

Needs of Polish district heating networks and industrial sectors – possible application of the nuclear cogeneration



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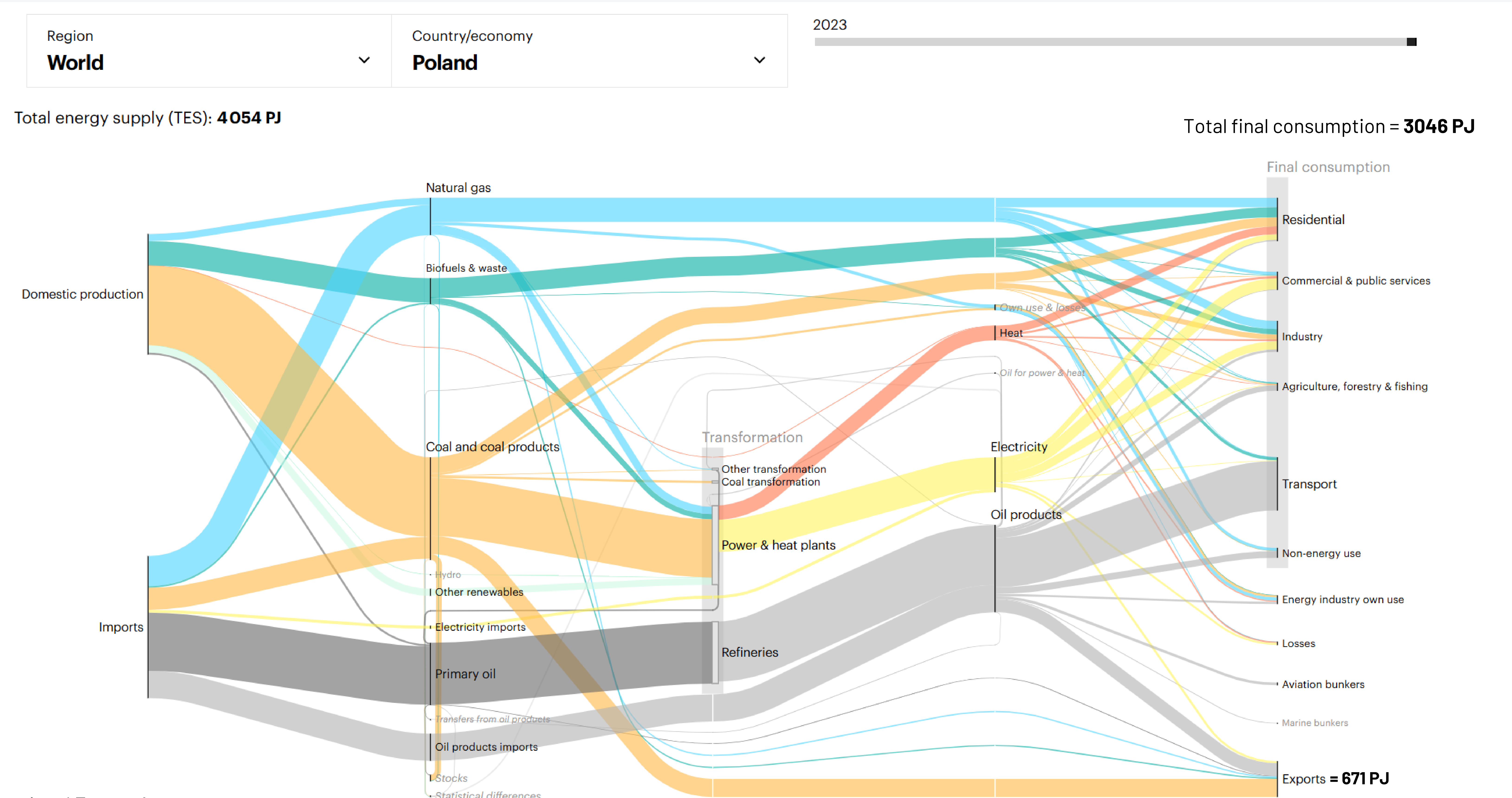
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GREEN ENERGY

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Polish energy consumption



Polish energy consumption

Usage	Product	Final consumption (PJ)	Share
Transportation	Electricity	13	0,4%
	Fuels	979	32,1%
Residential and commercial and public services	Electricity	309	10,1%
	Heat	186	6,1%
	Fuels	651	21,4%
Industry	Electricity	151	5,0%
	Heat	31	1,0%
	Fuels	392	12,9%
Agriculture, forestry, fishing, and non-energy use	Electricity	6	0,2%
	Heat	1	0,0%
	Fuels	326	10,7%
Total final consumption (PJ)		3046	100,0%

- 27,5% of total consumption = space heating
- 7,1% of total consumption = heat from district heating

District heating networks

- In Poland there are 380 licensed companies which produce heat.
- District heating networks supply heat to 52% Polish households (40% of population).
- Almost a half of Polish district heating networks have installed capacity up to 50 MWth.
- Typically district heating networks in Poland utilize about 5-10% of installed capacity during summer.
- Share of heat from cogeneration in district heating is 69%.
- Non-cogeneration heat from RES is 3,2%.

Heat production

	Total	Energy and District Heating Companies	Industry
Number of companies with installed capacity > 0	380	310	70
Installed thermal capacity [MWth]	50 952,8	39 382	11 571
Used thermal capacity [MWth]	41 240,6	33 312	7 928
Thermal capacity ordered by end users [MWth]	33 977,2	31 838	2 139
Heat production [TJ]	343 197,2	237 493	105 704
Recovered heat [TJ]	33 373,9	90	33 284
Own use consumption of heat sources [TJ]	11 469,2	4 724	6 746
Own use consumption by other forms of business activities [TJ]	112 202,4	2 224	109 978
Heat supplied to district heating networks [TJ]	252 899,6	230 635	22 265
Share of heat supplied to district heating networks [%]	100%	91%	9%
Heat losses [TJ]	33 022,0	31 798	1 224
Heat supplied to end users [TJ]	219 877,6	198 837	21 041

Fuel mix in district heating

			Heat production in cogeneration				Heat production not in cogeneration			
	TOTAL		Energy and District Heating Companies		Industry		Energy and District Heating Companies		Industry	
	TJ	%	TJ	%	TJ	%	TJ	%	TJ	%
hard coal	186 852,8	54%	96 010,7	66%	20 541,5	23%	61 685,6	68%	8 615,0	57%
lignite (brown coal)	3 291,8	1%	2 973,0	2%	0,0	0%	318,8	0%	0,0	0%
light fuel oil	2 137,4	1%	64,6	0%	51,3	0%	1 983,1	2%	38,4	0%
heavy fuel oil	24 626,0	7%	1,3	0%	24 570,3	27%	54,1	0%	0,2	0%
high-methane natural gas	57 850,5	17%	28 114,6	19%	11 654,9	13%	15 256,1	17%	2 825,0	19%
nitrogen-rich natural gas	6 454,9	2%	3 318,4	2%	2 459,1	3%	662,4	1%	15,1	0%
biomass	44 242,6	13%	12 395,7	8%	22 430,9	25%	8 707,7	10%	708,4	5%
biogas	150,9	0%	8,0	0%	110,2	0%	29,9	0%	2,9	0%
other renewable energy sources	1 517,0	0%	0,0	0%	54,7	0%	1 355,0	1%	107,3	1%
municipal solid waste	7 355,6	2%	1 353,3	1%	4 858,9	5%	0,0	0%	1 143,4	8%
non-renewable industrial waste	0,0	0%	0,0	0%	0,0	0%	0,0	0%	0,0	0%
other fuels	8 717,6	3%	1 919,8	1%	3 958,4	4%	1 281,1	1%	1 558,3	10%
Total	343 197,2	100%	146 159,5	100%	90 690,1	100%	91 333,7	100%	15 013,9	100%

Nuclear cogeneration applications

- Most likely scenario = replacement of some cogeneration heat sources based on fossil fuels.
- Non-cogeneration heat sources may have too small heating output to even consider any cogeneration.
- Therefore, upper limit for nuclear cogeneration application may be 55% of heat production (190 PJ).
- However, almost a half of Polish district heating networks have installed capacity up to 50 MWth, therefore, some of them may be too small to consider nuclear cogeneration.
- What is more, RES heat sources will replace some of cogeneration heat sources based on fossil fuels to fulfill Energy Efficiency Directive requirements.
- Future decrease of heat consumption also influences the potential of nuclear cogeneration application.

Energy Efficiency Directive

- District heating networks will decarbonize using RES and waste heat, thus decrease some of the potential of nuclear cogeneration
- Heat from nuclear reactor is barely mentioned in the Directive and totally omitted in the criteria.
- European Parliament and the Council of EU voted to treat the nuclear energy generation equally to renewable energy generation.
- The Directive should be updated to reflect this decision.

Date	Renewable energy and/ or waste heat	Cogeneration only	Mix (renewable energy + waste heat + cogeneration)
Until 31.12.2027	50%	75%	50%
From 01.01.2028	50%	80%*	50% (min 5% renewable)
From 01.01.2035	50%	N/A	80% (min 35% renewable or waste heat)
From 01.01.2040	75%	N/A	95% (min 35% renewable or waste heat)
From 01.01.2045	75%	N/A	N/A
From 01.01.2050	100%	N/A	N/A

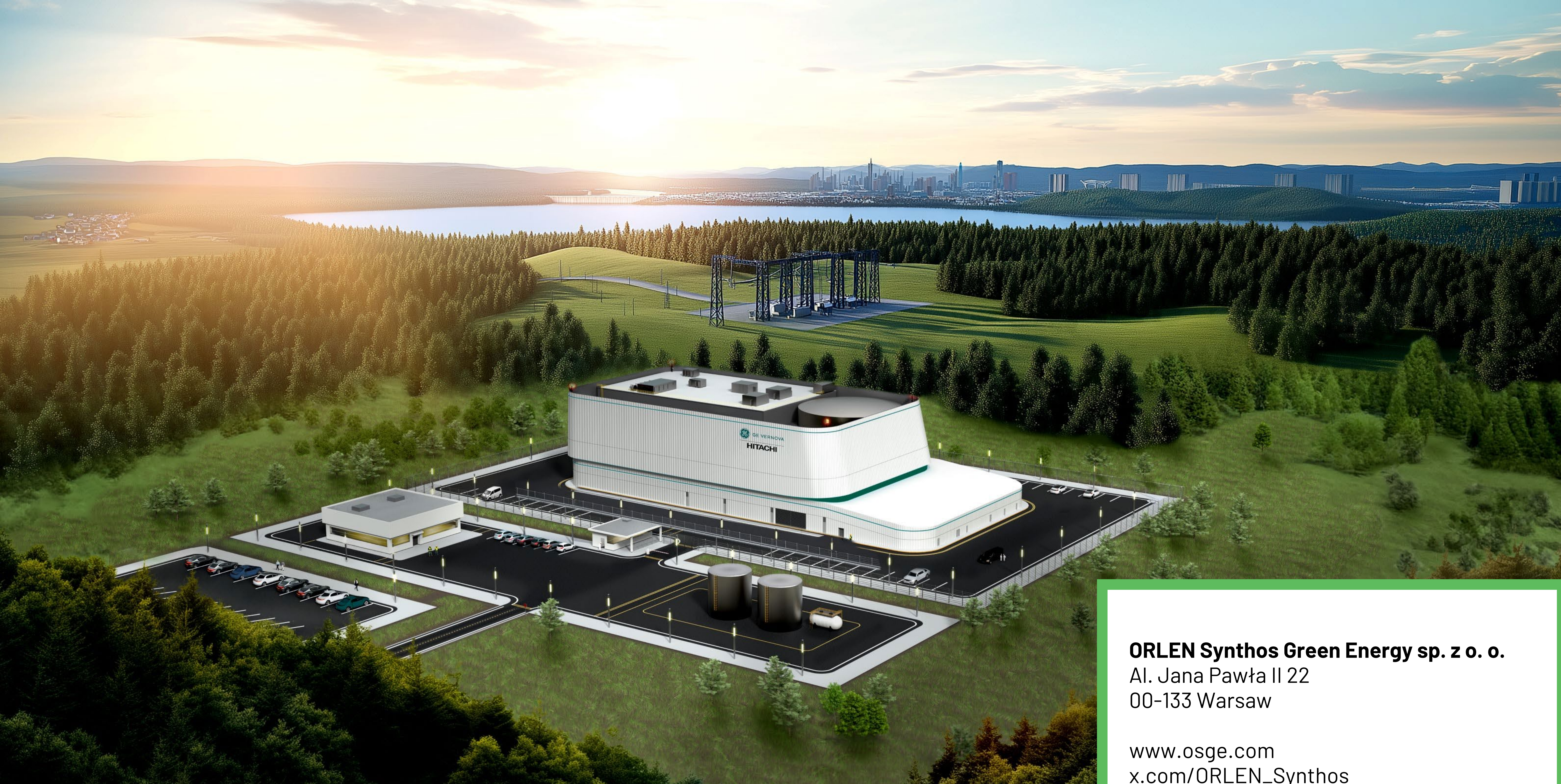
*high-efficiency cogeneration (defined in detail in the Energy Efficiency Directive)

Conclusions

- Nuclear cogeneration may be applied in Poland to produce heat for district heating networks and industrial facilities.
- The exact potential of the application must be further investigated due to multiple factors:
 - technical limitations,
 - economics,
 - timeline of implementation,
 - RES investments,
 - heat demand decrease.

Sources

1. International Energy Agency. World Energy Balances. <https://www.iea.org/data-and-statistics/data-product/world-energy-balances#energy-balances>
2. International Energy Agency. Energy Sankey. <https://www.iea.org/data-and-statistics/data-tools/energy-sankey#overview>
3. Energy Regulatory Office. Energetyka ciepła w liczbach – 2025. <https://www.ure.gov.pl/pl/urzad/informacje-ogolne/aktualnosci/13360>
4. Energy Efficiency Directive (UE) 2023/1791



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