



Polish Nuclear Power Program

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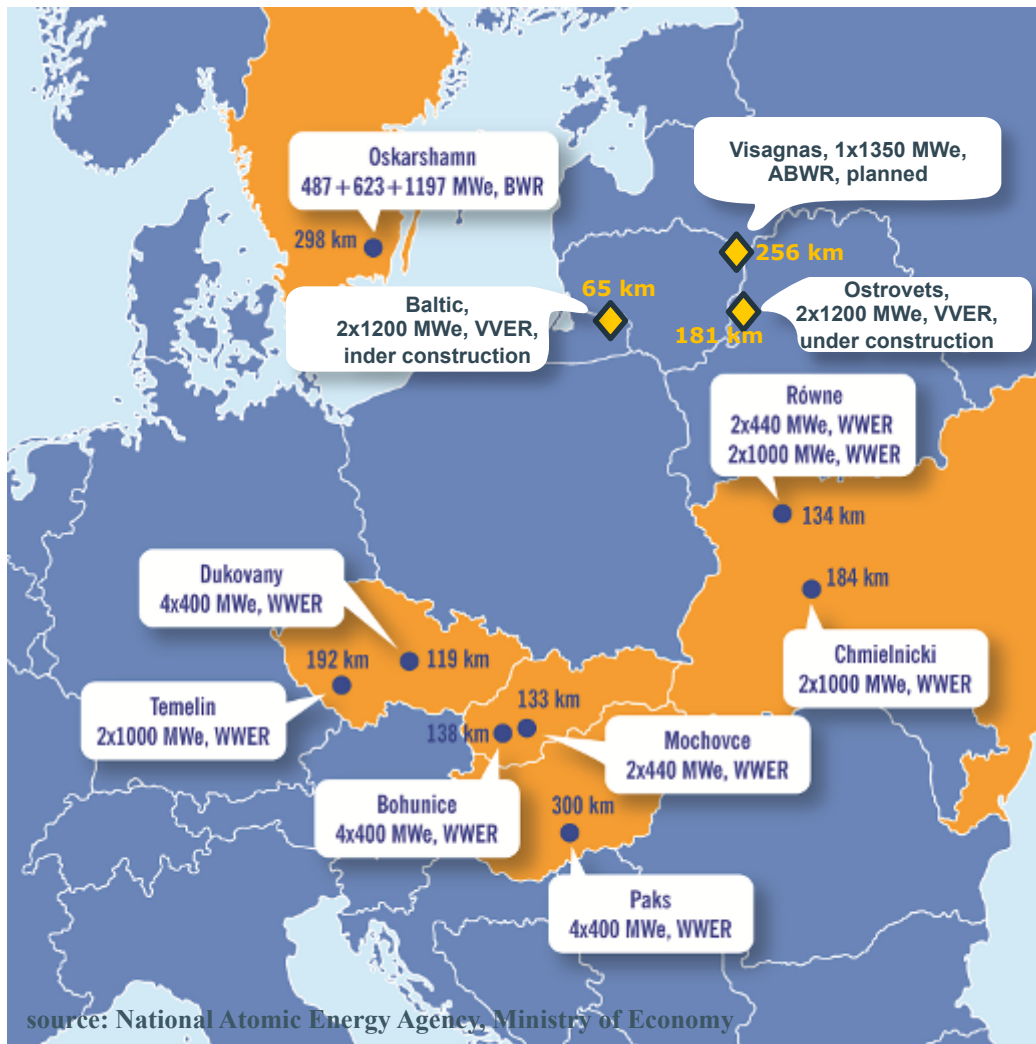
Polish Nuclear Power Program

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 SO₂, NO_x, PM and CO₂**



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.

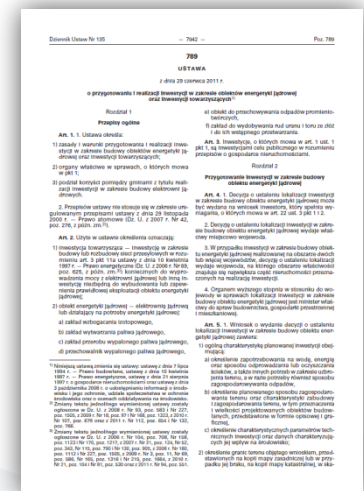
From 2024 Germany will be (probably) the only one neighbour without NPP despite of his considerable import of electricity from “nuclear” France, Sweden, Czech Republic, Switzerland and Poland.

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



Legal framework of the Nuclear Power Program

- Resolution no. 4/2009 of the Council of the Ministers of 13 January 2009 on nuclear power development activities
- Ordinance of the Council of Ministers of 12 May 2009 on establishing Government Commissioner for Nuclear Power in Poland
- Resolution of the Council of Ministers of 11 August 2009 on „Framework time schedule for nuclear power activities”
- **National Energy Policy up to 2030 – approved by the Council of Ministers in November 2009**
- Law of May 13th, 2011 on amendment of Atomic Law and other laws - entered into force on 2011.07.01, with latest amendment on track (implementation of EU ”waste directive”)
- Law of June 29th, 2011 on preparation and realization of Investments in nuclear facilities and accompanying investments - entered into force on 2011.07.01
- **Polish Nuclear Power Program – approved by the Council of Ministers on 28th of January 2014.**

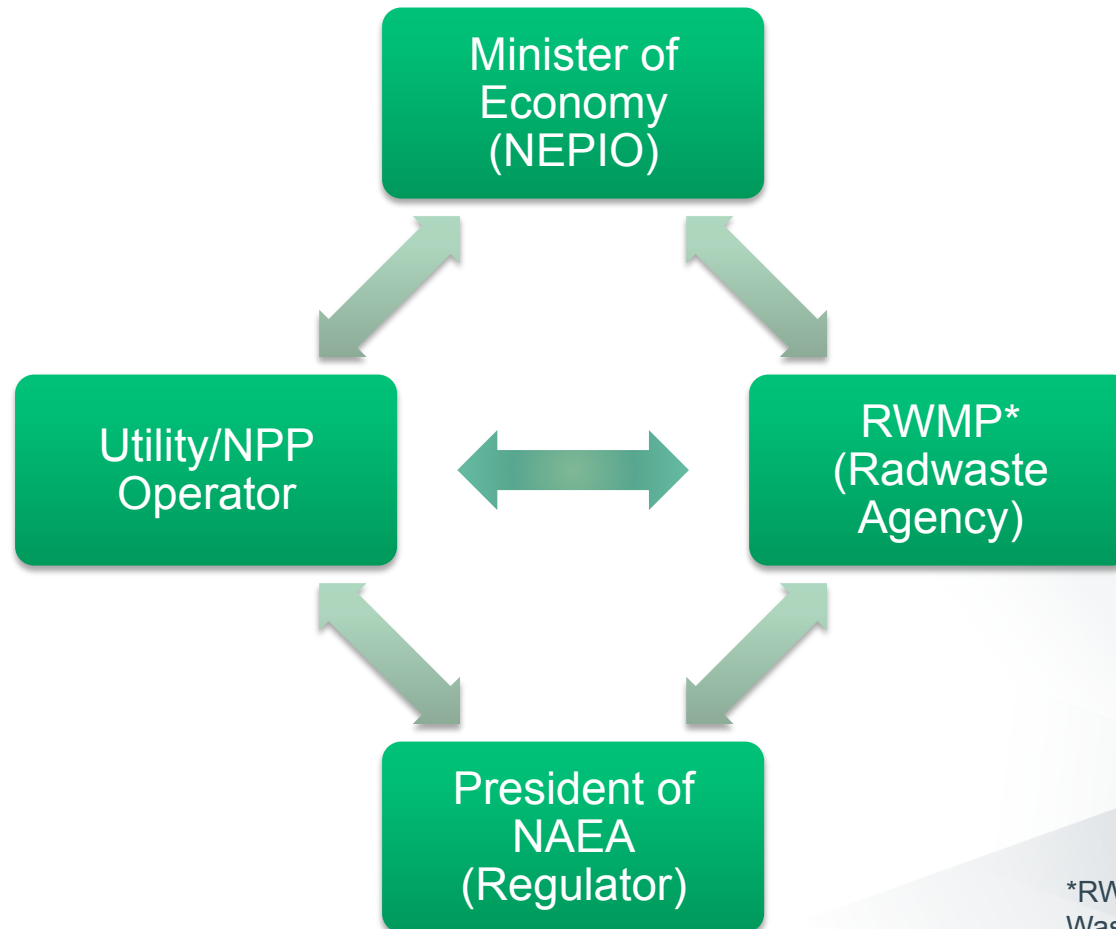


Status of implementation of the PNPP

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 - 12/31/2019:** drafting of blueprints and obtaining all required regulatory approvals
- **Phase III – 01/01/2020 - 12/31/2025:** 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**.

Main participants of the Program

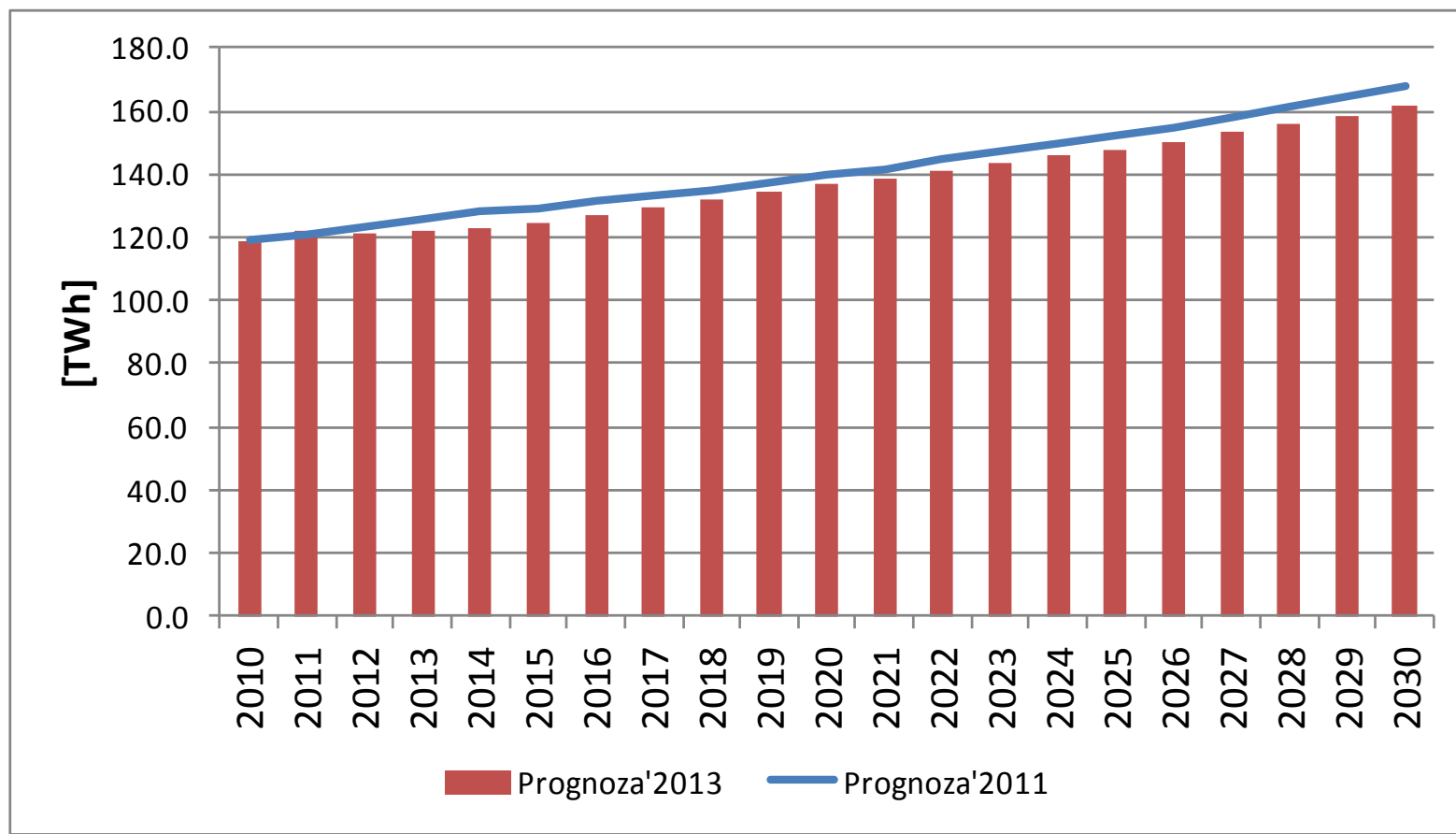


*RWMP = Radioactive Waste Management Plant (ZUOP)



Update of forecast for electricity demand until 2030

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.

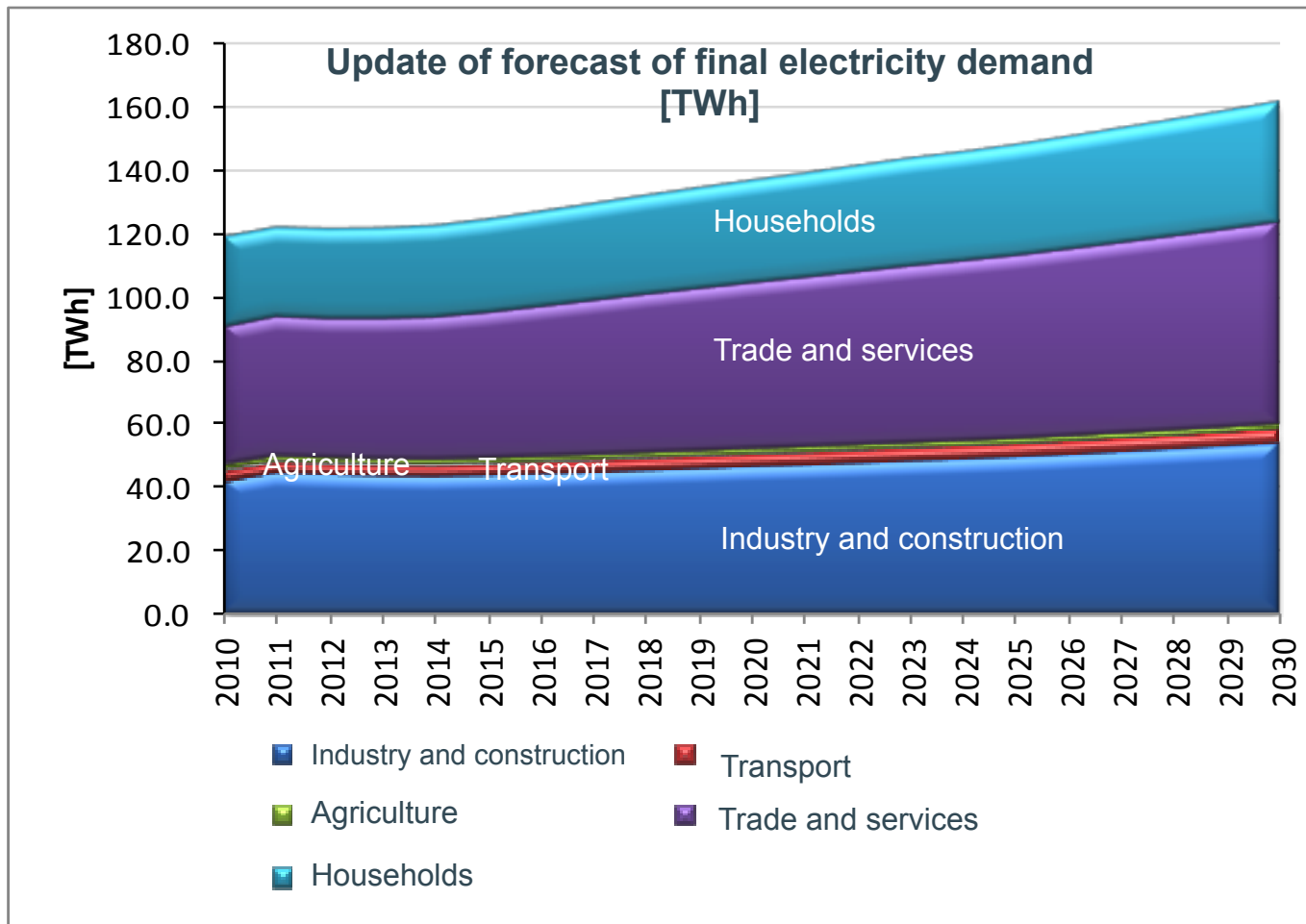


Source: Update of forecast of fuels and energy demand, EMA, June 2013

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

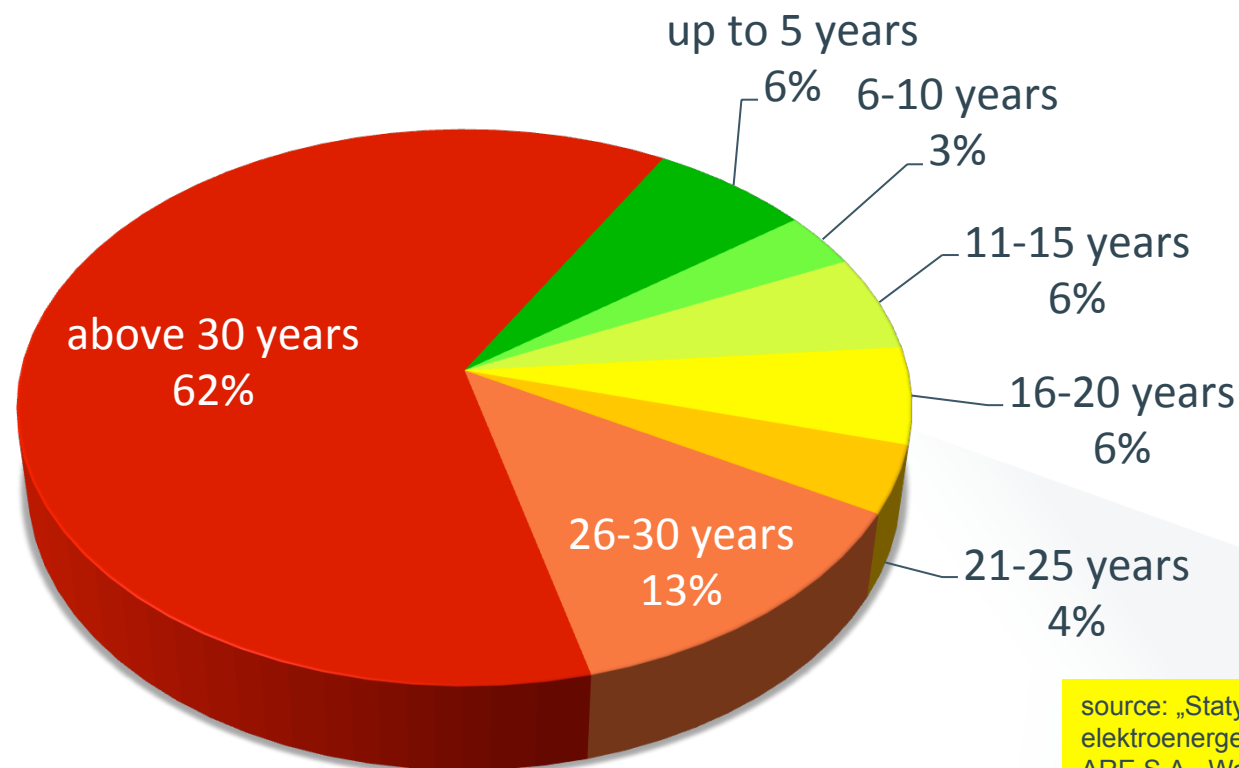


Demand for electricity in Poland will grow



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

Age structure of Polish thermal power plants



source: „Statystyka elektroenergetyki polskiej 2011”, ARE S.A., Warszawa 2012

Z 39 GW mocy obecnie ponad 6 GW zostanie wyłączonych do 2020 r., a kolejne 9 GW w latach 2020-2030 - łącznie 38% mocy zainstalowanej na dzień dzisiejszy. Elektrownie jądrowe pomogą uzupełnić te ubytki mocy.

Emissions of main air pollutants by the electricity generation sector in Poland (2012)

Pollutant	PM	SO ₂	NO _x	CO	Cd	Pb	Hg	CH ₄	CO ₂
Amount (tons)	17 454	366 634	216 960	39 911	84	1 694	2 512	4 255	147 338 000
Trend 2008-2012	↘	↘	↘	↗	↑	↓	↑	↑	↔



source: Emitter 2012, Energy Market Agency (ARE S.A.)



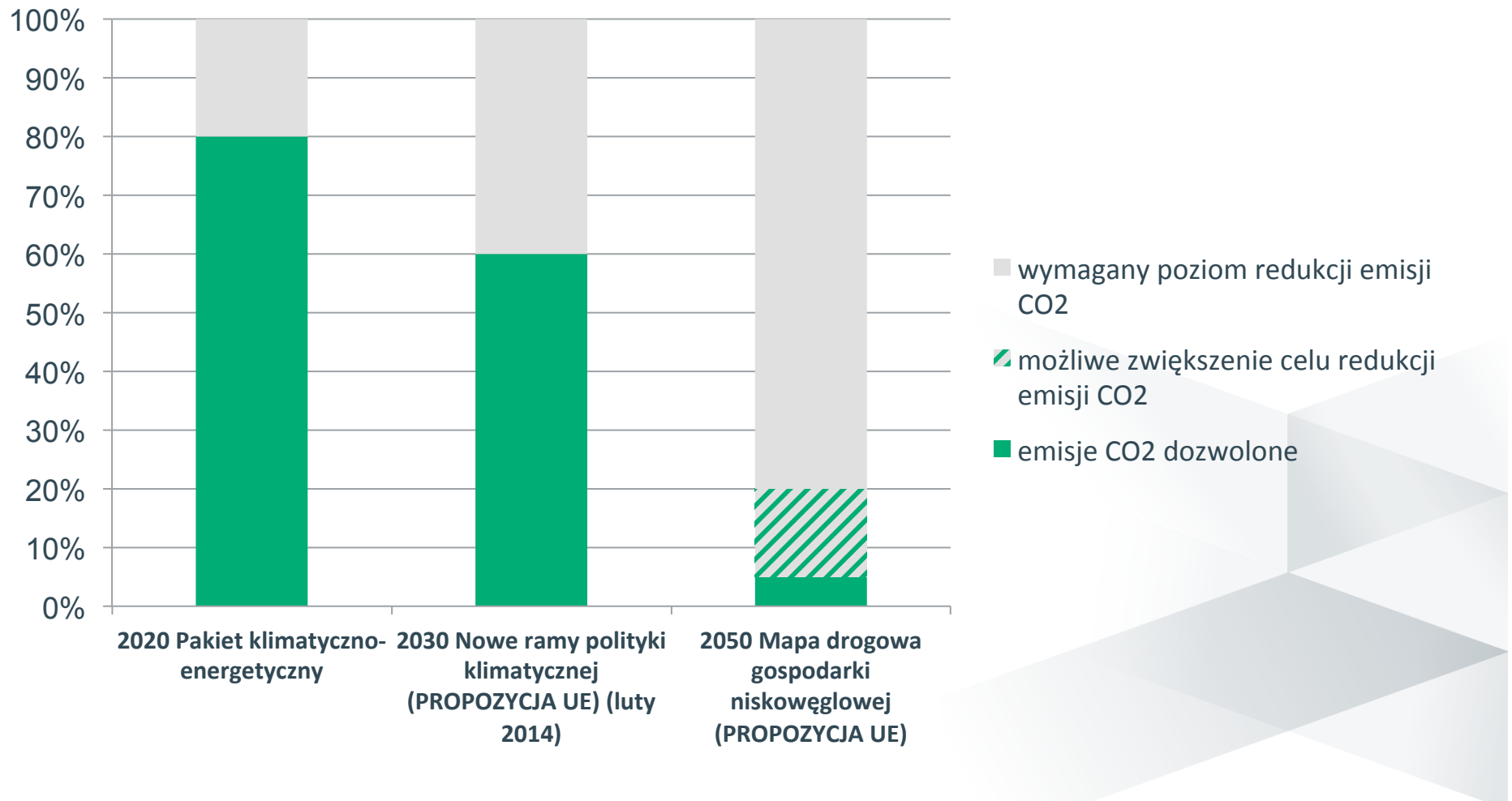
Coal electricity generation is more efficient and clean today, but still emitting air pollutants

Power plant	Dolna Odra	Jaworzno III	Bełchatów	Opole	Pątnów II	Łagisza	Opole
Unit(s) no.	1 - 8	1 - 6	1 - 12	1 - 4	n/a	10	5 - 6
Capacity (MW _e)	total 1567	total 1535	total 4440	total 1492	1x 474	1x 460	2x 900
Type	PC	PC	PL	PC	PL	PC CFB	PC
Start-up year	1974-77	1977-79	1981-88	1993-97	2008	2009	(2017-18)
Main Fuel	hard coal	hard coal	lignite	hard coal	lignite	hard coal	hard coal
PM (kg/MWh)	0,072	0,030	0,049	0,050	0,040	0,090	0,030
SO ₂ (kg/MWh)	2,233	1,060	2,671	0,630	0,720	0,600	0,260
NO _x (kg/MWh)	1,807	1,660	1,336	1,360	0,490	0,600	0,260
CO ₂ (kg/MWh)	941,80	912,21	1091,00	875,00	≈ 660,00	750,00	926,83

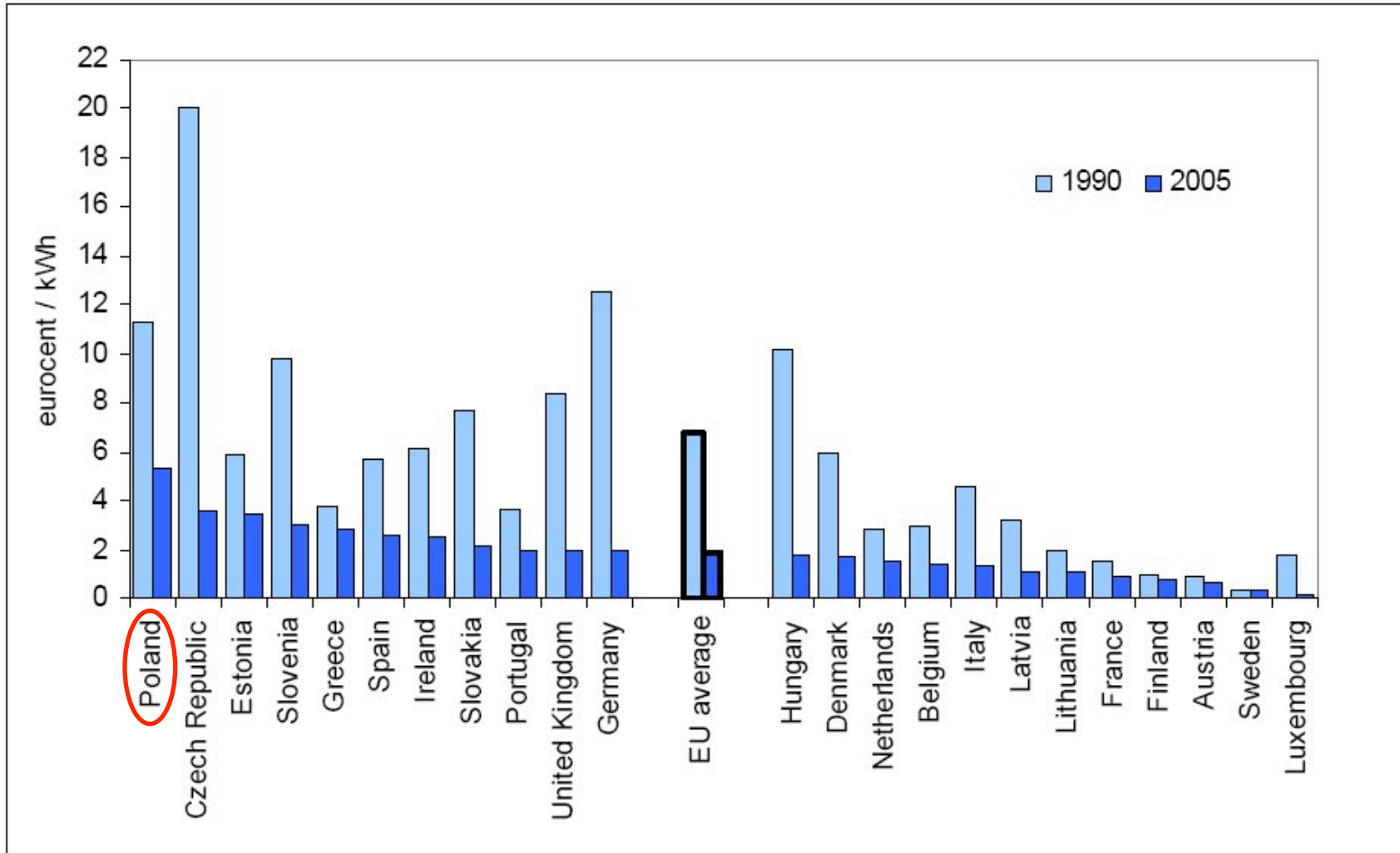
PC – Pulverized Coal ; PL – Pulverized Lignite ; CFB – Circulating Fluidized Bed

sources: utility's environmental declarations, EIAs (for new units), corporate websites

Polityka klimatyczna UE – następne cele redukcji emisji CO₂

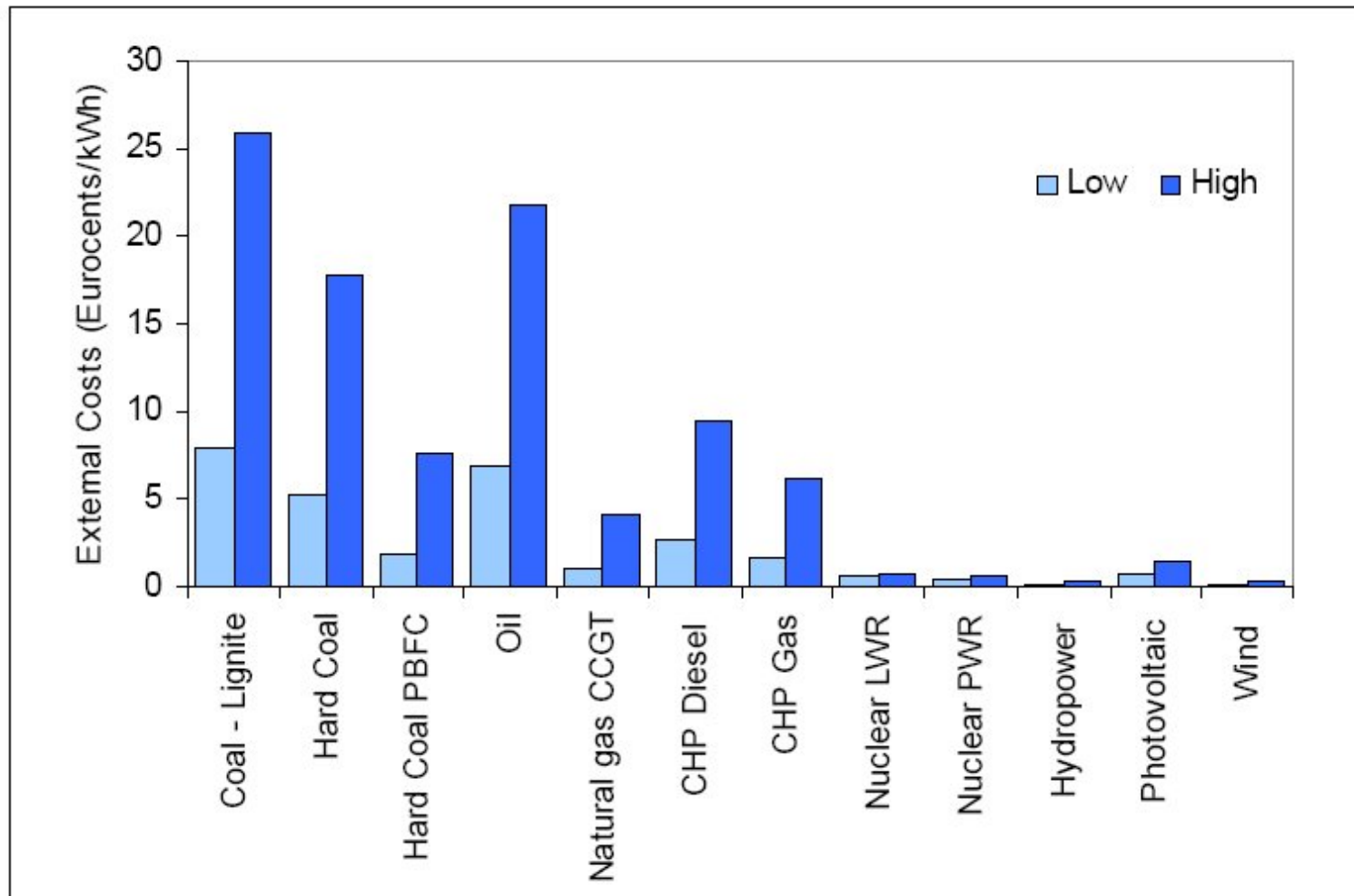


External costs of electricity production in EU (low estimate)



source: European Environment Agency, 2010

External costs of electricity production by power plant type



source:
European
Environment
Agency, 2010

McKinsey's curve of GHG reduction costs for Poland up to 2030

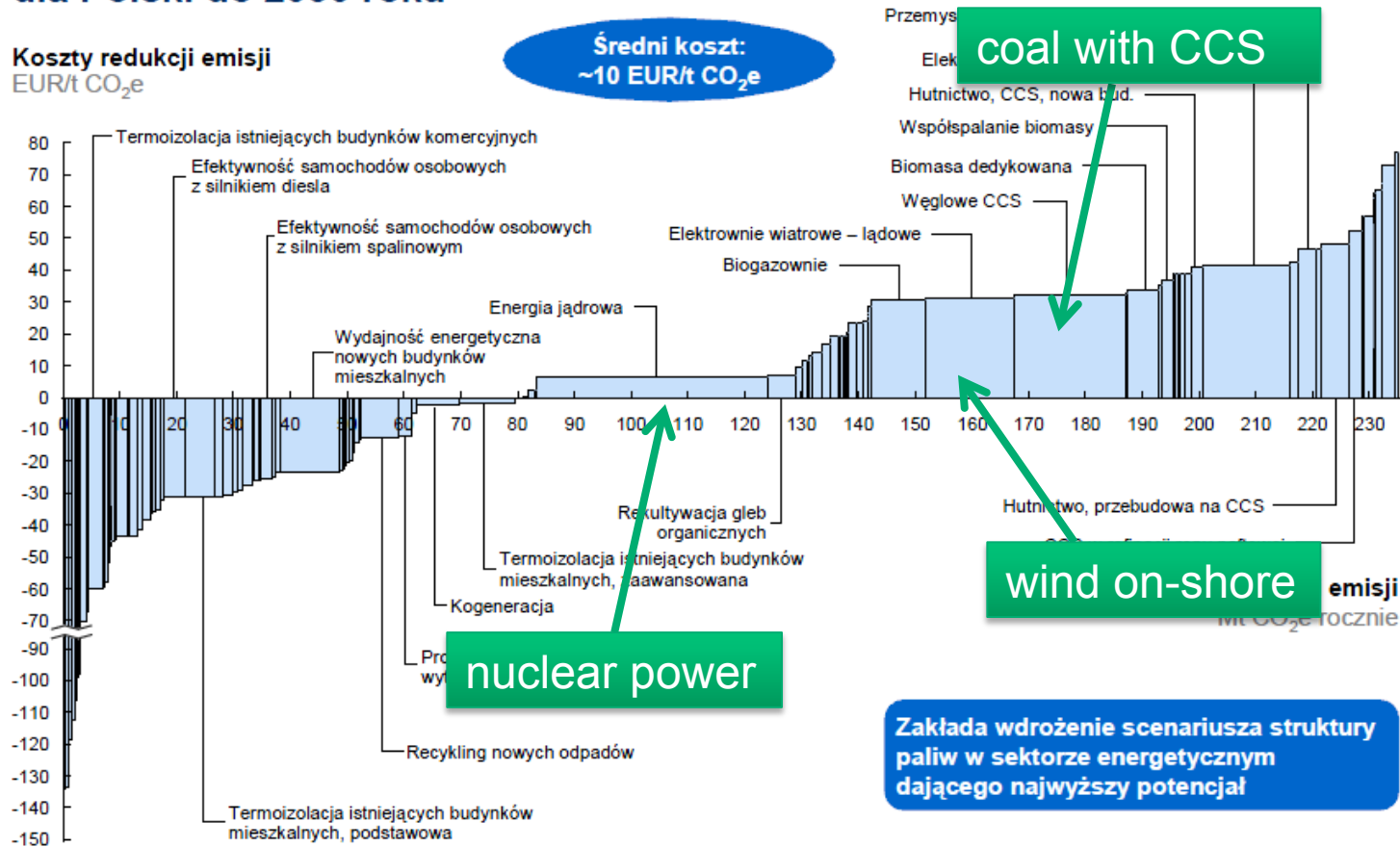
Assumed price CO₂: EUR 10 per tonne

dla Polski do 2030 roku

Koszty redukcji emisji
EUR/t CO₂e

Średni koszt:
~10 EUR/t CO₂e

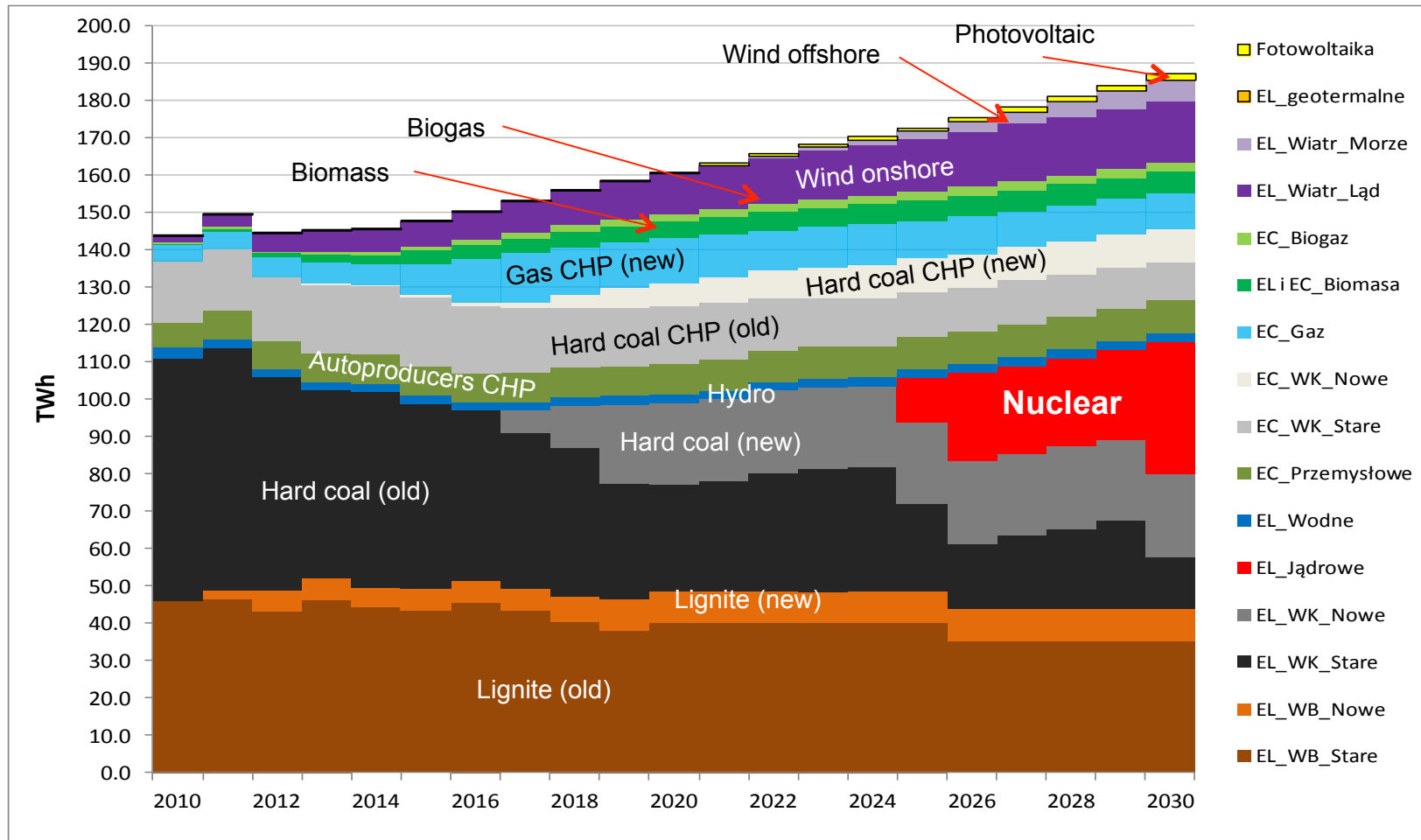
Emission reduction costs EUR/t CO₂e



1 Wymieniono nazwy tylko metod redukcji emisji o największym potencjale

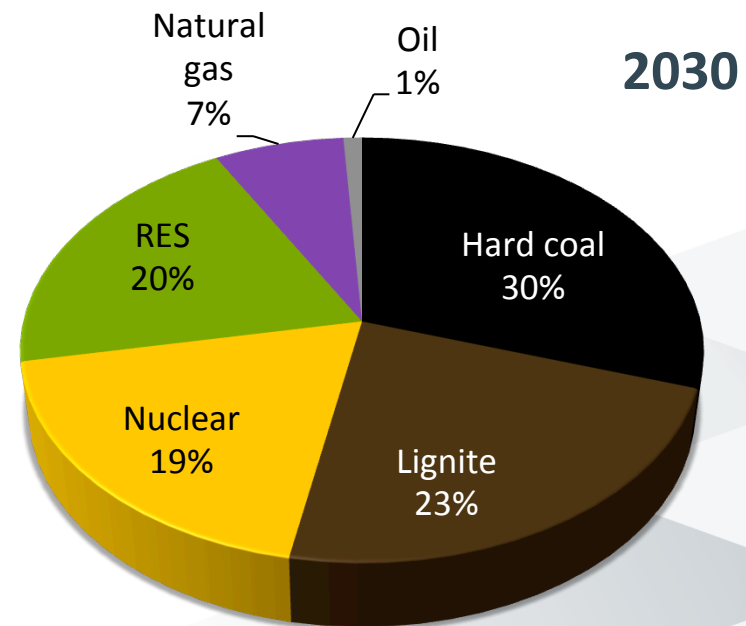
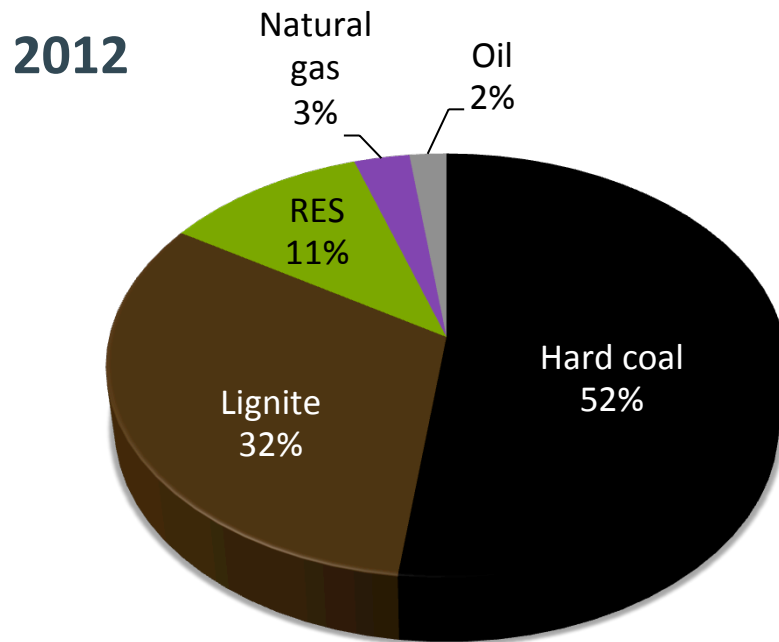
ŹRÓDŁO: Krzywa McKinsey redukcji emisji gazów cieplarnianych w Polsce

Electricity generation structure in 2030



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

Electricity generation structure (*energy mix*)



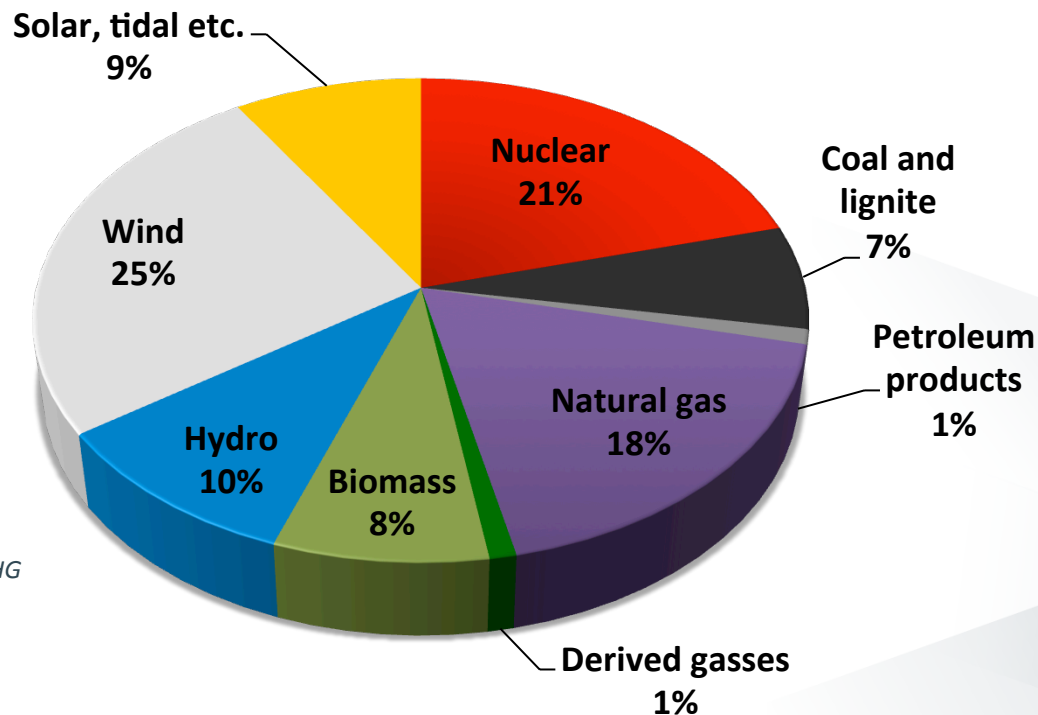
Source: Update of forecast of fuels and energy demand, EMA, June 2013



Future of nuclear power in EU - latest EC report

Nuclear power will maintain its role as an important source of electricity and alongside with RES as one of two main zeroemission sources – according to the latest European Commission report *EU Energy, Transport and GHG Emissions: Trends to 2050*

EU energy mix in 2050



source: *EU Energy, Transport and GHG Emissions: Trends to 2050*, European Commission, 2014.

Electricity production by fuel type.

Climate policy benefits from nuclear power in Poland

2 NPPs with combined capacity
of ca. 6 000 MWe

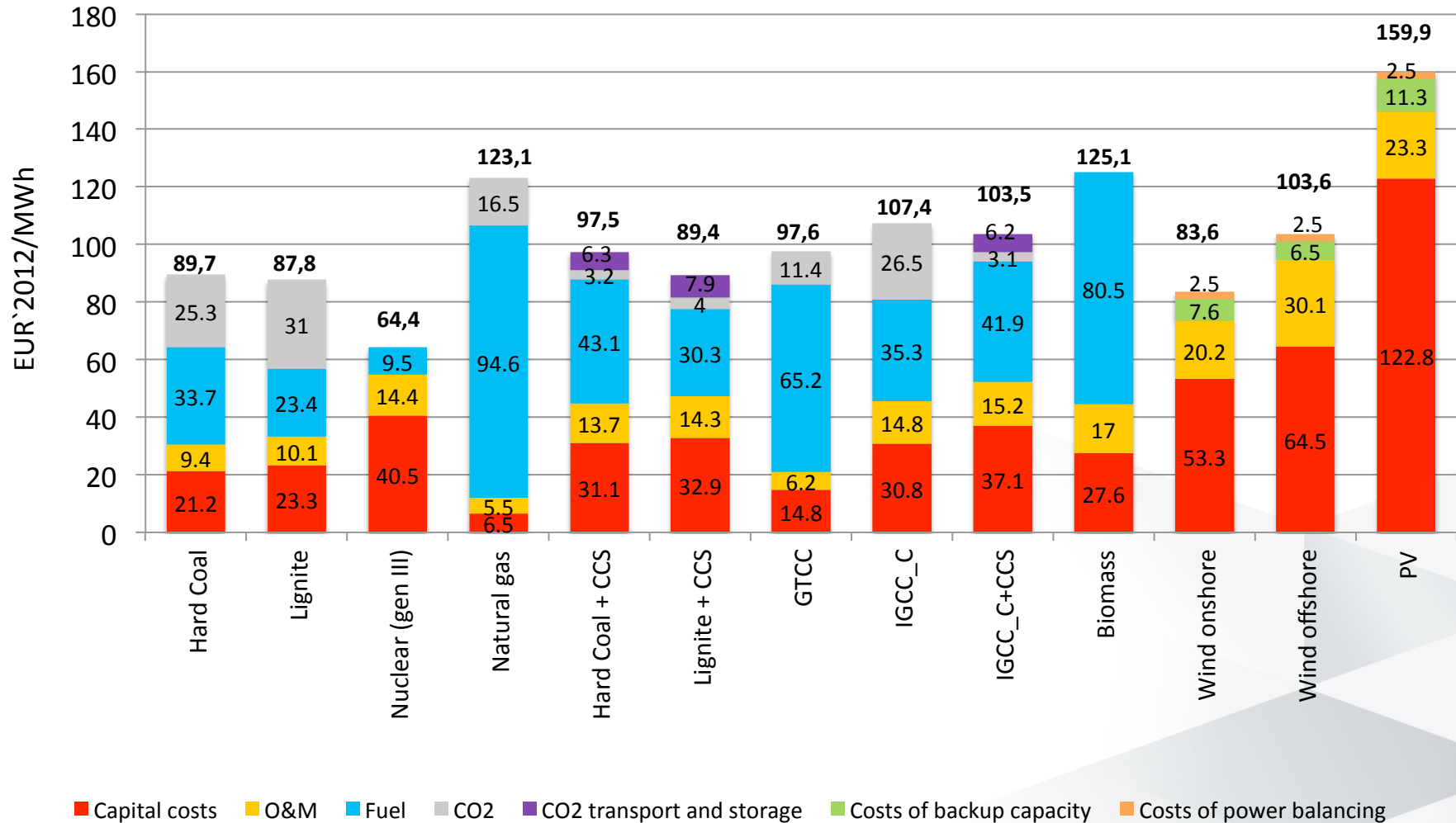
Electricity production of 50 TWh per year

Saving of **>36 million tons*** of CO₂ each
year or even more if cogeneration
(district heating) is considered

This is **24% of current CO₂** emissions per
year in Polish electricity generation sector

*in comparison to modern coal power plants with emissions rate less than 750 kg/MWh

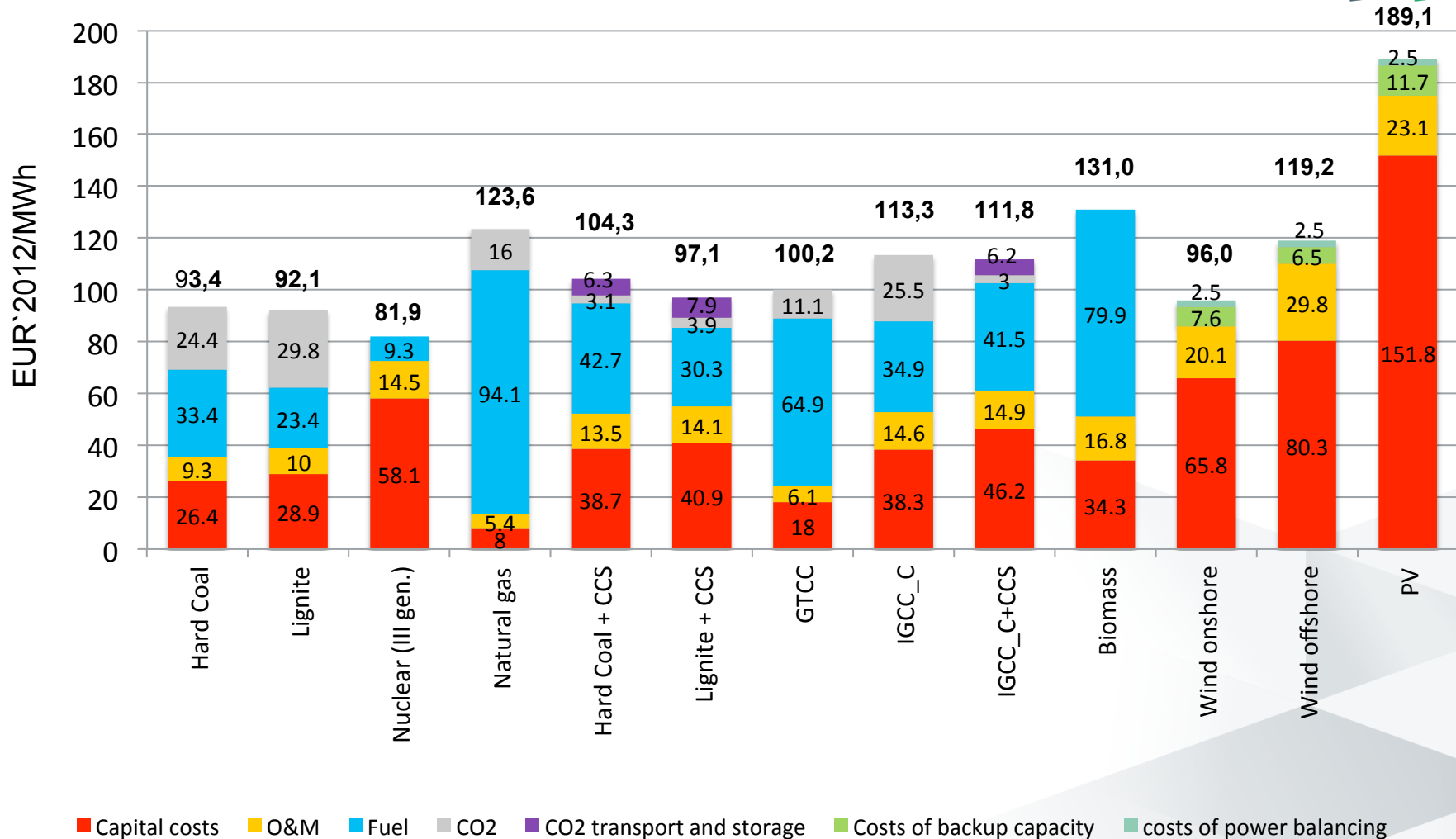
Comparison of averaged electricity generation costs for technologies foreseen to implement in PL from 2025



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

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: 8%
Nuclear investment cost: €4,000,000/MWe

Transboundary 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.



Three candidate sites for the first NPP location identified

- On 25th of November 2011 PGE announced three candidate sites (in alphabetical order: Choczewo, Gaški, Żarnowiec)
- PGE and MoE continue information and communication campaign in all three locations and neighbouring areas
- Financing & Investment analyses on-going by PGE
- Letter of intent was signed between PGE, ENEA, TAURON, KGHM to set up joint company which could be future operator and licensee.
- Site Characterization contractor was selected in January 2013



Nuclear Energy



Evolution in progress



Thank you for your attention

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