



MINISTRY  
OF  
ECONOMY



# Nuclear power in Poland

## Environmental and economical background

Łukasz KUŹNIARSKI  
Senior Expert

Nuclear Energy Department, Ministry of Economy  
POLAND



## Polish Nuclear Power Program

Rationale to introduce nuclear power in Poland:

1. assuring long-term security of electricity supply
2. maintaining electricity prices at levels acceptable by the national economy and the society
3. reducing emissions of  $\text{SO}_2$ ,  $\text{NO}_x$ , PM and  $\text{CO}_2$





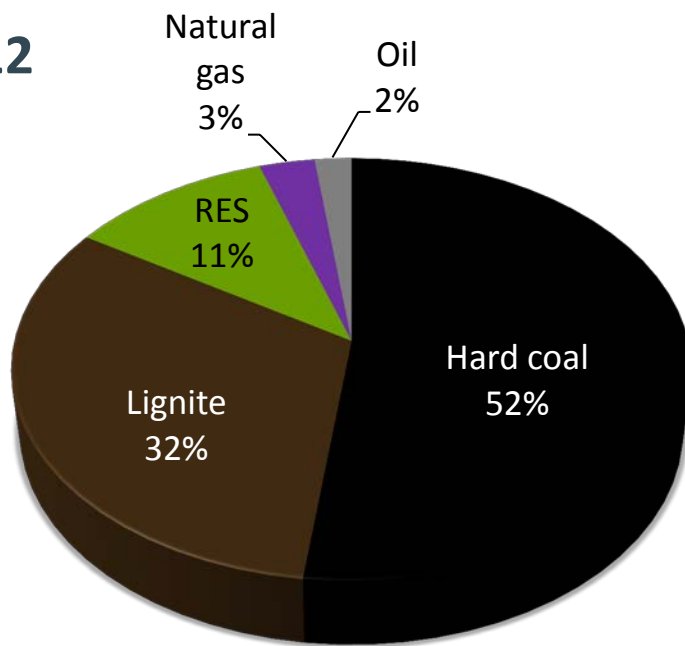
## Status of implementation of the PNPP

### PNPP phases:

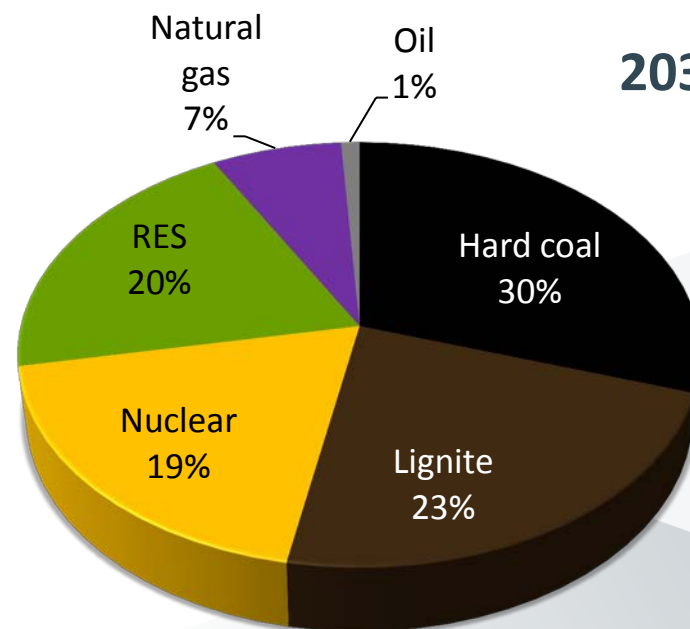
- **Phase I – 01/01/2014 - 31/12/2016:** site selection, call for tender for the reactor technology, technology selection
- **Phase II – 01/01/2017 - 12/31/2018:** drafting of blueprints and obtaining all required regulatory approvals
- **Phase III – 01/01/2019 - 12/31/2024:** building permit and construction of the 1st reactor of the first nuclear power plant, starting construction of the 2nd reactor
- **Phase IV – 01/01/2025 - 12/31/2030:** completion of the first nuclear power plant (2-3 units), beginning of construction of a second nuclear power plant. The PNPP envisages **6,000 MWe** (i.e. 2 NPPs with 2-3 units each) in nuclear until **2035**.

## Electricity generation structure (*energy mix*)

2012

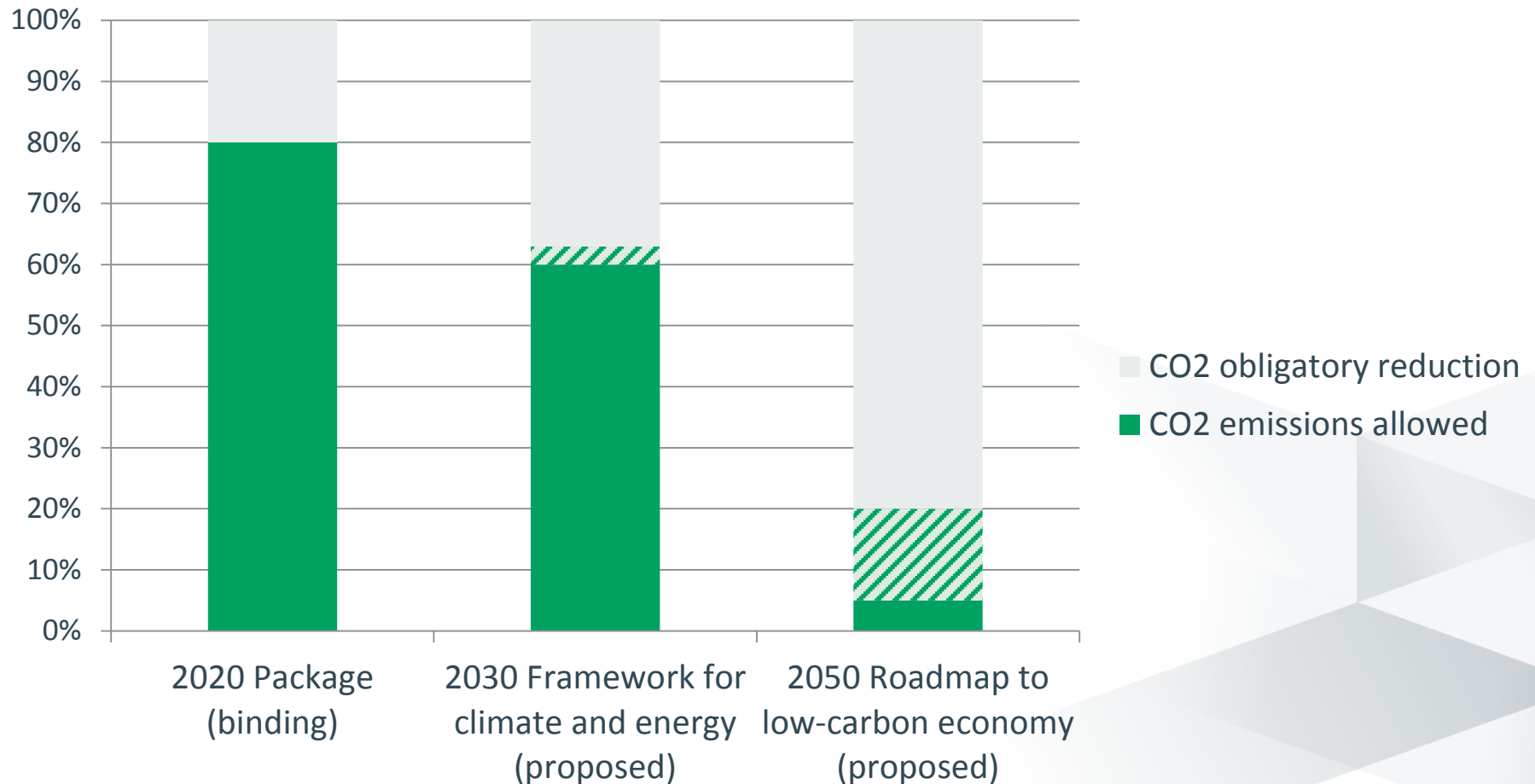


2030





# EU ambitions regarding climate change – a challenge for Poland





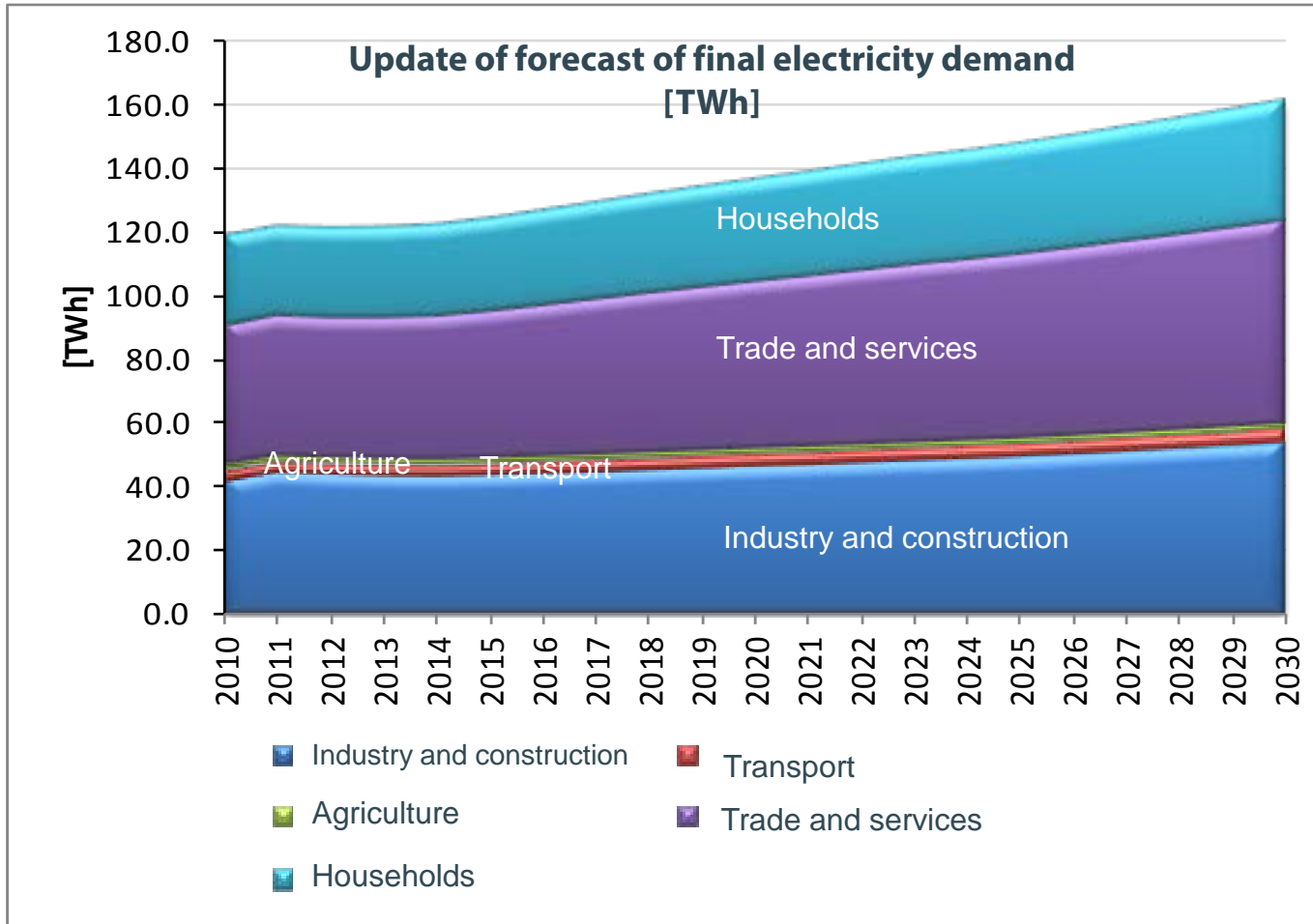
## The EC tightens requirements for coal-fired power

- The Industrial Emissions Directive (IED) opens the door to very strict emissions limits for air pollutants
- The limits are defined in the BREF documents which are specific guidelines based on BAT technologies (Best Available Technology)
- Currently defined emission limits force closure of approx. 6 GWe of coal units in Poland by 2020 (including derogations)
- Costs of retrofit of coal-fired units to **the current IED requirements amount to PLN 4.40 billion** in the period 2016-2025 (ca. EUR 1.05 billion)
- **The European Commission wants to tighten emissions limits** even twice by 2018, which will entail the increase of expenditures on retrofits of new units and replacement of old ones - these expenditures might be as high as **PLN 20 billion by 2025 (ca. EUR 4,76 billion)**.
- Soon the IED will also include additional types of pollutants, eg. mercury
- **In general, the EC policy is streaming towards elimination coal-fired power by tightening emissions standards for air pollutants**

	SO <sub>2</sub>	NO <sub>x</sub>
from 2016	200 mg/Nm <sup>3</sup>	200 mg/Nm <sup>3</sup>
from 2019 (planned)	10-130 mg/Nm <sup>3</sup>	50-180 mg/Nm <sup>3</sup>

# Demand for electricity in Poland will grow

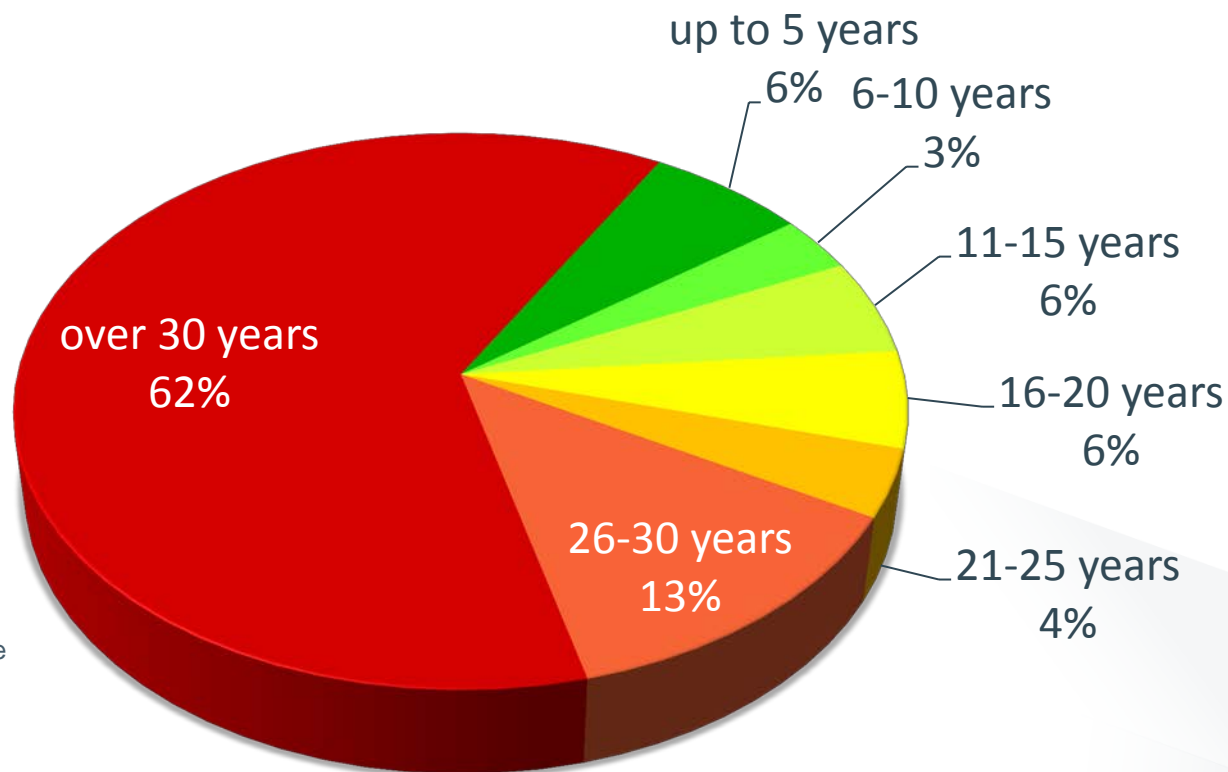
According to study made by EMA in June 2013 the final electricity consumption in Poland will increase by 36% in 2030 which is 1.5% on a year-by-year basis.



Source: Update of forecast of fuel and electricity demand until 2030, ARE S.A., June 2013

Total electricity production currently is ca. 160 TWh/y.

## Age Structure of the Existing Power Plants in Poland



Sorted by boiler's age

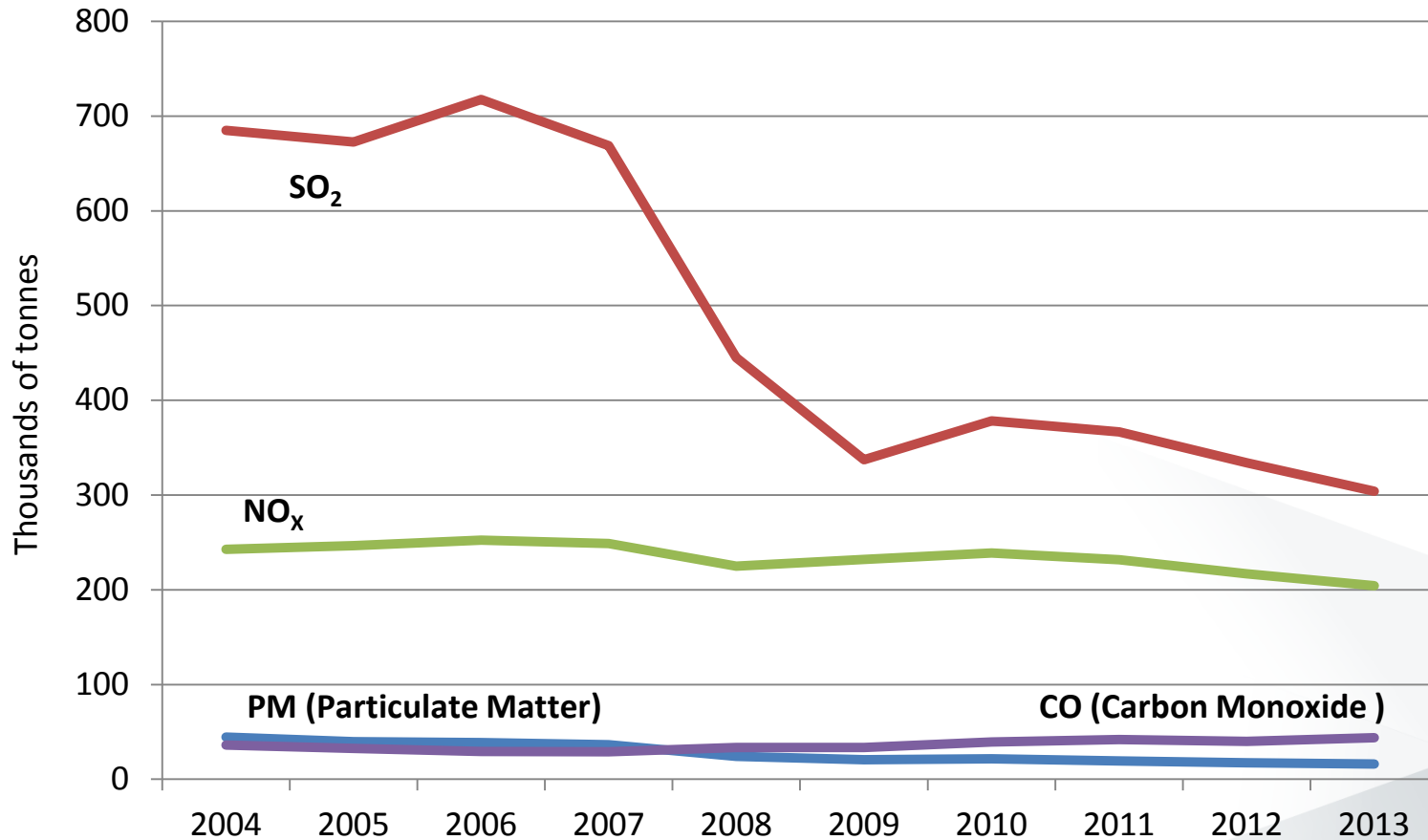
Data: Polish Energy  
Market Agency 2013

Out of 33.5 GWe of current capacity ca. 6 GWe will be written off before 2020 and further 6 GWe will be shutdown before 2030. This is 36% of present capacity. Nuclear power plants can replace it to some extent.



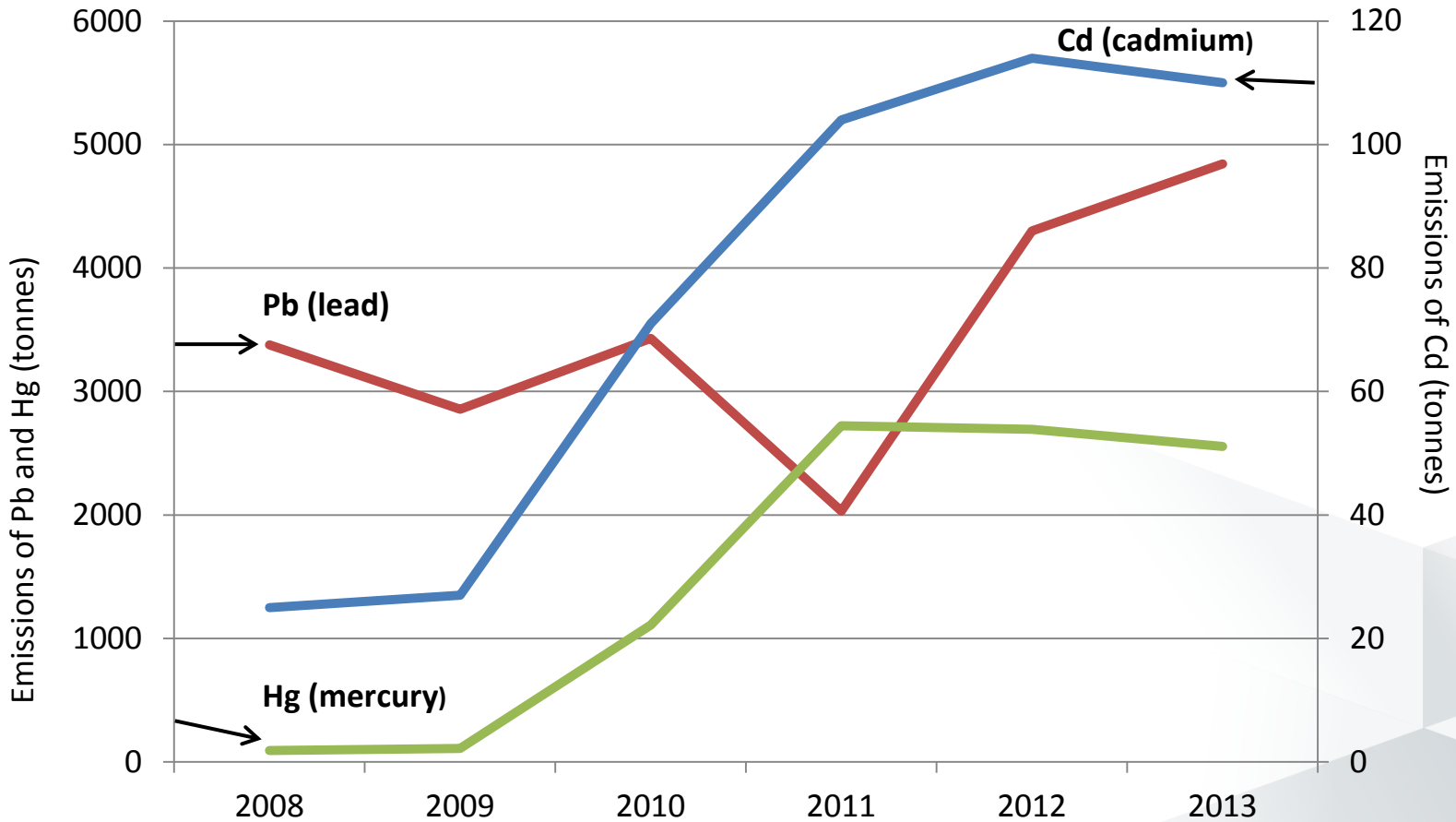


# Emissions in Polish power sector – reduction potential is diminishing



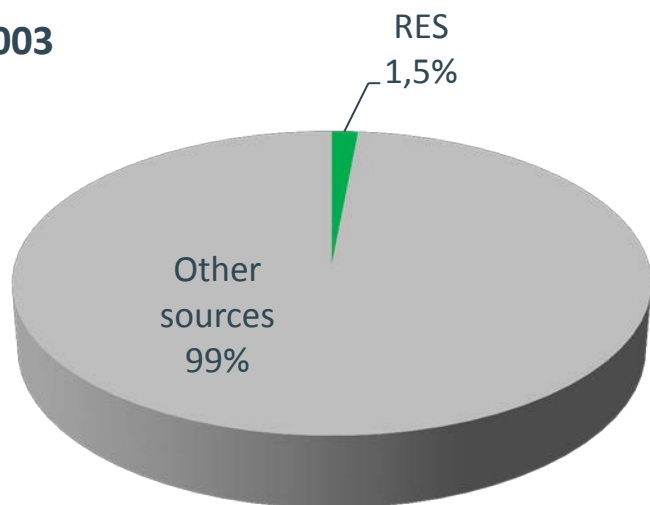
Data: Emitter 2007/2013, Polish Energy Market Agency

# Emissions in Polish power sector – reduction potential is diminishing

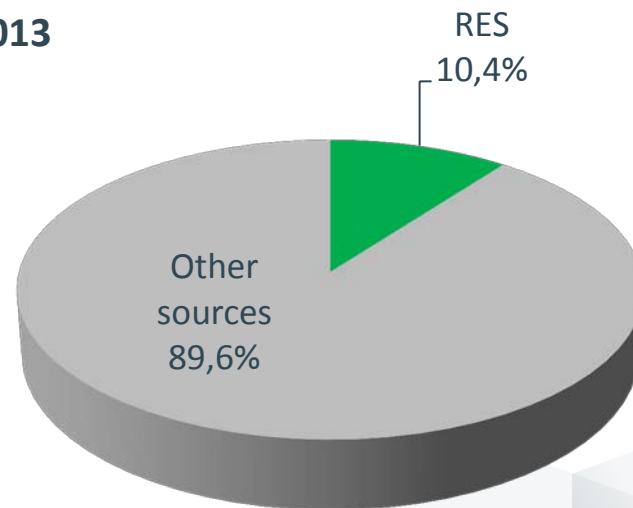


## Share of renewables in Poland's energy mix (2004/2013)

2003

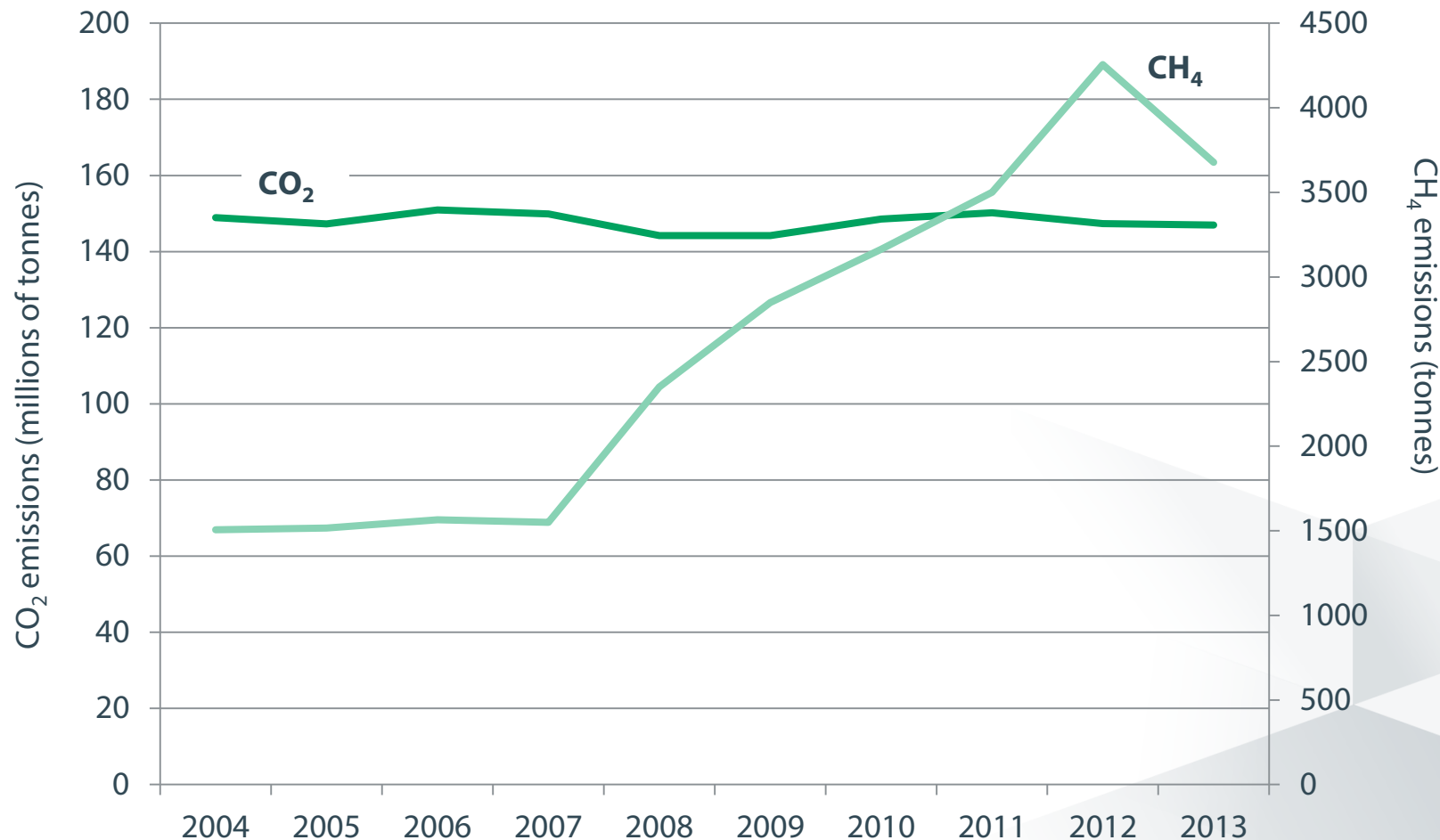


2013





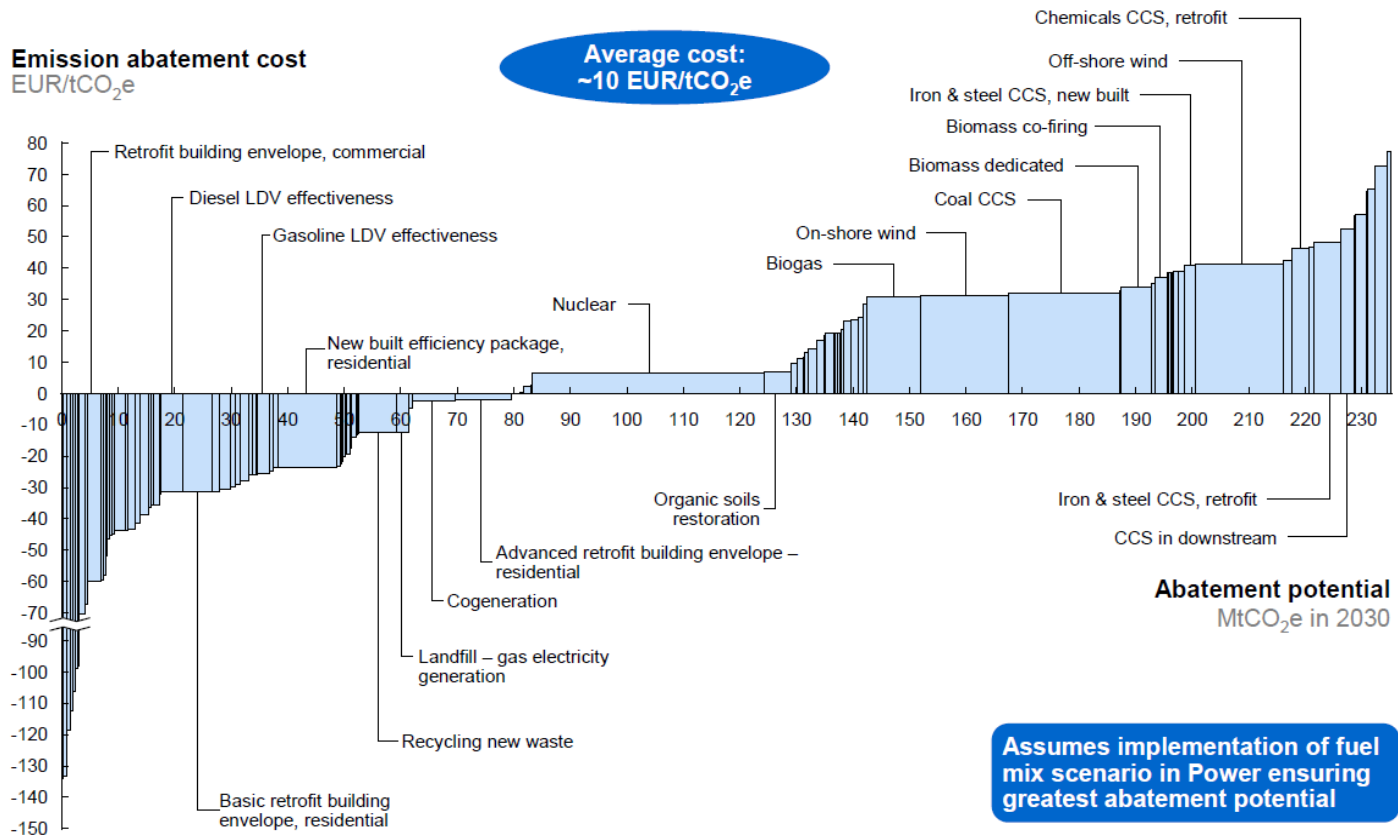
# GHG emissions in Polish power sector in 2004-2013



Data: Emitter 2007/2013, Polish Energy Market Agency

# McKinsey's study – nuclear is the most effective tool for GHG emissions reduction

## GHG abatement cost curve for Poland in 2030<sup>1</sup>



<sup>1</sup> Only the most significant abatement opportunities are named

## Climate policy benefits from nuclear power in Poland

2 NPPs with combined capacity  
of ca. 6 000 MWe

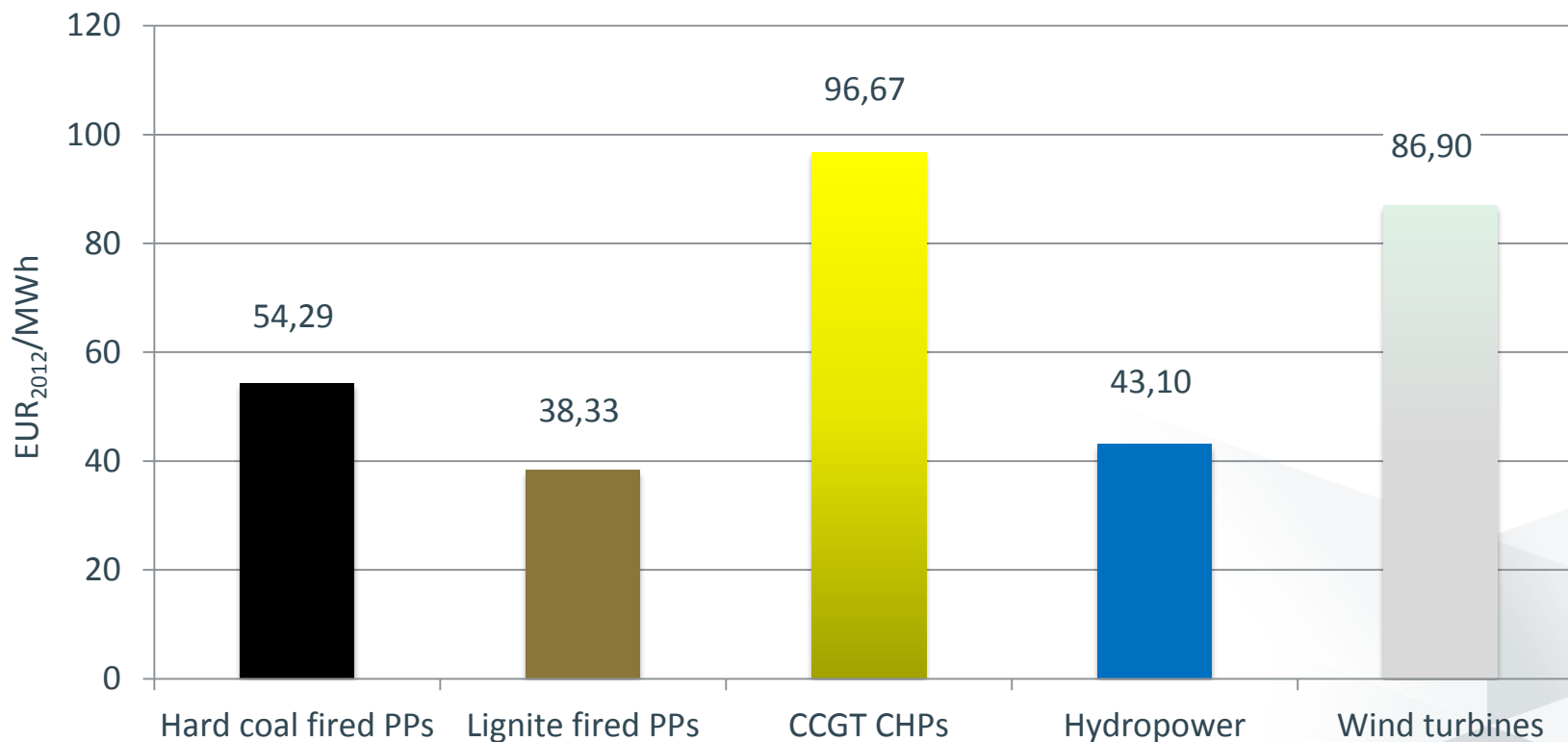
Electricity production of 50 TWh per year

Saving of **35 million tons\*** of CO<sub>2</sub> each  
year or even more if cogeneration  
(district heating) is considered

This is **23% of current CO<sub>2</sub>** emissions level  
in Polish electricity generation sector

\*in comparison to modern coal power plants, with emissions rate less than 700 kg/MWh

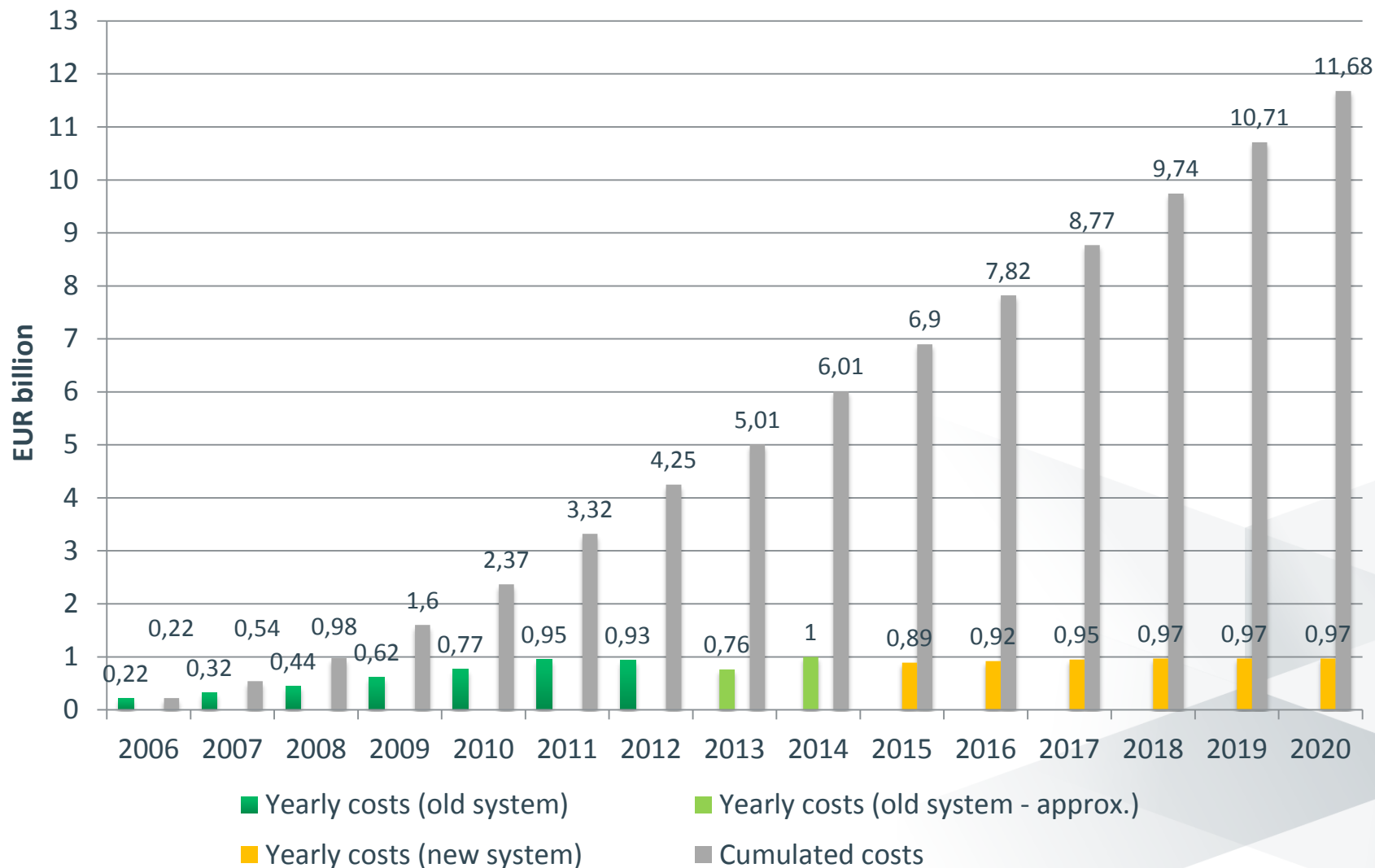
## Electricity generation costs in Poland in 2013



source: „Sytuacja w elektroenergetyce. IV kwartały 2013”, Polish Energy Market Agency, Warsaw 2014, p. 59

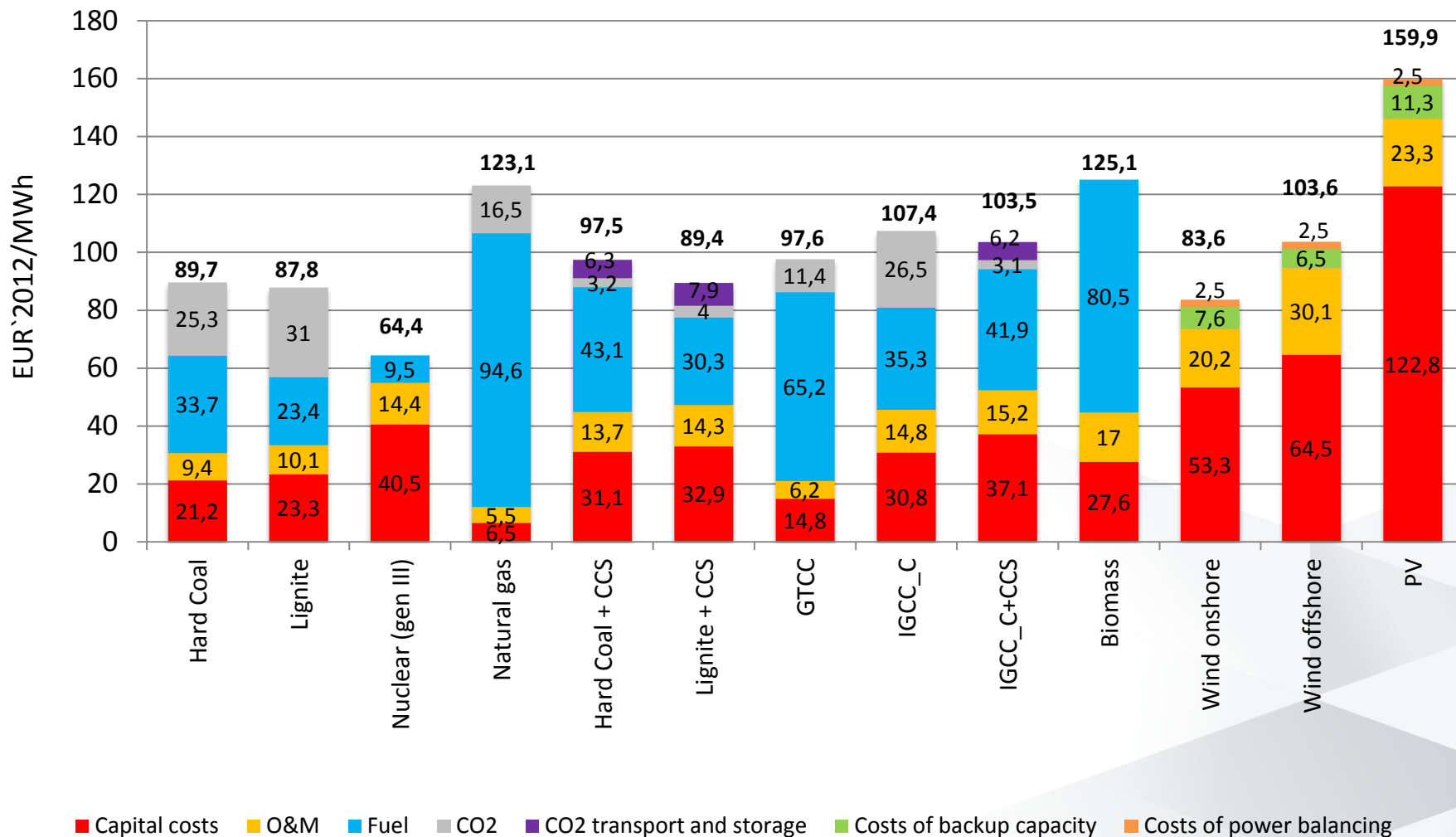


## RES support scheme costs in Poland





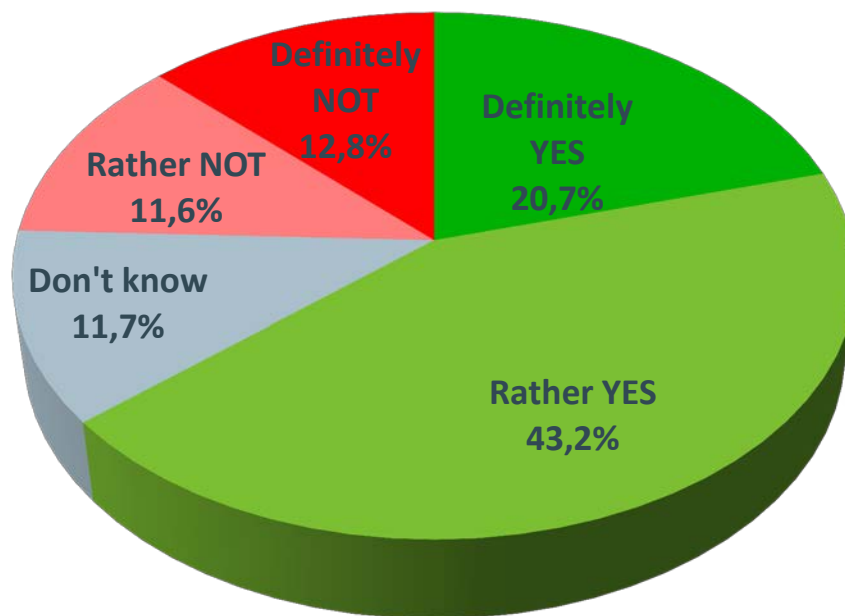
# Comparison of averaged electricity generation costs for technologies foreseen to implement in PL from 2025



Source: Update of study of electricity generation costs with nuclear, coal, gas power plants and RES, EMA, April 2013

Assumed discount rate: 6%  
Nuclear investment cost: €4,000,000/MWe

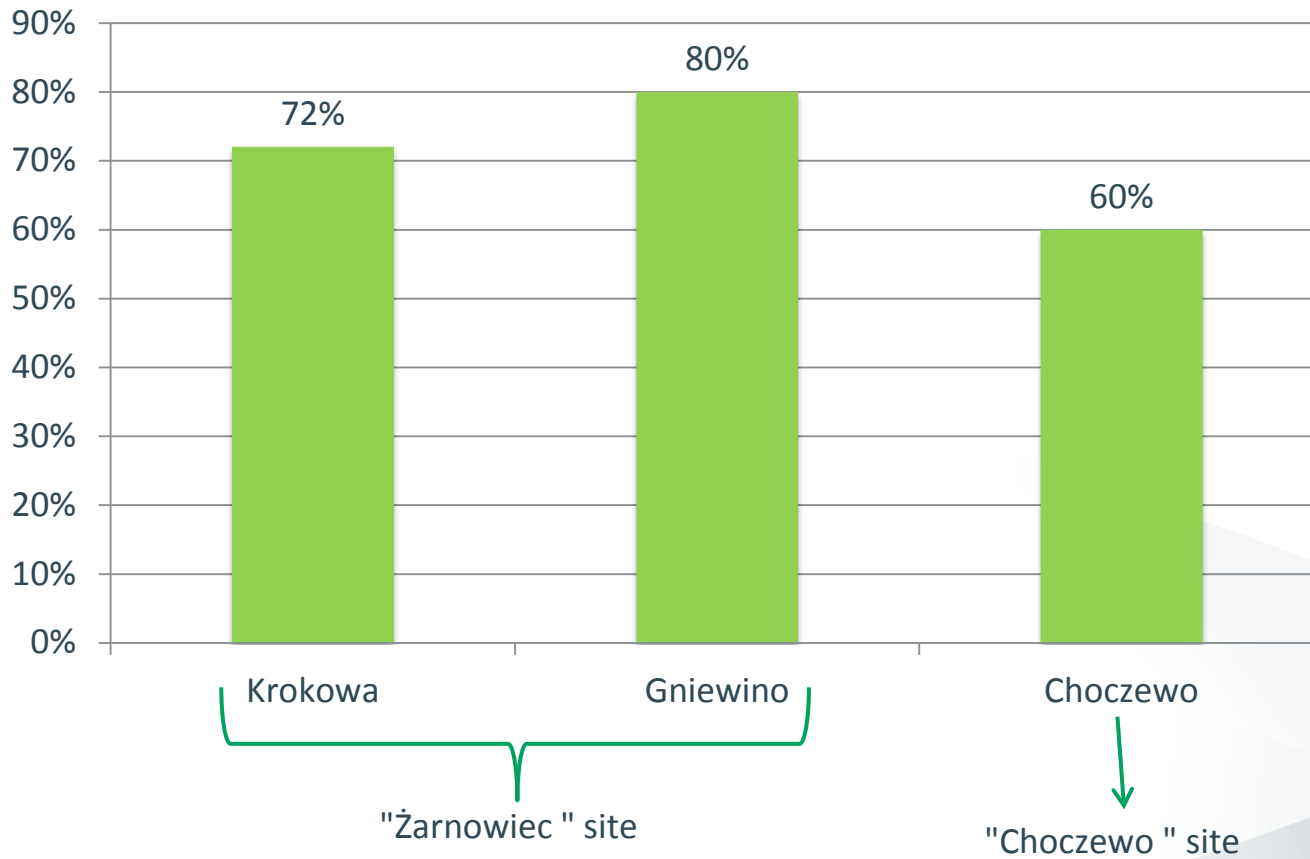
## Public support for nuclear power in Poland



source: Polish Institute of International Affairs, poll conducted in June 2014



# Local acceptance for NPP



source: TNS Polska, poll conducted in May-June 2014

## Crossboundary consultations

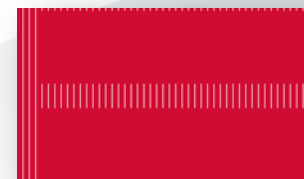
### Transboundary Environmental Impact Assessment was based on:

- Directive 2001/42 EC on the assessment of the effects of certain plans and programmes on the environment
- Protocol on Strategic Environmental Assessment to the Convention on Environmental Impact Assessment in a transboundary Context (Kiev Protocol)

From July to December 2012 meetings were held at the expert level with the countries concerned, i.e.:

- Slovakia (July 23)
- Austria (November 22)
- Germany (November 27)
- Denmark (December 4).

Those countries have submitted their formal final position. The last transboundary consultation's protocol has been signed with Austria in May 2013, what formally closed the transboundary consultation process.



## Technical Support Organisations

There are several Polish nuclear institutes and technical universities aspiring for the status of TSO, all of them were TSOs in nuclear power program during 1980's:

- **National Centre for Nuclear Research, NCBJ**, 50+ years of experience of research reactors operation, owner of 35 MWt Maria research reactor, competence in nuclear engineering, PSAs, radiological protection;
- **Institute of Nuclear Chemistry and Technology, INCT**, holds the status of IAEA Collaborating Centre;
- **Central Laboratory for Radiological Protection, CLOR**;
- Warsaw University of Technology (Warschau);
- Gdańsk University of Technology (Danzig);
- Wrocław University of Technology (Breslau);
- Silesian University of Technology (Gleiwitz).

## Technical Support Organisations

There are two regulators for NPP in Poland:

- National Atomic Energy Agency (PAA); a nuclear regulator
- Office of Technical Inspection (UDT); regulator for conventional part of NPP (mainly turbine island)

TSO for the (nuclear) regulatory body:

- As required by the Atomic Law Act, the organisation (e.g. a research institute) must ensure its competence and independence

TSO for the utility:

- There are no specific requirements by law

**There is no preference for national organisations, so foreign experts and institutions may play important role here, especially in training of Polish inspectors.**



In April 2012 the INCT and CLOR signed an agreement with PAA (nuclear regulator) which gives the regulator an easier access to their nuclear competencies, mainly in areas of safety analyses and radiological protection.



## Radioactive waste management

Polish Ministry of Economy has recently prepared a draft *National plan of radioactive waste and spent fuel management*. The plan will be subject to public consultation.

### LILW

National Radioactive Waste Repository in Rózan has started operation in 1961 and will be closed in 2024. It will be replaced by new LILW repository from 2025.

### HLW

Poland intends to build an underground laboratory (PURL – Polish Underground Research Laboratory). The draft *National plan...* gives a specific schedule: after ca. 17-18 years of preparatory works the construction of PURL will start and it will take 5 years. PURL should be operational before 2040.



**Thank you for your attention**

Ministry of Economy  
Nuclear 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](mailto:mg@mg.gov.pl)  
web [www.mg.gov.pl](http://www.mg.gov.pl)