CODE2

Cogeneration Observatory and Dissemination Europe

Workshop Poland

Deliverable D.4.2 – Workshop Report
07/05/2014

Co-funded by the Intelligent Energy Europe Programme of the European Union

1. Program and key information of the workshop:

Cogeneration Roadmap for Poland - expert workshop

8.30 ***Registration and welcome coffee***

SESSION 1: CHP STATUS AND ROADMAP	
9.00	**Welcome and introduction to the CODE2 project –** Fiona Riddoch, COGEN Europe
9.10	**National CHP goals and policies –** Tomasz Dąbrowski, Ministry of Economy
9.35	**CHP Roadmap for Poland –** Stane Merše, JSI
10.05	**Actual status of CHP in Poland –** Dr inż. Wojciech Bujalski, UCBEiOŚ PW
10.30	***Coffee break***
SESSION 2: ENERGY EFFICIENCY DIRECTIVE IMPACT ON CHP	
11.00	**Energy Efficiency Directive (EED) – what is new and how to implement it? –** Stane Merše, JSI
11.25	**EED impacts on CHP market -** Fiona Riddoch, COGEN Europe
11.50	**Discussion on EED implementation and impact on CHP**
12.30	***Lunch***
SESSION 3: CHP SECTOR SPECIFIC ISSUES	
13.30	**CHP in District heating – how to provide future development? –** Jacek Szymczak, IGCP
13.50	**Industrial CHP – status and future perspectives –** Henryk Kališ, IEPiOE
14.10	**Small scale CHP – status and future perspectives –** Prof. dr hab. inż. Krzysztof Żmijewski, SR RGN/PW
14.30	**Plenary discussion and next steps**
15:00	***End of the Workshop – Conclusion drink***

Date: 4. December, 2013

Location: Sheraton Warsaw Hotel, Warsaw, Poland

Number of participants: 21 - list of participants in Annex

2. Introduction

The key goal of expert workshop was to establish communication between key CHP market actors and to enable quality expert discussion on the current and future development of cogeneration in Poland based on the drafted CHP roadmap for Poland prepared within the CODE2 project.

Preparation of the workshop was based on the recommendations and concept prepared by Berlin Energy Agency (workshop Berlin, May 2013). In cooperation with Polish Association of Professional Heat and Power Plants (PTEZ)[1] we decided to invite limited number of relevant expert from different sectors and roles in the CHP framework in Poland (Ministry, Regulator, district heating, industry, services, electricity suppliers, ESCOs, CHP equipment producers, CHP project providers, etc.) which will enable balanced discussion of all key important issues influencing the recent and future development of cogeneration in Poland.

Poland is in the ongoing process of update of the CHP support scheme where due to the delay in the notification process at DG Competition (state aid) the CHP plants are facing with the gap in the support and high uncertainty for the future support of new CHP units.

There are already two strong very active associations linked to CHP in Poland:

- **Polish Association of Professional Heat and Power Plants (PTEZ)** / KOGEN Polska and
- **Chamber of Commerce Polish District Heating**,

both linked in activities supporting mainly prevailing CHP in district heating systems. So the core of CHP coalition is already established and well-functioning, so additional efforts are focused to extend this coalition also to the industrial and small scale CHP aspects in Poland.

3. Main conclusions

Participant's feedback on the drafted Cogeneration Roadmap for Poland was positive as key aspects and identified barriers were approved and further discussed and supplemented with more precise practical information during the workshop.

Energy policy: Energy efficiency is key energy policy priority besides reducing the environmental impact of the energy sector and development of RES where cogeneration is important technology that can significantly contribute to these goals with huge realistic market potential and national CHP goal to double CHP electricity generation till the year 2030 (compared to 2006). Incentivizing the development of cogeneration through support mechanisms (yellow and red certificates) is one of the main measures in place since 2007:

- **By recent Energy law amendment and Bill adopted in January 2013 the CHP support system was extended till the end of 2014.** In April 2013 the Bill has been submitted to Parliament and notified to European Commission. As notification procedure has not yet been completed[2] the certification scheme is not functioning and causing huge

[1] PTEZ is a national leading association in promoting production of heat and electricity in cogeneration and represents the largest heat and power plants which deliver about 60% of heat to district heating systems in Poland.
[2] It looks that Commission is waiting for the approval of new State aid guidelines.

uncertainty for the CHP operation and development beside current over accumulation of certificates as CHP generation exceeds the prescribed quota which results in very low certificate market price.

- **New support scheme is divided to the support of existing CHP units operation** (yellow, red and purple certificates) **and higher support of new CHP investments** (orange certificates). Detailed analysis has proved that natural gas CHP technologies are more competitive for the smaller (industrial) CHP units (requires lower support level) whereas coal CHP units are significantly more competitive on the large scale level.
- **Ministry is well aware of EED obligations and implementation has already started.**

District heating (DH): Poland is one of the most development district heating countries as around 60% of heat supply in towns is provided by DH and more than 15 million people use DH. CHP units supply more than 62% of total annual 400 PJ heat generation, where hard coal has prevailing 74% share. Several actual aspects were discussed:

- **Polish chamber of DH has implemented very successful broad marketing program for promotion of DH** to all involved actors resulting in evident increase of awareness and recognisability of DH, which is very important as customers have free choice in heat mode selection!
- **Environmental regulation is increasing district heating operation costs** (20% of allowances for ETS, IED higher emission standards).
- **17% share of RES is expected till 2020** (RENEAP) from 6,5% today share
- **Huge untapped potential for burning communal waste** (used only 0,5%) in CHP incineration plants exist (3 TWhel, 38 PJ heat)
- **Substantial District cooling potential was assessed** with several environmental and new economic benefits for DH systems – competitive with other alternatives. Planned Comprehensive assessment of CHP and DHC potential requested by EED should start already in 2014 and will bring additional knowledge and new special solutions for DHC.

Industry CHP: Current industrial CHP energy generation is based on mid-sized CHP units, usually coal-fired plants:

- **Total Industrial CHP electricity generation is close to 8 TWh** (5% of national energy generation) with total installed capacity 1,9 GWe (11,6 GWt). Produced electricity and heat is mainly used on-site (on-site CHP electricity consumption is exempted from "coloured certificates" costs).
- **Increase of energy efficiency and decrease of operation costs in industry is key policy priority** where CHP can contribute significantly. More than 1,6 GWe of the latest assessed industrial CHP potential is in sectors: Chemical industry (1.000 MWe), Wood and paper (300 MWe), Sugar (160 MWe), Steel (150 MWe) and Coal mining (50 MWe).
- **Due to obsolete equipment, efficiency of generation is often low** (small scale of CHP plants is economically infeasible for costly ecological investments, especially fulfilment of latest environmental standards by IED, ETS, etc.).

- **Natural gas is the best choice for industrial CHP** (cheaper than coal which is more competitive in units above 100 MWe) but need additional and stable support to enable new investments (current high natural gas prices) where current uncertain situation is very unfavourable for new investments. Analysis of selected CHP project proved that by minimum support level of 200 PLN/MWh (close to 50 €/MWh for 15 years) at 10 %IRR the large economic potential is triggered (bellow this support level the potential is very limited).
- **Utilizing existing industrial infrastructure and energy demand** offers very good opportunity for further development of CHP generation linked also to the local DHC with significant benefits for security of supply in Poland.

Micro and small scale CHP have huge prospect for growth in Poland:

- **Lack of public awareness,** proper support and legislative reasons are key barriers for micro CHP development where the interest exists only among enthusiasts and experts.
- **Micro CHP could significantly contribute to the stability of the low voltage grid** which is especially in the rural area facing with huge stability problems (up to 410 min of Interruptions of supply, low voltage quality (180 V), etc.)
- **Micro CHP is huge economic opportunity for the Polish industry** which could create huge number of new jobs (up to 0,25 million till 2030) end economic benefits with gradual market growth (form 12.000 CHP units per year in 2014 up to 145.000 units in 2020 if specific investment costs would be decreased down to 1.000€/kWe).
- **Several additional benefits:** positive utilisation of consumers' financial capacity, generation of strong competition in the retail market for electrical power, smart grid and smart energy service development, meeting current challenges of the sector and providing ways to solve strategic problems (upcoming deficit – 5.000 MWe, etc.)

4. Main lessons learnt

The workshop was very successful and highlighted next key issues:

- **High level of expert knowledge reflecting from the presenting analysis results and long CHP tradition in Poland are two very important pillars for future CHP development** – in line with the energy efficiency no. 1 priority in government energy policy and with strong support of two CHP associations. Increase of small scale and micro CHP awareness and development of Poland CHP industry supported by the existing knowledge is huge economic opportunity with several positive effects on economy, energy system and environment pollution.
- **Strengthening further development of district heating and cooling infrastructure with** proper heat market regulation, financing investments for the increase of energy effectiveness, reduction of pollution and improved competitiveness of customers services is key challenge for the largest CHP sector in Poland to sustain and increase significant contribution to the national energy and climate goals for 2020.
- **Fast European commission notification approval of the updated successful certificate support scheme is prerequisite for further CHP development**: current energy market conditions request additional support instruments for CHP, separately for the existing units (low level of support) and higher support of new investments, where huge untapped potential exist in industry, which could enable economically viable transition from coal to natural gas which is more competitive for medium size CHP units (less than 100 MWe).
- **EED implementation which already started in Poland could have several positive effects for future development of cogeneration** so active participation of CHP actors in the process (especially in comprehensive assessment of potential with cost benefit analysis and other regulation aspects) is very important for the proper future CHP development.
- **CHP Roadmap for Poland was well accepted and will be updated based on the workshop presentations and discussion and circulated for final approval and remarks to the participants of the workshop.**

With regard that all invited participants came from the CHP sector and high awareness of cogeneration in Poland (especially on existing large scale district heating CHP units), all workshop time was devoted to presentations and live discussion on the analysis of the current CHP issues with participants and the visit of CHP site was not carried out within the workshop. We will consider other options that could contribute to the awareness of CHP technology (especially small and micro scale) where the lack of knowledge and awareness in Poland exists.

5. Further steps planned after the workshop

Workshop proved good cooperation of especially large CHP market players in Poland and participants expressed further interest for participation in the CODE2 activities and exchange of actual information from other EU member states and EU policy issues, with special emphasis on EED and State aid regulation.

Next planned steps:

- Preparation of the final roadmap and circulation between workshop participants and other interest audience.
- Presentations of the roadmap: articles, events,…
- Discussion of the roadmap with politicians and ministries.

For more details - workshop participants and all presentations please refer to the annexes to this report

Ljubljana, 7.5.2014

ANNEXES:

1. List of participants

2. PowerPoint presentations:

1. **Welcome and introduction to the CODE2 project** – Fiona Riddoch, COGEN Europe
2. **National CHP goals and policies** – Tomasz Dąbrowski, Ministry of Economy
3. **CHP Roadmap for Poland** – Stane Merše, JSI
4. **Actual status of CHP in Poland** – Dr inż. Wojciech Bujalski, UCBEiOŚ PW
5. **Energy Efficiency Directive (EED) – what is new and how to implement it?** – Stane Merše, JSI
6. **EED impacts on CHP market** - Fiona Riddoch, COGEN Europe
7. **CHP in District heating – how to provide future development?** – Jacek Szymczak, IGCP
8. **Industrial CHP – status and future perspectives** – Henryk Kališ, IEPiOE
9. **Industry CHP support** – Jacek Karminsky, Energoprojekt-Katowice SA
10. **Small scale CHP – status and future perspectives** – Prof. dr hab. inż. Krzysztof Żmijewski, SR RGN/PW

COGENERATION OBSERVATORY AND DISSEMINATION EUROPE

Developing a CHP Roadmap for Poland

CODE2 project Expert Workshop

Sheraton Warsaw Hotel, Warsaw

4. December 2013

LIST OF PARTICIPANTS

N	*Name*	*Company/Organisation*	*Signature*
1.	Stanisław Błach	EDF Polska SA	
2.	Paweł Bogusławski	Energy Regulatory Office	
3.	Dr inż. Wojciech Bujalski	University Research Centre for Energy and Environmental Protection Warsaw University of Technology	
4.	Tomasz Dąbrowski	Ministry of Economy	
5.	Dr Ludomir Duda		
6.	Ewaryst Hille	E5 Ewaryst Hille	
7.	Adam Janczak	Polish Electricity Association	
8.	Henryk Kaliś	Polish Chamber of Industrial Energetics and Energy Customers	
9.	Jacek Karmiński	Energoprojekt–Katowice SA	
10.	Włodzimierz Kędziora	Dalkia Polska SA	
11.	Arkadiusz Kosiel	Fortum Power and Heat Polska Sp. z o.o.	

COGEN europe

POLSKIE TOWARZYSTWO ELEKTROCIEPŁOWNI ZAWODOWYCH

Co-funded by the Intelligent Energy Europe Programme of the European Union

Jožef Stefan Institute, Ljubljana, Slovenia
Energy Efficiency Centre

12.	Łukasz Lech	Fortum Power and Heat Polska Sp. z o.o.	
13.	Mariola Linkiewicz	Ministry of Economy	
14.	Stane Merse	Jozef Stefan Institute	
15.	Remigiusz Nowakowski	Fortum Power and Heat Polska Sp. z o.o.	
16.	Jacek Piekacz	EDF Polska SA	
17.	Fiona Riddoch	COGEN Europe	
18.	Dr inż. Janusz Ryk	Polish Association of Professional Heat and Power Plants (PTEZ) / KOGEN Polska	
19.	Jacek Szymczak	Chamber of Commerce Polish District Heating	
20.	Maciej Tomaszewski	Elektrociepłownia Zielona Góra SA	
21.	Małgorzata Wesołowska	Energy Regulatory Office	
22.	Prof. dr hab. inż. Krzysztof Żmijewski	Public Board for the Development of Low-Emission Economy	
23.	Ewa Woźniak	M6	
24.			
25.			
26.			

CODE2

Cogeneration Observatory and Dissemination Europe

Dr Fiona Riddoch, COGEN Europe
CODE2 Workshop Developing a CHP Roadmap for Poland
4. December, Warsaw, Poland

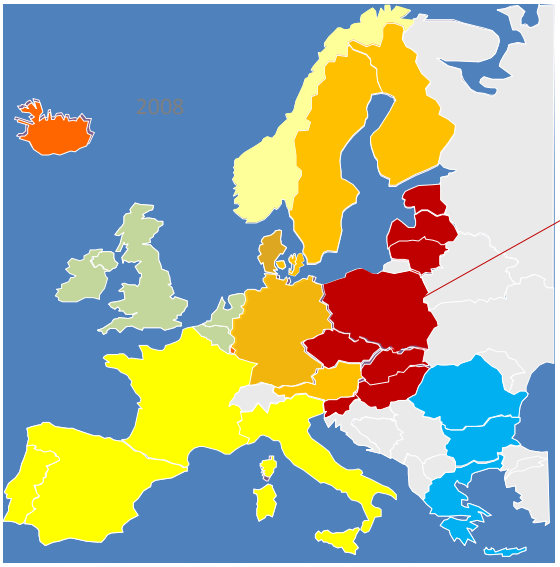
Introduction to CODE2

The CODE2 project jointly funded by the IEE and industry:

- Develops the first clear plan of action for cogeneration in each EU Member State
- Gathers experts and establishes information networks around cogeneration
- Reviews published data and presents conclusions
- Introduces in detail the new EED
- Assesses the EED's impact with national stakeholders
- Does the first specifically micro-CHP and bio-energy CHP analysis

All in all, CODE2 mobilises effort in each of the 27 EU Member State.

CODE 2 Regional Groupings

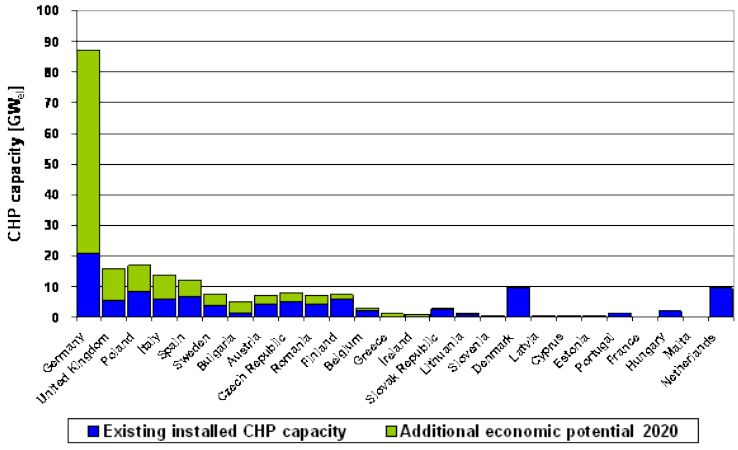


Eastern Europe region:
Stane Merše, Jožef Stefan Institute (JSI), stane.merse@ijs.si
Countries: Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, Slovenia

Regional CODE2 leaders

Project Coordinator: Fiona Riddoch, COGEN Europe, fiona.riddoch@cogeneurope.eu

- **Eastern Europe region:** Stane Merše, Jožef Stefan Institute (JSI), stane.merse@ijs.si
  Countries: Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, Slovenia
- **Northern Europe region:** Adi Golbach, KWK kommt, adi.golbach@kwkkommt.de
  Countries: Austria, Denmark, Finland, Germany and Sweden
- **North Western region:** Joni Rossi, COGEN Vlaanderen, joni.rossi@cogenvlaanderen.be
  Countries: Belgium, Ireland, Luxembourg, Netherlands and United Kingdom
- **Partner responsible for South-Eastern Europe region:** Costas Theofylaktos, Hellenic Association for the Cogeneration of Heat and Power (HACHP), hfa@heatflux.eu
  Countries: Bulgaria, Cyprus, Greece, Romania
- **Partner responsible for South-Western Europe region:** Giorgio Tagliabue, Federation of the Scientific and Technical Association (FAST), giorgio.tagliabue@gmail.com
  Countries: France, Italy, Malta, Portugal, Spain



Cogeneration: Roadmap for Europe

2012 2030

Market	Industry, buildings, home and public offerings Best practise exchanges Improve solutions and service offering	**Additional 122 Gwe + 455 TWh el + 1,000 TWh heat**
Policy	Complete barrier removal Provide effective Member State support	
Awareness	Strengthen industry communication Increase awareness in all target sectors	

Background to CODE1

CODE1 (2008-2010):

COGENERATION OBSERVATORY AND DISSEMINATION EUROPE

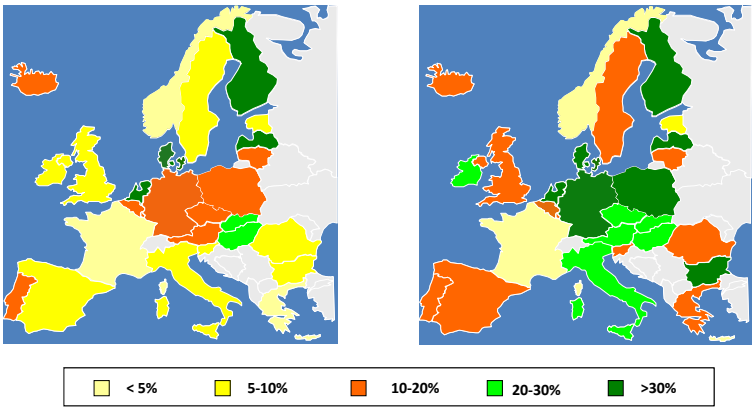
- Monitored the implementation of the Cogeneration Directive at national level
- Analysed the reporting of cogeneration potential by the 27 EU Member States
- An additional 122 GWe of potential CHP capacity in Europe was identified
- The project operated in a regional structure: 4 regional groups were established that analysed the implementation of the Cogeneration Directive
- The regional groups reported on the successful and struggling initiatives and the legislation and support schemes around the directive
- A central database with EU and national legislation was created and case studies of best practise projects were collected
- A proposal and first draft of a European Cogeneration Roadmap was developed

Follow-up project CODE2

- The new CODE2 project runs from 1 July 2012 till 31 December 2014.
- It will develop 27 **national Cogeneration Roadmaps** and one **European Cogeneration Roadmap**. These roadmaps will propose actions on several fronts in close interaction with the key stakeholders (policy-makers, industry and civil society).
- The project uses a desk research/workshop format to develop and comment the roadmaps and raise all round awareness of the opportunity and existing resources for developing CHP deployment. Workshops in 7 pilot countries will specifically explore the implications and develop an interpretation of the new EED and will seek to develop **coalitions on CHP** at national level involving key stakeholders.
- The CODE2 project will identify explicitly the **potentials** for micro-CHP and bio-energy CHP.

2008

2008 plus 1000 TWh heat with 122 GWe



Partners and contacts

The CODE2 team consists of the following partners:

1. **COGEN Europe**, the European association for the promotion of cogeneration (Belgium)
2. **HACHP**, the Hellenic Association for Cogeneration of Heat & Power (Greece)
3. **Jožef Stefan Institute** (Slovenia)
4. **FAST**, Federazione delle Associazioni Scientifiche e Techniche (Italy)
5. **COGEN Vlaanderen** (Belgium)
6. **Energy Matters** (Netherlands)
7. **Berlin Energy Agency** (Germany)
8. **KWK kommt** (Germany)

For more information visit www.code2-project.eu

Thank you for your attention

Expected results

- A further strengthening of the CODE1 Regional Network.
- 27 national Cogeneration Roadmaps
- One European Cogeneration Roadmap with concrete proposals for policy improvement, expansion in key industry sectors and awareness raising
- Identification of micro-CHP and bio-energy CHP potentials
- 7 workshops in pilot countries where draft Roadmaps are discussed
- Establishment of CHP Coalitions in 27 EU Member States involving industry, policy-makers and interest groups
- Practical "How-to" guides for key sectors (paper, food, hospitals, SMEs)
- Best practice cases on cogeneration in target sectors

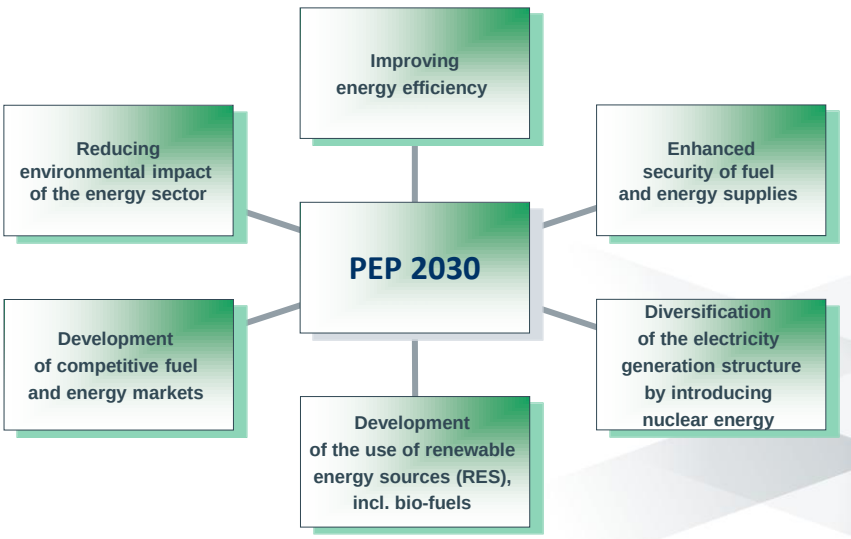
National CHP goals and policies

Expert Workshop on Developing a CHP Roadmap for Poland

Tomasz Dąbrowski
Director of Energy Department at the Ministry of Economy of Poland

Warsaw, 4 December 2013

Priorities of Polish energy policy



Energy efficiency

The main targets:

- To achieve zero-energy economic growth, i.e. economic growth with no extra demand for primary energy
- Reducing the energy intensity of Polish economy to the EU-15 level (in 2005)

The above targets will be realized through:

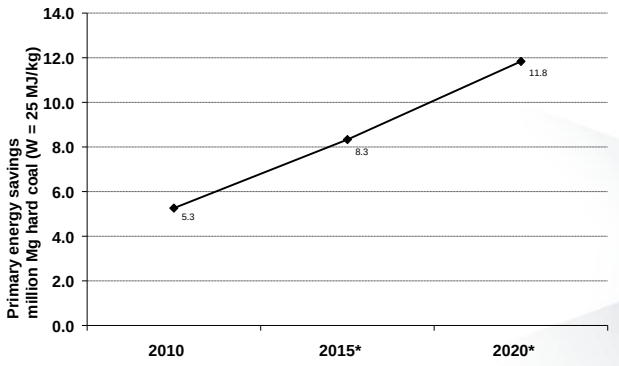
- Reducing energy consumption
- Enhancing the efficiency of generation
- Decreasing transmission losses

Main measures:

- Setting the national energy efficency action plan
- Introducing a mechanism to support investment in energy savings (*white certificates*)
- Incentivizing the development of cogeneration through support mechanisms (*yellow and red certificates*)
- Introducing energy performance certificates for buildings and apartments
- Model role of public sector in energy saving activities
- Supporting investments and research in new solutions and technologies
- Informational and educational campaigns

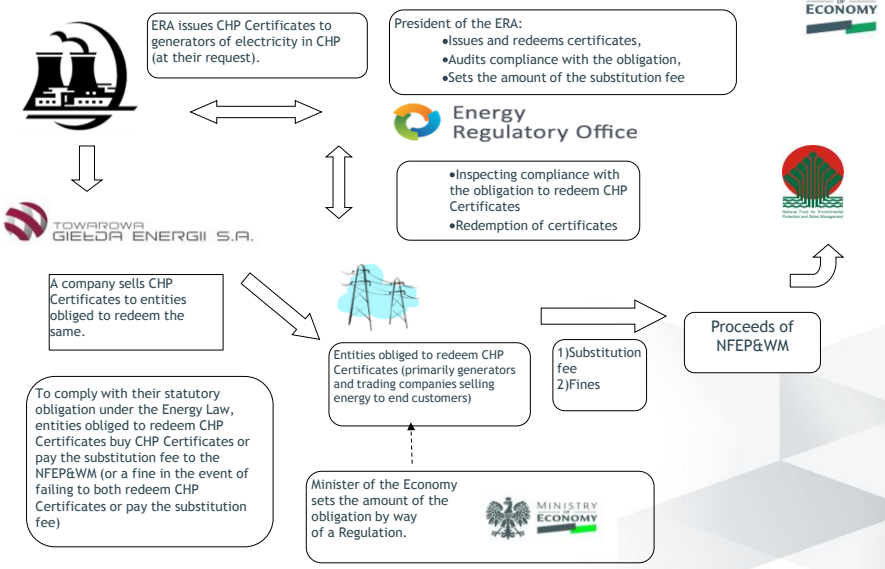
National CHP goal

By 2020 - to dobule the amount of electricity generated from highly efficient cogeneration technology (as compared to 2006).



5

Functioning of the system



6

New support scheme for CHP

New Energy Law

New support scheme for CHP producers

Support based on:

- yellow certificates
- red certificates
- purple certificates
- orange certificates – issued for new CHP installations

- Annual settlement of certificates
- An algorithm for the new substitution fee „Ozs”

Last amendment of Energy Law

Extension of the CHP support system that was in place in 2007 - 2012, based on yellow and red certificates by the end of 2014

The Bill adopted by the Council of Ministers in January 2013

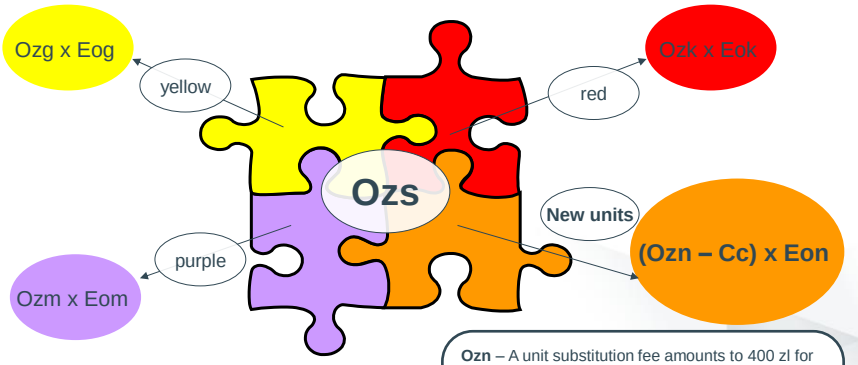
In April 2013 the Bill has been submitted to Parliament and notified to European Commission.

7

An algorithm for the new substitution fee “Ozs”

[Polish zloty]

Ozs = Ozg x Eog + Ozk x Eok + Ozm x Eom+ **(Ozn – Cc) x Eon**



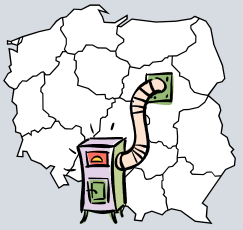
Oz $_{gkm}$ – A unit substitution fee (given by the President of ERO),
Eo $_{gkm}$ - An amount of an electric energy equal of the difference between the amount of the electric energy from the obligation and the amount of the electric energy from certificates of origin.

Ozn – A unit substitution fee amounts to 400 zl for 1 MWh (400 zl ≈ 100 €),
Cc – An average sales price of the electric energy on the competitive market,
Eon – An amount of an electric energy equal of the difference between the amount of the electric energy from the obligation and the amount of the electric energy from certificates of origin.

8

Energy efficiency directive 2012/27/UE

- By 31 December 2015, Member States shall carry out and notify to the Commission a comprehensive assessment of the potential for the application of high-efficiency cogeneration and efficient district heating and cooling.
- In addition, Member State must take adequate measures when the assessment identifies potential whose benefit exceeds the costs.
- Member States shall also ensure, with certain exceptions, that a cost-benefit analysis is carried out under specific circumstances.



MINISTRY OF ECONOMY

Thank you for your attention

Ministry of Economy
Energy Department

Pl. Trzech Krzyży 3/5
00-507 Warsaw

tel +48 22 693 50 00
fax +48 22 693 40 46

email mg@mg.gov.pl
web www.mg.gov.pl

ITC

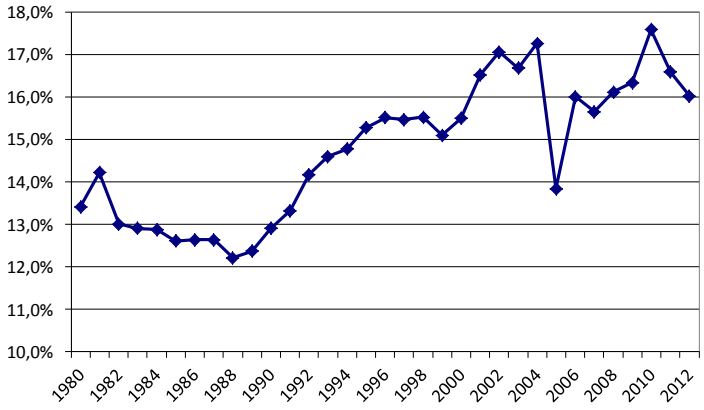
Current status of CHP in Poland

Wojciech Bujalski, Janusz Lewandowski

Warsaw, 4th December 2013

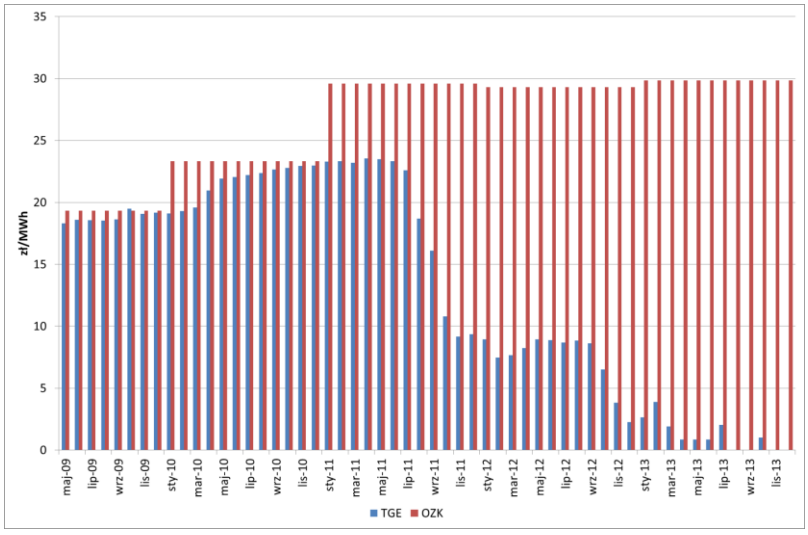
ITC

Percentage of generation in a cogeneration



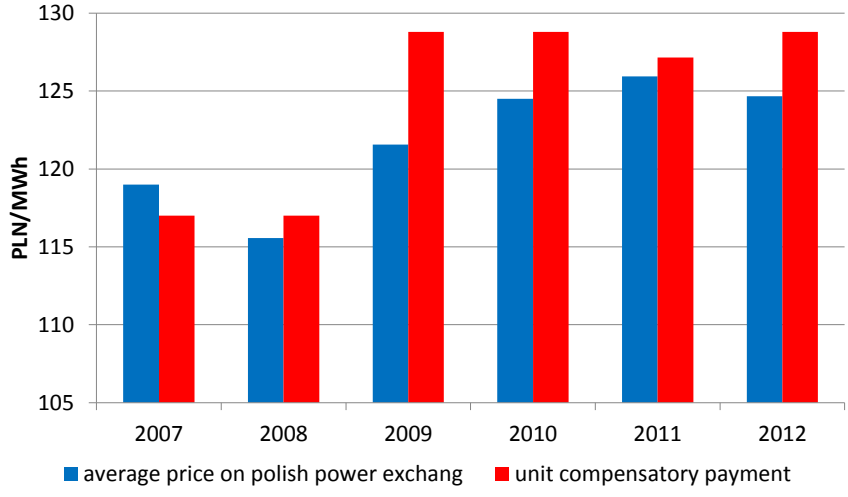
ITC

Support systems: valid until 2012 renewal to 2020 is in progress



ITC

Support systems: valid until 2012 and prolonged to 2020



ITC

Economic potential of cogeneration - definition

Technical potential of high-efficiency cogeneration – the amount of electric power and heat generated by high-efficiency cogeneration unit, which could be (taking into account technical conditions) generated by utilization of technologies listed in Annex I to the Directive 2004/8/WE. Potential of cogeneration is measured by power or amount of generated heat and power.

ITC

Technical and economic potential of cogeneration - assumptions

- To determine the technical potential of cogeneration, the following aspects were analyzed:
  - extra potential from heating of tap water
  - extra potential from power industry (existing systems) for space heating
  - extra potential from separated power generation for individual company needsc
  - extra potential from large building spaces heating (CHP - individuals)
  - extra potential from the coolness.

ITC

Economic potential of cogeneration (2010)

Year	2010	2015	2020	2025	2030
Economic potential of heat production [TWh]	122,6	119,5	119,0	118,0	113,9
Economic potential of electricity production variant: coal [TWh]	55,4	54,0	53,3	53,3	50,7
Economic potential of electricity production variant: gas [TWh]	86,0	82,3	80,9	79,8	74,6

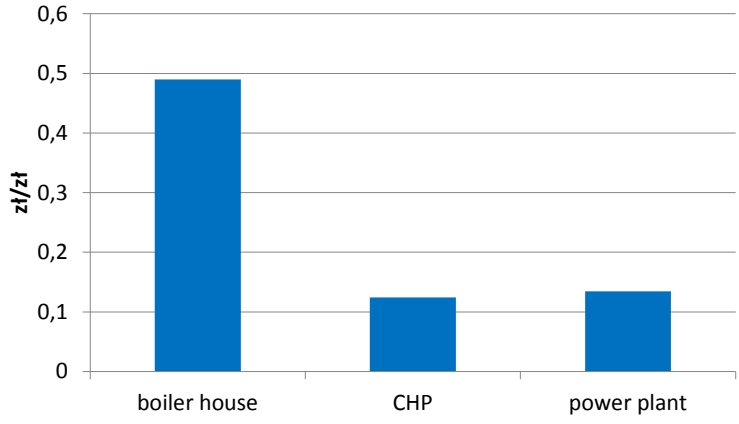
High-efficiency electricity production in 2012 is about 25 TWh

ITC

Is the support needed?

Difference between incomes and fuel cost, which is determined with respect to investment cost

C – heat generation plant – 5200 h,
EC – combine heat & power plant – 4580 h,
EL – power plant – 7200 h

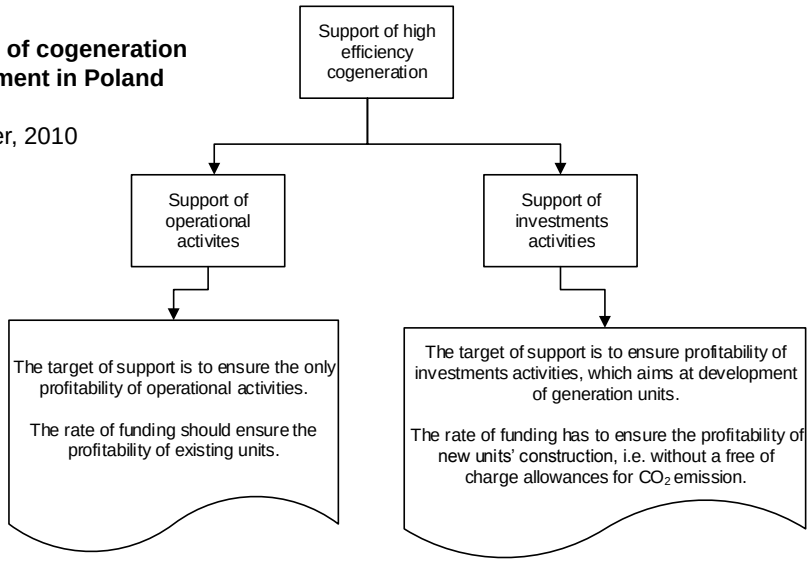


ITC

Considered support mechanisms

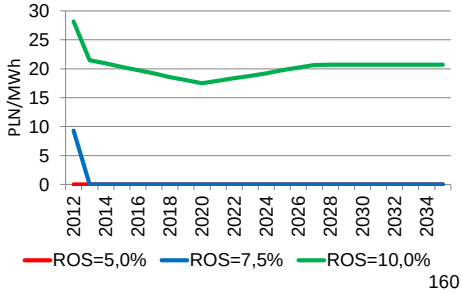
Program of cogeneration development in Poland

November, 2010



ITC

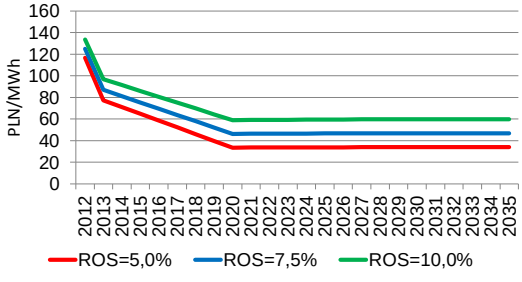
Considered support mechanisms - operational support



Hard-coal fired CHP plant (50 MW)

ROS (return on sale) = net profit/income

Gas fired CHP plant (50 MW)



ITC

Considered support mechanisms - separated investments' certificates

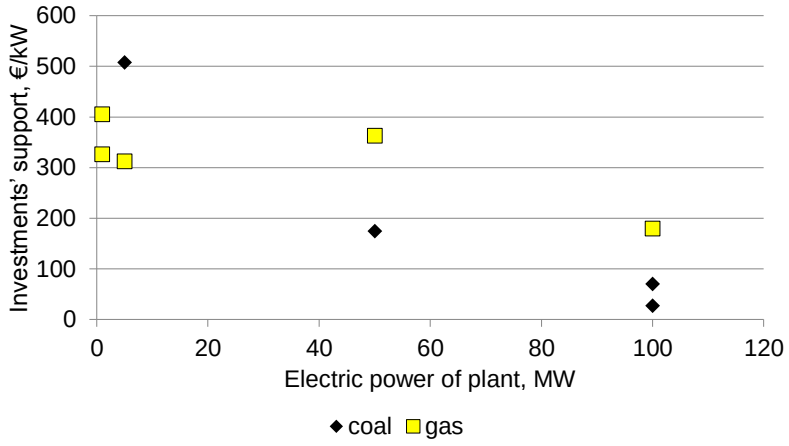
Separated system of investments' certificates.

To assume that, prices of the electricity and emission allowances are changing, the minimum certificates' price, which ensures economic profitability of investment is:

- **64,45 zł/MWh - coal-fired CHP plant**, equipped with steam turbine (electric power 50 MW) and circulating fluidized boiler,
- **159,83 zł/MWh - coal-fired CHP plant**, equipped with 5 MW steam turbine
- **231,37 zł/MW - CCGT** plant fired by natural gas; electric power 50 MW,
- **234,48 zł/MW - 5 MW** gas turbine with boiler, TG_5 fired by natural gas

ITC

Considered support mechanisms - investments' (grants) support



Dependence of the investment support's rate, which is expressed in **€/kW of installed capacity**, on the installed capacity (including technology) and fuel type.

ITC

Considered support mechanisms

Constant unit income from electricity and certificates of origin sales (400 zł/MWh)

Gas fired units (cogeneration index 1,83)						
Power	Heat price (zł/GJ) / Operation time (h/year)					
	28 zł/GJ		37 zł/GJ		65 zł/GJ	
	4600 h	7600 h	4600 h	7600 h	4600 h	7600 h
10	6,8%	14,3%	8,5%	16,4%	13,1%	22,3%
20	7,9%	15,8%	9,7%	18,0%	14,5%	24,2%
50	9,7%	18,1%	11,5%	20,5%	16,7%	27,2%
100	11,3%	20,3%	13,3%	22,8%	18,8%	30,0%
200	13,2%	22,9%	15,3%	25,6%	21,2%	33,4%
400	15,6%	26,2%	17,9%	29,2%	24,4%	37,7%

ITC

Considered support mechanisms

Constant unit income from electricity and certificates of origin sales (400 zł/MWh)

Coal fired units (cogeneration index 0,4))						
Power	Heat price (zł/GJ) / Operation time (h/year)					
	28 zł/GJ		37 zł/GJ		65 zł/GJ	
	4600 h	7600 h	4600 h	7600 h	4600 h	7600 h
50	18,8%	29,5%	23,3%	35,3%	34,7%	50,6%
100	21,4%	33,0%	26,1%	39,3%	38,6%	55,9%
200	25,2%	38,3%	30,5%	45,4%	44,6%	64,0%
400	21,9%	33,7%	26,7%	40,1%	39,4%	57,0%

ITC

Than you for attention

CHP Roadmap for Poland

Stane Merše
Jozef Stefan Institute – Energy Efficiency Centre,
Ljubljana, Slovenia

Developing a CHP Roadmap for Poland – CODE2 project Expert Workshop
Sheraton Warsaw Hotel, Warsaw
4. December 2013

Co-funded by the Intelligent Energy Europe Programme of the European Union

Content

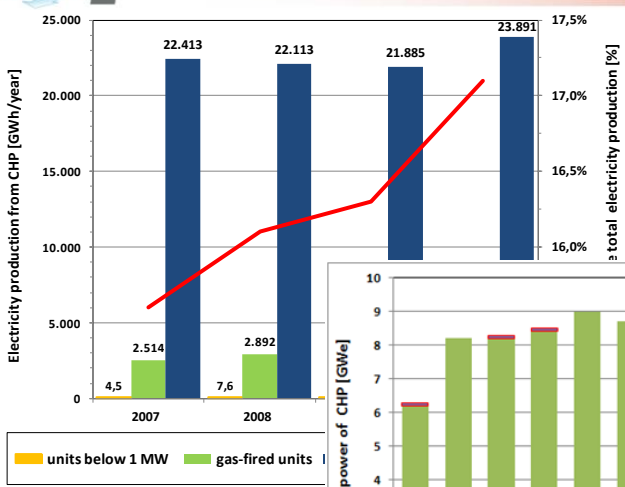
1. Where are we now?
2. CHP awerrness assesment
3. CHP economics
4. CHP potential
5. Key barriers
6. Roadmap strategy and measures for further development of CHP in Poland
7. Roadmap impact assessment
8. Conclusions

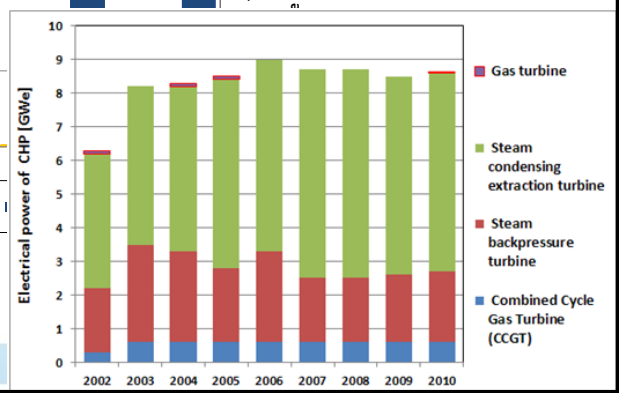
Where we are?

Poland is the EU CHP giant:

- **1st place:** by **installed capacity 32,8 GWe (8,8GWe)** (2010)
- **3rd place:** by CHP **heat generation 252 PJ** (2010) (D, FIN)
- **5th place:** by CHP **electricity generation 27 TWh** (2010) (D, NL, I, FIN)
- **7th place:** by **share of CHP electricity generation 17,6%** (2010) (DK, LV,FIN,LT, NL, H)

Recent CHP statistics





Institut "Jožef Stefan" Ljubljana, Slovenija
Center za energetsko učinkovitost

Energy and Climate Strategy of Poland

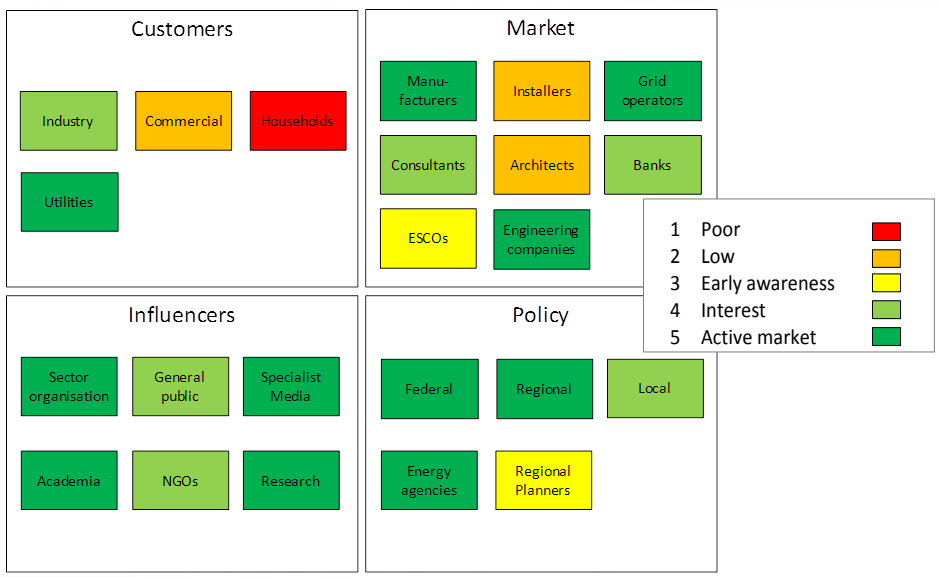
The key goals of energy and climate policies are: to improve energy efficiency, increase utilisation of renewable energy sources and decrease the emissions of CO_2, SO_2, NO_X and dust in the next years.

The important objectives and goals and measures considering cogeneration are:

- Pursuing a „zero-energy" economic growth, economic growth without an increase of demand for primary energy.
- Increasing the efficiency of electricity generation, through construction of high efficiency units, reducing network losses and development of distributed generation.
- Doubling electric energy production in high efficiency cogeneration technologies until 2020, compared to production in 2006.
- Stimulating developments of CHP, including CHP from sources below 1 MW, through support mechanisms, and adequate regional policies.
- Aiming at replacing the heat only plants supplying district heating systems with CHP by 2030.
- Preferential treatment of CHP as the technology recommended for building new generation capacity.
- Implementation measures to achieve the target in the national action plan for energy efficiency.
- Maximising the utilization of local renewable energy potential in cogeneration of heat, cold and electricity.
- Developing the district heating systems.
- Cogeneration is listed between technologies of the greatest potential for growth

Cogeneration can contribute 295 PJ primary energy savings and 32 Mt CO_2 savings to the stated EE and CO_2 reduction targets of Poland.

CHP awerrness assesment in Poland



CHP awerrness assesment in Poland (2)

Users	
Industry	Rather high level of awareness about the cogeneration in industry due to long tradition of cogeneration in process intensive industry. Large potential on several locations is not resulting in new investments due to uncertain future support and too short support period.
Utilities	The cogeneration is especially well developed in large district heating systems, where cogeneration has old tradition and huge potential for new investments.
SMEs	Cogeneration awareness in SMEs, service sector, including public sector, is still on a relatively low level, due not proper economic incentives for new investments.
Households	Low level of awareness on micro cogeneration in households due to high share of district heat supply and not yet available economical solution of micro-CHP on the market.

CHP awerrness assesment in Poland (3)

Market and supply chain	
Manufacturers/ Technology providers	Several national and international cogeneration manufacturers and technology providers are key actors on the large and medium scale market (>1MWe). Small and micro-CHP market is still in premature phase.
Installation companies	The awareness about cogeneration on small scale level is still on a quite low level.
Grid operators	Grid operators are traditionally acquainted with cogeneration. The preferential terms for the connection o renewable energy sources (capacity <5MW_e) and cogeneration (<1MW_e) at 50% reduced connection costs (50% of the connection cost is paid by grid operator) is important incentive for these units.
Consultants	Excellent knowledge and awareness on large and medium scale cogeneration, detailed know-how on small scale is often missing.
Architects	The awareness about cogeneration is on a quite low level.
Banks, leasing	The financial sector is financing larger cogeneration investments. Although current uncertainty with future support of cogeneration has stopped majority of the financial activities.
ESCOs	Although the Polish ESCO market has a significant potential, it still remains at the initial stage of its development. The number of its players – both ESCOs and clients – is rather small. Limited number of cogeneration projects has already been implemented in industry, some of ESCOs are focused also on micro-CHP projects.

CHP awerrness assesment in Poland (4)

Policy	
Policy makers on different levels	Improving energy efficiency is the first priority of Energy Policy of Poland until 2030, where cogeneration has important role. The main actors for cogeneration promotion on a state level are Ministry of Economy infrastructure and Energy Regulatory Office, responsible for the energy policy and certificates support scheme implementation (ongoing process of legislation renewal which is resulting in current gap and huge uncertainty about the future support is the key barrier for further cogeneration development). Shifting responsibility for security of heat supply to the municipal level has increased the role of local policy makers, traditionally aware of cogeneration in district heating system, although the awareness on smaller decentralised cogeneration options is still on the low level.
Energy agencies	Energy agencies offer services and support to the municipalities in preparation of local energy strategies ("Objectives for heat, electricity and gaseous fuel supply plan") where cogeneration is one of the important efficient supply option.
Planners	Cogeneration is well known on national and municipal level, but usually the project initiators are technology providers not planers.

CHP awerrness assesment in Poland (5)

Influencers	
Sector organisations	There are several strong organisation, like Polish Cogeneration Association (PTEZ) and Polish District Heating Chamber of Commerce that are supporting cogeneration in Poland.
General public	General public awareness about cogeneration in Poland is good, especially very positive attitude to cogeneration in district heating systems. High - close to 50% share of district heating in total heat supply in Poland and limited economics are key reasons for low awareness on local small scale cogeneration.
Media	Media has positive attitude in reporting on cogeneration.
Academic area/ Research	Long cogeneration tradition in district heating and industry is resulting also in strong research and academic support and awareness.
NGOs	In general NGOs support cogeneration although they are sensitive to the environmental aspects of coal cogeneration (air and environment pollution).

CHP awerrness assesment in Poland (6)

General public awareness about cogeneration is in Poland is RATHER GOOD! The attitude toward cogeneration is positive on several levels of discussions (parliament, government, press, etc.) and the awareness on the advantages and benefits is growing.

Compared to the cogeneration leading member states (Germany and Belgium) we have identified next key differences in the awareness:

- **Firm governmental and political support and awareness resulting in clear, stable and predictable long term legislative framework is still not yet present, although cogeneration is properly positioned in several strategic documents.**
- **Lack of awareness on small scale cogeneration on all levels:**
  raise of awareness of all actors is necessary for establishing proper conditions for implementation. Besides developing market and supply of natural gas (shale gas, LNG terminal), renewable cogeneration could have important role on small scale level.

Stable and predictable long term CHP legislative framework is key element for further increase of awarreness on CHP in Poland

CHP economics

The current energy market trends are unfavorable for developing of cogeneration in Poland in the near term:

- Recent **decrease of electricity wholesale market prices** is especially influencing large district heating cogeneration plants on the competitive electricity market .
- **Increase of natural gas prices** is decreasing economics of natural gas cogeneration plants and their competitiveness toward coal generation

Additional support of existing and new cogeneration units through the certificate support scheme is key instrument, essential for both the cogeneration operational cost recovery and the necessary return of investment projections of new cogeneration plants in current unfavorable energy market conditions.

CHP economics

Poland	Micro		Small & Medium		Large		
	up to 50kW		*up to 10 MW*		*more than 10 MW*		
	NG	RES	NG	RES	NG	Coal	RES
Industry							
District heating							
Services							
Households							

Legend:

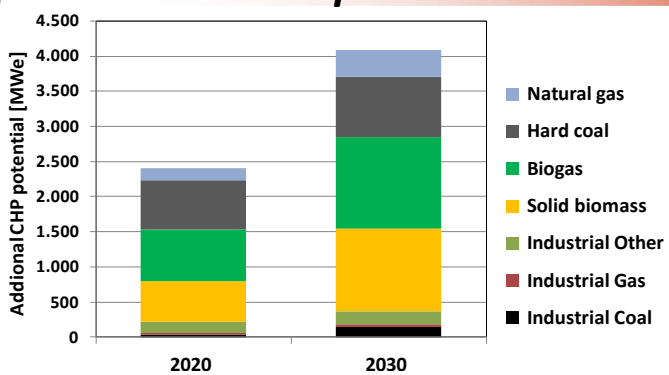
"normal" CHP Investment has **good economic benefits**, return on investment acceptable for the investors, **interest for new investment exists**; there are no significant economic barriers for the implementation.

"modest" CHP Investment has **modest/limited economic benefits** and return on investment(Y?), **limited interest for new investments**.

"poor" CHP Investment has poor or negative return on investment (?2) or is not

Current framework is providing a proper basis for further development of cogeneration in Poland in all sectors where the largest economic cogeneration potential is assed: RES CHP units (biogas and solid biomass), large CHP units on coal and industrial CHP units on natural gas and other fuels.

CHP potential



The installed capacity of high-efficiency cogeneration in Poland could be increased by more than 50% i.e. 4.000 MWe (total more than 12 000 MWe installed) by2030.

- **the CHP heat generation would be increased for almost 200 PJ,**
- **electricity production would more than double compared to the year 2006 and supply 48 TWh or 22% of gross electricity demand.**

Micro CHP potential assesment - Services

SME & Collective systems (±40 kWe)

Boiler add-on technology

Present market (2013)

Boiler stock: 170 000 units
Boiler sales: 30 400 units/year

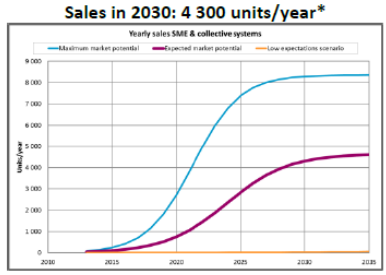
Potential estimation

Indicator	*Score*
Market alternatives	0
Global CBA	4
Legislation/support	1
Awareness	0
Total	**5 out of 9**

Expected final market share: 15% of boiler sales in SME & Coll. sector

Yearly sales

Sales in 2020: 750 units/year*
Sales in 2030: 4 300 units/year*



Stock

Stock in 2020: 4 500 units*
Stock in 2030: 29 000 units*
Stock in 2040: 46 000 units*

Micro CHP potential assesment - Households

Household systems (±1 kWe)

Boiler replacement technology

Present market (2013)

Boiler stock: 1 230 000 units
Boiler sales: 217 000 units/year

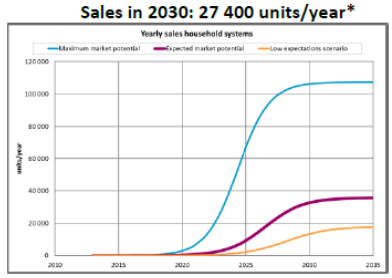
Potential estimation

Indicator	*Score*
Market alternatives	0
Global CBA	2
Legislation/support	1
Awareness	0
Purchasing power	1
Total	**4 out of 12**

Expected final market share: 17% of boiler sales in Household sector

Yearly sales

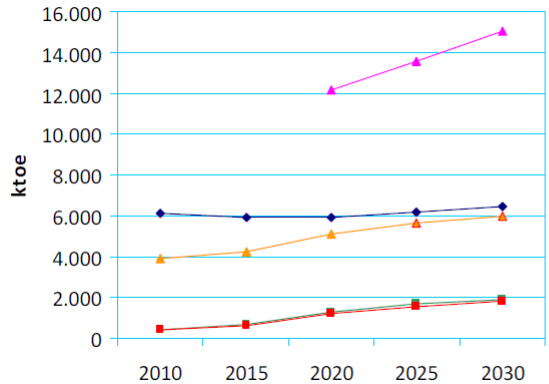
Sales in 2020: 300 units/year*
Sales in 2030: 27 400 units/year*



Stock

Stock in 2020: 740 units*
Stock in 2030: 102 000 units*
Stock in 2040: 345 000 units*

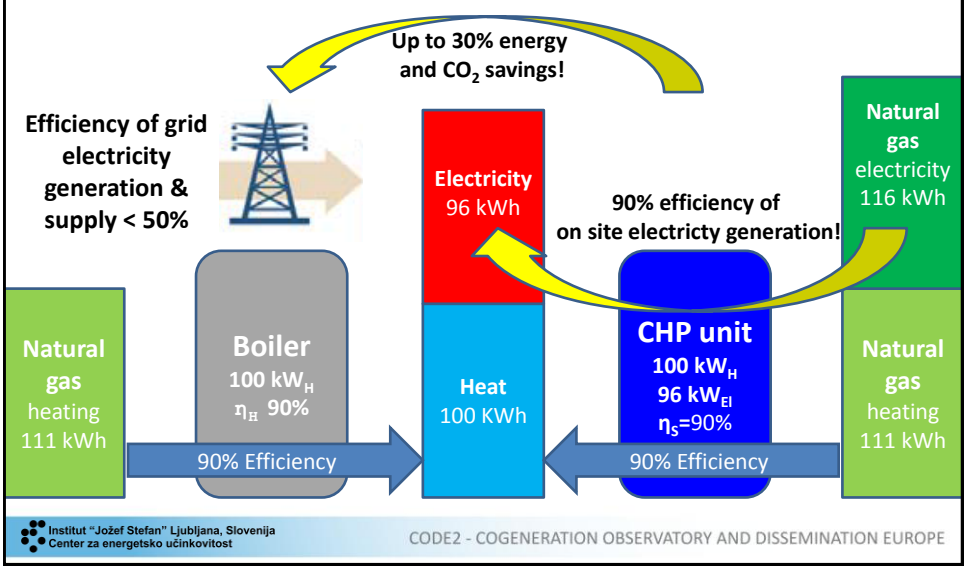
Bio-energy CHP potential analysis



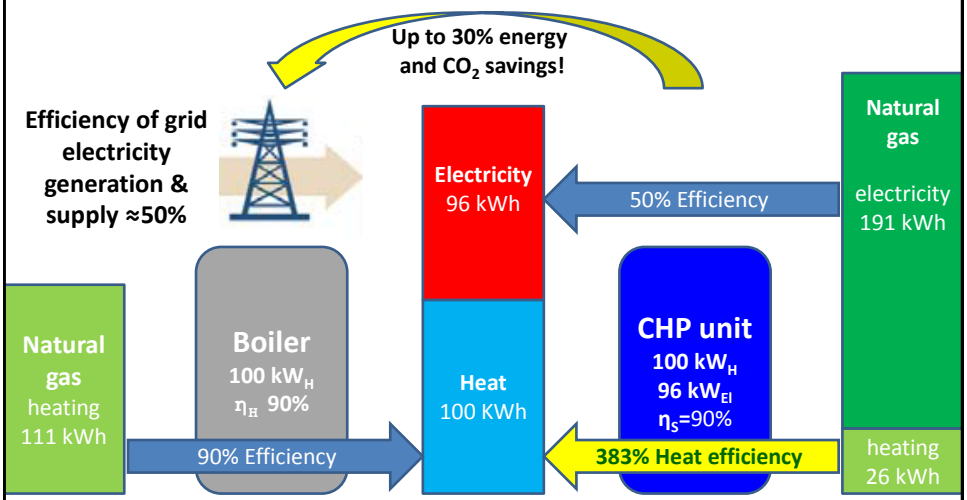
75 PJ of heat from RES CHP in 2030
(20 PJ in 2010)

Framework Assessment (Score card)	Score		
Legislative environment	+ 2 (of 3)	National supply chain for biomass for energy	++ 3 (of 3)
Suitability of heat market for switch to bio-energy CHP	++ 3 (of 3)	Awareness for DH and CHP	++ 3 (of 3)
Share of Citizens served by DH	++ 3 (of 3)		

CHP – champion in electricity generation efficiency



CHP – champion in generation efficiency



Key barriers for CHP

1. UNSTABLE LEGAL FRAMEWORK:
Changes of Energy law and CHP related legislation, long procedures, gap in the year 2013, policy indecision.

2. UNPREDICTABLE LEVEL of CHP SUPPORT:
High influence of uncertain market conditions on the price of certificates, low IRR for natural gas CHP, especially for small scale CHP units.

3. CO_2 and other ENVIRONMENTAL COSTS:
ETS and IED Directive

4. INCOMPETITEVNESS of DISTRICT HEATING:
High cost of energy and environmental refurbishment and new construction.

5. AWARNESS:
Poor awareness of micro and small scale cogeneration, incompetence of municipalities for local energy planning.

Strategy for development of CHP till 2030

Duble CHP electricity generation	• **CHP electricity production should double from 24 TWh in the year 2006 to 48 TWh till the year 2030** (22% share in domestic gross el. demand)
20% share of RES CHP	• **RES CHP should have at least 20% share in total installed CHP capacity in the year 2030** (1% in the year 2006)
Enforce sustainable local heat planning and implementation	• **Further development of district heating and other sustainablle heat supply options**

The main requirement to achieve these measurable goals of the cogeneration strategy we should establish a proper supporting framework & different specific measures to address identified barriers.

Establishing long term stable legal framework for CHP

1. **Fast establishment of CHP legal framework:**
   - **existing strategic, policy and action documents on the national level, should be better reflected in the related executive legislation and support instruments to enable a meaningful contribution of cogeneration to the EU and national goals**
   - **The Ministry of Economy should accelerate legislative procedures for approval of all cogeneration related legislation.**
2. **Modification of theCHP & RES certificates support scheme as necessary to achieve a stable and effective system:**
   - **Overcome existing gap and establish midterm, a stable and predictive support environment (at least till the year 2020, orientated toward 2030)**
   - **Transparent and active regulation of the support scheme** (New elements for mitigation of excessive energy market volatility & environmental costs)
   - **Keep the support for wood biomass co firing for CHP plants**

Development and competitiveness of district heating systems

3. **New instruments to support energy efficiency and environmental retrofit in DH and assure the competitiveness of DH compared to the other individual heating alternatives:**
   - **Subsidies (EU funds) and soft loans** for energy and environmental retrofit and extension of DH system with cogeneration and use of RES**,**
   - **Active programs and financial support of new connections** to the DH network,
   - **Simplification of administrative procedures** (simple standardised procedures), obligatory connections for new buildings in the DH area (effective legislation provision),
   - **Improvement of heat price regulation – better reflection of market conditions and cogeneration specifics** (implementation of the benchmarking method for the determination of heat prices)**.**

Development and competitiveness of district heating systems (2)

4. **Enforcing the local energy planning:**
   - **Improving the current legal framework for provinces on their obligation to develop the "objectives for the heat, electrical energy and gaseous fuel supply plan" within the process of implementation of EED:**
     - **Setting clear deadlines** for the preparation of "objectives" and **legal sanctions** for provinces
     - **Setting clear sustainable heating mode priorities** with proper legislative provisions
     - **Providing financial and expert support, training for municipal staff** and development of a standardized planning tool for local heating and cooling

Support for development of new financing & business models

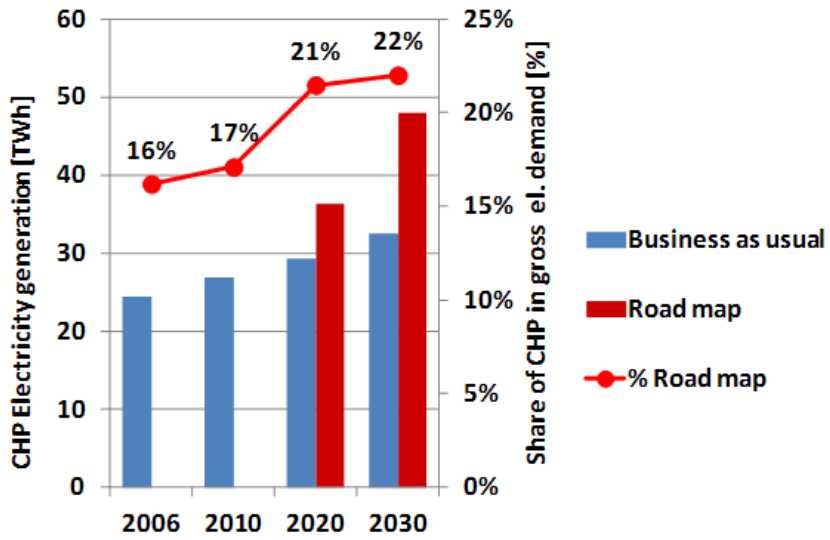
5. **Enforcing the framework for energy contracting & ESCOs:**
   - **establish necessary conditions which will enable the further development of new financing models for the implementation of energy efficiency projects by ESCOs and other private investors::**
     - Improving legislation on energy contracting, public private partnership and ESCO project implementation (clear legal basis for constitute of ESCO contracts, exclusion of ESCO contracts from municipal depth, ownership issues, etc.)
     - Preparing clear legislation interpretation and guidelines for public sector on ESCO project implementation
     - Inclusion of the ESCO concept in the subsidies program for more efficient allocation of public founds
     - Training and promotion activities for the potential customers, banks, and implementation of pilot projects

Raise awerness of small scale CHP

6. **CHP promotion campaign:**
   - **Several responsible ministries should coordinate and steer wide promotion campaign on advantages of cogeneration technology for Poland on all levels including:**
     - Promotion activities, good practice exchange
     - Incorporation of cogeneration in education and research programs

To build up on the existing successful measures, several actions are taken from Energy policy of Poland until 2030, updated with recent new proposals of actions.

Roadmap impact assessment



Conclusions

The Presented CHP Roadmap for Poland provides several advantages and benefits of exploitation of the estimated more than 4000 MWe economic potential of high efficiency cogeneration in Poland. By implementation till the year 2030 CHP could:

- **Supply 48 TWh or more than 22% of gross final electricity demand**
- **Provide more than 55 TWh additional heat**
- **At least 20% of total installed CHP capacity would use RES**
- **Reduce CO_2 emissions for at least 23 miot CO_2**
- **Contribute at least 7% to indicative target on energy savings and 20% to set targets on Energy Efficiency and RES electricity generation till the year 2020**

Roadmap implementation would have several other positive effects on development of new energy services, local cogeneration technology providers, on new jobs creation, reduced pollution and would have significant benefits for the whole economy in the sensitive period of sustainable economic crisis recovery.

Institut "Jožef Stefan" Ljubljana, Slovenija
Center za energetsko učinkovitost
CODE2 - COGENERATION OBSERVATORY AND DISSEMINATION EUROPE

Thank you for your attention and your support of the CODE 2 project in our common goal on better promotion and faster development of cogeneration in EU!

stane.merse@ijs.si

Energy Efficiency Directive (EED) – what is new for CHP and how to implement it?

Stane Merše
Jozef Stefan Institute – Energy Efficiency Centre,
Ljubljana, Slovenia

Developing a CHP Roadmap for Poland – CODE2 project Expert Workshop
Sheraton Warsaw Hotel, Warsaw
4. December 2013

Co-funded by the Intelligent Energy Europe Programme of the European Union

Content

1. Energy Efficiency Directive (EED) in general
2. Key articles linked with CHP
3. Some details and challenges for implementation
4. Other new items in EED
5. Conclusions

Institut "Jožef Stefan" Ljubljana, Slovenija
Center za energetsko učinkovitost
CODE2 - COGENERATION OBSERVATORY AND DISSEMINATION EUROPE

Merging of Directives to EED

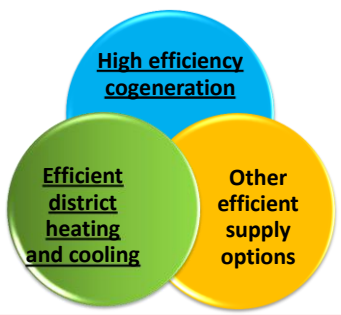
How much we gain?

Have expected more?

- ✓ **CHP – proved energy efficiency technology / measure**
- ✓ **Gets role in NEEAP**
- – **No binding target for MS (binding measures instead) –** indicative final/primary energy consumption in absolute volume in 2020.
- – **Implementation lies on MS – all capable of this task?**

Efficiency in energy supply – new in EED

The overall objective is to encourage the identification and delivery of cost effective potential for efficient heating and cooling through the use of:



Integrated approach!

Efficient heating & cooling: planning & utilization

Efficient heating and cooling

EED definitions:

'High efficiency CHP' – no changes!

'Efficient DHC' means a DHC system using at least:

- ***50 % renewable energy,***
- ***50 % waste heat,***
- ***75 % cogenerated heat or***
- ***50 % of a combination of such energy and heat***

'Efficient heating and cooling' *- measurably* ***reduces the input of primary energy*** *needed to supply one unit of delivered energy […]* ***in a cost effective way****, taking into account the energy required for extraction, conversion, transport and distribution*

PE savings + Cost effectiveness = Key EED concept

Key tasks for the MS

Comprehensive assessment of the potential for the application of high efficiency cogeneration and efficient district heating and cooling based on a **country-wide cost-benefit analysis (CBA)** – ***Annex VIII*** **(till 31 December 2015):**

CHALLENGE FOR MS!

1. **Assessment of the potential:**
   Heating and cooling demand, forecast, map of the national territory,…
   - **Technical potential for high efficient CHP & DHC**
2. **Cost benefit analysis assessment on the Country level:**
   MS shall provide detailed methodologies, assumptions, **comprehensive energy system planning that cover all relevant technical and economic options, scenario definition (baseline, alternative), valuation method & criterion (NPV), sensitivity analysis,…**
   - **Economic potential for high efficient CHP & DHC**
3. **MS shall take adequate measures […] and/or to accommodate the development of high-efficiency cogeneration […] if CBA is positive!**

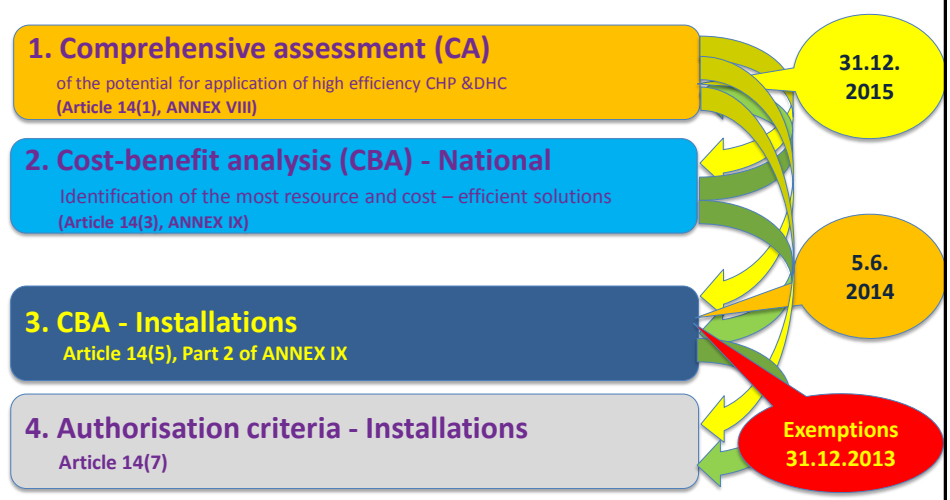
Authorisation procedure >20MW$_{ther.inp.}$

Authorisation or equivalent permit criteria and procedures based on cost benefit analysis – installation level (after 5 June 2014): for planned or substantially refurbished installations with total thermal input > 20 MW:

- **Thermal electricity generation:**
  - CBA for CHP
  - Exempted: Nuclear PP, Peak load/Back-up power, CCS
- **Industrial installation**
  - CBA for CHP & connection on DHC network
- **District heating and cooling network**
  - CBA for nearby industrial waste heat utilisation

- **MS to adopt detailed guidance on the CBA to ensure consistent, robust and quick application of this requirement across sites**
  (common assumptions on payback periods, required rates of return on investment, projected fuel and electricity prices, policy costs and support levels)

MS Obligations



CA (1): Description of heating and cooling demand

Description based on real (measured and verified) consumption information:

- National and energy statistics, national balances
- In **detailed sectoral and geographical break-down** (not less detailed than in relevant EU energy statistics): **Industry, services, agriculture and households**
- **Based on latest available data** – for year 2013? (deadline 31.12.2015)

Heat and cooling demand ≠ Statistical data

Do not wait for the 2013 data! Prepare the CA as quick as possible in order to provide guidelines for the regulation, new incentives, etc.

CA (2): Forecast of demand for next 10 years

Forecast should take into account the trends in the major sectors of the economy:

- Industry: **analyse the likely evolution of heat demand,** taking into account:
  - **longer term structural trends** (such as de-industrialisation or re-industrialisation or efficiency improvements and the impact of new production technologies)
  - as well as **shorter term cyclical changes**.
- Buildings: heat demand evolution in buildings should be given specific consideration, including analysis of the impact of energy efficiency improvements in buildings required by:
  - **Energy Performance of Buildings Directive** (2010/31/EU) and
  - **EED**

Very challenging task in current economic conditions and uncertain development.

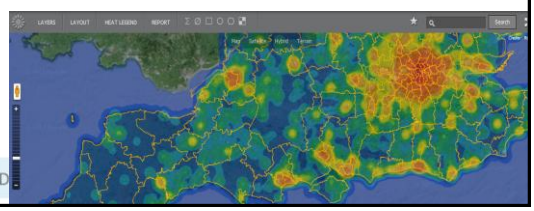
Map of the national territory with main demand and supply points

Heating and cooling demand points:

- municipalities and conurbations with a **plot ratio of at least 0.3** (2,5MWh/m linear heat density)
- industrial zones with a total annual heating and cooling consumption of **more than 20 GWh**

- **Existing and planned district heating and cooling infrastructures.**
- **Potential heating and supply points:**
  - **electricity generation installations** with a total annual electricity production of **more than 20 GWh**
  - **waste incineration plants**
  - existing and planned **cogeneration plants** (by technologies Annex I)

Map data will be used also in the individual installation CBA (nearby heat demand/supply options)



CA (4): Establishing technical potential for high efficiency CHP &DHC

Based on the identified heat demand and heat demand forecast, identification of those elements of the heat demand that technically could be satisfied by:

- **high-efficiency cogeneration,**
- **micro-cogeneration and**
- **efficient district-heating and cooling.**

This means establishing the maximum or technical potential.

CA (5): Establishing economical potential for high efficiency CHP and DHC

Identification of those parts of the technical CHP & DHC potential that can economically be met:

- by high-efficiency cogeneration, including residential micro-cogeneration,
- by the refurbishment of existing and the construction of new generation and industrial installations,
- by other facilities generating waste heat, and
- by efficient district-heating and cooling infrastructures.

This is the economic potential whose benefits exceed the costs and it is the only potential that needs to be achieved.

Establishing the economic potential will not be possible without cost-benefit analysis (CBA).

CA (6): Strategies, policies and measures

MS will have to define strategies, policies and measures that may be adopted up to 2020 and up to 2030 for development of identified cost beneficial potential (efficient DHC infrastructure, high efficiency CHP, waste heat and renewable energy sources).

- **MS have no obligation to take measures if:**
  - a potential with cost-benefit surplus **is not identified**
  - when the **cost-benefit surplus is not sufficient to cover the administrative costs of carrying out the CBA** for an installation
- **Exemption for CBA - Article 14(5)** - may be applied to installations situated in those regions/territory **where CA has not found cost-effective potential.**

CBA: Steps and considerations

1. **Identification of system and geographical boundary for given project or group of projects**
   - Region, city, project, etc.
2. **Integrated approach to demand and supply options**
   - Identification of **all heat and cooling supply and demand options** within geographical boundary
3. **Constructing a baseline (business-as usual scenario):**
   - Describe the existing situation: collection of all available data
4. **Identify Alternative scenario:**
   - Consider all relevant realistic alternatives (technical, financial, time, law, etc.) **feasible for increasing heating and cooling efficiency:**
     - **Cogeneration & DHC**
     - **Other efficient (individual) solutions**

CBA: Steps and considerations (2)

5. **Cost-benefit surplus assessment**
   - **The total long-term cost and benefits assessment and comparison**
   - **Net present value (NPV)** valuation criterion requested
   - **Used prices shall reflect the true socio economic costs and benefits** (include external costs – environmental and health effects, to the extent possible).
   - **Forecasts** of energy prices and other relevant variables for economic analysis,
   - **Inventory of all relevant economic effects:**
     - **Benefits:** value of output for consumer, external benefits, avoided costs & savings
     - **Costs:** Capital, O&M, energy, environment & health (plants, networks)
   - **Sensitivity analysis**

MS shall designate the competent authorities responsible for carrying out the CBA (local, regional, national, individual operators, etc.)

Article 15 (CHP)

Obliges MS to ensure that cogenerated electricity from high efficiency CHP gets:

- a **guaranteed transmission and distribution**
- priority or **guaranteed access** to the grid
- **priority of dispatch** in so far as the secure system operation
- **simple notification** "install and inform" for micro CHP
- **enable system services** from CHP, demand response

But:

Reference is made to Electricity Directive, 2009/72/EC and RES-E provisions in Directive 2009/28/EC:

- **When ranking different types/classes of generators, variable RES-E shall be first but high efficiency CHP may be on a parity level.**
- **However, MS shall take into account the need to ensure continuity in heat supply**

Other EED provisions

Article 7: Energy efficiency obligation schemes

- **1.5% energy saving target per annum** for energy suppliers (to be designated by MS)
  - full latitude to design the scheme based on Primary or Final Energy Savings
  - energy savings achieved in the energy transformation, distribution and transmission sectors, including efficient DHC infrastructure allowed
  - MS can use also alternative measures to achieve same savings

Other EED provisions (2)

Article 4: Building renovation

- long-term strategy for mobilising investment in the renovation of the national stock of residental & commercial buildings

Article 5: Exemplary role of public bodies' buildings

- Obligatory 3% annual state buildings energy retrofit

Article 8: Energy audits and energy management systems

- Programs for SME
- Obligatory for other companies – every 4 years, except if implemented certified energy or environmental management system (ISO 50.001, etc.)

Article 9: Metering

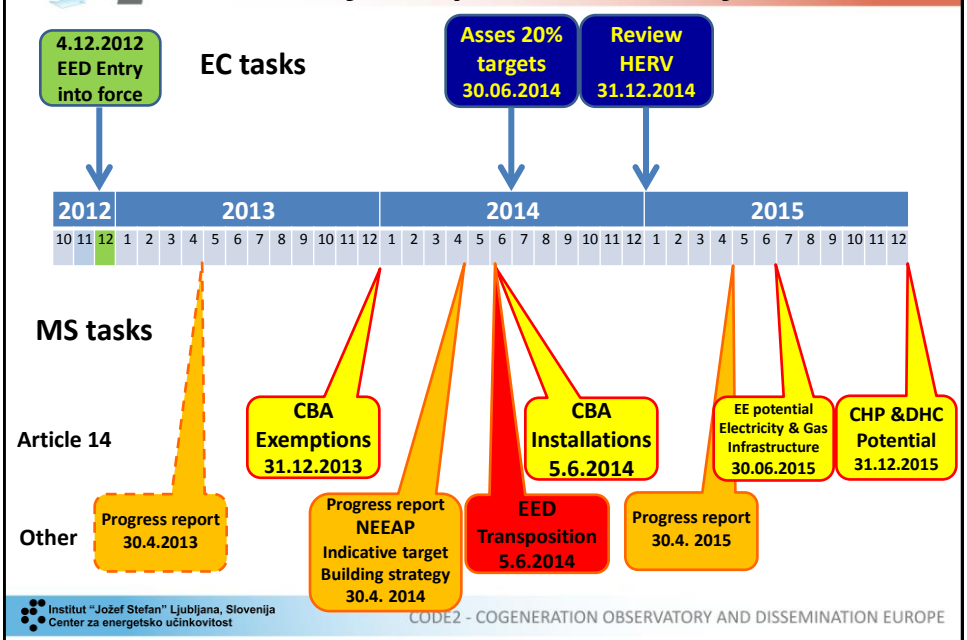
- Individual metering, provide information on time of use and objectives on energy efficiency

Article: 18: Energy services (ES)

- MS promotion of ES and access for SMEs

Could that trigger faster CHP development?

Timeline for implementation of art 14



Conclusions

➢How much we gained?

- We have not lost, cogeneration founded as energy efficiency!
- Efficiency in energy supply!
- Hope for the improvement by new obligations and instruments

➢Implementation lies on MS

- Assessment of the potential
- CBA on national/installation level and authorisation procedures (what for units < 20 $MW_{ther.inp.}$?)
- Regulatory aspects (dispatch, connection,…)
- CA – EED: New CT 7 Efficiency in Energy supply (CHP, DHC)

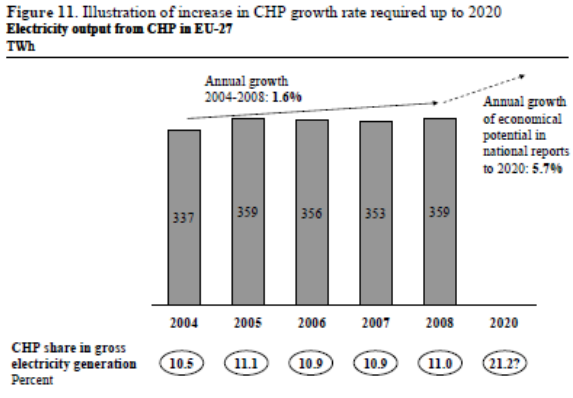
www.esd-ca.eu

Dr Fiona Riddoch - COGEN Europe

CODE2 Workshop

"**EED impacts on CHP market** - Fiona Riddoch, COGEN Europe"
Warsaw December 04 2013

CHP electricity output 2004-2008



www.cogeneurope.eu

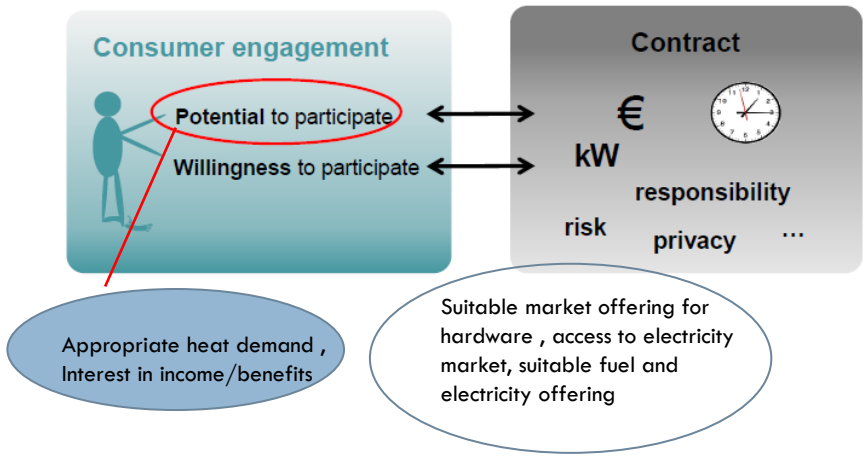
European Market for cogeneration in 2013

- The Cogeneration market in Europe is generally flat with pockets of growth.
- Growth in areas where member states have taken initiative to promote.
- Growth in small scale flexible cogeneration<1MW in some member states
- Refurbishment going on in a small number of sectors
- Investment frozen in much of large industrial CHP on gas.

Impacts on CHP market of the EED : confidence

- EU aiming to put confidence in the original aims of 20% ES by 2020
  - EU strengthening actions on Energy Efficiency through a range of possible measures .
  - EU concept of creating a single market for Energy Efficiency
- CHP opportunity to win better policy support by full implementation of Articles 14,15,7.
- Private investment confidence : Credit risk, project risk and technical risk
- Industry confidence that it can have energy efficiency rewarded.

Customers engage with CHP for much the same reasons consumers choose to buy and operate products.



Barriers to CHP and why is not economic? (or why does it require a suitable policy environment?)

- There is no market for energy efficiency investment : Investing in cogeneration the local fuel costs rise and the energy savings is made at a remote power station.

  Issues

  - The electricity market does not always reward the electricity produced, and recent changes have both increased investment risk and reduced wholesale prices to variable cost based pricing at certain periods.
  - The utility sector sees increased cogeneration as an erosion of their own market.
  - Cogeneration is heavily dependent on the “spark spread” the difference between the cost of fuel and the cost of electricity. Strong fuel link to profitability.

Why cogeneration from a market perspective?

- Where it makes good economic sense by reducing energy costs for the host…….
- Approach is scalable to many target project sizes
- Fuel independent approach.
- Straight forward to implement available well supported technology
- Small environmental footprint with good public acceptance
- Lowers carbon footprint

What does the member state get out of CHP ?

- Clear primary energy savings associated with High efficiency CHP and lower electricity network losses (min 10% in practice closer to 25%).
- Good use of existing infra structure in both electricity and fuel supply.
- Reliability of generation good match to renewables on the electricity network
- Supports industrial productivity, and efficiency
- Small environmental footprint with good public acceptance.

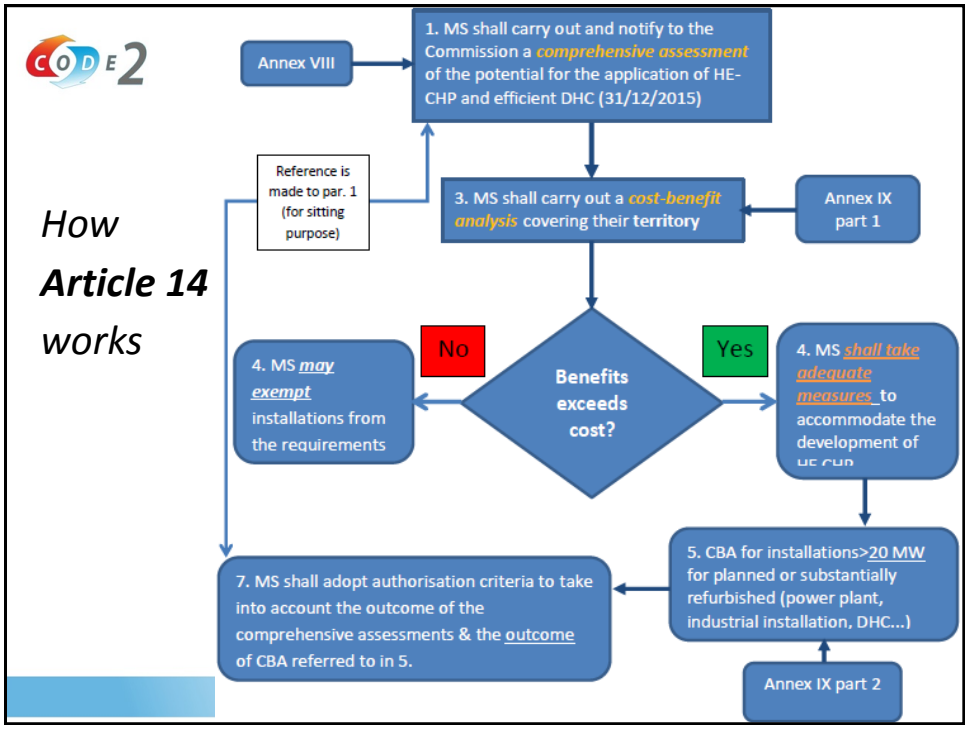
EED positives for CHP Market

- **Article 14 : Comprehensive Assessment : Strong scrutiny needed on annexes VIII & IX, decision-making process + methodologies (Allows member states to quantify the system benefits, PES , infra structure network resilience, productivity)**
- **Article 15 : According to the national context, action will be needed in the process of setting the priority of dispatch ranking . Propose CHP electricity equal to renewables. (cost reduction and risk mitigation for projects)**
- **Article 15 : Demand Side Management provisions and balancing potential of HE CHP clearly mentioned (with MS setting penalties for those hampering the development of those markets)**
- **Article 7 : Links to Energy Performance of Buildings Directive (EPBD) 2010/31/EU. DHC and micro-chp steps on the way to deep rennovation. Grows the customer base of interested customers . Improve attractiveness to utilities and ESCOs.**
- **Recitals + articles 12, 15+ annexe VIII : Micro-chp mentioned many times throughout the text**
- **Article 20 : National fund / financing opportunities for the Energy Efficiency sector**
- **Article 25 : Online tools to raise awareness on Energy Efficiency solutions**
- **Article 8 : Auditing include CHP assessment and advice?**

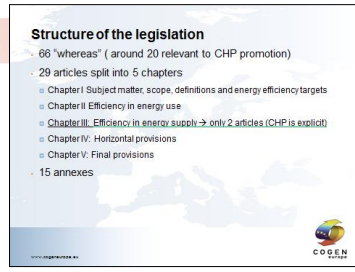
www.cogeneurope.eu

COGEN europe

How ***Article 14*** *works*



Key dates



- Article 14 para 6: Notify the Commission of exemptions December 2013
- Article 7: Notify Commission of use of 25% other measures equivalent
- National progress report April 2014
- Transposition deadline: May 2014
- Assessment of 20% EU target and consider new measures June 2014
- Introduce CBA in line with Article 14 for new installations over 20MW
- Comprehensive assessment December 2015

- THANK YOU
- DZIĘKUJEMY

www.cogeneurope.eu

EED - *Article 14, Annexes VIII & IX*

- MS shall carry out by 31 December 2015 a « comprehensive assessment » (CA) of the potential for the application of high-efficiency cogeneration and efficient district heating and cooling
- CA shall contain the information set out in Annex VIII
- As part of the CA, Member State shall carry out a cost-benefit analysis (CBA) according to Annex IX part 1
  - Covering their territory
  - Based on climate conditions, economic feasibility and technical suitability
- If the outcome of CBA is positive then:
  - "Member States shall take adequate measures […] and/or to accommodate the development of high-efficiency cogeneration […]"
  - Each installation above 20 MW thermal input shall carry out a CBA according to Annex IX part 2
  - Authorisation/permitting decision shall take into account the outcome of the CBA

EED - *Article 14 & Annexes*

- **Annexes I**, **II** and **X** (HE CHP methodology and PES calculation + Guarantee of Origin): No change
- **Annex I**: Delegated act needed for the review of the ref values (by 2015 and then every 10 years but possible loophole for the 2025 review)
- **Annex VIII** "potential for efficiency in heating and cooling":
  - Comprehensive assessment "shall include […] Strategies, policies and measures that may be adopted up to 2020 and up to 2030"
  - Potential identified via 2004/8/EC and Primary Energy Savings are clearly indicated
- **Annex IX** "Cost benefit analysis (CBA)" :
  - 2 parts → one for analysis at territory level, the other one at installation level
  - Net Present Value criteria
  - Time horizon of CBA mentioned for handful of examples

EED - Article 15

Article 15 obliges Member State to ensure that cogenerated electricity from high efficiency CHP gets:

- a guaranteed transmission and distribution
- priority or guaranteed access to the grid
- priority of dispatch in so far as the secure operation of the national electricity system permits

AND:

- Reference is made to Electricity Directive, 2009/72/EC
- Reference is made to the RES-E provisions in Directive 2009/28/EC
- When ranking different types/classes of generators, variable RES-E shall be first but high efficiency CHP may be on a parity level
- However, MS shall take into account the need to ensure continuity in heat supply

EED - Article 15 (5)

"Without prejudice to Article 16(2) of Directive 2009/28/EC and taking into account the provisions of Article 15(1) and (2) of Directive 2009/72/EC and **the need to ensure continuity in heat supply**,

....

Member State shall ensure that rules relating to the ranking of the different access and dispatch priorities granted in their electricity systems are clearly explained in detail and published. When providing priority access or dispatch for high efficiency cogeneration, Member States may set rankings as between, and within different types of, renewable energy **and high efficiency cogeneration and shall in any case ensure that priority access or dispatch for energy from variable renewable energy sources is not hampered**."

EED - *Article 7*

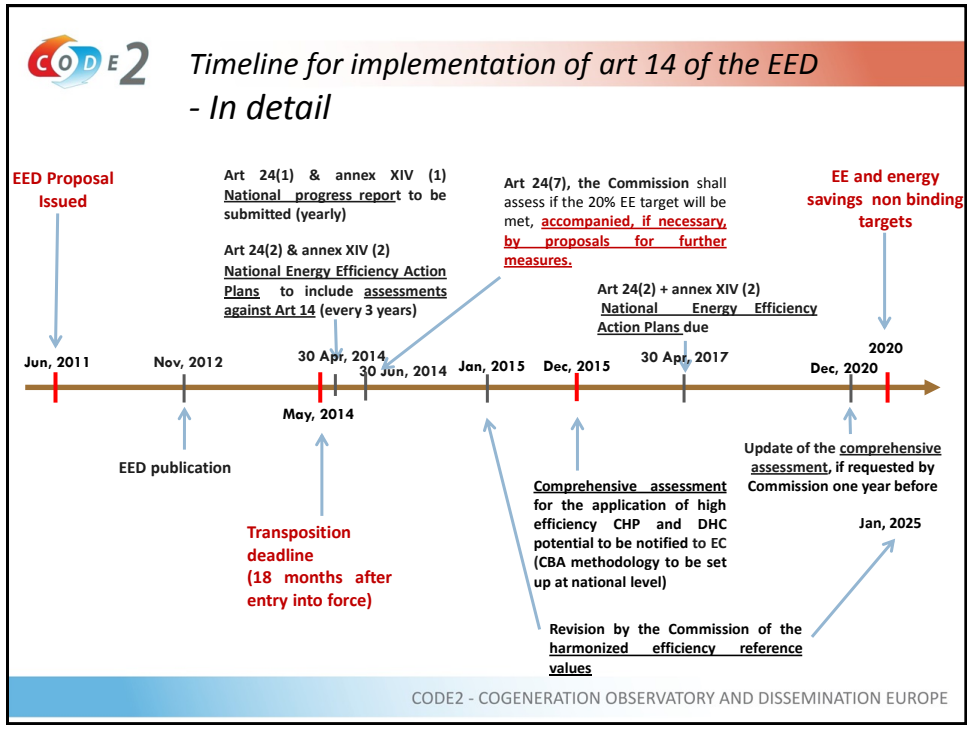
- Aiming at changing the way companies retail energy→ energy services promotion
- Full latitude to design the scheme based on Primary or Final Energy Savings
- 1.5% energy saving target per annum for obligated parties (to be designated by MS)
- ETS covered installations may be excluded from the obligation
- Par. 2.c) allowing energy savings achieved in the supply side to be taken into account → MS "may" use this approach but no double counting allowed
- Par 3. capping at 25% the bundle effect of all the flexible measures
- Linkages to the EPB Directive
- Energy Services Companies to take part in the « energy efficiency obligation schemes »

EED positives for CHP growth

- Article 14
- Comprehensive Assessment : Strong scrutiny needed on annexes VIII & IX, decision-making process + methodologies could be useful focus for coalition on CHP.
  - Annex VIII → UK and Danish experience and work
  - CODE 2 process helps identify barriers and "adequate measures", particularly under 20MW.
  - CODE 2 develops proposals on micro CHP
- Article 15
  - According to the national context, action will be needed in the process of setting the priority of dispatch ranking . Propose CHP electricity equal to renewables.
- Article 7
  - Make sure link to Energy Performance of Buildings Directive (EPBD) 2010/31/EU in what regards DHC and micro-chp is well understood and clear enough
  - Utilities may be encouraged to understand the value of implementing CHPs while moving to ESCompanies

Others

- Micro-chp mentioned many times throughout the text (recitals + articles 12, 15+ annexe VIII…)
- Demand Side Management provisions and balancing potential of HE CHP clearly mentioned (with MS setting penalties for those hampering the development of those markets)
- financing opportunities for the EE sector
- Online tools to raise awareness on EE solutions
- And many more: auditing, empowerment of customers…


Timeline for implementation of art 14 of the EED
- In detail
EED Proposal Issued
Art 24(1) & annex XIV (1) National progress report to be submitted (yearly)
Art 24(2) & annex XIV (2) National Energy Efficiency Action Plans to include assessments against Art 14 (every 3 years)
Art 24(7), the Commission shall assess if the 20% EE target will be met, accompanied, if necessary, by proposals for further measures.
Art 24(2) + annex XIV (2) National Energy Efficiency Action Plans due
EE and energy savings non binding targets
Jun, 2011
Nov, 2012
30 Apr, 2014
30 Jun, 2014
Jan, 2015
Dec, 2015
30 Apr, 2017
2020
Dec, 2020
May, 2014
EED publication
Transposition deadline (18 months after entry into force)
Comprehensive assessment for the application of high efficiency CHP and DHC potential to be notified to EC (CBA methodology to be set up at national level)
Update of the comprehensive assessment, if requested by Commission one year before
Jan, 2025
Revision by the Commission of the harmonized efficiency reference values
CODE2 - COGENERATION OBSERVATORY AND DISSEMINATION EUROPE

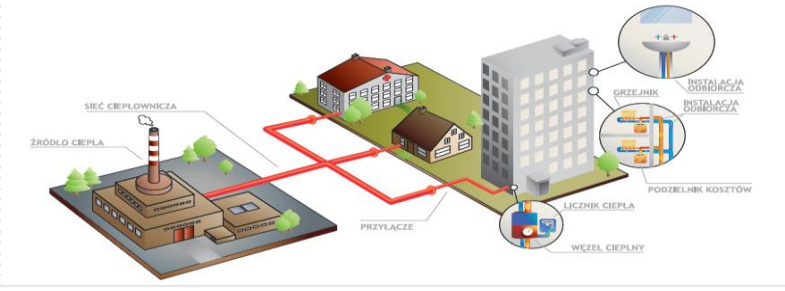
CHP in District heating
How to provide future development?

Chamber of Commerce
Polish District Heating

Izba Gospodarcza
Ciepłownictwo Polskie

Basic information about district heating

District heating always has local character and concerns local heat markets



In Poland, around 15 mln people use district heating
The participation of district heating in meeting demands for communal heat in cities amounts to around 60%

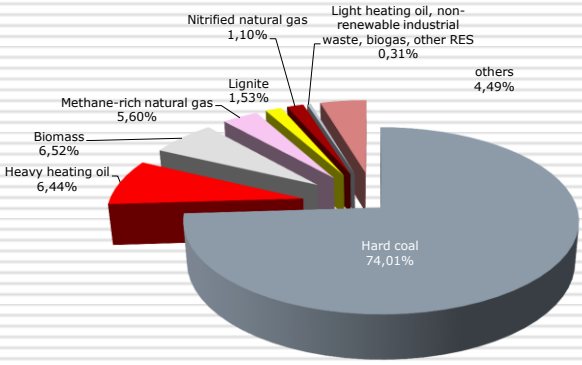
Characteristics of district heating in Poland

Surface of all flats in Poland	**951,2 mln m²**
Surface of all flats heated with district heating	around 335 mln m²
Number of flats heated with district heating	around 5,4 mln
Number of receivers (combined: individual and collective)	around 140.000
Number of individual receivers (mainly single family houses)	around 39.000
Average annual use of heat per flat	31,2 GJ/year
Average power ordered per flat	5,8 kW

Technical and economic data describing district heating in Poland

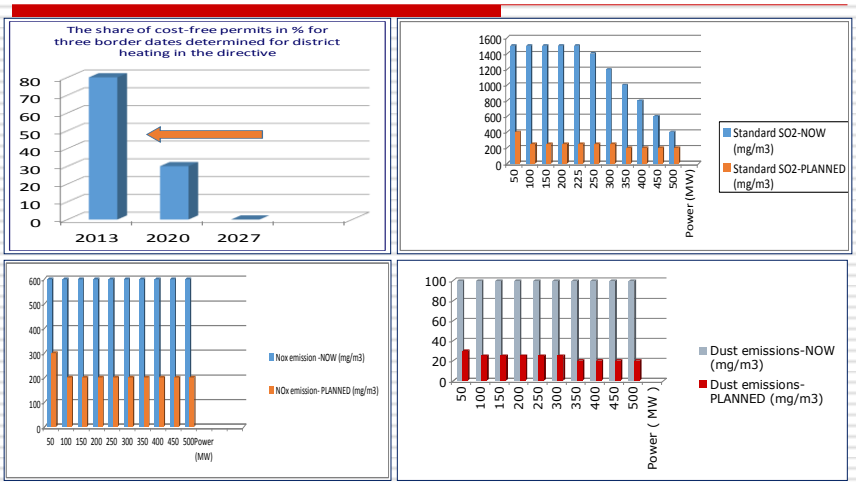
Specification	**Measurement unit**	**Value in:**	
		2011	2012
Number of licensed heating companies	-	476	463
Installed heating power	MW	58 300	58 140
Heating power ordered by receivers	MW	34 470	34 400
Annual heat production	TJ	392 000	399 670
including CHP	TJ	252 200	249 960
Annual amount of heat provided to receivers connected to network	TJ	240 400	248 000
Length of heating networks	km	19 620	19 790
Annual incomes	PLN (in thousands)	15 430 000	16 780 000
Profitability	%	-1,56	- 1,64
Decapitalization	%	56	52
Annual CO_2 emission	t	39 800 000	41 500 000

Scale of required investments determined by the structure of fuel consumption



Structure of fuel consumption in heat production in 2011 (measured by amount of heat in fuels)

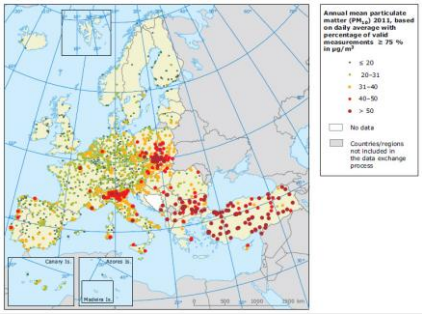
Investments required by the EU climate and energy package



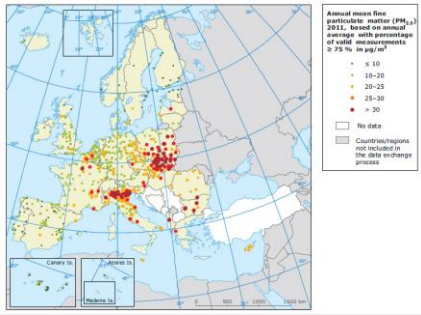
The necessity of liquidation of the low emission

Air quality in Europe – EEA report for 2013

Average annual mean particulate matter (PM 10)



Average annual mean fine particulate matter (PM 2,5)



Europe's polluted cities

(source: The New York Times, according to EEA)

Cities in Bulgaria and Poland had the highest levels of air pollution, as measured by concentrations of particulates, in a survey of 386 European Union cities.

Most polluted European cities

Level of pollution in selected cities

Average number of days in 2011, when PM pollution exceeded EU target (max 35 days/year)

Nr	City/country	Days above target	Nr	City	Days above target
1	Pernik / Bulgaria	180,0	43	Venice	85,0
2	Plovdiv / Bulgaria	161,0	57	Bucharest	69,0
3	Cracow / Poland	150,5	87	Budapest	54,4
4	Pleven / Bulgaria	150,0	117	Frankfurt	37,0
5	Dobrich / Bulgaria	145,0	136	Berlin	31,5
6	Nowy Sącz / Poland	126,0	150	Brussels	28,5
7	Gliwice / Poland	125,0	204	Amsterdam	20,8
8	Zabrze / Poland	125,0	225	Birmingham	18,0
9	Sosnowiec / Poland	124,0			
10	Katowice / Poland	123,0			

The potential of district heating in the liquidation of low emission

- According to statistics provided by GUS (Main Statistics Office) for 2011, 10 million tons of hard coal is burned annually for individual heating in Poland. Taking into the account the fact that the efficiency of these installations is significantly below 65%, it is assumed that around 4 million tons of hard coal is being wasted. These devices produce 178 000 TJ of heat.
- In order to make a comparison, it is worth looking at the process of district heating production. In heating- and CHP plants, coal burning takes place with an average efficiency of 85,3%, while transportation of heat - 87,3%, what, in effect, gives a combined production and transportation efficiency at the level of 74,5%.
- **Comparison of dust emission during the production of 178 000 TJ of heat**

Type of pollution	Individual heating	District heating
dusts	101.000 tons	10.000 tons

Cogeneration

Challenges for DHC

Source: Energy Regulatory Office Publisher report

Genaration of heat Year	Total (TJ)	In cogeneration (TJ)	Share of cogeneration heat (%)
2008	396622	250675	63
2009	398340	253249	64
2012	399 670	249 960	63
to the utilization			36

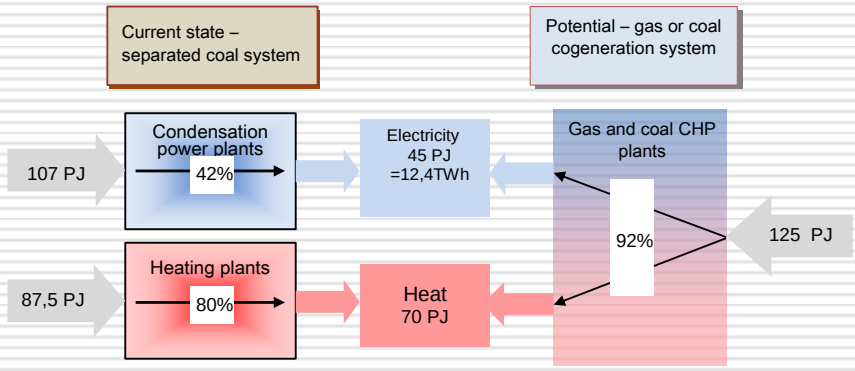
Estimated electricity power possible to obtain concerning the planed rise of cogeneration share	2000 – 3000 MW

The development of cogeneration is necessary due to:

- energy efficiency improvement,
- energy safety increase,
- development of competitive fuel and energy markets,
- limitation of energy influence on environment

Potential of development for high-efficiency cogeneration

Ecological effect of cogeneration systems – 30% lower emission



Energy potential of communal waste in Poland

Amount of waste produced	12-13 mln tons/year	
Burnable communal waste	6-6.5 mln tons/year	Around 38 PJ of heat Around 3 TWh of electricity
Current state	86% of waste reaches landfills unprocessed	Around 9% - recyclable waste Around 4.5% - waste after biomechanical treatment
Burned waste	ca. 0.5 %	One plant

Requirements related to RES participation

for district heating in Poland will amount to 17% in 2020

Zwiększanie udziału OZE

Rok	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Ciepło (%)	12	12,3	12,6	12,9	13,2	13,6	14,3	15,0	15,7	16,2	17,0
E (%)	6,2	7,22	8,22	9,25	10,40	11,52	12,9	14,35	15,68	17,73	19,43
T (%)	5,3	5,8	6,6	7,2	7,8	8,3	8,7	9,1	9,6	10,0	10,2
Całkowity udział (%)	9,1	9,6	10,2	10,7	11,2	11,7	12,5	13,2	13,9	14,7	15,5

Źródło: Krajowy plan dla OZE

Development of district cooling

The benefits of the association of processes of electricity, heating and cooling generation, are:

- more efficient use of primary energy,
- reduction of CO_2 emission,
- elimination of environmentally harmful CFC's used in compressor units,
- improvement of economic efficiency of domestic heating systems,
- increase of electricity production in in summer peak load of power system

The main benefit of cooling production is the possibility to use heat produced in summer periods in installations provided with cogeneration units

In major Polish agglomerations provided with heat from CHP plants, there are favorable conditions for associating the processes of electricity, heat and cooling production.

According to the President of Energy Regulatory Office:

The emergence of a new economic activity, which is already functioning in EU Member States' economies, i.e. ***the production and sale of heat based on district heating*** *on domestic market, would be positive.*

Promotion of ecological and efficient solutions on EU legislation level – directive on energy efficiency

support for cogeneration and district heating
heating networks are indispensible for the development of cogeneration

EFFICIENCY IN ENERGY SUPPLY

- Article 14
- Promotion of efficiency in heating and cooling 1. By 31 December 2015, **Member States shall carry out and notify to the Commission a comprehensive assessment of the potential for the application of high-efficiency cogeneration and efficient district heating and cooling**, containing the information set out in Annex VIII. If they have already carried out an equivalent assessment, they shall notify it to the Commission.
- **Member States shall adopt policies** which encourage the due taking into account at local and regional levels of the potential of using efficient heating and cooling systems, in particular those using high-efficiency cogeneration. Account shall be taken of the potential for developing local and regional heat markets.
- 4. Where the assessment referred to in paragraph 1 and **the analysis referred to in paragraph 3** identify a potential for the application of high-efficiency cogeneration and/or efficient district heating and cooling whose benefits exceed the costs, **Member States shall take adequate measures for efficient district heating and cooling infrastructure** to be developed and/or to accommodate the development of high-efficiency cogeneration and the use of heating and cooling from waste heat and renewable energy sources in accordance with paragraphs 1, 5, and 7. 4.

➢ *efficient district heating and cooling" means a district heating or cooling system using at least 50 % renewable energy, 50 % waste heat, 75 % cogenerated heat or 50 % of a combination of such energy and heat*

Advantages of district heating

1	High level of energy and ecology efficiency of heating in terms of: production, transportation and distribution:
a	high efficiency of heat production with the use of cogeneration and local RES
b	ability to use the synergy effect of processes connected to the utilization of communal waste and its energetic usage, as well as with other technologies characteristic for communal economy
c	limitation and liquidation of low emission's influence on ecological standards in large population centers
2	Reduction of greenhouse gases on global scale
3	High guarantee of stability and security of heat supply regardless of the character of needs (heating, warm water, cooling)
4	Possibility of ensuring heat comfort for consumers with minimal financial and organizational engagement. Ensuring heat comfort does not require consumer's engagement
5	High competence level of management and employees

The development of the awarenees (in exactly definite groups of approach)

Project of the Polish Chamber – broader view

Marketing program covering all Poland

Old product – new product brand called 'System Heat' , promotion of DH and cogeneration

CONSUMER
end user of heat network

CLIENT
housing associations and communities

commercial and individual receipients (agreement)

INVESTOR
executing investments

DESIGNER
specialists designing installations

architect executing the project

MEDIA
journalists dealing with heat branch (local and covering all Poland media)

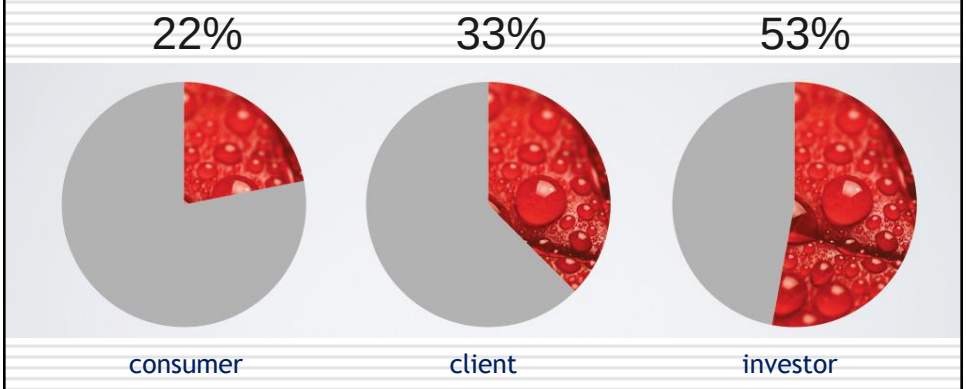
AUTHORITIES
local and state

HEATING ENTERPRISES
system heat distributors

CHP PLANTS HEAT PLANTS
system heat producers

COMPANIES COOPERATING WITH DH SECTOR
Program partners

The recognizability of the mark



Dane: badania PBD/DGA 04.2011

CHP in District heating
how to provide future development?

Thank you for your attention

Jacek Szymczak
Tel. +48 022 6447019
bi.warszawa@igcp.org.pl

Chamber of Commerce
Polish District Heating

Izba Gospodarcza
Ciepłownictwo Polskie

ELEKTROCIEPŁOWNIE PRZEMYSŁOWE

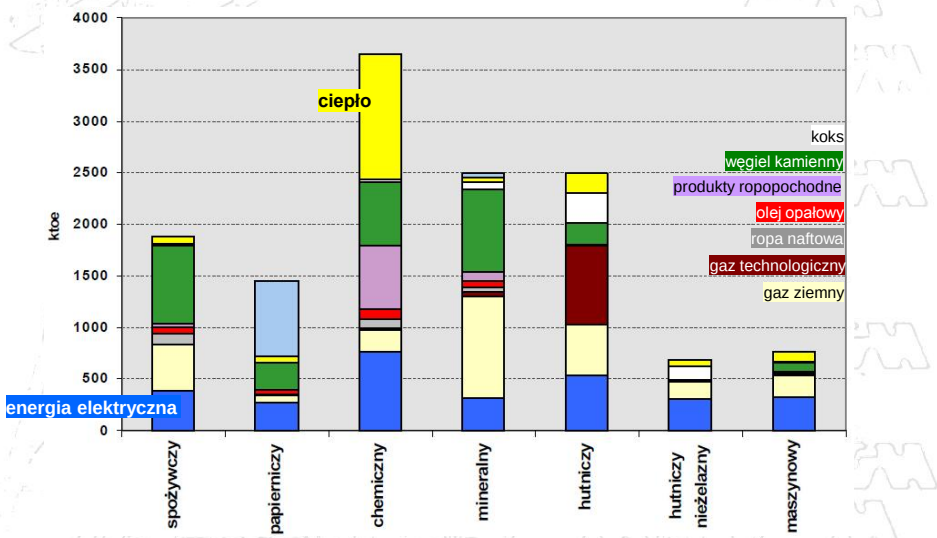
STAN I PERSPEKTYWY NA PRZYSZŁOŚĆ.

Henryk Kaliś
PTEZ Warszawa 04 grudnia 2013 r

ENERGETYKA PRZEMYSŁOWA

- **stan obecny.**

POLSKI PRZEMYSŁ – zapotrzebowanie na energię.



Polski przemysł zużywa rocznie około 16 mln. ton paliwa umownego (toe) w tym około 30 TWh energii elektrycznej.

ENERGETYKA PRZEMYSŁOWA – zalety i wady.

Obecnie energetyka przemysłowa oparta jest w większości na średniej wielkości jednostkach energetycznych produkujących energię elektryczną i ciepło. Produkcja odbywa się często w wysokosprawnej kogeneracji, przede wszystkim na potrzeby własne i lokalne. Są to przeważnie jednostki węglowe.

Zalety energetyki przemysłowej:

- ✓ energia jest **zużywana w pobliżu miejsca jej wytwarzania** - brak strat przesyłowych;
- ✓ **zmniejszenie opłat za przesył**;
- ✓ łatwe **dopasowanie wytwarzania do potrzeb** odbiorców;
- ✓ **brak kosztu „kolorowych certyfikatów”** dla energii elektrycznej zużywanej na potrzeby własne.

Wady energetyki przemysłowej:

- ✓ często **niska sprawność wytwarzania** ze względu na efekt skali i stopień wyeksploatowania urządzeń wytwórczych;
- ✓ **niski poziom inwestycji** w energetyce przemysłowej często z powodu zarządzania nią przez gremia przemysłowe a nie energetyczne;
- ✓ **mała wielkość jednostek wytwórczych** często powodująca, że duże inwestycje pro-ekologiczne w takie jednostki nie są opłacalne.

ENERGETYKA PRZEMYSŁOWA – aktualny potencjał.

Źródła wytwórcze w przemyśle:

- ✓ Chemiczny;
- ✓ Drzewny i celulozowo papierniczy;
- ✓ Spożywczy.
- ✓ Hutnictwo stali;
- ✓ Górnictwo Węgla, Koksowniczy;
- ✓ Hutnictwo metali nieżelaznych;
- ✓ Mineralny;

5 % krajowej produkcji energii elektrycznej

moc cieplna zainstalowana **11,6 tys**. MW_t

moc elektryczna zainstalowana **1,9 tys**. MW_e

produkcja energii elektrycznej **7,8 TWh**

Średnia sprawność źródła przemysłowego wynosi 77,36%, wykorzystanie mocy zainstalowanej elektrycznej nieznacznie przekracza 50% a mocy zainstalowanej cieplnej, jest nieco poniżej 40%.

ENERGETYKA PRZEMYSŁOWA – aktualny potencjał, chemia.

LP.	Nazwa podmiotu gospodarczego	P_n turbozespołów	P_{nEl} osiągalna
1	Polski Koncern Naftowy ORLEN S.A. (d. Petrochemia Płock)	345,0	345
2	ANWIL S.A.	126,6	91,6
4	Zakłady Azotowe PUŁAWY S.A.	117,5	112
6	Zakłady Chemiczne "POLICE" S.A.	101,6	100,4
7	Zakłady Azotowe w Tarnowie Mościcach S.A.	96,8	102
8	Synthos Dwory 7 Sp. z o.o. - Elektrociepłownia Oświęcim	84,3	79,8
11	Soda Polska CIECH S.A. Zakład w Janikowie	52,2	31
12	Zakłady Azotowe "KĘDZIERZYN" S.A.	45,8	45,8
16	Soda Polska CIECH S.A. Zakład w Inowrocławiu	35,9	35,9
17	Grupa LOTOS S.A. (d. Rafineria Gdańska)	30,0	30
22	PCC Rokita S.A. - Ec. Rokita III	14,0	14
32	LOTOS Petrobaltic S.A. Przeds. Poszukiwań i Eksploatacji Złóż Ropy i Gazu	8,9	3,3
35	PCC Rokita S.A. - Ec. Rokita II	8,2	8,2
49	Gdańskie Zakłady Nawozów Fosforowych FOSFORY Sp. z o.o.	4,0	3,1
54	Rafineria Nafty JEDLICZE S.A.	2,5	2,5
66	Synthos Dwory 7 Sp. z o.o. - Elektrownia Tarnów	0,8	0,8
	BRANŻA CHEMICZNA	1 074,1	1 005,4

ENERGETYKA PRZEMYSŁOWA – aktualny potencjał: papier, stal, górnictwo.

LP.	Nazwa podmiotu gospodarczego	P_n turbozespołów	P_{nEl} osiągalna
3	Mondi Świecie S.A.	122,0	100
5	INTERNATIONAL PAPER KWIDZYN Sp. z o.o.	111,6	111,6
13	Stora Enso Poland S.A.	43,0	43
14	Arctic Paper Kostrzyn S.A.	40,4	36,3
50	Fabryka Papieru Myszków Sp. z o.o.	4,0	3
51	Głuchołaskie Zakłady Papiernicze Sp. z o.o.	4,0	2,5
63	Metsa Tissue Poland Sp. z o.o. - Ec. Jeziorna (d. ENERGOPEP Sp. z o.o.)	1,6	1,6
	BRANŻA PAPIERNICZA	326,6	298,0
9	„ArcelorMittal Poland" S.A. - Oddz. w Krakowie (d. Huta Sendzimira)	81,0	80
10	„ArcelorMittal Poland" S.A. - Oddz. Zdzieszowice Koksownia ZDZIESZOWICE	75,0	64
36	„ArcelorMittal Poland" S.A. - Oddz. w Sosnowcu (d. Huta Cedler)	7,5	7,5
	BRANŻA STALOWA	163,5	151,5
15	Koksownia PRZYJAŹŃ Sp. z o.o.	39,0	43,5
58	Kompania Węglowa S.A. - KWK Knurów - Szczygłowice	1,9	1,9
59	Kompania Węglowa S.A. - KWK Sośnica - Makoszowy	1,9	1,9
61	Jastrzębska Spółka Węglowa S.A. KWK BORYNIA	1,8	1,8
67	Kompania Węglowa S.A. Oddz. KWK HALEMBA - WIREK	0,5	0,5
68	Kompania Węglowa S.A. - KWK Bielszowice	0,5	0,5
	GÓRNICTWO WĘGLA	45,6	50,1

ENERGETYKA PRZEMYSŁOWA – aktualny potencjał, cukrownie.

LP.	Nazwa podmiotu gospodarczego	P_n turbozespołów	P_{nEl} osiągalna
19	Krajowa Spółka Cukrowa S.A. Oddz. Cukrownia KRUSZWICA	18,4	18,4
20	Pfeifer & Langen Glinojeck S.A.	18,0	18
21	Krajowa Spółka Cukrowa S.A. Oddz. Cukrownia KLUCZEWO	14,5	8,5
23	Krajowa Spólka Cukrowa S.A. Oddz. Cukrownia KRASNYSTAW	12,0	12
24	Pfeifer & Langen Polska S.A. Cukrownia ŚRODA	12,0	12
25	SUDZUCKER POLSKA S.A. - Zakład produkcyjny Cukrownia ROPCZYCE	12,0	12
26	Krajowa Spółka Cukrowa S.A. Oddz. Cukrownia WERBKOWICE	12,0	8
27	Nordzucker Polska S.A. - Cukrownia CHEŁMŻA	11,1	7,5
28	Krajowa Spółka Cukrowa S.A. Oddz. Cukrownia DOBRZELIN	11,0	9
30	Nordzucker Polska S.A. - Cukrownia OPALENICA	10,0	7
34	SUDZUCKER POLSKA S.A. - Zakład produkcyjny "Cukrownia CEREKIEW"	8,5	4,5
37	SUDZUCKER POLSKA S.A. - Zakład produkcyjny "Cukrownia STRZELIN"	7,1	5,1
39	Krajowa Spółka Cukrowa S.A. Oddz. Cukrownia Malbork - Ec. MALBORK	6,0	6
40	Pfeifer & Langen Polska S.A. Cukrownia MIEJSKA GÓRKA	6,0	6
41	SUDZUCKER POLSKA S.A. - Zakład produkcyjny "Cukrownia STRZYŻÓW'	6,0	6
42	Pfeifer & Langen Polska S.A. Cukrownia GOSTYŃ	6,0	6
44	Krajowa Spółka Cukrowa S.A. Oddz. Cukrownia NAKŁO	6,0	5,5
47	SUDZUCKER POLSKA S.A. - Zakład produkcyjny "Cukrownia OTMUCHÓW"	5,2	4
48	SUDZUCKER POLSKA S.A. - Zakład produkcyjny "Cukrownia ŚWIDNICA"	4,0	4
	BRANŻA CUKROWNICZA	185,8	159,5

ENERGETYKA PRZEMYSŁOWA

- rewitalizacja istniejącej infrastruktury.

ENERGETYKA PRZEMYSŁOWA – cel, zagrożenia i wyzwania.

CELE — **Redukcja kosztów energii**, **poprawa efektywności energetycznej**, uniezależnienie kosztów energii od polityki energetycznej i klimatycznej.

ZAGROŻENIE 1 — **Brak darmowych uprawnień do emisji CO_2** dla energii elektrycznej w kogeneracji, w III okresie ETS *(konkurencyjność , SYSTEMOWA)*.

ZAGROŻENIE 2 — **Wysokie ceny gazu** – nieopłacalność produkcji energii elektrycznej w elektrociepłowniach przemysłowych opalanych gazem GZ-50.

ZAGROŻENIE 3 — **Możliwa likwidacja systemów wspierania rozwoju kogeneracji** – wstrzymanie inwestycji w nowe moce, likwidacja elektrociepłowni gazowych.

WYZWANIE 1 — **Nowe normy emisji na obszarze UE** – dostosowanie do wymogów.

WYZWANIE 2 — **Rozszerzenie systemu handlu uprawnieniami o emisje SO_2 i NO_x.**

Dla polskiego przemysłu wysoka EFEKTYWNOŚĆ ENERGETYCZNA stała się koniecznością! POLITYKA ENERGETYCZNA zadecyduje czy odtwarzając moce wytwórcze przemysł będzie budował tanie ciepłownie węglowe, czy nowoczesne źródła kogeneracyjne.

KOGENERACJA PRZYSŁOWA – efekty dla KSE i odbiorców indywidualnych.

Zmniejszenie szczytowego zapotrzebowania na moc w KSE,

a przez to ograniczenie potrzeb inwestycyjnych w nowe źródła energii w energetyce SYSTEMOWEJ, przy redukcji zapotrzebowania końcowego o 5% *(1 300 MW)*, można uzyskać ograniczenie wydatków na nowe źródła SYSTEMOWE o około 8,3 mld zł.

Redukcja ograniczeń i strat sieciowych, oraz odblokowanie możliwości przesyłowych na połączeniach transgranicznych

(moc tych połączeń tylko na zachodniej i południowej granicy przekracza 30% zapotrzebowania szczytowego), których aktualnie nie można wykorzystać ze względu na ograniczenia sieciowe występujące w sieci wewnętrznej KSE głównie w okolicach aglomeracji warszawskiej. Zbawienny jest tutaj wpływ rozproszonych źródeł energii pracujących w pobliżu punktów jej odbioru i odciążających przez to linie 400 / 220 / 110 kV.

Rozwój energetyki rozproszonej – przemysłowej powoduje poprawę bezpieczeństwa energetycznego odbiorcy, ale i KSE, redukcje strat w przesyle i dystrybucji oraz obniża koszt energii elektrycznej dla odbiorców indywidualnych.

KOGENERACJA PRZYSŁOWA – argumenty za rozwojem.

1. **Wykorzystanie istniejącego terenu i infrastruktury technicznej**: budowli, systemów przesyłowych ciepła i energii elektrycznej.
2. **Podwyższenie sprawności** krajowego wytwarzania ciepła i energii elektrycznej.
3. Odbudowa zdolności produkcyjnych ciepła technologicznego i grzewczego w sposób dający **perspektywę pracy modernizowanych instalacji i urządzeń na okres powyżej 20 lat**
4. **Optymalizacja doboru urządzeń** zgodnie z aktualnym i prognozowanym zapotrzebowaniem energetycznym
5. **Redukcja kosztów remontów i modernizacji** istniejących urządzeń z uwagi na ich długi czas pracy i naturalne zużycie techniczne
6. **Wysoka pewność dostaw** ciepła i energii elektrycznej oraz zwiększenie regulacyjności i dyspozycyjności urządzeń.
7. **Uzasadnione technicznie i ekonomicznie osiągniecie** dla źródeł istniejących wyznaczonych dyrektywą IPPC (od 20216 r) **standardów: emisji SO_2, NO_x i pyłu** (bez konieczności inwestowania w instalacje do oczyszczania).

PROBLEMY DO ROZSTRZYGNIĘCIA.

Wybór paliwa pierwotnego:

- węgiel kamienny;
- biomasa;
- gaz ziemny;
- gaz technologiczny (np. koksowniczy).

Wybór struktury organizacyjnej:

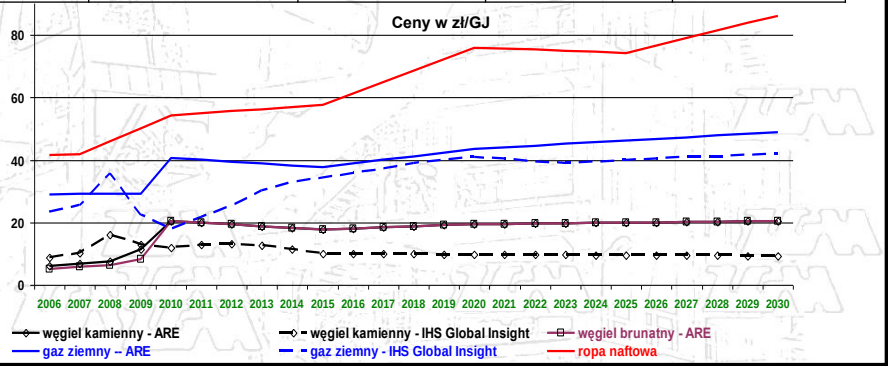
- ✓ **pozostawienie działalności energetycznej w strukturze przedsiębiorstwa**;
- ✓ **wydzielenie działalności energetycznej ze struktury przedsiębiorstwa**, restrukturyzacja organizacyjna polegająca na utworzeniu odrębnego podmiotu gospodarczego, którego celem będzie pozyskanie **inwestora strategicznego** do odbudowy elektrociepłowni.

Wybór technologii produkcji.

Kogeneracyjne źródła wytwórcze winny być dobierane do możliwości odbioru ciepła, by zapewnić **wytwarzanie energii elektrycznej wyłącznie w pełnym skojarzeniu.**

JAKIE PALIWO PIERWOTNE WYKORZYSTAĆ DO PRODUKCJI EE ?

	Gaz GZ-50	Węgiel	Zrębki drewna	Pelety
cena	1220 zł/1000 Nm^3	300 zł/tonę	230 zł/tonę	780 zł/tonę
	35,9 zł/GJ	**13,6 zł/GJ**	**23 zł/GJ**	**43,3 zł/GJ**
parametry	**> 34 GJ/1000 Nm^3**	**> 22 GJ/tonę**	**10 GJ/tonę**	**18 GJ/tonę**
	0,0105 kG/1000 m^3 pyłu	< 18% popiołu	wilgotność $W_t^r \leq 40\%$	wilgotność $W_t^r < 8\%$
	1,28 kG/1000m^3 NO^2	< 0,6% siarki	chlor $Cy^r \leq 0,15\%$	< 1,5% popiołu
emisja CO_2	1 460 kG CO_2/1000 Nm^3	2 670 tonCO_2/ tonę WK	**0**	**0**
	384 kG CO_2/MWh	**950 kG CO_2/MWh**		




DZIĘKUJĘ ZA UWAGĘ

SYSTEM WSPARCIA WYSOKOSPRAWNEJ KOGENERACJI

Warszawa, grudzień 2013r.

WSPARCIE WYSOKOSPRAWNEJ KOGENERACJI

Rodzaje kogeneracji

Wielkość:
- mikro
- mała
- Średnia
- duża

Produkt główny / odbiorca:
- Gorąca woda dla celów ogrzewania i ciepłej wody użytkowej – odbiorca komunalny
- Para technologiczna – odbiorca przemysłowy

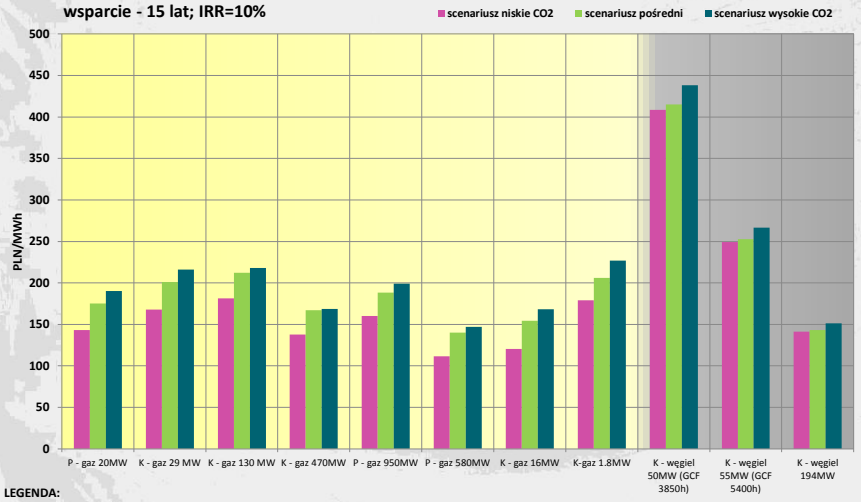
Paliwo:
- gaz ziemny
- węgiel
- gazy procesowe
- odpady komunalne

Technologia:
- silnik
- blok parowo-gazowy
- kocioł - turbina

WSPARCIE WYSOKOSPRAWNEJ KOGENERACJI

Analiza wybranych projektów. Wyniki analizy

Instalacje nowe

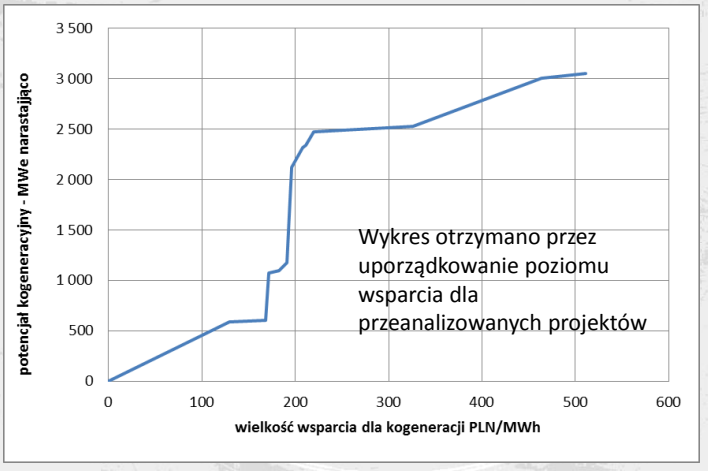


LEGENDA:
K – komunalni odbiorcy ciepła
P – przemysłowi odbiorcy ciepła

Źródło danych: Obliczenia własne EPK

WSPARCIE WYSOKOSPRAWNEJ KOGENERACJI

Analiza wybranych projektów. Wyniki analizy



Wielkość wsparcia determinuje potencjał kogeneracyjny

ZALEŻNOŚĆ TA JEST SILNIE NIELINIOWA

WSPARCIE WYSOKOSPRAWNEJ KOGENERACJI

Analiza projektów - wnioski

Nowe moce:

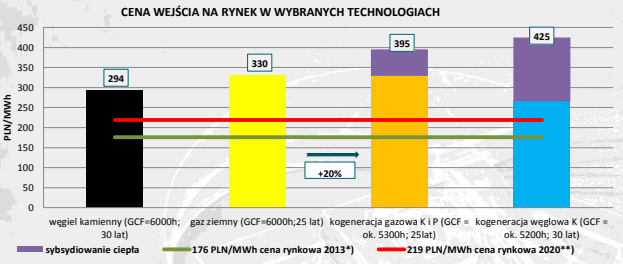
- **BRAK WSPARCIA –** oznacza **BRAK INWESTYCJI**;
- **GRANICZNY POZIOM WSPARCIA** zapewniający zwrot z kapitału na poziomie IRR=10% w zależności od scenariusza rozwoju rynku energetycznego:
  - kogeneracja gazowa – od ok. 141 do ok. 177 PLN/MWh (cena średnioważona z analizowanych projektów)
  - kogeneracja węglowa – od 193 do 207 PLN/MWh (cena średnioważona z analizowanych projektów);
- przy przyjętych założeniach brak uzasadnienia biznesowego dla kogeneracji węglowej poniżej 100MW:
  - ✓*wyższe jednostkowe nakłady inwestycyjne*
  - ✓*wyższa emisja CO_2*
  - ✓*niższa sprawność*

  vs jednostki gazowe
- węgiel zaczyna mieć przewagę nad gazem w kogeneracji w jednostkach o mocy powyżej 150 MW oraz w dużych jednostkach systemowych kondensacyjnych o mocy rzędu 1000 MW
- okres wsparcia - 15 lat eksploatacji nowej jednostki.

WSPARCIE WYSOKOSPRAWNEJ KOGENERACJI

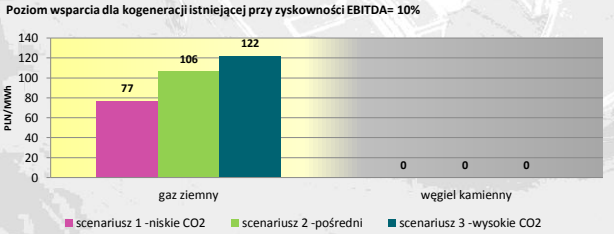
Ceny, koszty, nakłady inwestycyjne

Cena rynkowa vs cena wejścia na rynek poszczególnych technologii:



Źródło danych: Obliczenia własne EPK

*) Towarowa Giełda Energii - Indeks IRDN - dzień dostawy: 2013-09-13
**) prognoza PLEXOS



Źródło danych: Obliczenia własne EPK

Public Board for the Development of Low Emission Economy

Micro-Cogeneration in Poland

Prof. Krzysztof Żmijewski
Secretary General
Public Board for the Development of Low Emission Economy

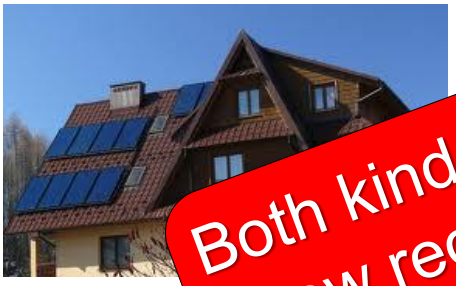
CODE2 - Developing a CHP Roadmap for Poland - A Workshop

Warsaw, 4 December 2013

SPOŁECZNA RADA DS. ROZWOJU GOSPODARKI NISKOEMISYJNEJ

Two worlds

Energy



Pro[illegible] Professional

Both kinds need new regulations!!!

SPOŁECZNA RADA DS. ROZWOJU GOSPODARKI NISKOEMISYJNEJ

Reasons

- Electrical power deficit – as from 2016;
- Low quality of energy in Poland – present fact;
- No remedial action – only words;
- Constitutional requirement – if we respect our own Constitution
- EU requirements – looming sanctions.

SPOŁECZNA RADA DS. ROZWOJU GOSPODARKI NISKOEMISYJNEJ

Case study

- **Combined Heat and Power for installations up to 20kW (electric power) for existing buildings:**
- up to 1kW *€ 1500*
- up to 19kW *€ 3450*

- **Additional requirements:**
- Service agreement
- Energy savings in building must be:
  - 15% for systems up to 10kW
  - 20% for system up to 20kW
- Equipment efficiency must be at least 85%.
- Availability of a heat tank of 1.6kWh capacity
- **Smart system for the management of power production and heat accumulation.**

SPOŁECZNA RADA DS. ROZWOJU GOSPODARKI NISKOEMISYJNEJ

A new deal

Integration of markets

Energy efficiency

Renewable energy and CHP

Producers

RES

GAS

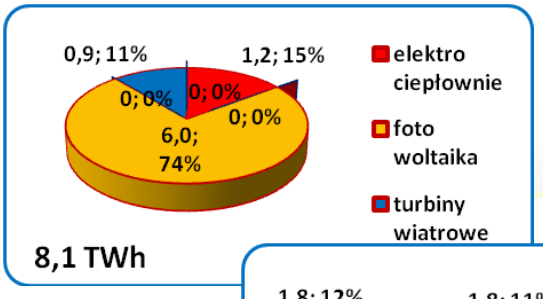
Prosumers

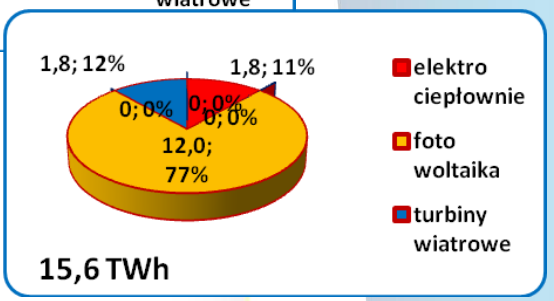
Smart grids

5/24

SPOŁECZNA RADA DS. ROZWOJU GOSPODARKI NISKOEMISYJNEJ

Structure of prosumers in Poland





6/24

SPOŁECZNA RADA DS. ROZWOJU GOSPODARKI NISKOEMISYJNEJ

CHP – WHAT FOR?

- Interruptions of supply – 410 min.
- Low quality – 180 V
- Upcoming deficit – 5000 MW

SPOŁECZNA RADA DS. ROZWOJU GOSPODARKI NISKOEMISYJNEJ

Interruptions of supply

Unplanned cuts of electrical power supply in 2007 (Germany and the UK 2006)
H – high vo

410 min
180 V

Source: [1] 4TH Benchmarking Report on Quality of Electricity Supply, CEER 2008

SPOŁECZNA RADA DS. ROZWOJU GOSPODARKI NISKOEMISYJNEJ

Advantages of micro-generation

- Lower cost of energy for users.
- Lower consumption of fuels.
- Reduction of pollution.
- Elimination of transmission losses.
- High reliability of supply (almost 100% for LPG)
- Stabilisation of the National Power System (production of energy from these sources is stable – in contrast to RES, weather has no effect on production).

9/24

SPOŁECZNA RADA DS. ROZWOJU GOSPODARKI NISKOEMISYJNEJ

Micro installations – method of closing the gap

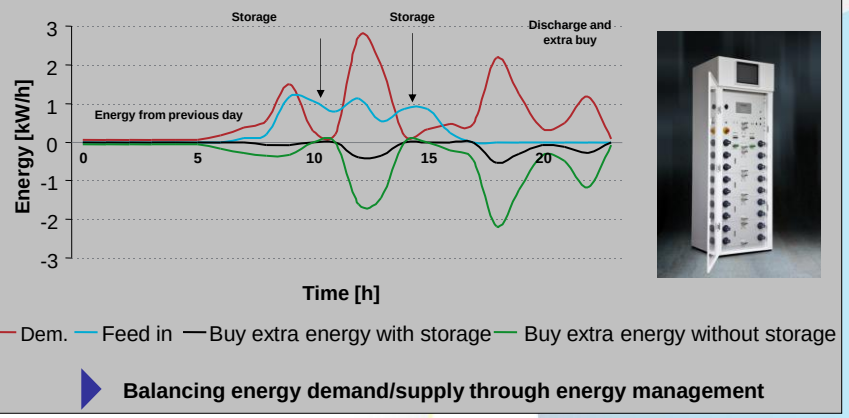
- Utilisation of consumers' financial capacity
- Increase of employment
- Generation of strong competition in the retail market for electrical power
- Meeting current challenges of the sector and providing ways to solve strategic problems
- Stabilisation of the grid
- Increase of innovation in the consumer-grid-source relationship

10/24

SPOŁECZNA RADA DS. ROZWOJU GOSPODARKI NISKOEMISYJNEJ

On-site balancing

November, single-family house in Magdeburg



Balancing energy demand/supply through energy management

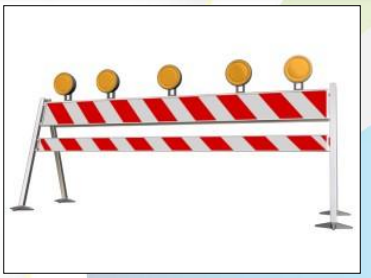
SPOŁECZNA RADA DS. ROZWOJU GOSPODARKI NISKOEMISYJNEJ

CHP in Poland – state-of-art

- Lack of installations with capacity up to 40kWe
- Lack of public awareness of the possibility and economic viability of micro-CHP
- Interest only among enthusiasts and experts
- Lack of relevant legislation
- Lack of financial support

SPOŁECZNA RADA DS. ROZWOJU GOSPODARKI NISKOEMISYJNEJ

Barriers to CHP development in Poland



- No guarantee of quality of installed devices (device certification)
- No guarantee of quality of installation process (certification of installers)
- Resistance of distribution companies to connect micro-sources to the grid
- Lack of smart meters and smart grids

13/24

SPOŁECZNA RADA DS. ROZWOJU GOSPODARKI NISKOEMISYJNEJ

Legal change needed

- Feed-in tariff
- 15-year support period
- Ensuring a priority formula for connecting to the grid
- Preferential treatment of micro-installations in terms of waiving an obligation of a distribution license and of running an economic activity
- Priority of connection of micro RES and CHP systems over conventional-fuel systems.

14/24

SPOŁECZNA RADA DS. ROZWOJU GOSPODARKI NISKOEMISYJNEJ

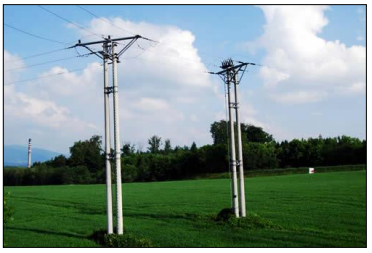
Support to micro-generation

- **Legislative**
  - Removal of barriers (obligation to run a business, social security contributions, licensing, building permits, EIAs);
  - Financial support (feed-in tariff);
  - Acceptance for micro-CHP installations.
- **Operational**
  - Installation services;
  - Quality warranty;
  - Support services on the market (LAB,HAB, etc.).

15/24

SPOŁECZNA RADA DS. ROZWOJU GOSPODARKI NISKOEMISYJNEJ

Problems with connecting to the grid



- It is suggested that, as in the initial draft of the RES Act, micro-systems should be connected to the grid within the limit of the current connection capacity of the user (prosumer) automatically, via notification by an authorized installer

16/24

SPOŁECZNA RADA DS. ROZWOJU GOSPODARKI NISKOEMISYJNEJ

Micro-sources – chief players

25.18 ¢/kWh	14.99 ¢/kWh	25.18 ¢/kWh
24.43 ¢/kWh	7.50 ¢/kWh	8.93 ¢/kWh

Photovoltaics

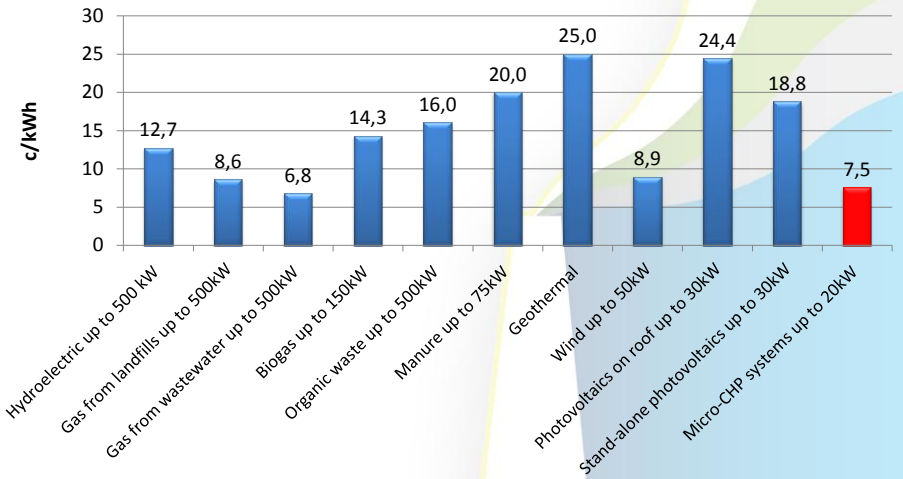
Micro-CHP

Micro windmills

17/24

SPOŁECZNA RADA DS. ROZWOJU GOSPODARKI NISKOEMISYJNEJ

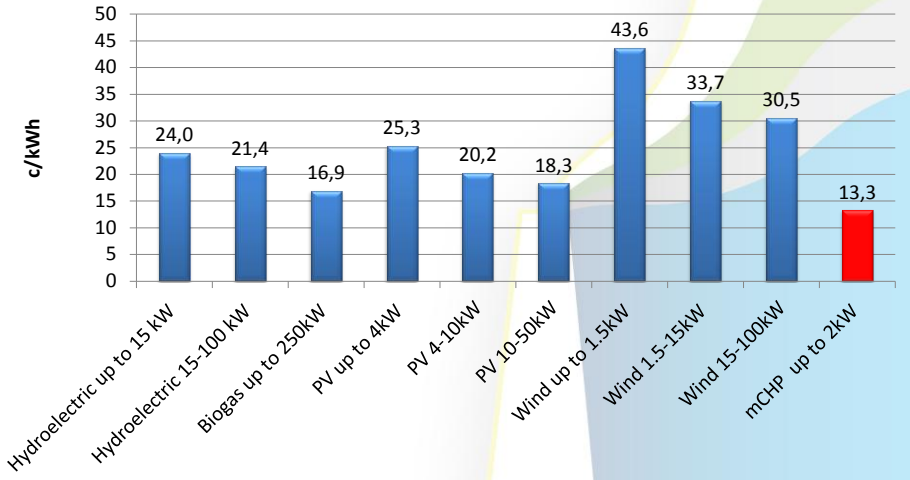
Germany | tariff for micro-sources



18/24

SPOŁECZNA RADA DS. ROZWOJU GOSPODARKI NISKOEMISYJNEJ

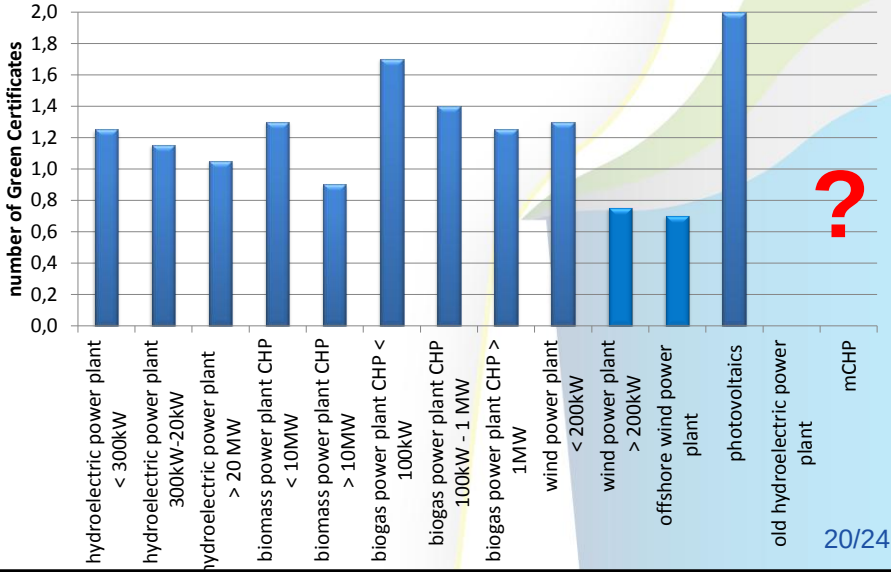
UK | tariff for micro-sources



19/24

SPOŁECZNA RADA DS. ROZWOJU GOSPODARKI NISKOEMISYJNEJ

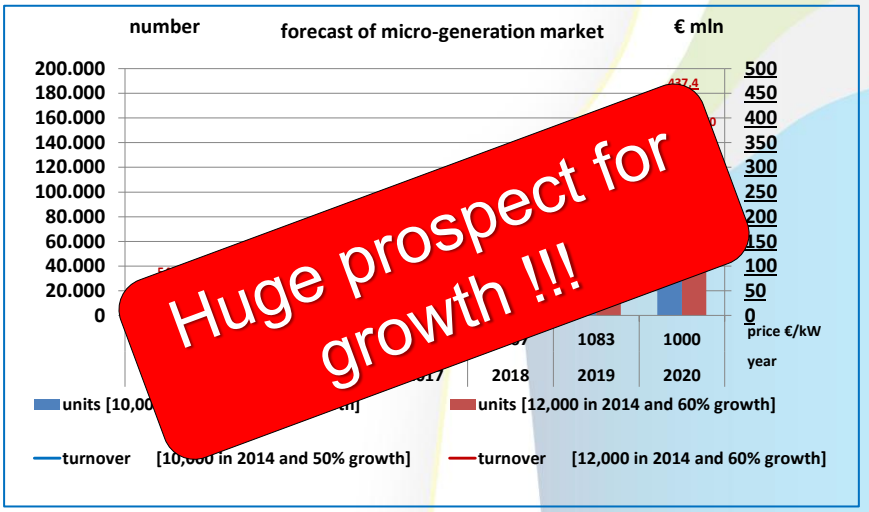
Proposed rates of support to RES and CHP



20/24

SPOŁECZNA RADA DS. ROZWOJU GOSPODARKI NISKOEMISYJNEJ

Forecast development of micro-installation market in Poland



Huge prospect for growth !!!

SPOŁECZNA RADA DS. ROZWOJU GOSPODARKI NISKOEMISYJNEJ

Development of micro-systems in Poland

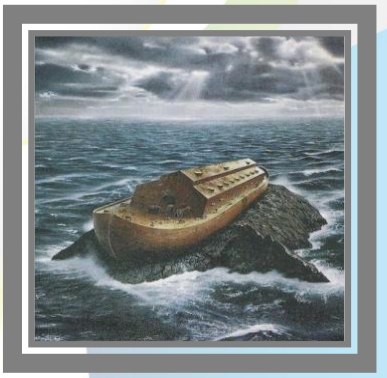
- 13,000-16,000 jobs in 2020
- 75,000-115,000 jobs in 2025
- 200,000-250,000 jobs in 2028
- € 1.1-1.4 billion of turnover in 2014-2020

Figures depend on the adopted legislation and information campaign

SPOŁECZNA RADA DS. ROZWOJU GOSPODARKI NISKOEMISYJNEJ

Quo vadis Polonia ?

We’re not building the Tower of Babel



We’re building the Noah’s Arc

23/24

SPOŁECZNA RADA DS. ROZWOJU GOSPODARKI NISKOEMISYJNEJ

Thank you for your attention

Krzysztof Żmijewski
Professor, Warsaw University of Technology

Secretary General
Public Board for the Development of Low Emission Economy