in case of SMEs).

Hungary:

Legal framework: Act No. CX of 2001 on Electricity came into effect on 1 January 2003, amended in 2005. Much of the current legal framework applicable to cogenerators is derived from this Act, together with Act XVIII/1998 on district heat supply.

Policy approach: There is a CHP Support (Feed-in obligation). Fixed purchase prices for sold electricity to the network. Prices vary by unit size and hours of selling electricity (peak, valley, deep valley). The future of support scheme is uncertain after 2010. A green certificate scheme was introduced with the Electricity Act (2001, as amended in 2005). This act gives the Government the right to define the start date of implementation. At that time, the feed-in tariffs will cease to exist. Investment subsidies are potentially provided by KIOP (mainly for renewable projects).



Picture 2 Wärtsilä 18V34SG gas CHP application (12 MW) in Győr, Hungary

Ireland:**Legal framework:**

- Energy (Miscellaneous Provisions) Act 2006
- Electricity Regulation Act 1999 (Appointment of Person to Calculate Power to Heat Ratios of Combined Heat and Power Units) Order 2009

Policy Approach: There are no supports mechanisms for new CHP plant modelled. There is a grant support system to assist the deployment of small scale (less than 1 MWe) fossil-fired CHP and biomass (anaerobic digestion and wood residue) CHP systems. Financial tax incentives are available through the Accelerated Capital Allowance (ACA) scheme to encourage the purchase of plants that are highly efficient.

Italy:

Legal framework: Decreto Legislativo 8 febbraio 2007, n.20

Policy Approach: CHP plants are granted a FiT as well as a reduction in the tax paid in gas input fuels and, at the smallest scale (50 kW) a payment to account for the benefit of decentralised generation to the grid.

Latvia:**Legal framework:**

- Law on Electricity Market (2005), adopted on 5 May 2005
- Regulation No. 221 of Cabinet of Ministers on Electricity Production and the Price Regulation in Cogeneration, adopted on 10 March 2009

Policy approach: The Latvian FiT is paid on all electricity generation and applies to all fossil CHP. Purchase price differs depending on the installed electric capacity and fuel used (for natural gas calculated according to a fixed price formula as natural gas price multiplied by factor, individually calculated). Investment support for renewable CHP units is available from the EU Structural Funds.

Lithuania:

Legal framework: Rules on Issue of Guarantees of Origin of Electricity produced from High-efficiency Cogeneration (2008). Official Gazette 2008, No 59-2254. The Regulations for Public Service Obligations approved by the Minister of Economy

Policy approach: Lithuania has a FiT with purchase obligation on all generation is controlled by National Control Commission for Prices and Energy (level of support sets annually and differs between plants).

Luxembourg:**Legal framework:**

- Law on the rational use of energy (5th August 1993)
- Regulation on CHP and electricity generation from RES for units with a maximum capacity of 1.5MWe (30 May 1994)

Policy approach: There was no support modelled for fossil fuel fired CHP.

Malta:

Legal framework: Subsidiary Legislation 423.27

Policy approach: Malta lacks a FiT for CHP and there is also a lack of incentives and local expertise. These tariffs are directly linked to avoided costs in terms of new generation equipment, avoided fuel, O&M and network costs, avoided CO₂ costs and finally a factor accounting for network losses.

Netherlands:

Legal framework:

- Electricity Act 1998, EIA Energy list 2010, Arrangement for Guarantees of Origin electricity production
- The Act 'Wet belastingen op milieugrondslag' (environmental taxes)

Policy approach: There is a tax credit: extra depreciation of 44% of the investment; applicable tax rate 25.5%; subsidy $0.44 \times 25.5\% = 11.2\%$ of the investment temporarily subsidy for the exploitation of co-generation, only applicable to the CO₂-free kWh (approximately 30% of the production first two cases, 20% for the last).

Poland:

Legal framework:

- Amended Energy Law and Environmental Act 2007 (Green Certificates from 1. July 2007)
- Issuing GoO (Energy Regulatory Office): Ordinance on issuing CHP GoO, 2007

Policy approach:

Certificates of origin ("Green Certificates") are issued separately for two groups of cogeneration units:

1. Gaseous fuels or with total installed electrical capacity below 1MW
2. All remaining sources (4,8 €/MWh).

Certificates carry a range of purchase obligations and a different level of substitute fee. The level of the substitute fee is determined each year by the President of the Energy Regulatory Office. The support system will remain in force until 31 March 2013.

Portugal:

Legal framework:

- Decree-Law nº. 23/2010
- Law nº. 19/2010

Policy approach: Cogenerated electricity exported to the grid benefits from feed-in tariffs. These feed-in tariffs are applied for a period of ten years and it is indexed to the price of oil, to reduce fuel-price risks. As the price of oil rises, so will the feed-in tariff for cogenerated

electricity. Micro-CHP in Portugal benefits from a higher level of support than larger cogeneration.

Romania:

Legal framework:

- Electricity Law (2007)
- Government Decision on the promotion of co-generation based on the effective thermal energy demand (2007)
- Government Decision on the approval procedure for issuing guarantees of origin for electricity produced by high efficiency cogeneration (2008)

Policy approach: The support mechanism operating in Romania is in the form of a two stage FiT; one part paid on all generation and worth 1.5 cents per kWh across all fuel types and plant sizes. There is also a support paid on exported generation and this varies from between 0.5 and 0.43 cents per kWh exported power. For CHP installations running on renewable fuels, cogenerated electricity receives Green Certificates. Systematic CHP support in Romania is not developed yet and it is only subject to special (EU) funds and programmes. Two funds are available for energy efficiency improvements: the Romanian Energy Efficiency Fund (FREE) and the Environmental Fund.

Slovakia:

Legal framework: Act on promotion RES and High Efficiency Cogeneration (309/2009)

Policy approach: Support for CHP in Slovakia comes in the form of an operation support as fixed purchase price composed of electricity price for losses and surcharge (varies by size and type of technology). Fixed purchase price is paid for all sold electricity to the network operator, whereas surcharge is paid on all other generated electricity. Investment subsidies from EU structural fund are available in the period 2007 – 2013 (if plant is granted from 30 – 50% of total acquisition costs, the fixed electricity price is reduced from 4% to 16%).

Slovenia:

Legal framework:

- Energy Law
- Decree on Support for Electricity Produced in High-Efficiency Cogeneration (Off. Gaz.of RS No. 37/09)

Policy approach: Support scheme was approved in 2009 with higher and more stable support for cogeneration as fixed purchased price for units up to 1 MW or premium on all generated electricity for all plants for a 10 year period. Separate support for fossil fuel and wood biomass plants and different support levels for different size classes. Higher level of support for units with up to 4,000 operation hours per year (heating). Predictable methodology for yearly adjustment of supports based on forecast of natural gas and wood biomass market price and electricity market price minimise market risks for the investors.

Spain:**Legal framework:**

- Royal Decree 616/2007, entered into force on 11 May, on the Promotion of CHP
- Royal Decree 616/2007, entered into force on the 25th of May, on the regulation of electricity produced on special regime

Policy approach: The support for CHP is in the form of a reduction on the tax applied to the input fuel and a generation based FiT which is smaller per kWh generated the larger the size of the plant.

Sweden:

Legal framework: Lag (2003:113) om elcertifikat (Law on Green Electricity Certificate (2003:113) revised 2010).

Policy approach: There is no support for new fossil fired CHP in Sweden. New CHP plants are bio-energy.

United Kingdom:

Legal framework: Energy Act 2008

Policy approach: Enhanced Capital Allowances (ECAs) enable a business to write off capital cost of investment, against their taxable profit FiTs offer financial support for gas-fired CHP up to 2 kW (and renewable electricity up to 5MW). Climate Change Levy Exemption Certificates (CHP LECs) operate for high efficiency CHP sources. Electricity suppliers are required to source a proportion of their electricity from renewable sources. Suppliers acquire Renewable Obligation Certificates (ROCs) from eligible generators when purchasing electricity, in order to demonstrate the proportion of renewable supply delivered to customers. CHP operators receive Embedded Benefits payments to refund the costs incurred in the charging system which assumes use of the transmission network.

5. Regional Overview

CODE Northern Region (Austria, Belgium, Denmark, Finland, Germany, Ireland, Netherlands, Sweden, UK)

The Northern Region contains some of Europe's biggest CHP countries, including the leader in CHP, Denmark. In some of these countries there is already a penetration of CHP in their electricity supply system of upwards of 20%. In the Nordic countries (Denmark, Finland Sweden), there is limited support for fossil CHP as the focus has already moved to renewable and lower carbon solutions.

In the remaining countries in the region some very complicated support mechanisms exist possibly reflecting sensitivity to strongly liberalised markets and a desire by national governments to apply only the minimum required stimulus. Such complexity can act as a barrier to entry and a further cost penalty on new entrants who need to invest to understand the system.

Belgium (Flanders) and Germany are the two EU Member States which have shown convincing promotion of CHP. The support mechanisms in these countries both show an advantage over the basic rate of return of upwards of 10%. For the large plant in Germany this is not the case and in fact this part of the market is not progressing at a parallel pace to the smaller systems where stimulus is clear.

A common theme across the Northern Region members with significant CHP support is the combination of capital support (through grants or tax liability reduction) with generation/power export support.

CODE Eastern Region (Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, Slovenia)

FiTs and bonuses on electricity are the strongest CHP promotional support used in all countries in this CODE region. The details of FiTs in range covered, period, setting, etc are unique to specific countries but the consistent choice of FiT may reflect the more managed electricity markets which still exist. Full market liberalisation is still ahead.

More market oriented FiT with premium on all generated electricity is the most successful mechanism in the countries with average/higher end users electricity prices (Slovenia, Slovakia, Czech Republic, Hungary) with the fastest recent development (except Slovenia with new support from 2010). For the Baltic countries, with still very low wholesale prices and lower end users prices, the fixed purchase price approach to support seems to be a better option. A fixed purchase price is a good option for supporting the competitiveness of

district heating plants on the electricity market. District heating applications incorporating cogeneration are a dominant cogeneration sector in the CODE Eastern region.

Coal is a significant fuel in several Member States and the price data which are available are difficult to verify. This region is also characterised by very high upfront costs and capital costs for the smaller units. In a time of limited access to capital this is an issue for new projects.

CODE South East Region (Bulgaria, Cyprus, Greece, Romania)

There are two quite separate experiences of CHP in this region: two of the countries Bulgaria and Romania have considerable district heating investments, some with CHP; in Greece and Cyprus district heating applications are very limited and CHP is in general not a prominent energy efficiency method in key sectors where it would exist in other countries.

None of the Member States in this region have support mechanisms to encourage micro-CHP or smaller building and small process sites.

In general, the profitability of CHP across this region is heavily affected by the relatively low level of market liberalisation. The electricity supply price data for Bulgaria for example shows that the electricity price is lower than the basic fossil fuel price. Market liberalisation issues in Greece effect market access and competition around basic fuel. Despite support mechanisms which could stimulate the market in Greece the bureaucracy for obtaining permits from many different state organisations are time consuming and act as a barrier to entry for new participants. The volatility of fuel prices, and frequent changes in the policy structures around the electricity market and CHP in recent years has added to the investment risk.

CODE South West Region (France, Italy, Luxembourg, Malta, Portugal, Spain)

Similarly to the CODE Northern Region, the countries of the South West region are relatively advanced in market liberalisation. For cogeneration support mechanisms this means that the support mechanisms tend to be complex to reflect the structure of the market with gas and electricity prices built up in tranches.

The supported IRRs in both France and Italy benefit by well over 10% uplift however despite the apparently attractive returns these markets are not showing the growth that might be expected as a result. In France the limited application and duration of new support contracts mean that there is in reality only investment in replacement plant. In Italy additional costs to cogenerators, local legislation and local taxes restrict development adding risk cost to this basic IRR calculation.

6. Discussion of the findings and main drivers for success

The WP3 CODE modelling highlights a basic fact of the CHP sector which is that the impact of fuel price and electricity price are very significant within the IRR. Volatility in both or either of these prices impacts the IRR and increases the uncertainty of return. To standardise the analysis the CODE team chose to model plants with only one assumption on electricity use/generation i.e. that all the self generated electricity in modelled projects apart from the 66 MWe project was consumed on sight. As sales (or not) of electricity are a key element of profitability of a project, these assumptions must always be taken into account in using the results of the modelling. The impact of these assumptions also has a bearing on support mechanism design as support mechanisms can either encourage or discourage sale of electricity to the grid from CHP, hence influencing the size of plant an investor will choose to install and the overall energy efficiency gains in the end.

There is also a clear impact of the degree of market liberalisation on the IRR result (see modelling of Romania and Bulgaria). Liberalised markets add complexity to the electricity trading and hence require additional sophistication from support mechanisms. Non-liberalised markets artificially effect fuel or electricity prices requiring a compensating support mechanism to address the resulting lack of profitability.

The high capital cost of the smaller CHP units has a large overall impact on IRR. This increased capital cost is partially a result of lacking the advantages of scale of the other bigger units but also the relative immaturity of this part of the market results in high prices through a lack of competition on individual projects.

Several aspects of overall project cost are difficult to model and the fiscal risk which is missing from the current IRR was particularly mentioned in the South Eastern Region as a barrier to development. However attractive a support mechanism is for a short period investors are reluctant to invest if there is a history of frequent changes to detail or the overall legislation. Stability of the support structure to give clarity to investors is very important for long term investments of this kind. South Eastern Region mentions need for consistent policy and not frequent changes of mechanisms.

7. Case study: Use of certificate scheme in Flanders to promote CHP

Flanders has been uniquely successful in promoting CHP over the period 2004-2010. The region has established a target for CHP and put a multi-layered set of support mechanisms in place to encourage growth in CHP installations. The schemes have been successful across a range of installation capacity from large industrial sites down to small sized CHPs. The exception is units in the micro CHP capacity at 50kWe and under.

The support mechanisms available for CHP in Flanders are:

- Premium for ecological investment (until January 2011)
- Tax reduction
- 20% investment support for micro-CHP (until June 2010)
- Demonstration support for micro-CHP
- CHP Certificates (CHPC)

Premium for ecological investment:

This support applies to all enterprises that realise ecological investments in Flanders. The funds are administered under a “call for projects” system with 3 calls per year. The total budget for the 3 calls 2010 was 120 million €. Projects are ranked by means of a performance factor. Only the best ranked projects receive support. The support is granted only for additional investment in a project to incorporate CHP not for investment which would have been undertaken for normal business reasons. Support is differentiated by the size of enterprise and by the type of fuel used with bio-energy CHP attracting 50% support. Funds are limited to a maximum of 1.75 million € per call. A rejected project cannot be submitted in a next call. Since 2007 fossil fuel CHP projects were often ranked too low to have support. Biomass CHP was more successful in gaining the premium for ecological investment.

Tax reduction:

There is a tax reduction available to cogenerators on taxable profit associated with investments in energy savings. This applies to investment in CHP. The extra reduction is 10% and is cumulative with the ecological premium. Basis reduction dependent on index:

- Investments 2009: 5,5% → 15,5%
- Investments 2010: 3,5% → 13,5%

20% investment support for micro CHP:

Support is available for all micro CHP which qualify under the conditions of the CHP Directive. Twenty percent of the costs for installation is provided by a government grant. The beneficiaries can be from a range of economic sectors, provinces and municipalities, public centres and governments, schools and universities, hospitals and rest-homes, non-

profit organisations. Cumulative with other financial support. Total budget: 200,000 € per year. The support ended in June 2010.

Demonstration support:

There is a support scheme for demonstration projects with micro-CHP (< 50 kW_e) in residential applications. The schemes are granted a maximum of 50% of the costs of the innovative part of the new technology, exclusive of VAT to a maximum of 250,000 € per year. The results of the project are published for reference by other potential users.

CHP certificate principal:

The government of Flanders has set a up a cogeneration target which is the basis of activity to grow cogeneration capacity (19% electricity supply from high efficient CHP by 2010). This target is related to an obligation on all electricity companies to realise a certain amount of primary energy savings by means of high efficiency CHP sources. Each company has to be able to deliver proof of having realised the primary energy savings, increasing year on year, by delivering CHP certificates against the quota which the company has been tasked to deliver. Any producer of high efficiency CHP applies for CHP certificates to the regulator and can trade these in a CHP certificate market where they are bought by the electricity companies tasked with the quota. One CHP certificate is given for every MWh of primary energy savings delivered through high efficiency CHP. The government provides a guaranteed minimum price for the certificates of 27 Euro (for installations connected to the distribution grid) and if a supplier should fail to meet their obligation in providing the regulator with the correct quota of certificates the regulator will fine the supplier 45Euros per missing certificate.

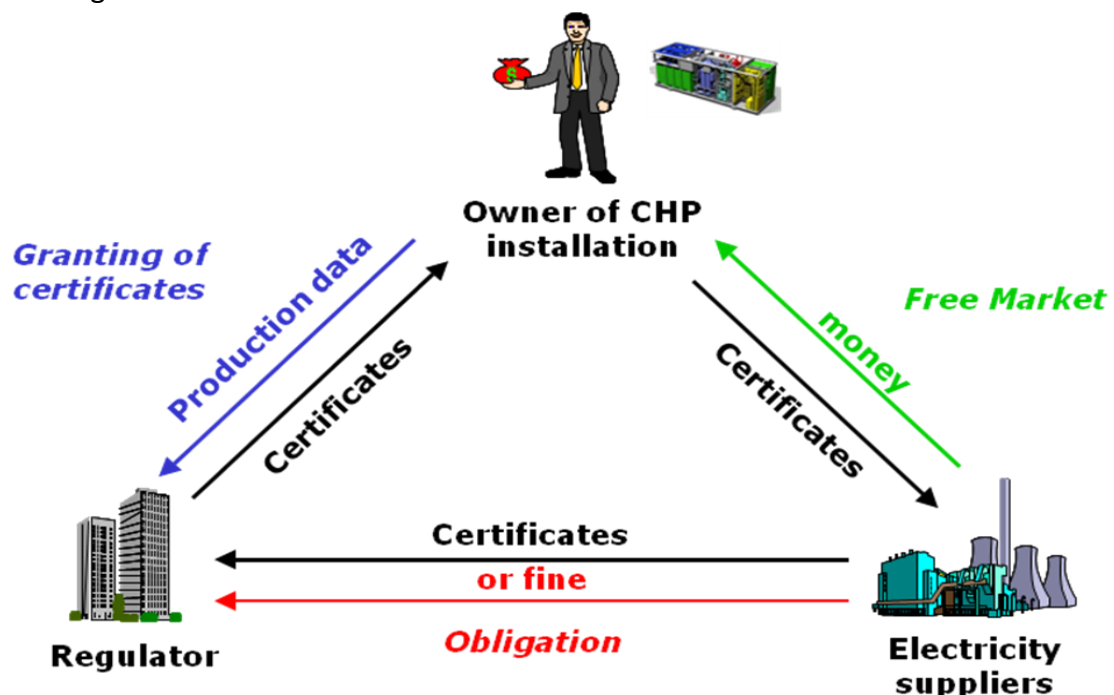


Figure 3 The Green certificate scheme for promotion of CHP in Flanders

All electricity suppliers have an obligation to supply a fixed amount of CHP electricity to their customers. The number of CHP certificates to be handed in each year are a percentage of amount of delivered electricity to end-users in the preceding year. If the supplier cannot hand in the correct number of certificates they are fined per CHP certificate of shortage.

The only section of the market which has not so far responded to the range of schemes available is the micro-CHP sector.

The WP3 model shows that with all the support mechanisms currently in place the 50 kWe project has the lowest internal rate of return and the longest payback of all projects modelled. There is a large difference between the apparent payback of the 1 MWe and the 12 MWe projects and that of the 66 MWe showing that selling electricity to the network for the 66 MWe case is not as attractive as being able to use all of the electricity on site as in the 12 MWe case. However even without government support the internal rates of return for the 1 MWe to the 66MWe plants gives a payback running at less than 5 years.

The overall effect of support is different for each capacity of plant. For both the 1 MWe and the 12 MWe plants the support mechanisms are equivalent to an improvement on the modelled IRR of over 25%. This sector of the market is in fact showing the highest levels of expansion. The effect of the support for the 66 MWe and the 50 kWe is to raise the IRR by around 10 percentage points, bringing the payback period on the 66 MWe plant down to 2.6 years. This sector of the market has also seen substantial growth since 2007. On the 50 kWe the government support lowers the period for a return on investment from 8.9 years to 4.4 years. At this time this is not sufficient to drive investment on its own.

Notional electrical capacity	50 kWe	1 MWe	12 MWe	66 MWe
Financials without benefits				
Simple payback without benefits	8.9	2.6	2.0	4.2
Internal rate of return (IRR) without benefits	2.55%	13.91%	28.54%	12.32%
Financials with benefits				
Simple payback with benefits	4.4	1.3	1.1	2.6
Internal rate of return (IRR) with benefits	12.91%	47.58%	51.17%	22.16%
Effect of benefits on financials				
Effect of benefits on simple payback	-4.5	-1.3	-1.0	-1.7
Effect of benefits Internal rate of return (IRR)	10.35%	33.67%	22.63%	9.84%

Table 3 Overall effects of support

The growth of the installed capacity of cogeneration in Flanders is shown in figure 4 below. The support mechanisms were introduced in 2004 and have achieved a high level of activity across the market particularly in the small and medium sized applications. Industry and agriculture have seen considerably expanded use of CHP.

The Flanders scheme also exhibits the type of characteristics of generally successful support regimes with a well defined, easy to follow structure for the main funding mechanism, a near and medium term commitment to the support scheme and visibility of likely development going forward. The presence of an overall target underpins the member state commitment to the process.

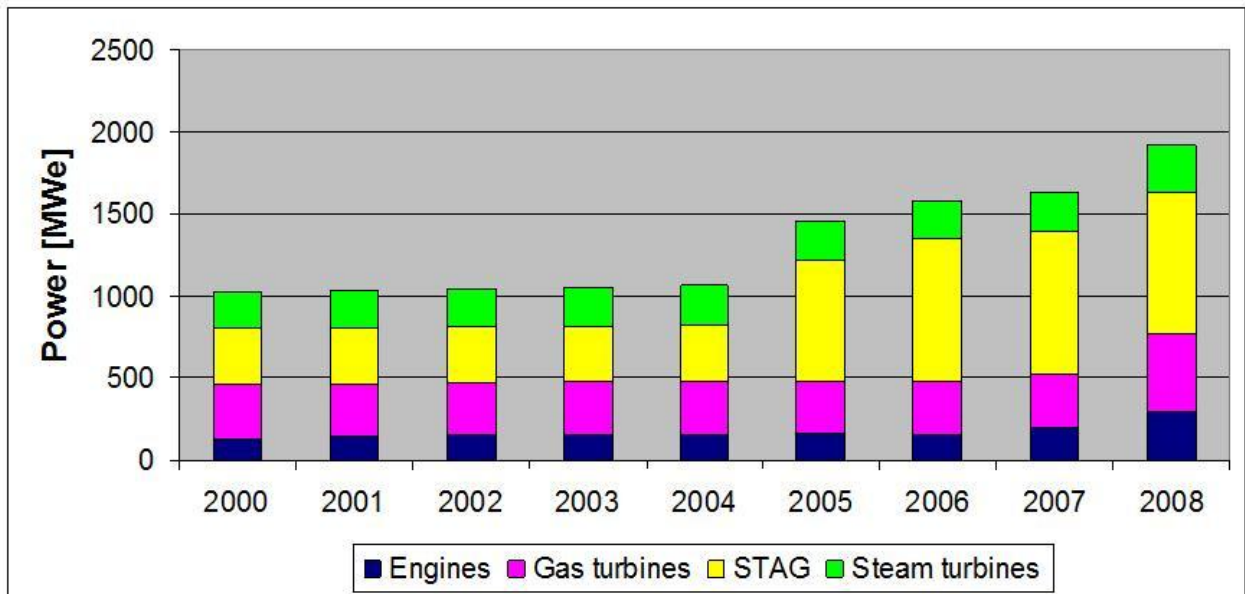


Figure 4. Growth of installed cogeneration by technology type in Flanders 2000 to 2008. Support mechanism were started in 2004

There are several barriers for micro-CHP in buildings:

In this best case example there is both a substantial uptake of the support offered combined with using an array of planning tools and a supportive local government in every sense. This highlights that while suitably crafted financial support is often necessary to grow CHP in a member state this is not sufficient on its own. In both Flanders and Germany (another best case example in Europe) there has been considerable work by local and central government and by energy agencies on barrier removal in the structure of existing permitting and connection processes and in the general communication of the usefulness and appropriateness of CHP as an energy efficiency approach for many applications.

The one sector which has not been effectively stimulated by the support system in Flanders is micro-CHP. The modelling shows that with the current support structure in place the payback period for a micro-CHP installation at 50 KWe will be 4.4 years which is three times the length of payback period for the 1 MW and 12 MW plants modelled and double that for the 66 MWe plant. While the absolute values would take closer modelling of the plants to be taken as accurate the relative values are indicative of a scheme which favours larger installations. The lack of activity in Belgium with a standardised 4.4 years of return is consistent with no activity in the market for this type of return period. Further investigation

into the barriers preventing wider deployment of micro-CHP in buildings highlights the following basic problems in buildings:

- It is not possible to sell the electricity in apartments. This has a big impact on the profitability of the project
- Heat demand is not sufficiently known, or too small, to install a profitable CHP
- Profitability is very project dependent. The calculation from the CODE project is just one general case, and certainly representative for all micro-CHP projects
- For the very small installations (< 5 kWe) the availability of CHP installations is a barrier. The support by CHP certificates is also very small for micro-CHP
- Photovoltaic is supported very well in Flanders. This can also have an impact on the lower interest in micro-CHP (for the electricity side)

There is considerable literature covering the surprisingly high rate of return expected by consumers and small end users for energy efficiency investments. This suggests that in general support mechanisms to stimulate the smaller more distributed CHP investments need to be carefully constructed to give a suitably attractive and short payback period.

8. Conclusions on WP3 modelling

The IRR analysis gives useful information for further developing successful support mechanisms for CHP and for approaching the question of why CHP is not growing in some Member States.

1) The model shows the ability of mechanisms to stimulate particular sectors of the CHP market in one member state. The IRR results indicate successfully which areas will be stimulated relative to others.

2) In the case where no other barriers exist or the market barriers to CHP are low the model gives a good indication of whether a specific set of support mechanisms will be successful or not.

- Germany and Belgium (Flanders) are countries with relatively low levels of additional market barriers for CHP projects. The model predicts that the CHP sector which will be the least successfully stimulated by the current support mechanisms in Flanders is micro-CHP and that the very large CHP units will be the least successfully stimulated under the German scheme.
- The model also produces a consistent predictor of support uplift which seems to trigger action in these two countries. In both cases an uplift of a minimum of 10% is needed to trigger a response from the market. In the model's terms this relates to a payback time of less than 3 years.

3) In the case where a suitable uplift is provided by a Member State scheme but there is still no CHP market response it is a good indication that other market barriers exist.

- Both France and Italy have support mechanisms which should lift a large part of the industrial market into a positive return rate above the 10% support lift and with a return in under 3 years. However, in France over the period since 2007 the support mechanism has been steadily withdrawn and restricted as France moves to focus its support exclusively on renewables. This exclusive focus is virtually complete at the time of writing and existing CHP is being scrutinised for even renewal support. In Italy there is still much change in the policy around CHP itself leading to a high level of investment uncertainty which coupled to the still considerable permitting and access issues deter investment.

4) The support mechanisms in several member states have no effect at all on the return on investment in CHP. This suggests that best practise in designing support mechanisms could usefully be transferred between Member States.

5) The 50 KWe micro-CHP yielded the most challenging IRRs due to the relatively high capital cost of the plant. As this is also the most demanding sector of the market in terms of expected rate of return special effort is required to lower costs and to improve financial performance through the support mechanisms for such applications.

6) The IRR of CHP is heavily dependent on the structure of the primary energy market and the electricity market in a member state. The degree of market liberalisation is one of the key factors in determining a successful return on investment.

7) The use of IRR modelling as an indicator of impact of support is a useful tool in combination with other analysis. In interpreting the results an understanding of the complex detail of particular member states markets is key to correct modelling

- Models need regular updating/refining – limitations are still found
- Industry specific support very difficult to quantify

Annex 1: Methodology for IRR calculation under WP3 of CODE

Work Package 3 ‘Comparison of member state approaches’ provides standardised cogeneration plant scenarios providing a theoretical financial assessment of the investment case with and without financial support mechanisms provided in each Member State under the European Cogeneration Directive.

Each Member State, as part of their implementation of the Cogeneration Directive, must ensure that support for cogeneration is based on meeting useful heat demand and delivering primary energy savings compared to separate heat and power generation. It is, however, very difficult in the abstract to anticipate the actual stimulus that will be achieved in the market and whether removal of the identified barriers will in itself be enough to improve the take-up of cogeneration. Barriers, support mechanisms, finance, economic climate, and wider policy can result in an apparently favourable set of policy instruments having no real effect on implementation.

The standard tool used by commerce and industry to evaluate whether or not an investment may be worthwhile is the IRR and simple payback periods. It incorporates, in a transparent but consistent way, effects such as cost of capital, competing investment opportunities, and actual support in specific circumstances. The analysis models an anticipated rate of return on investment which to base the investment, and compare the investment across member state boundaries.

At the project outset three cogeneration scenarios were originally considered; a 50 kW and 1 MW gas engine and 50 MW combined cycle gas turbine (CCGT) CHP. In consultation with the regional project partners and the Commission, these were revised and extended in the early stages of the project to:

- 50 kWe gas engine CHP
- 1MWe gas engine CHP
- 1 MWe diesel (gas oil) engine CHP
- 12MWe coal fired heat recovery steam turbine CHP; and
- 66MWe CCGT CHP

These sizes and fuel types represent a range of real life plant and the 12 MW and 66 MW in particular were specified using plant design software GT pro. To create a basis for comparison it has not been possible to capture the reality in every Member State.

It is important to note that whilst biomass fuelled cogeneration is a significant energy conversion technology in a number of Member States; it was beyond the scope of this project to model a range of biomass scenarios. It is recommended that this be modelled as a subsequent project.

Assumptions

To ensure an equal basis for comparison, a number of assumptions have been made in these theoretical models of construction and maintenance. These are as follows:

- 2007 price data were used throughout (thereby ensuring complete dataset available) this includes the effect of EU ETS modelled as at 2007. Originally 2009 data was used
- Data supplied directly from Member States were the preferred source, but where this was not available published (fuel electricity and tax data) Eurostat or International Energy Agency (IEA) data were sought. Where construction and maintenance costs were not available UK sourced data were used
- The cost of land purchase was not included within the model
- An assumed weighted average cost of capital (WACC) was modelled at 8%
- Benefits and financial support mechanisms were spread across each operating year until the support finished. In some cases support at the beginning of the year is higher (to help address capital costs) and this falls with increasing cumulative output. The model was not sufficiently refined to address this
- Writing down allowance (WDA) standardised at 13% across all Member States
- All electricity modelled as used on site with the exception of the 66MW which is modelled to export 60% electricity
- The plant life was modelled to be 20 years
- Where electricity wholesale price data were not available, the wholesale price was calculated to be 70% of the industrial supply price based on the ratio between UK Government long term industrial supply and wholesale price data.

Methodology

The analysis was undertaken in the following stages:

- Five plant scenarios agreed with CODE project team (COGEN Europe and Regional Project Leaders detailed below)
- IRR calculation spreadsheet developed and tested for UK
- Data input template sent to CODE Regional Project Leaders (CHPA in United Kingdom, HACHP in Greece, FAST in Italy and JSI in Slovenia) to gather data from individual Member States
- IRR calculations undertaken by CHPA and where data not available from Member State, remaining input data sourced from Eurostat and IEA
- Calculation sheets returned to Member State via Regional Project Leaders for approval
- Two page country written descriptions of calculations written by CHPA and sent to Member State for approval
- Regional overviews written by Regional Project Leaders
- European overview written by COGEN Europe

Work package deliverables

- D3.1 Country IRR calculations and reports x27
- D3.2 Region comparative reports x4
- D3.3 European overview of results
- D3.4 Case studies for handbook

Possible futures uses for the IRR calculation spreadsheets

- Model specific engine sizes, more relevant to a given Member State situation
- Model outputs for other countries
- Refine modelling to date
- Model changes in tax, support and legislation
- Model biomass/bioenergy support
- Model differing export scenarios
- Examine support effects on cost inflation by supply chain

Annex 2 National Support Schemes

Country	Tax support	Feed in tariff	Certificate scheme	Capital grant	Other
Austria		✓			✓
BE - Flanders	✓		✓		✓
Bulgaria		✓			✓
Cyprus					✓
Czech Republic		✓			✓
Denmark					
Estonia					✓
Finland				✓	✓
France		✓			✓
Germany		✓			✓
Greece	✓	✓			✓
Hungary		✓			✓
Ireland				-	✓
Italy	✓	✓		✓	
Latvia		✓			✓
Lithuania		✓			✓
Luxembourg	✓				✓
Malta	✓				✓
Netherlands	✓	✓		✓	✓
Poland			✓		
Portugal				✓	✓
Romania		✓		✓	
Slovakia		✓			
Slovenia		✓			✓
Spain	✓	✓			✓
Sweden				✓	✓
United Kingdom	✓	✓		✓	

Table 4: Overview of support CHP support mechanisms for fossil fuel based CHP in the EU in 2007

The details of minor support mechanism and qualifications on the existing systems are contained in the column “Other” of figure 3. These are listed in more details here:

Austria: There is no financial support for fossil CHP > 2 MW

Belgium: For smaller scale CHP there are payments to reflect the reduction in grid losses.

Bulgaria: Comment from regional representative: There is need for governmental support.

Cyprus: There is a lack of available data on fuel.

Czech Republic: The paybacks for the CHP were all low ranging, besides the 66 MW gas CHP plant.

Estonia: There are supporting mechanisms for renewable and efficient cogeneration electricity producers.

Finland: No evidence of govt support for fossil fuelled CHP, there is investment support for biomass based CHP plants.

France: Comment from regional representative: Positive impact of FiT on the plants, IRR increased.

Germany: Comment from regional representative: The result of the stepped FiT is that fixed costs can be accounted for during the initial run time and therefore, the investment presents less of a risk for developers.

Greece: The support modelled was a reduction in capital costs for installing plants. Without government support, small scale CHP modelled for Greece are 0 for the 50kW and 1MW gas oil plant.

Hungary: Comment from regional representative: CHPA unable to source the value of FiT

Ireland: Given no support mechanisms for new CHP plant, returns calculated were based on unsupported financial case

Latvia: IRR increased or decreased depending on the plant.

Lithuania: IRR increased or decreased depending on the plant.

Luxembourg: High IRRs and short paybacks; it was difficult to obtain MS data for Luxembourg.

Malta: It was not possible to source fossil fuel price data for Malta, thus the ITT for the 5 plants could not be drawn.

Netherlands: The model presented is unable to account for the value of the support system in Netherlands.

Portugal: No quantitative details of support mechanisms used; strong spark spread.

Slovenia: Comment from regional representative: FiT has led to unusually high IRRs with the assumptions modelled

Spain: Increase in IRR because of reduced fuel tax and generation tariff.

Sweden: New CHP plants are bioenergy (based on biomass, peat)