

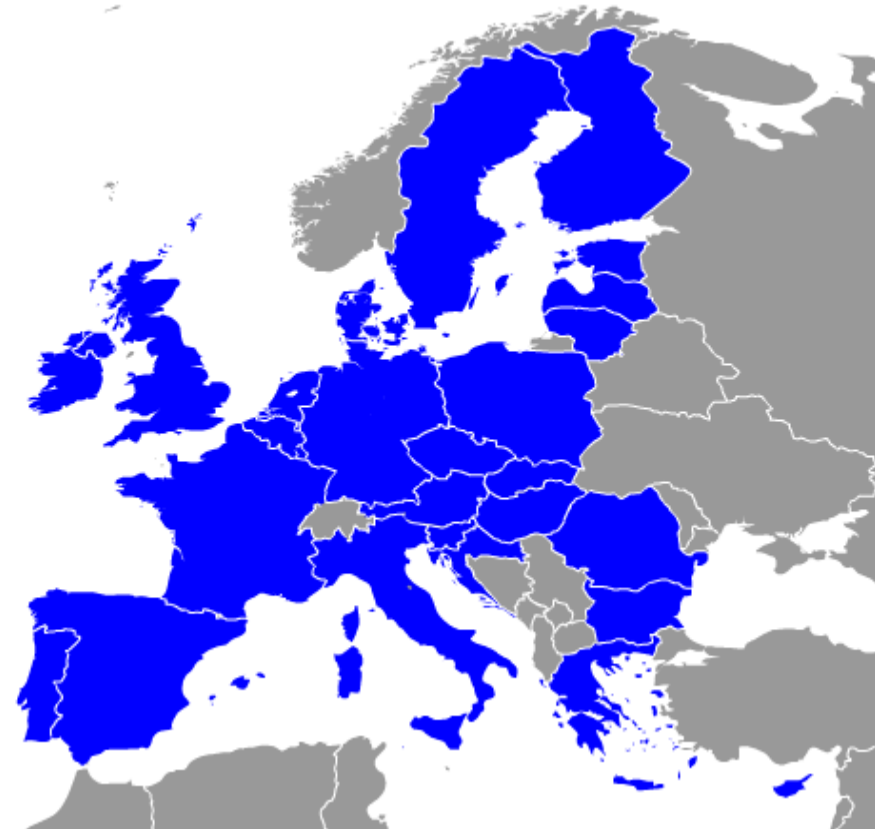
# Nuclear Power Programme: Current Status and Prospects

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Zbigniew KUBACKI  
Director  
Nuclear Energy Department,  
Ministry of Economy  
POLAND

## Nuclear power in the EU today

- 132 reactors in operation
- 4 reactors under construction
- 50% of MS use nuclear power (Lithuania not included)
- 27% share of nuclear power in the EU energy mix (2012)
- All NPPs generate approx. 850 TWh each year
- Impact on growth & jobs (500 000 direct & indirect jobs)
- Excellent safety record proven by *stress tests* (only minor safety improvements needed)



# Nuclear power in the EU - perspectives

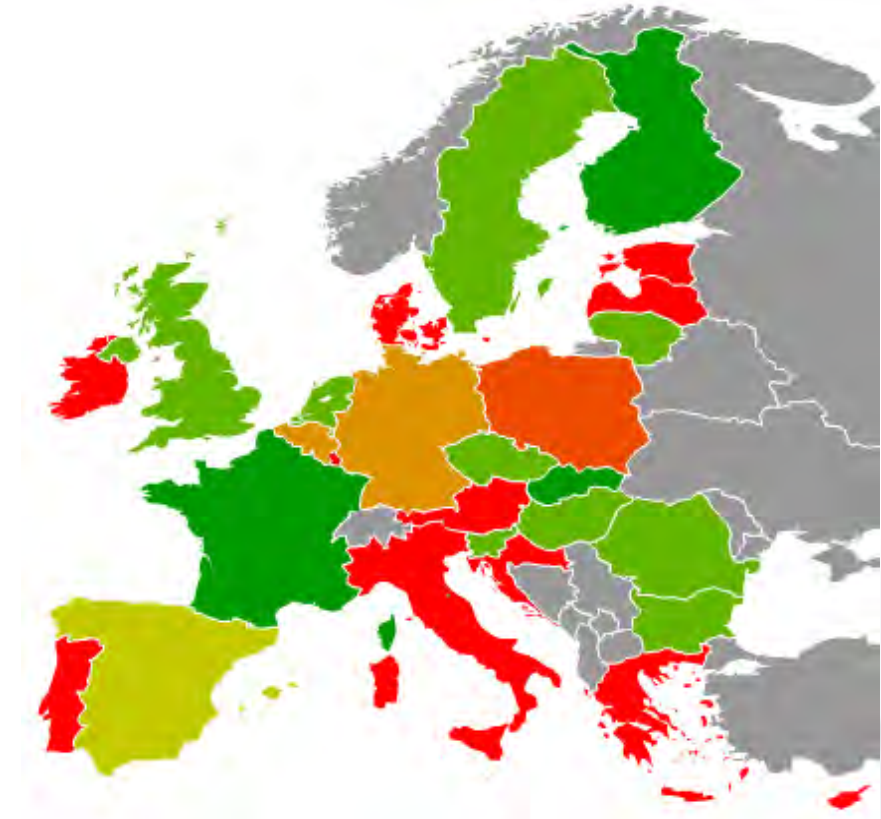
- 32-37 reactors planned up to 2030
- LTO: 14 MS concerned –  
12 positive, 2 phase out
- New Build: 16 MS concerned –  
12 positive, 4 negative
- Reprocessing: 14 MS concerned –  
3 positive, 11 negative

## *Conclusion*

**A large majority of MS having NPPs in operation will go for LTO and New Build.**

**Only 2 MS have phase out policies (BE and DE). Reprocessing limited to FR, NL and UK.**

source: Results of formal consultation of the MS in the Atomic Questions Group of the Council (as of 31 July 2013)



Map legend	
New build: FI, FR, SK	New build planned: BG, CZ, HU, NL, RO, SI, UK, (LT)
Status quo: ES	Phase out: BE, DE
Newcomer: PL	No nuclear: PT, IT, AT, DK, IE, LV, EE, HR, EL, CY, LU

## NPPs around Poland (up to 300 km)



23 units in operation  
6 units in construction  
9 units planned until 2025 r.

In 2020 all neighbours of Poland will have nuclear power plants.

From 2024 Germany will be (probably) the only one neighbour without NPP despite of his considerable import of electricity from “nuclear” France, Sweden, Czech Republic, Switzerland and Poland.

German NPP will be shut down, however their decommissioning will not be finished before 2050.

## Key EU energy challenges

EU Energy Policy objectives/pillars:

1. Sustainability (= Env Protection: GHG, +...)
2. Security of energy supply (i.a. stability and reliability of electricity supply)
3. Competitiveness (incl "affordability for final consumer")

### How to address them all and in which order?

Tackling these challenges requires:

- an ambitious set of **energy efficiency** measures
- a proper mix of **low-carbon energy** sources

**Thus:**

- Investments in generation & infrastructure
- Increase in R&D in the field of energy technologies, including nuclear

## Polish Nuclear Power Program

Key objectives and goals:

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 SO<sub>2</sub>, NO<sub>x</sub>, PM and CO<sub>2</sub>**



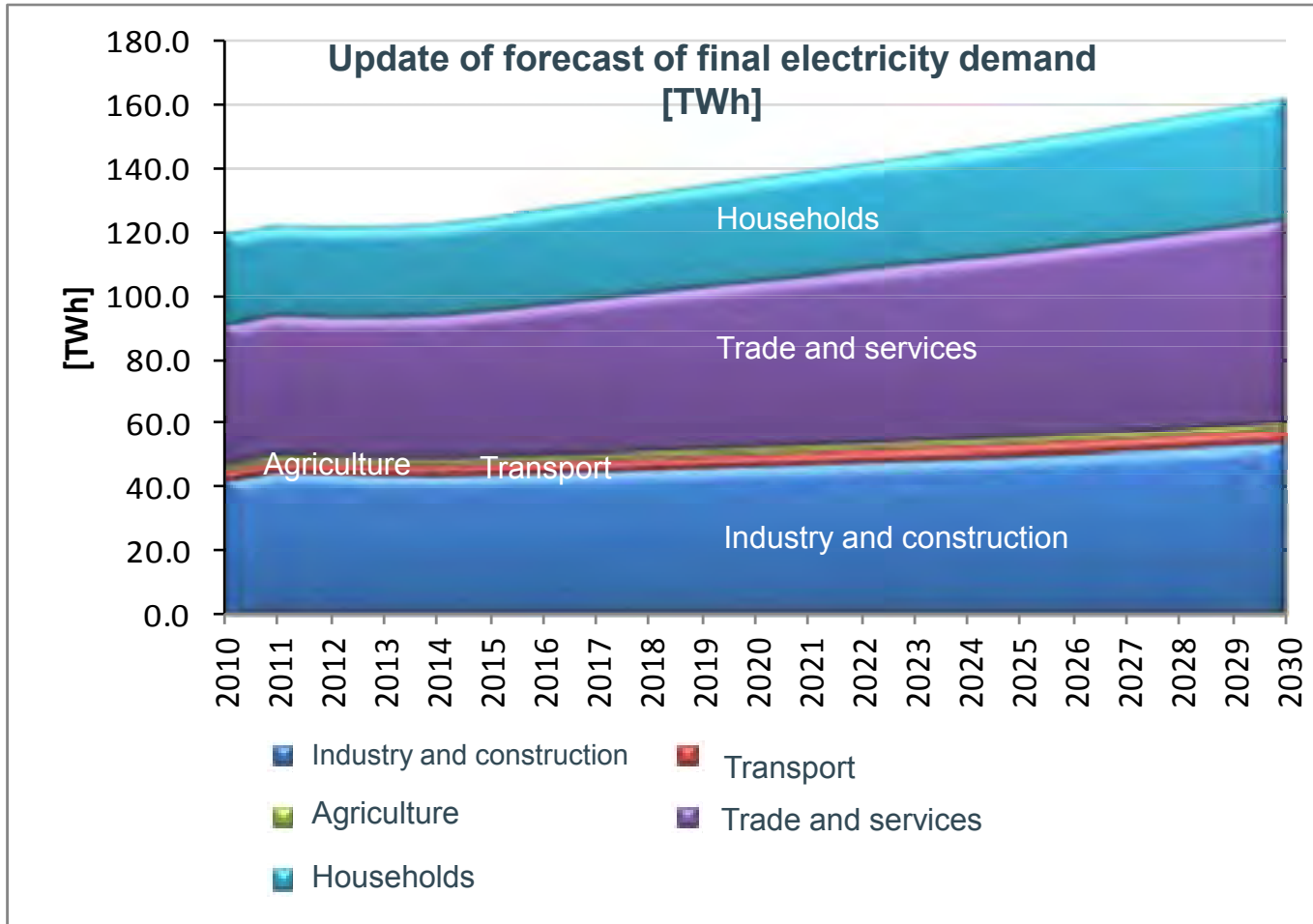
## Status of implementation of the PNPP

### 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**.

# 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.



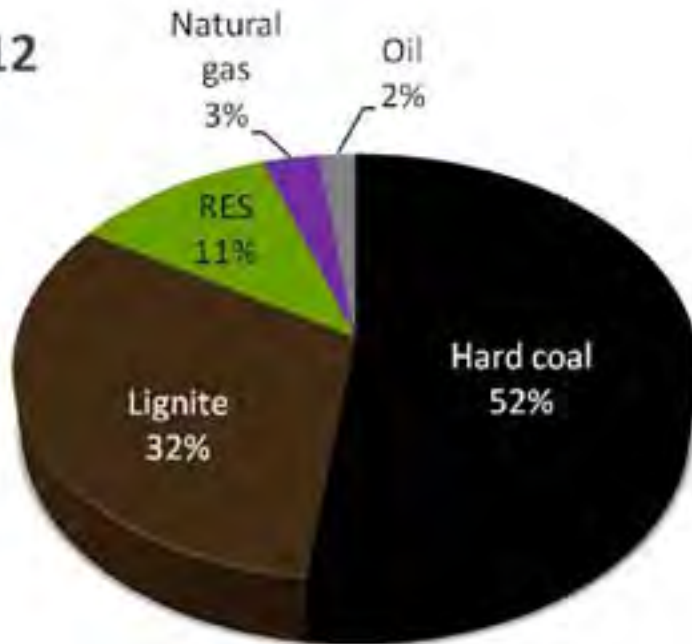
Source: Update of forecast of fuel and electricity demand until 2030, ARE S.A., June 2013

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

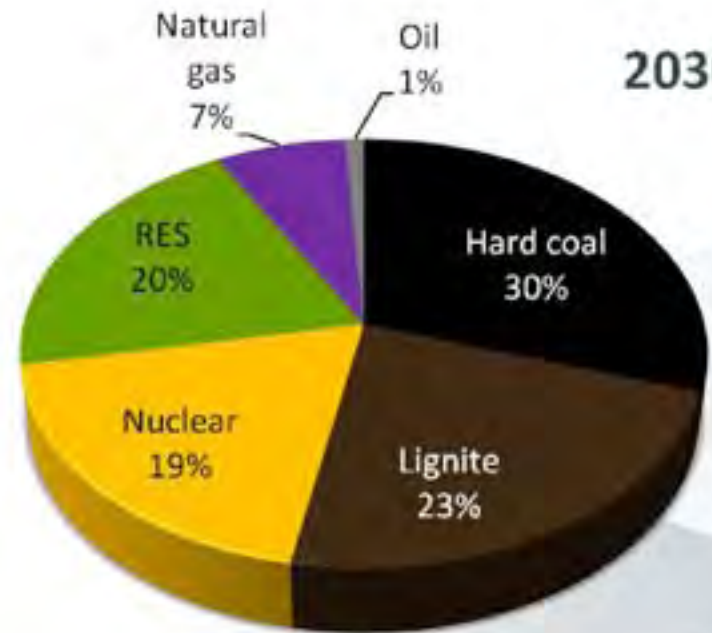


## Electricity generation structure (*energy mix*)

2012

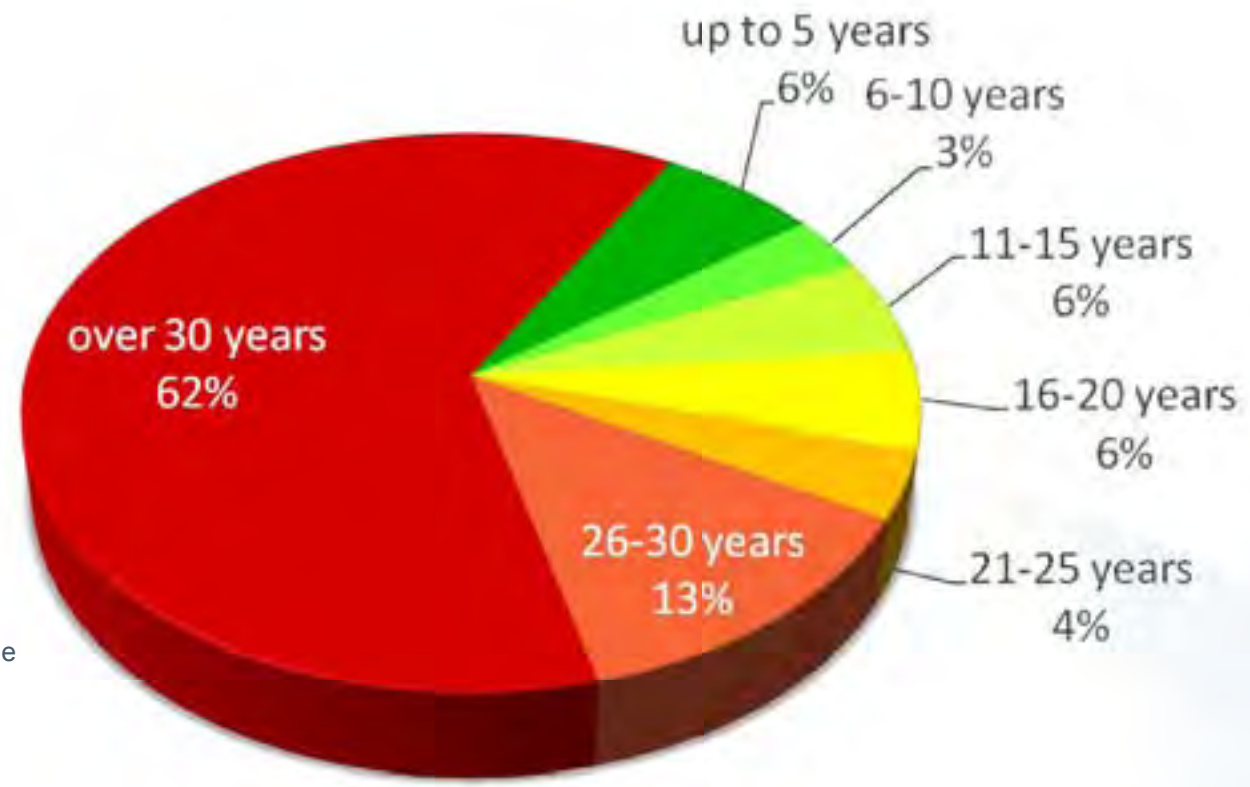


2030





# Age Structure of the Existing Power Plants in Poland



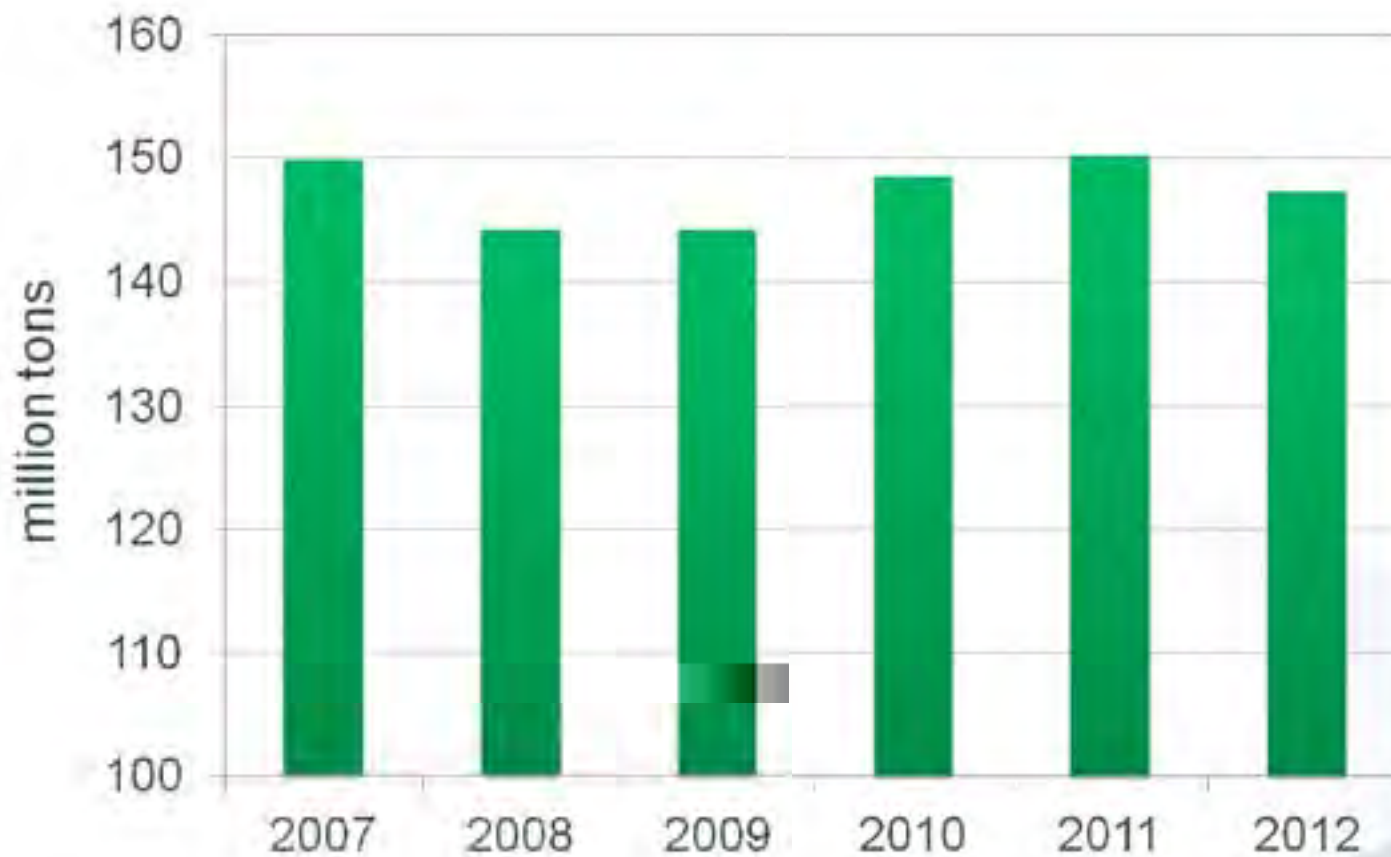
Sorted by boiler's age

Data: Polish Energy Market Agency 2013

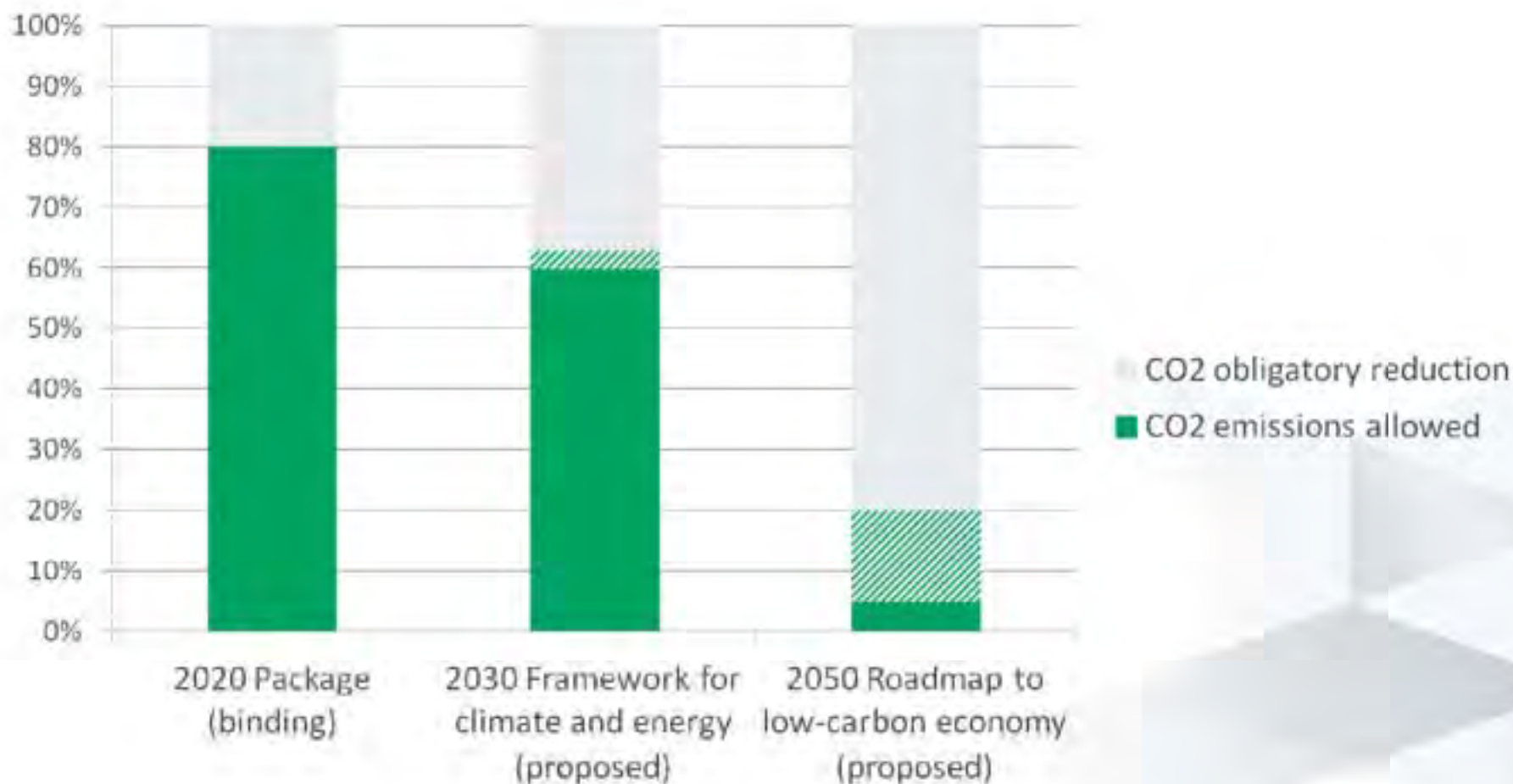
Out of 33.5 GWe of current capacity ca. 6 GWe will be written off before 2020 and further 6 GWe will be shutdown before 2030. This is 36% of present capacity. Nuclear power plants can replace it to some extent.



## CO<sub>2</sub> emissions in Polish power sector

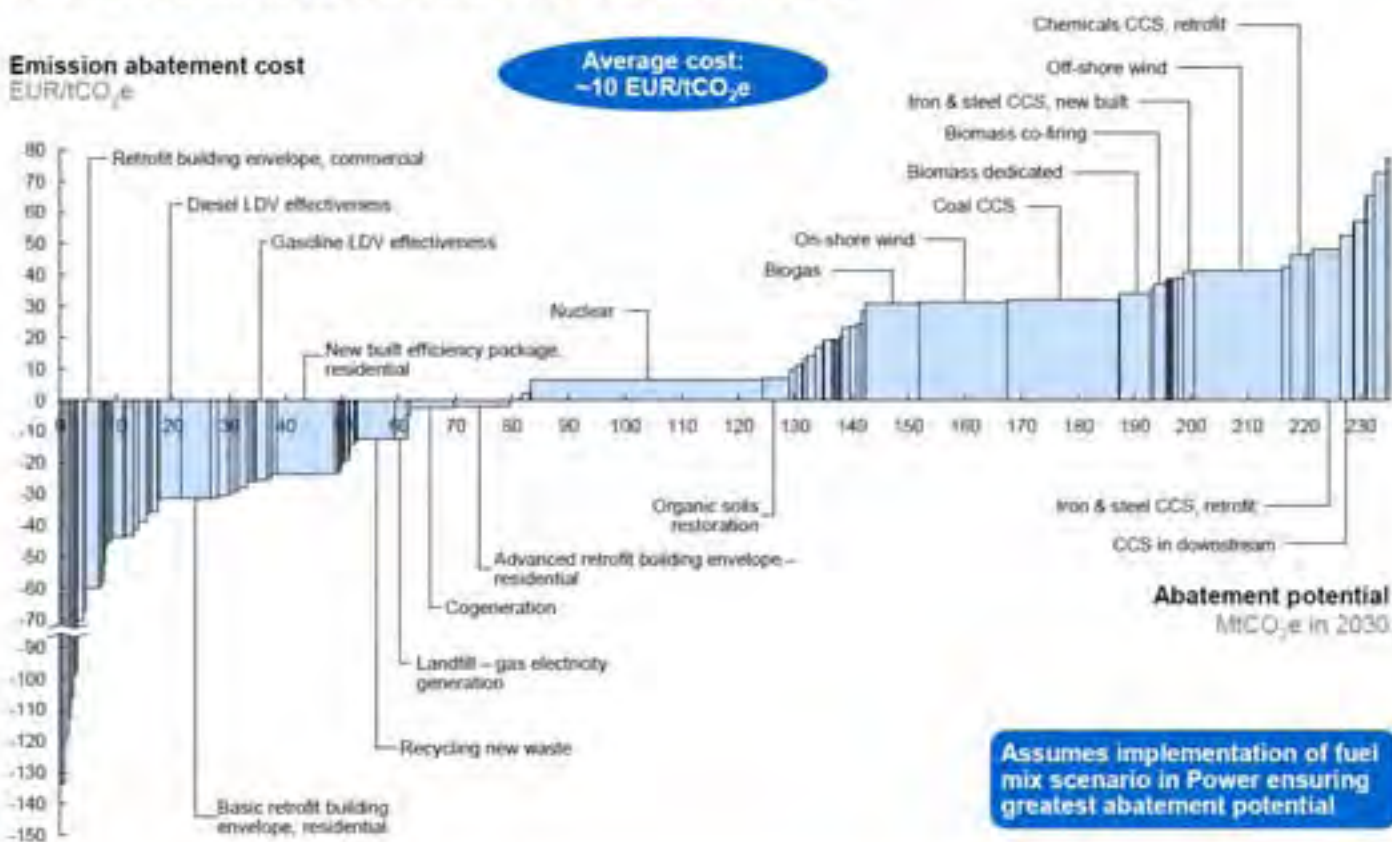


## EU ambitions regarding climate change – a challenge for Poland



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

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



Assumes implementation of fuel mix scenario in Power ensuring greatest abatement potential

<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

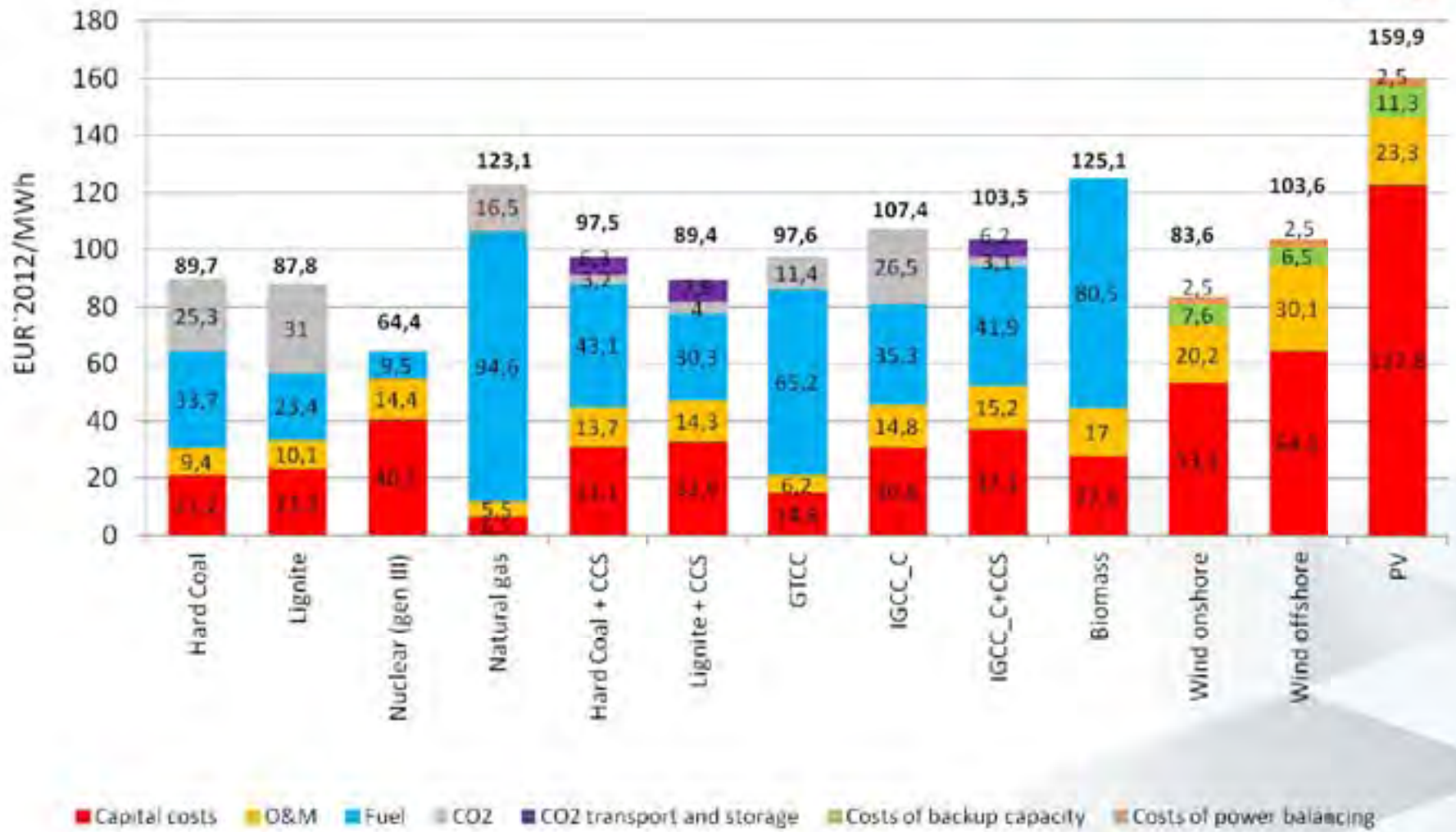
Saving of **35 million tons\*** of CO<sub>2</sub> each  
year or even more if cogeneration  
(district heating) is considered

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



# 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

## Status of PNPP implementation – legal framework

Two laws/bills which allow investment process are in force :

- amended Atomic Law
- Act on the preparation and implementation of investments in nuclear power facilities and investments for the supporting infrastructure (called "investment law").

The Atomic Law is complemented by about 45 regulations, including 3 regulations of the Minister of Economy.

On May 23rd, 2014 the amendment to the Atomic Law to implement the so-called EU radwaste directive (Council Directive 2011/70/Euratom) entered into force.

The strategy: Polish Nuclear Power Program – was adopted by the Council of Minister on January 28th, 2014.

Finally, Ministry of Economy is preparing now a draft of Regulation on the types of technical equipment subject to technical inspection at the NPP





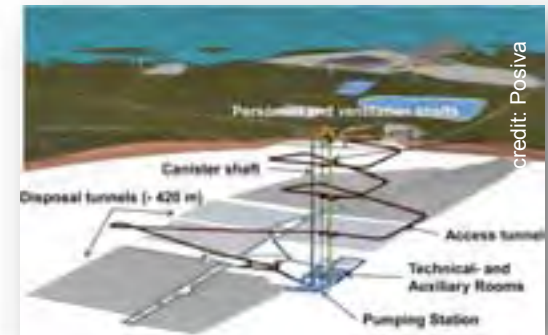
## Status of PNPP implementation – radioactive waste management

In 2014, following the adoption by the Council of Ministers of the PNPP, a draft of the National Plan of radioactive waste management and spent fuel management was prepared and will be approved at the beginning of October by the Ministry of Economy

The plan will be subject to public consultation on its environmental impact assessment.

On 9 of April 2013 a tender for the "Development of methodology to evaluate the safety and identify the optimal location of near-surface LILW disposal" for new LILW disposal was settled, the winning bidder was a consortium led by the Polish Geological Institute. The most suitable site has been identified

In January 2013 a special exploratory unit was set up at the Polish Geological Institute for geological repository for spent fuel



## Status of PNPP implementation – national industry involvement

- MoE is working on a database of Polish companies with competence and capacity to participate in the program.
- In 2012, the first nuclear industrial cluster Europolbudatom was created
- The Polish companies are gaining experience in nuclear projects in Europe. Olkiluoto-3: 4500 workers at the peak (2011), 40% of them were Poles, 25 Polish companies. Polish nationality site manager in 2009-11. Polish workers were recognized as competent and reliable professionals in many projects - Flamanville-3, Pierelatte enrichment plant, Philippsburg NPP, Forsmark NPP, Ignalina NPP.





## Status of PNPP implementation– investor’s activities

PGE wants to commission the first unit by the end of 2024.

In early January 2013, the utility concluded a tender for Site Survey Contractor - the winning bidder was WorleyParsons. The value of the contract is PLN252 million (\$80 million). The study will take more than two years and will include: geological, hydrological, seismic, environmental and natural conditions, the current land use, availability of infrastructure (including power grid). Expected report in the middle of 2014

July 2014 PGE has selected Owner’s Engineer to support the first Polish NPP build project - AMEC

On September 3rd, 2014 PGE, Tauron (power utility), Enea (power utility) and KGHM (copper supplier) signed an agreement to buy shares (10% each) of the PGE subsidiary PGE EJ 1. PGE EJ 1 is responsible for the preparation of the investment process and the subsequent construction of Poland's first nuclear power plant with a capacity of approximately 3000 MW on joint SPV for nuclear project.

In early 2015, in connection with the adoption by the Polish Government of the Polish Nuclear Power Program - launch of tender for reactor technology and the financing scheme of investment is expected (integrated procedure)



## Human resources and Competences

Ministry of Economy is responsible for coordination and follow-up activities related to human resources development

Human resources development plan for nuclear is under final stage of preparation, expected in IV quarter 2014.

### For 2015

Industry – inventory of competencies,

Human resources development for regulator – trainings,

Implementation of training strategy by utility,

Human resources development for Radioactive Waste Disposal Enterprise (ZUOP) – trainings,

Human resources development for Technical Supervision Office – trainings,

Trainings for medical services – for nuclear protection's purposes,

## NPP's possible financing models

### Equity financing:

- PGE + other energy companies (TAURON, ENEA) + large energy consumer (KGHM)
- participation of foreign strategic investor (eg. NPP operator)
- other possibilities: Finnish model (cooperative), model Exeltium, technology providers capital participation

### Dept financing:

- Export Credit Agencies
- international financial institutions, including banks
- project bonds
- other sources

### Possibilities of state support:

- stable law
- guarantees of the State Treasury (state aid for NPP is prohibited under normal rules, but the Euratom Treaty creates some possibilities)
- long-term contracts and similar instruments (eg. Contracts for Difference, solutions from the Exeltium model)
- market capacity
- other possibilities

## Public support for nuclear power in Poland



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

## Local acceptance for NPP



# 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)