

# History and prospect of voluntary agreements on industrial energy efficiency in Europe

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## Abstract

Many European countries have implemented voluntary agreements or long-term agreements to stimulate energy efficiency in the industry. This paper analyses the history of voluntary agreements on industrial energy efficiency in Europe and reflects on its future. This history reveals some factors influencing the deployment of such agreements in Europe. A first factor is the demonstration of good practice examples of a successful implementation of voluntary agreements, which seems to be instrumental in building enough confidence in this novel policy instrument. Second, EU legislation both has had a stimulating and inhibiting effect. Third, national circumstances have triggered the implementation of voluntary agreements in some cases. In contrast, the Global Financial Crisis did not substantially impact the deployment of voluntary agreements in Europe.

The analysis of the design of the different European voluntary agreements on industrial energy efficiency revealed a huge variety. No tendency to harmonize the design can be observed, apart from a gradual introduction of the implementation of energy management schemes as an obligation in most voluntary agreements.

The comparison of policy instruments implemented by countries with or without voluntary agreements has not led to the identification of some policy instruments that compete with voluntary agreements.

This analysis concludes that voluntary agreements still can have a future in Europe on the condition that there is still room to stimulate an efficient energy consumption practice in indus-

try compared to a continuously more stringent baseline in a way that is both cost-efficient for the government and attractive for the industry.

## Introduction

Energy efficiency policies aim at influencing the energy end-consumers with the objective to change their behaviour or to stimulate them to act. Each of the energy consuming sectors has its own characteristic interaction between end-consumers and other relevant actors. Hence, an energy efficiency policy targeting a specific sector needs to take this sector-specific interaction into account if it wants to be effective.

The energy-intensive industry is characterised by a rather limited number of actors or companies and by an above-average level of knowledge and competence on energy related issues compared to other sectors. There is, as a result, a request from the industry to be involved in energy efficiency policy making and implementation, rather than being a passive subject to enforced energy-efficiency policy.

Voluntary agreements (VAs) are policy instruments that can respond to this need of the industry. Voluntary agreements are defined as formal agreements that are essentially contracts between government and industry that include negotiated targets with time schedules and commitments on the part of all participating parties (IEA 1997). The peculiarity of these contracts is their tailor-made nature; voluntary agreements distinguish from traditional command-and-control policy tools by their process of negotiation between the industry and government on the targets, the timetable for action and definition of rewards and penalties (Thalmann and Baranzini, 2004).

The oldest voluntary agreement on energy efficiency is the Canadian Industry Program for Energy Conservation, established in 1975 (Tiedemann and Sulyma, 2011). Since then, voluntary agreements have been implemented in many parts of the world, including the USA, Canada, Japan, Australia, New Zealand, Japan, South Korea, and China (Price, 2005; Hu, 2007). In Europe, the implementation of voluntary agreements on energy efficiency started in the beginning of the 90s. A survey, conducted in 2006, listed twelve voluntary agreements in nine EU Member States (Bertoldi and Rezessy, 2007).

When conducting their survey, Bertoldi and Rezessy (2007) have observed a wide variety in design in the different voluntary agreements and they “strongly advocate for ‘common’ rules and structures for future VAs [...] for [...] processes, including rigorous estimation of the saving potential, monitoring and evaluation mechanisms”. They concluded their survey that voluntary agreements could represent an important instrument for climate change mitigation, but it cannot be the sole instrument to achieve energy efficiency improvements. They finally also warned for the potential interaction between voluntary agreements and the EU ETS (Emission Trading Scheme), which “perhaps will ultimately replace or downplay the role of existing VAs in the sectors under obligation”.

This paper takes the conclusions of Bertoldi and Rezessy (2007) as a starting point. The paper’s objective is to look forward from 2018 and to verify whether voluntary agreements can continue to be the vehicle to improve industrial energy efficiency in the next decade. This paper looks to this end backwards in the past and by updating the history of voluntary agreements in Europe, it tries to understand the driving forces behind the implementation of new voluntary agreements or the discontinuation of existing ones. This is the topic of the next chapter. The paper continues by examining the changes in design of the voluntary agreements to verify whether common rules and structures have emerged in time as Bertoldi and Rezessy (2007) were suggesting and to examine a potential interaction with the EU ETS. The fourth chapter looks for alternative policy measures to voluntary agreements to verify whether more competition for these alternative policy measures can be expected in future. The paper concludes with a discussion on the findings and by answering the research questions stated above.

## History of voluntary agreements on industrial energy efficiency in Europe

The implementation of voluntary agreements on industrial energy efficiency is based on an already well-established tradition by EU Member States in using voluntary agreements to control environmental pollution in general. They were introduced as an alternative to classic regulatory instruments; they aim at a collaboration with the industry to achieve a reduction in pollutant emissions rather than demand-and-control strategies imposed by public agencies (Nilsson, 1998; Börkey and Lévêque, 2000). France was the first European country to conclude an agreement in the field of environmental protection in 1971 and other countries soon followed, such as Germany, Austria, Belgium or the Netherlands (ANPA, 2001).

Voluntary agreements were in the 80s and 90s one of the most rapidly growing policy instruments in Europe. The Fifth Environmental Action Programme of the EU (1992) backed

this trend; it made a call to develop and apply a broader mix of instruments based on a shared responsibility and advocated voluntary agreements as one type of novel instruments next to economic and fiscal instruments, horizontal supporting instruments and financial support mechanisms (Börkey and Lévêque, 2000; Krarup and Ramesohl, 2002; van Beeck, 2007). When in the 90s climate change became an imminent environmental challenge to tackle, various countries gradually developed voluntary agreements to reduce greenhouse-gas emissions from the industry as well (Oberthür and Roche Kelly, 2008).

*The Netherlands* was the first country to introduce voluntary agreements in this field. Long Term Agreements on energy efficiency were concluded with all the energy intensive industry sectors as part of an ambitious National Environmental Policy Plan, setting stringent quantitative pollution abatement targets for over 200 substances. Some of the agreements were signed directly with targeted major companies, the others were first signed with industrial organizations and subsequently with individual companies. The target for most sectors was to improve energy efficiency by 20 % by 2000 compared with 1989 (Abeelen et al., 2013).

*Germany* followed in 1995 with a declaration of five federations representing the whole of industry, and subsequently at branch level via the commitments of 19 branch associations. Their target was to reduce the specific energy consumption with 20 % compared to 1990. However, this target was – in contrast to the Dutch agreements – not translated to the individual participating companies (Jochem and Eichhammer, 1996; Börkey and Lévêque, 2000).

The *French* AERES-agreement (Business Association for the Reduction of Greenhouse Gas Emissions) started in the same year as the German ones (in 1995). After lengthy discussions, reduction targets for specific CO<sub>2</sub> emissions (per unit output) or absolute CO<sub>2</sub> emissions were negotiated between the French Ministry of the Environment and individual companies or branch organisations. The agreements covered around 40 % of the industrial energy consumption in France (Chidiak, 2002).

Some countries took an intermediate step before introducing voluntary agreements directly. A first example is the first voluntary agreement in *Finland* (1992–1997), which was basically an energy audit programme. The programme provided subsidies to companies and organisations who decided to carry out energy audits of their buildings or processes, but there was no obligation to implement the detected energy saving measures, nor was there an energy savings target for the programme overall. The main motivation for not setting a target was the unpredictability of the energy savings that would result from the energy audits. In 1997, specific targets regarding audit volumes were added, such as 80 % of the total industrial energy consumption to be audited by 2005 (Khan, 2006).

A second example is the first *Danish* voluntary agreements on the reduction of GHG (greenhouse gas) emissions (1993–1996). These participants to these agreements had the obligation to implement an energy management scheme. This obligation was expanded in the second agreements (1996–1999) by imposing energy auditing and the implementation of economic viable CO<sub>2</sub> reduction measures. The Danish voluntary scheme was strongly linked to the introduction of a national CO<sub>2</sub> tax for the industry (Börkey and Lévêque, 2000; Croci, 2003; Ericsson et al., 2006; Ellegaard Vejen and Maagøe Petersen, 2017).

The Swedish EKO-Energi programme, in operation between 1994 and 1997, aimed, like the first Danish agreement, at stimulating the implementation of energy management schemes at the participating companies. This programme targeted companies having the ambition to be environmental vanguards only; it wanted to challenge the other companies by moving these vanguards more forward. The participation was hence limited, only 47 companies joined this programme (Helby, 2002).

The *Great-Duchy of Luxembourg* concluded in 1996 a voluntary agreement between the government and the Fedil, the Business Federation Luxembourg. The participants had the obligation to carry out an energy audit, to appoint an energy manager if relevant, and to report their energy efficiency values. Also, company-specific energy efficiency targets were derived based on energy consumption versus production statistics (MURE).

The implementation of voluntary agreements was not a success in every country. *Italy* implemented a system of multilevel voluntary agreements at different industrial sector and territorial scales in 1998 as part of a national “Energy and Environment Pact” (Crocì, 2003). However, the agreements failed to deliver due to a lack of coherence, targets and adequate monitoring of the results. These agreements were abandoned soon after their implementation.

These first voluntary agreements started to present their results at around the turn of the century. While some failed to deliver, such as the French and the Italian agreements (Chidiak, 2002; Crocì, 2003), others demonstrate to be effective. The Dutch Long-Term Agreements especially could present exemplary results; the energy efficiency was improved with 22.3 % compared to 1989 levels, which was an overachievement of the target of 20 % (Farla and Blok, 2002). As a result of their specific construction and their success, the Dutch voluntary agreements are often show-cased in literature on voluntary agreements (Nilsson, 1998; Börkey and Lévêque, 2000; Crocì, 2003).

All countries, except Italy and Sweden, entered into a second generation of the voluntary agreements schemes. They took the opportunity to modify the design of the voluntary agreements based on the lessons learnt from the first generation of agreements; the next chapter will elaborate these changes in design.

Examples of a good practice stimulated also other countries to copy the voluntary approach to improve the industrial energy efficiency. However, another factor explaining the increased interest in Europe for voluntary agreements in the first half of the years 2000, is the harmonisation of the energy taxation within the European Union and the exemptions granted to participants to voluntary agreements. Whereas Council Directive 2003/96/EC imposed on the one hand EU Member States to raise a minimum tax on electricity and fuel for heating, its Article 17 on the other hand allows the Member States to apply tax reductions in the case “where agreements are concluded with undertakings or associations of undertakings, or where tradable permit schemes or equivalent arrangements are implemented, as far as they lead to the achievement of environmental protection objectives or to improvements in energy efficiency”.

*Switzerland* adopted an ambitious Swiss Energy action plan in the beginning of 2001; its overall objective was to reduce the national CO<sub>2</sub> emissions with 10 % by 2010 compared to 1990 levels. The implementation of voluntary measures in industry, trade and services was one pillar of this action plan.

Tailor-made agreements were implemented for large CO<sub>2</sub> emitters on the one hand and small enterprises and handicrafts on the other. The programme was managed by the Energy Agency for Industry. Their role was to support participating companies in identifying the energy savings potential and the determination of the targets. One core element in their support is the organisation of training session to stimulate knowledge sharing amongst the participants on how to implement energy savings measures. Following preparatory work in 2001, the first voluntary agreements were signed in 2002 and in 2004. The voluntary agreements were converted in 2016 into formal commitments with mandatory actions for the participants to improve energy efficiency in return for a rebate of a CO<sub>2</sub> tax. (Mörkofer, 2001; Meyer, 2003; IEA, 2016).

The *United Kingdom* was at the same time preparing their Climate Change Agreements. These agreements built upon a sector agreement with the chemical industry that started in 1997. When a year later a national climate policy for the UK was proposed, it was suggested to install a climate change levy on the one hand and Climate Change Agreements with the whole energy-intensive industry on the other, inspired by the sector agreement with the chemical industry and by the Dutch Long-Term Agreements. These Climate Change Agreements allow the participants to rebate the climate change levy in case they fulfil their obligations. The negotiations started in 1999 with the 10 most-energy intensive sectors; eventually 34 sectors signed up when the scheme started in April 2001 (Huddleston and Pender, 2011).

Another country following the Dutch example is *Belgium*. As energy efficiency is the competence of the regions (Flanders, Wallonia and Brussels), various regional voluntary agreements are implemented. The first Belgian voluntary agreement started in 2002; Flanders in the north of Belgium implemented almost an exact copy of Dutch Benchmarking Covenant, a second-generation voluntary agreement targeting the energy-intensive industry, soon expanded to all industrial companies having obligations under the European Emission Trading Scheme (Cornelis, 2014). A year later, the Branch Agreements started in Wallonia, in the south of Belgium. This region took inspiration from the first generation of the Dutch voluntary agreements and organised the agreements according to industrial sector. Two agreements were signed in 2003: a first with the chemical industry, a second with the pulp and paper industry. The other sectors followed in 2004 (Air & Climat, 2013). In 2005, a second voluntary agreement started in Flanders; the Auditing Covenant targeting medium-sized companies (Cornelis and Reunes, 2012; Cornelis, 2014).

*Spain* intended to implement voluntary agreements with the industry as one of the action to realise its Energy Savings and Energy Efficiency Strategy 2004-2012. As a first step, the aim was to sign agreements with four energy-intensive sectors: non-metal minerals, chemistry, iron and steel and food and beverages (MURE). There is however no record found that these agreements eventually were implemented.

Voluntary agreements also started to spread in the north of Europe. Energy-intensive companies in *Norway* were offered to possibility to enter a programme for energy efficiency in industry from mid-2014 on. This programme targeted four energy-intensive sectors. Participating companies were granted a full exemption from an electricity tax if they fulfilled their obliga-

tion, which includes implementation of an energy management system, detection via auditing and implementation of measures saving electricity specifically (MURE). The implementation of voluntary agreements was part of a national energy efficiency policy, approved by the Parliament in 1998. This in turn was a response to exceptionally low water inflow to the hydropower stations in 1996 which has led to power supply shortfalls and high power prices that year.

The *Swedish* voluntary agreement started half a year later than the Norwegian one. As in Norway, concerns about increasing electricity prices were the main motivation to install a voluntary agreement in Sweden. Moreover, installing a voluntary agreement gave the Swedish government the possibility to exempt the energy-intensive participating companies from an electricity tax and to maintain a zero electricity tax policy for the industry, as otherwise a minimum tax of €0.5/MWh should be raised according to the obligations imposed by Energy Taxation Directive (Council Directive 2003/96/EC) on Sweden (Stenqvist and Nilsson, 2012). Both the Norwegian and Swedish voluntary agreements had a similar approach.

*Ireland* launched in 2006 the Energy Agreements Programme as a subset of the Large Industry Energy network. The objective of the programme was to stimulate the energy-intensive industry to implement a new Irish energy management standard, later replaced by the international standard EN 16001. Participating companies could enter into an agreement for three years with Sustainable Energy Authority of Ireland (SEAI), the agency operating the scheme. They had the obligation to implement the energy management system and to significant energy users to identify energy saving measures. SEAI, in return, provided support in implementing the standard, subsidising the implementation of identified measures and by organising tailored knowledge sharing workshops, training and networking events. Prior to the instalment of the Energy Agreements Programme, a Negotiated Agreement pilot was carried out in 2003 (MURE).

The *Maltese* government published in 2007 a corporate environmental policy which sets targets for energy efficiency in state owned companies, some of which are major energy consumers in the country. The Water Services Corporation in particular consumes about 5 % of the national electricity demand and an increased energy efficiency assists in safeguarding the precarious water supply of the country. This policy is the basis for a collaboration between the Energy and Water Agency and non-SMEs (non-small and medium size enterprises) in the industrial and services sector with the objective to foster the implementation of viable energy saving measures. This collaboration can be considered as a voluntary agreement (MURE).

From 2005 until 2018, three trends in the development of voluntary agreements in Europe can be observed: first, some countries discontinue their voluntary agreements; while, second, some new countries show interest in implementing these, and; third, there are attempts to implement voluntary agreements on energy efficiency on local scale. Each of these trends is now discussed more in detail.

In 2007, the second *French* voluntary agreement AERES (“Association des Entreprises pour la réduction de l’Effet de Serre”) expired. It was created in 2002 by three organisations representing the interests of the French industry, companies working in the field of the environment and the employers.

Its 42 participants represented about half of the total French greenhouse gas (GHG) emissions. They reduced their GHG emissions with 25 % compared to 1990, which was an overachievement of the target, set at a 15 % reduction (MURE). There was however no interest from the industry to renew the agreements; they considered their mission as accomplished and made an appeal to other sectors, such as buildings and transport, to commit to GHG reductions (AERES, 2008).

When the second *German* voluntary agreement (“Erklärung der deutschen Wirtschaft zur Klimavorsorge II”) came to an end in 2012, the decision was taken not to continue it. Instead, the regulation on electricity and fuel taxes was reformed by including targets for energy-intensity improvements as a prerequisite for tax exemptions. In other words, the voluntary approach was replaced by an incentive scheme. Although the energy savings target of the German voluntary agreements was overachieved, there were not considered as a success as many of the energy savings is the result of the restructuring of the Eastern German industry (MURE).

The European Commission started in 2012 an investigation to verify whether the tax reduction, granted to participants to various voluntary agreements, were in line with the state aid rules. It concluded that the tax exemptions, granted to the participants to the *Swedish* and *Danish* voluntary agreements, were illicit indeed (MURE, Energistyrelsen, 2013). These two countries had to remove this benefits to the participants and, consequently, the voluntary agreements ceased to function.

When in 2014 the second generation of the *Norwegian* voluntary agreements ended, it was not longer continued. The participation to these voluntary agreements always was below expectations. Only one of the targeted four energy-intensive sectors, the pulp and paper sector more in particular, had entered into agreements and no more than eighteen companies acceded. This number further halved when renewing these agreements in 2008.

The second trend on the development of voluntary agreements in Europe, is the interest of some new countries to implement this policy instrument.

In 2009 ended the EU-funded project ‘LTA-uptake’<sup>1</sup> that aimed at providing a web-based toolkit to support industrial SME associations and public authorities in the EU in their process of setting up long-term agreements (Gels, 2009). This project allowed a knowledge exchange on voluntary agreements from three experienced countries – the Netherlands, Denmark and Finland – to EU Member States with an interest of copying their approach; *Poland, Czech Republic, Bulgaria, Greece, Spain* and *Italy*. The two former countries attempted to set up voluntary agreements at national level, while the four latter ones attempted to set agreements between a regional or municipal authority and sector organisations or individual companies. Indeed, *Bulgaria, Greece, Czech Republic* as well as *Croatia, Latvia, Romania, Slovakia, and Slovenia* announced voluntary agreements as an intended policy instrument in their National Energy Efficiency Action Plans of 2014<sup>2</sup>.

1. LTA: Long Term Agreement.

2. Hungary and Lithuania also showed interest in voluntary agreements, but these would target the energy sector and not the industry.

Table 1. Local voluntary agreements on industrial energy efficiency (source: VACO2R, 2013).

EU Member State	Voluntary agreement	Organising authority level	Operational in	Participants		Actions (°)			
				Number	Size	A	I	E	N
Sweden	Energy analysis Ulricehamn	Municipal	2003–2004	10	S / M	✓			✓
	EnergInVäst	Provincial	2010–2012	>7	S / M				✓
Italy	Life+ LACRe	Provincial	2009–2010	30	S / M / L	✓	✓		
	Microkyoto	Provincial	2008–	65	S / M / L	✓			✓
	CRESCO	Regional	2010–	10	S / M / L				✓
Denmark	Environmental Reviews	Provincial	2000–	120	S / M			✓	✓
	Green Shops	Municipal	2000–		S / M	✓			
	Climate+	Municipal	2009–	700	S	✓			✓
Spain	EE improvement in industry	Regional	2008–2011	120	M	✓			
	Oviedotiendas	Municipal	2009	50	S	✓			
Ghent, BE		Municipal			S	✓	✓		

(°) Actions: A: energy audits; I: commitment to implement energy saving measures detected in the energy audit; E: Energy management scheme; N: networking: to share best practices and information amongst the participants of the programme.

The implementation on the field, however, remains limited. The government of Bulgaria has signed agreements with two sector organisations in 2010–2011 but did not bring these in operation. Bulgaria has signed four voluntary agreements with power producing companies instead (MURE; Concerted Action EED, 2014). Romania implemented a trial agreement with one company but decided not to expand the practice at the end of the trial as there was a lack of facilities that could be offered to potential participants (MURE).

Latvia is the only country that succeeded in bringing a voluntary agreement into practice. The programme started mid-2011 and had a duration of five years. The overall target of the programme was a 10 % energy savings in the industrial sector, manufacturing sector or local authority. The voluntary agreement was concluded between the Ministry of Economy and industry associations or individual companies or local authorities. Each of the program participants needed to create the Energy Efficiency Action Plan, stipulating energy reduction targets and planned energy efficiency measures and annually monitor and report the achieved results. An independent mid-term evaluation, however, critiqued the programme as not completely developed as it lacked marketing to attract participants, clear benefits to the participants and an appropriate management of the scheme (Dobrāja et al., 2013, MURE).

The LTA-uptake project, that fostered the interest in voluntary agreements in Central Europe, also heralded the third trend, which is the development of voluntary agreement schemes on industrial energy efficiency at local level. Ten of such voluntary agreements, implemented in four countries, were listed in the framework of the EU funded VACO2R project (VACO2R, 2013), see Table 1. The project listed in total 17 voluntary agreements; the other seven agreements aim at compensating GHG emissions by reforestation, promoting renewable energy or target local authorities rather than the industry. The authors have added another agreement they have knowledge of (Govaerts et al., 2016). Very likely, more such agreements have been implemented; Table 1 has hence not the pretention to be exhaustive.

The overview, offered by Table 1, indicates that all local authority levels can start voluntary agreements, from single municipalities to larger regions. While some operate from two to five years, some other run for more than ten years. The number of participants vary substantially, from about ten to several hundreds. They mostly target small and medium-sized enterprises, while some allow the participation of large companies as well. This indicates that the local programmes aim at addressing industrial companies that are insufficiently reached by national programmes. Most of the agreements offer energy audits (A); only to however request the implementation of promising energy saving measures (I). The implementation of an energy management scheme (E) is an obligation of one voluntary agreement only. However, about half of the listed voluntary agreements include network activities allowing participants to share experiences and best practices amongst them. This indicates that local authorities, more than national authorities, rely on the interaction between local stakeholders for mobilizing them.

## Design of the voluntary agreements

This chapter analyses the design of the different European voluntary agreements on industrial energy efficiency with the objective to verify whether common rules and structures have emerged, as suggested by Bertoldi and Rezessy (2007). Five design aspects are looked at, see Table 2:

- A first aspect is the sectorial coverage of the voluntary agreements: does it cover the whole industry or only some segments; does it cover also other sector, and if so, which?
- Second, the concept of the voluntary agreement indicating whether the environmental commitments were set by industry, public authorities or both (see *i.a.* Börkey and Glachant, 1997):
  - Unilateral commitments: consist of environmental improvement programmes set up by firms themselves and communicated to their stakeholders.

- Public voluntary schemes: in which participating firms agree to standards which have been developed by public bodies such as environmental agencies.
- Negotiated agreements: contracts between the public authorities and industry, which contain a target and a time schedule to achieve it.
- Third, the approach of the voluntary agreement: target-based, where quantitative targets are set, or implementation-based in which the targets are qualitative (see *i.a.* Hanks, 2002).
- Fourth, the method to determine the commitment of the individual participants to the voluntary agreement.
- Fifth, supporting actions; the obligation to implement an energy management scheme, and/or network activities to foster knowledge exchange amongst the participants of the voluntary agreement on good practices.

The overview, presented by Table 2, indicates that the different European voluntary agreements vary in sectors they cover. All cover the industry; some however focus on the energy-intensive industry only. An interaction with the EU ETS scheme can be observed as well; the Netherlands and Flanders, Belgium have designed their agreements to make these tailor-made either to the ETS industry or non-ETS industry. Other sectors are covered as well, such as the services sector (NL, FI, LU, UK), the power sector (FI, DE), agriculture (UK: large pig, poultry or cattle breeding companies) or the transport sector (NL: railways only). The third generation of the Dutch voluntary agreements even have expanded the scope to outside the perimeter of the participants by allowing them to include actions in the supply chain or by allowing them to design products with less GHG emissions during their utilization phase.

Most of the voluntary agreements are negotiated ones or there is a tendency to move towards negotiated ones, as the evolution in design of the Finnish and German voluntary agreements indicates. The sole exception is the Irish voluntary agreement, which can be considered as a public voluntary one.

The split between target-based or implementation-based approach is about half-half. Countries tend to maintain the approach of their first voluntary agreements. Only Finland has moved from an implementation-based approach to a target-based one and the approach for the ETS-companies in Flanders, Belgium has moved in the opposite direction.

Energy auditing is the most common method to determine the commitments of the individual participants. Some evolution in method can be observed. The Netherlands introduced the benchmarking approach for the ETS-industry in 2000, copied by Flanders, Belgium in 2002. This method was abandoned about ten years later; more specifically in 2009 in the Netherlands and in 2014 in Flanders. The Dutch voluntary agreements – both ETS and non-ETS – have introduced sector roadmaps to 2030 as a method instead. This method was copied by Wallonia, Belgium in 2014. It is interesting to note that the Swiss voluntary agreements also rely on benchmarks, but for the small enterprises and not for the most energy-intensive sectors as it is in the Netherlands and Flanders. The German, French and British agreements did/do not specify a

method to determine the participants' commitment as they entirely rely on energy efficiency or emission reduction targets.

There is, with relation to actions supporting the energy efficiency improvement of the participants, a tendency to include energy management schemes as an obligation to the participants. Nine in the fourteen listed countries have included such an obligation in their most recent generation of voluntary agreement; five of them did not in their first generation. Two countries, Switzerland and Ireland, also rely on networks to exchange knowledge amongst the participants. Only Luxembourg has included this design aspect in its fourth generation of voluntary agreement.

### Implemented alternatives to voluntary agreements

The aim of this chapter is to analyse the interaction of voluntary agreements with other policy instruments aiming at stimulating industrial energy efficiency. To this end, the number of policy instruments, targeting the industry and listed in the MURE database<sup>3</sup>, was analysed. The MURE database considers following categories of policy instruments:

- Co-operative Measures: voluntary agreements and technology procurement for energy efficient equipment
- Cross-cutting with sector-specific characteristics: eco-taxes
- Financial: either grants, subsidies or soft loans
- Fiscal/tariffs: tax exemptions, tax reduction or accelerated depreciation
- Information/Education/Training: information campaigns, information centres, voluntary audits or voluntary labelling of cross-cutting technol. (e.g. industrial motors)
- Legislative/informative: mandatory appointment of an energy manager or mandatory audits for industrial processes/buildings
- Legislative/normative: mandatory Demand Side Management or other standards

Furthermore, the analysis considered following categories of countries<sup>4</sup>:

- Countries with still operational voluntary agreements: BE; CH; DK; FI; IE; LU; NL; UK
- Countries that have abandoned voluntary agreements: DE; FR; LV; NO; SE
- Countries that have explored but not started: BG; CZ; IT; ES; GR; HR; PL; RO; SI; SK
- Countries that did not consider nor implement voluntary agreements: AT; CY; EE; HU; MT; LT; PT

The number of policy instruments on industrial energy efficiency per category and country is given by Table 3<sup>5</sup>.

3. Source: MURE: <http://www.measures-odyssey-mure.eu/>, consulted in January 2018.

4. Serbia, although included in the MURE database, is not included in this analysis.

5. See list of country codes at the end of the paper.

Table 2. Characteristics of the European voluntary agreements on industrial energy efficiency.

Country (1)	Voluntary agreement	Operational in	Coverage	Concept	Approach	Commitment determining method	Supporting actions	
							Energy Mgt. Sch.	Network
NL	Long Term Agreements 1	1992–1998	Industry, services	Negotiated	Target	Energy audits		
	Long Term Agreements 2 (2)	2000–2012	Non-ETS industry, services	Negotiated	Target	Energy audits		
	Benchmarking Covenant (2)	2000–2012	ETS industry	Negotiated	Target	Sector benchmarks		
	Long Term Agreements 3	2008–2020	Non-ETS, services, transport + supply chain	Negotiated	Target	Energy audits Roadmaps	X	
	Long Term Agreement – ETS	2009–2020	ETS industry + supply chain	Negotiated	Target	Energy audits Roadmaps	X	
FI	Energy Audit Programme	1992–1997	Industry, services, energy sector	Public voluntary	Implementation	Energy audits		
	Energy Conservation Agreement	1997–2007	Industry, services, energy sector	Negotiated	Implementation	Energy audits		
	Energy Efficiency Agreements (3)	2008–2016	Industry, services, energy sector	Negotiated	Target	Energy audits	X (3)	
	Energy Efficiency Agreements (3)	2017–2025	Industry, services, energy sector	Negotiated	Target	Energy audits	X (3)	
	EWK I (4)	1995–1999	Industry, power production	Unilateral	Target	(Not specified)		
DE	EWK II (4)	2000–2012	Industry, power production	Negotiated	Target	(Not specified)		
	AERES 1 (5)	1995–2002	Energy intensive industry	Unilateral	Target	(Not specified)		
FR	AERES 2 (5)	2002–2007	Energy intensive industry	Unilateral	Target	(Not specified)		
	Agreement on Industrial Energy Efficiency	1993–1996	Energy intensive industry	Public voluntary	Implementation	(Not specified)	X	
DK	Revised agreement	1996–2013	Energy intensive industry (6)	Negotiated	Implementation	Energy audits	X	
	Revised agreement	2015–	Energy intensive industry	Negotiated	Implementation	Energy audits	X	
LU	Voluntary Agreements 1	1996–2000	Industry, services	Negotiated	Implementation	Energy audits		
	Voluntary Agreements 2	2000–2010	Industry, services	Negotiated	Implementation	Energy audits	X	
	Voluntary Agreements 3	2011–2016	Industry, services	Negotiated	Implementation	Energy audits	X	
	Voluntary Agreements 4	2017–2020	Industry, services	Negotiated	Implementation	Energy audits	X	X
	Climate Change Agreements 1 (7)	2001–2011	Industry, services, agriculture	Negotiated	Target	(Not specified)		
UK	Climate Change Agreements 2	2013–2023	Industry, services, agriculture	Negotiated	Target	(Not specified)		
	Emission Reduction Target Agreements	2002–	Industry	Negotiated	Large: Target SME: Implement	Large: energy audits SME: benchmarks	X	X

The table continues on the next page ... →

Table 2. Characteristics of the European voluntary agreements on industrial energy efficiency (continuation).

Country (1)	Voluntary agreement	Operational in	Coverage	Concept	Approach	Commitment determining method	Supporting actions	
							Energy Mgt. Sch.	Network
BE-VLA	Benchmarking Covenant	2002–2014	ETS industry	Negotiated	Target	Sector benchmarks		
	Auditing Covenant	2005–2014	Non-ETS industry	Negotiated	Implementation	Energy audits		
	Energy Governance Agreement – ETS	2014–2020	ETS industry	Negotiated	Implementation	Energy audits	X	
	Energy Governance Agreement. – non-ETS	2014–2020	Non-ETS industry	Negotiated	Implementation	Energy audits	X	
BE-WAL	Branch Agreements 1	2003–2012	Industry	Negotiated	Implementation	Energy audits		
	Branch Agreements 2	2014–2020	Industry	Negotiated	Implementation	Energy audits Roadmaps		
NO	Programme for Energy Intensification	2004–2014	Energy intensive industry	Negotiated	Implementation	Energy audits	X	
SE	Programme for Energy Intensification	2005–2013	Energy intensive industry	Negotiated	Implementation	Energy audits	X	
IE	Energy Agreements Programme	2006–	Energy intensive industry	Public voluntary	Implementation	Energy audits	X	X
LV	Agreements on Energy Efficiency	2011–2016	Industry	Negotiated	Implementation	Energy audits		

(1) See list of country codes at the end of the paper.

(2) The Long-Term Agreement 3 replaces the Long-Term Agreement 2 in 2008 and the Long-Term Agreement ETS replaces the Benchmarking Agreement in 2009, both prior to their anticipated end.

(3) The implementation of an energy management scheme in the Finnish voluntary agreements is an obligation for energy-intensive companies only.

(4) EWK: Erklärung der deutschen Wirtschaft zur Klimavorsorge (Declaration of German Industry on Global Warming Prevention).

(5) AERES: Association des Entreprises pour la réduction de l'Effet de Serre (Business Association for the Reduction of Greenhouse Gas Emissions).

(6) The scope of the Danish voluntary agreements varied in line with the tax reduction regime; in 1999 space heating was included; in 2010 the focus shifted from all energy carriers to electricity only.

(7) The first UK Climate Change Agreements were prolonged until 2013 when the second agreements were ready to start.



Table 3. Number of policy measures on industrial energy efficiency per category and per European country.

Countries		Co-operative Measures	Cross-cutting	Financial	Fiscal/tariffs	Inform. Educ. Training	Legisl. – Informat.	Legisl. – normative	TOTAL
VAs still operational	BE	1		1	1	1	1		5
	CH								0
	DK			2		1	2		5
	FI	2		2		5			8
	IE	1				5		1	7
	LU	3			1		1		5
	NL	3	1	5	2	2		1	15
	UK		6	2	2	2			9
Abandoned VAs	DE	3	2	11		2	1	4	23
	FR	1	2	2		1	2	2	9
	LV	1	4	6	2	2	2		15
	NO		1	13		4			17
	SE	3		1		2	1		5
VAs considered but not implemented	BG		1	6		1	2	1	13
	CZ	1	1	3				1	5
	ES			4			1		5
	GR			2		2	2	1	3
	HR	2	3	5				1	10
	IT	2	1	4	1		3		12
	PL		1	2					3
	RO	2	3	3			1		7
	SI		1	5			1		8
	SK	1	3	5		5	5		17
Did not consider nor implement VAs	AT		1	2		2	1		5
	CY		2			1			3
	EE		5	6	1	1			13
	HU			2	1		2		5
	LT			5					5
	MT			2					2
	PT			1	1	1	2		4
SUM		26	38	102	12	40	30	12	243

One can observe that financial measures are implemented the most (102 measures), far ahead of Information/ Education/Training (40), Cross-cutting (38), Legislative/informative (30) and Co-operative Measures (26). The two least implemented measures are the Legislative/normative and Fiscal/tariffs measures (12 measures each).

Table 3 allows to derive some overall trends in implementing policy measures on industrial energy efficiency:

- Countries that have abandoned the voluntary approach have implemented more measures (14 on average) than other countries. This is especially the case for Germany, Norway and Latvia, where in total 55 measures are implemented. Most of these measures are financial, followed by information/education/training measures.
- Countries with still operational voluntary agreements have implemented half the number of those countries that have abandoned voluntary agreements (7 on average). They implemented, next to the voluntary agreements (co-operative measures), mostly information/education/training measures and fiscal incentives/tariffs (on average double as much as the two following categories of countries). On the contrary, they have implemented half as much financial measures as the other categories of countries.

- Countries that have explored but not implemented voluntary agreements have implemented as many instruments as those countries that have (8 on average). Most of these measures are financial followed by legislative/informative and cross-cutting measures.
- Finally, countries that did not have implemented nor considered voluntary agreements have implemented less instruments than the other category of countries (5 on average). Most of these are financial followed by cross-cutting, legislative/informative and information/education/training measures.

No relation was found between the type or the number of measures and the geographical location of the countries (in the North, South or Central Europe). No correlation was found either between ranking according to achieved energy savings and the implementation of voluntary agreements.

## Discussion

The update of the history of voluntary agreements on industrial energy efficiency in Europe revealed that fourteen European countries<sup>6</sup> have implemented such instruments in the last 25 years, and eleven others have considered their implementation. Nine countries continue to rely on this policy instrument to foster industrial energy efficiency: the Netherlands, two Belgian regions: Flanders and Wallonia, the Great Duchy of Luxembourg, Finland, Denmark, Switzerland, Ireland, the UK; while five others have abandoned the approach: France, Germany, Norway, Sweden and Latvia. This survey completes earlier ones on this policy instrument in Europe (Price, 2005; Rezessy and Bertoldi, 2011).

Some influencing factors can be derived from the depicted evolution of voluntary agreements on industrial energy efficiency in Europe.

First, good practice examples of a successful implementation of voluntary agreements seem to have stimulated the deployment of this novel policy instrument in Europe. One can make some observations from the depicted history supporting this conclusion: the fact that voluntary agreements on industrial energy efficiency build upon voluntary agreements on environmental pollution supports this conclusion; the success of the Dutch Long Term Agreements that has inspired many other countries, such as Belgium, the UK, Romania, ...; and, the similarity in design of voluntary agreements of neighbouring countries, such as the Netherlands – Belgium or Norway – Sweden. Good practice examples hence seem to be instrumental in building enough confidence amongst the stakeholders that its implementation in their case can work.

Second, EU legislation did have had an impact on how voluntary agreements evolved in Europe; it has had both a stimulating and an inhibiting effect. The Fifth Environmental Action Programme of the EU (1992) and the Energy Taxation Directive 2003/96/EC on the one hand helped in increasing the interest in voluntary agreements. Also, the obligation to draft National Energy Efficiency Action Plans forced the EU Member States to take various policy instruments into consideration, which in turn invited them to consider voluntary agreements amongst other policy instruments. On the other hand, the Swedish and Danish voluntary agreements stopped because they conflicted with the EU State Aid Rules in vigour. The EU ETS also had an impact on voluntary agreements, but it did not “replace or downplay the role of existing VAs in the sectors under obligation”, as Bertoldi and Rezessy concluded in 2007. Instead, the design of the existing agreements was adapted to suit the obligations under the EU ETS. The same can be observed for later obligations, arising from the Energy Efficiency Directive, including its Art 8 on energy auditing and Art 14 on CHP and district heating.

Third, national circumstances have triggered the implementation of voluntary agreements in some cases. High power prices in Scandinavia in 1996 urged the Norwegian and Swedish governments to take urgent action on energy efficiency and ultimately resulted in the introduction of voluntary agreements.

Malta embraced the voluntary approach ten years later because of similar problems.

Finally, the Global Financial Crisis of 2008–2009, in contrast, did seem to have influenced the deployment of voluntary agreements in Europe, although the crisis significantly impacted industrial activity and the performance of the participating companies under the various voluntary agreements, as *i.a.* observed by Cornelis (2014). However, the crisis might have had an influence on the decision in France not to continue the AERES and the decision of about half of the participants of the Norwegian agreement not to participate to its second phase in 2008.

The analysis of the design of the different European voluntary agreements on industrial energy efficiency revealed a huge variety. There is hence no tendency to arrive at common rules and structures as Bertoldi and Rezessy (2007) were suggesting, except for the implementation of energy management schemes that gradually is included as an obligation in most voluntary agreements. One can ask whether the organisation of knowledge sharing networks will a next common design aspect.

Instead, countries tend to maintain the original design of their agreements and hesitate to introduce drastic changes. There is one exception though; the Netherlands experimented with new design concepts and introduced *i.a.* benchmarking and road mapping as method or the supply chain as expansion in scope; new concepts that were copied by other jurisdictions.

The comparison of policy instruments implemented by countries with or without voluntary agreements has not led to the identification of some policy instruments that compete with voluntary agreements. Most countries have implemented a mix of instruments instead.

Countries with operating voluntary agreements tend to opt for fiscal measures as supporting ones, more than other countries do. This underlines the link between both measures; most voluntary agreements do offer energy tax reduction or other fiscal benefits to the participating companies. Financial measures are less preferred, although privileged access to grants or subsidies for the implementation of energy saving measures might be more in line with the objective of a voluntary agreement on energy efficiency.

Some countries, that had agreements but have abandoned the voluntary approach, has implemented an above-average number of policy instruments, while countries that did not consider nor implemented agreements seem to rely on a few policy instruments only. The former group of countries might seek compensation for the effect of an agreement, while the latter might have less interest in fostering industrial energy efficiency at all; however, no evidence is found to support these hypotheses.

## Conclusion

Can voluntary agreements continue to be the vehicle to improve industrial energy efficiency in the next decade? This is the basic research question of this paper.

Basically, voluntary agreements are agreements and agreements stand as long as all agreeing parties can benefit from it. Governments benefit from voluntary agreements because they lead to a reduced energy consumption and greenhouse gas emissions in their jurisdiction. The participating industrial companies benefit from voluntary agreement as they are

6. Counting the Belgian regions as distinct jurisdictions with competences equal to a country in the field of energy efficiency policy.

**Table 4. List of country codes.**

AT	Austria	FR	France	NO	Norway
BE	Belgium	GR	Greece	PL	Poland
BG	Bulgaria	HR	Croatia	PT	Portugal
CH	Switzerland	HU	Hungary	RO	Romania
CZ	Czech Republic	IE	Ireland	SI	Slovenia
CY	Cyprus	IT	Italy	SK	Slovakia
DE	Germany	LT	Lithuania	SE	Sweden
DK	Denmark	LU	Great Duchy of Luxembourg	VLA	Flanders, Belgium
EE	Estonia	LV	Latvia	WAL	Wallonia, Belgium
ES	Spain	MT	Malta	UK	The United Kingdom
FI	Finland	NL	The Netherlands		

granted with some financial incentive, quite often energy tax reduction.

The challenge is to keep a good balance in benefits of the different parties. The distortion of this balance explains why some voluntary agreements have ended. The German voluntary agreement was not able to demonstrate convincing additional energy savings compared to baseline; the French and Norwegian agreements ended because the effort and cost of participation outweighed the benefits; and the reduction of the benefits of the participants directly caused an end to Danish and Swedish agreements.

There is also an asymmetry in measuring the benefits to the different parties. Tax reductions or subsidies are accounted and could be determined to the eurocent (although hardly reported), whereas clear evidence for the additional energy savings resulting from a voluntary agreement is hard to generate.

So, voluntary agreements still can have a future under the condition that they manage to keep a good balance between additional energy savings and financial benefits to the participants. There is a trend to increase the baseline energy management practices in companies; the Energy Efficiency Directive for instance has made energy audits mandatory for large companies. As a result, countries considering voluntary agreements are challenged to define best energy management practices they want to promote by these agreements. The inclusion of knowledge sharing networks as a service to the participants might help differentiating voluntary agreements from baseline practice. Government should at the same time carefully select the benefits they wish to grant to participants. Benefits that are related to energy savings rather than to energy consumption are to be preferred, as this creates a direct link between the benefits of both agreeing parties. This, in turn, help to safeguard the cost-effectiveness of voluntary agreements.

In 2017, Luxembourg has started its new generation of voluntary agreement; Denmark continues the approach after an interruption of two years and the two Belgian regions Flanders and Wallonia have announced to renew their agreements, while the Brussels Capital Region has introduced a light version of voluntary agreement. These countries apparently managed in keeping a good balance in benefit both for the government and for the participating companies. These countries do demonstrate that voluntary agreements indeed still have a future in Europe.

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