

A lot of arguments against nuclear power within the last two decades of ongoing public discussions and debates have been less about nuclear power as such but more about its systemic limitations: that nuclear takes too long to build to be considered efficient in the face of need to decarbonise quickly, that it costs too much upfront and that all too often, it also fails to meet the targeted timelines and budgets. Topped with the sacramental “we still don’t know what to do with the radioactive waste”, these arguments have always been hard to counter. The experience of the last two decades was simple: as derived from the will to disregard the social, political, legal, financial and systemic environment as these arguments may have been, they were - on the face of them - painfully true. Just look at the delays in the Vogtle project in the US¹. Hinkley Point C in the UK². The flagship EDF project in Flamanville in France³. Or, for that matter, at Olkiluoto 3 in Finland which succeeded, a decade after it was due, thanks to the incredible stamina of the Finns as a sober and extremely pragmatic society⁴. The sad observation that the share of nuclear energy in the global energy mix had been steadily declining was also true. Even the Chinese drive to first collect all technologies available on the nuclear market and then to develop and export their own, did little to slow this decline down.

But recently the times have been, oh, a’changing - globally, not only here in Poland.

Nuclear energy does not fit well into the economic model that has been dominating our thinking and policies over the last three decades⁵: the investment process is long and when it brings returns, and high ones, it brings them decades after it’s completed. No matter that nuclear reactors can operate for as long as 80 years and counting - no commercial bank looks that far into the future, which makes it quasi-impossible for nuclear projects to find commercial financing options. Not to mention the insurance - this question had been lying neglected for decades making it a vicious circle: not much was happening on the nuclear front so the insurance options were not exactly in hot demand but since they were not readily available, nuclear projects bumped against an insurance wall and crumbled. Even the American market, the only one who used to be able to build and run nuclear projects

without State support, was not ready to accommodate their needs. And since there had been no will, the way was not there either.

The need, however, is there. We see it now – it's obvious.

The Japanese were the first to point it out. Yes, the Japanese – the people who, burdened with fear and guilt after Fukushima, decided to stop all their nuclear reactors overnight only to realize how badly they need them. It was them who first publicly – since everyone was watching – raised the crucial point: that it is not only how much electric energy you produce and how much it costs that actually matters. It also matters how you produce it.

Carbon emissions and environmental aspects of importing natural gas and coal for energy generation are one thing. But being forced to import them at all – almost entirely in this case and in enormous quantities at that – was, for the practically energy independent pre-Fukushima Japan, quite another. The website of the Japanese Agency for Natural Resources and Energy tells a heart-breaking story: “Having experienced oil crises in the 1970s, Japan reduced its dependency on fossil fuels to a certain extent” – we read, knowing that it was done thanks to carbon-free nuclear – “However, since the Great East Japan Earthquake in 2011, thermal power generation has increased with dependency on fossil fuels.”⁶ In 2019 this dependency reached 84,8%. 85% – with fossil fuels being practically entirely imported from overseas and all this despite dynamic development and roll-out of RES technologies. These massive imports meant utter reliance on volatile global markets and they had Japan reconsider nuclear power. As early as 2014, Japan set the target for nuclear participation in the country's energy mix at 22%⁷.

Very few people, apart from the energy experts, paid close attention to what the Japanese case was telling all those who would listen. Until, what is known in media and communication studies as a focusing point materialized.

Focusing point is an event, a development that draws attention to an aspect of a matter that had, until then, escaped the radar. It's an event that forces us to question our attitudes and very often – also our political and social policies. And that is the case of the Russian aggression on Ukraine which took place in February 2022.

In summer 2023, Ukraine is still successfully resisting, assisted in its heroic efforts by a number of allies and supported by NATO, while the global energy market has, over the last 18 months, been through a number of upheavals related to the West imposing sanctions on the import of many things Russian, including gas and coal.

The facts, when you want to look at them closely, are self-explanatory: fossil fuels are not a given. Or rather, to an extent, they used to be but are no more. Not if we consider the climate, the economics, the availability, the long-term planning and – most importantly – the politics. During times of relative global stability and peace, it was convenient to lull ourselves into thinking that fossil fuels would always be up for grabs somewhere on a large global market, at least until we all are able to fuel ourselves with RES. But even then it's not so simple, especially when you also need industrial heat, and the Japanese case should have taught us the lesson. And here we are: at this moment in history when we are confronted with the question: will fossil fuels indeed always be available? Is it wise to put our countries, people and economies on the mercy of the more and more remote regions and volatile allies who peddle them? All that at the time when the competition for access to these limited resources will only be growing?

China has it all calculated: they have calculated they will run out of their own coal by 2034. Already, transportation of hard coal produced in remote, sparsely populated and non-industrialized regions constitutes ca. 50% of the cargo transported by an extremely developed Chinese rail network to places where it is consumed. The logistics and costs of these operations are exorbitant and China still buys coal and natural gas abroad: where it can and when it can. Also the Indian drive to go nuclear has been motivated by its desire to lessen its reliance on imported fuels with their own hard coal reserves quickly diminishing. This very desire was one of the main drivers behind the original development of the Indian thorium-based nuclear fleet: they needed stable and disposable power production sources, while due to the breach of the Non-Proliferation Treaty, India had been, for a long time, not allowed to buy uranium on a global market. And if China and India are, to say the least, not exactly onboard with the univocally anti-Russian stance of the West in the Ukrainian conflict, then power play involving cheap supply of natural gas and coal from Moscow are not to be neglected as part of this obviously more complicated and nuanced equation.

India has made enormous investments into RES technologies⁸ and so did China^{9 10}. They both put the rest of the world to shame in this respect. But none of them, even for a minute, considered dropping nuclear as did the West. All this for a reason.

Nuclear is the only energy source that can replace fossil fuels in the energy mix on a one to one basis, which has been evident for decades. Just look at who was responsible for the Australian ban on any nuclear infrastructure in a country that is one of the three largest uranium ore suppliers for the global market – it was the coal mine owners, playing the card of nuclear killing mining towns and driving whole communities out of their mining jobs. Just look at who killed the Żarnowiec NPP built in Poland during the country's transition to democracy and market economy – was it coincidence that this decision was made by

government representatives issued from coal mining trade unions who helped bring “Solidarność” to power? In hindsight – an extremely costly and fateful decision that cemented the heavy reliance of the Polish energy sector on coal for decades to come?

In 2023 we are leaving this history behind, however. If we are doing so it's because the realization of how important energy security and energy independence are hit home, hit it hard, and things started moving on the nuclear front also in areas and places where they were not really expected to.

Vogtle 3 has finally been completed, with Vogtle 4 coming online next year. Hinkley Point C is making steady progress. Sweden switched off two reactors in Ringhalls¹¹ in the attempt to follow the Germans in their *Energiewende* footsteps, only to see change at the highest political level revive the plans to deploy more and not less nuclear in the country¹², including the SMRs¹³. Spain, following the elections planned for the fall of 2023, is on the path to repeating the story that played out in Sweden¹⁴ and, curiously enough, in South Korea, a notable nuclear technology exporter^{15 16}. Finland, where the local Green Party and Greenpeace were the first to announce they are not going to oppose nuclear any more, has not only plugged the Olkiluoto 3 into its system and became the owner and operator of the largest nuclear production unit in Europe but is already talking about new nuclear builds. Turkey, going dynamically forward with the construction of its first NPP¹⁷, sets its eyes on as much as 20GWe of energy from nuclear power in 2050¹⁸. Egypt has been working intensely to complete its first NPP, El Dabaa¹⁹, and a number of African countries²⁰, including Nigeria²¹, plan to follow suit²². And nuclear France? Thrown off the track by the not-so-successful EPR design and the doomed Flamanville project, France is bouncing back with its nuclear fleet reaching high production levels after a series of outages caused by refurbishments, repairs and maintenance works done over the winter 2022/spring 2023 season²³, new built plans^{24 25}, SMR and xSMR development projects²⁶ in the pipeline as well as with active pro-nuclear lobbying on the European level²⁷. It is just as well since France has learnt the lesson on energy independence earlier than most of its European neighbors. If France is regarded as a nuclear country today – and justly so with over 75% of its electricity production coming from nuclear sources – it is because of a deliberate political decision and centrally coordinated execution of a national strategy developed by the French Prime Minister Pierre Messmer in the wake of the global oil crisis of 1973. That one national strategy, though aborted and never completed, gave France the benefit of being net energy exporter for decades and a paragon of decarbonisation with emissions from the energy sector constituting a fraction of those seen in Germany and, in fact, most of the world²⁸.

In the meantime, when closing the transborder consultations around the Polish nuclear built

project in Warsaw, the German delegation did not exactly seem happy: they closed down their nuclear power plants, only to see “the nukes” spring up right behind their fence. Not only that, the internal public debate in Germany is shifting too and voices claiming *Atomausstieg* might have been a mistake, though still shy, are being heard²⁹.

Poland is not looking to imitate its Western neighbor. It moving forward not only with the national plan to have 6 to 9GWe of installed nuclear capacity in the system^{30 31} by 2040, but its industry has extensive plans for nuclear rollout involving both: full scale reactors in partnership with South Korea^{32 33} as well as a number of SMRs. The first is to come online in Poland as soon as 2029 - in cooperation with GE Hitachi and Canadian partners³⁴⁴ who, on their side, have just boosted the pool of BWRX-300 SMRs to be built in Darlington in Ontario from one to four^{35 36 37}.

The nuclear revival that we see now, however, is about much more than just the extensive and ambitious plans: it's about the fact that these plans start to materialize and they do so fast, shaking the global institutions out of their sleep with the International Atomic Energy Agency, the global nuclear watchdog, playing a much more assertive role in promoting the peaceful use of nuclear than what we had seen in decades.

This revival is about things that can be done - being done, about problems to be solved - getting solved, now.

It's about lifetime extensions for reactors that were supposed to share the lot of the prematurely closed German NPPs: we have seen them in Belgium³⁸ and, most symptomatically, in the US where the already world-famous Diablo Canyon, the bargaining chip in the conflict between the global, antinuclear environmental movement and the harsh reality of climate change and demands of the California energy system, succeeded - against all odds - in receiving its license extension³⁹ and where the shuttered Palisades NPP in Michigan, thought to be beyond redemption due to inability to compete with cheap electricity generated from burning natural gas, may soon be back online with support from Democrats and Republicans alike⁴⁰.

It's about an agreement to have Russian supplies of nuclear fuel for VVER reactors operating in Europe replaced by fuel from Westinghouse⁴¹ and an agreement to build an AP-1000 in Khmelnytsky NPP in Ukraine⁴² to compensate for the sad lot of the Russia occupied Zaporizhzhya NPP, which will most likely not be able to come online without extensive rewiring of the cooling system dependent on the water relations maintained by the now destroyed Kakhovka Dam.

What is more, things are also happening at the very back end of the nuclear life cycle: US has been making progress with its radioactive waste management issues with Holtec receiving NRC's license to construct and operate an interim storage for spent nuclear fuel from 75 nuclear sites⁴³; UK moves forward with site evaluations for geological disposal⁴⁴; the French nuclear regulator is reviewing Andra's application for the construction of the underground high-level waste repository in Bure⁴⁵; Sweden has already approved the site for such facility⁴⁶ and Finland is nearing completion of the pioneering Onkalo geological repository⁴⁷ stirring imagination of film-makers and documentalists.

It turns out that after all, the problems with nuclear energy can be solved to the tune of the old saying that if there is a will, there is also a way.

This revival is about nuclear research and development getting attention and funding that had been trickling rather than flowing for the previous decades⁴⁸ and nuclear being successfully implemented in a number of crucial areas of life, besides energy production and its widely known medical applications with the IAEA furnishing the developing countries with know-how in isotopic hydrology to allow them to map, monitor and manage water resources as just one example⁴⁹.

Most importantly though, this revival that we have been witnessing sees a drastic change in public attitudes towards nuclear. In fact, it is hard to say which came first: the revival or the social shift since these two seem to be feeding off each other.

In the US, support for nuclear hit record high for the third consecutive year⁵⁰. Interestingly enough, it seems to overcome the deep political divide and support is rising among both the Republican and the Democratic voters⁵¹. It is also increasing in all EU Member States⁵², with a degree of rejection steadily going down. Nuclear is making a comeback into the collective, societal imagination as a great power that it really is: the sad lot of Zaporizhzhya NPP under Russian shelling seems to prove that nuclear power plants aren't exactly disasters in the waiting, even during conflicts. The iconic HBO mini-series "Chernobyl" fascinates instead of instilling fear. Oliver Stone's "Nuclear Now. Time to think again"⁵³ is driving the message of nuclear as a potent tool in the fight against climate change further home. The number of pro-nuclear climate activists and organizations - in real life and online - is rising and they are gathering massive audiences presenting nuclear as safe, fun and fascinating. Just look at [Generation Atomic](#), at Voices for Nuclear, Re:Planet, Emergency Reactor or Mothers for Nuclear who started as a small group of women fighting against the closure of Diablo Canyon, for the preservation of their jobs and communities they belong to.

And while "Oppenheimer" the movie is premiering in cinemas across the globe in summer

2023, Robert Oppenheimer's grandson, Charles – entrepreneur and investor – writes in Time⁵⁴:

“Internationally there is great hope for nuclear energy development increasing cooperation that my grandfather, Neils Bohr, Albert Einstein, and other scientists said was our path to a safe future. They recognized that there was only one way humans could survive when we possessed technology as powerful as atomic bombs: and that is to cooperate on a shared, safer, cleaner future.”

Thus, Charles Oppenheimer sums up his grandfather's legacy by wording it into the message that has already been eloquently described in a Pulitzer-winning book “The Making of the Atomic Bomb” by Richard Rhodes in 1987. It's the message of hope and conviction that if we as mankind hold the tool so potent so as to be able to obliterate ourselves completely, we also hold the key to our own successful survival in the era of the global, existential threat that the climate crisis and reshuffling of the geopolitical scene came to be. And that nuclear maybe, just maybe, may be it. Or at least part of it.

If we look at it from this perspective, the shift in public attitudes towards nuclear power should hold no mystery.

It may, in fact and in part, be a healthy and productive reaction to the pessimistic narrative of climate doom and gloom that had dominated the discourse over the past decade. Tired of apocalyptic fatalism, of waiting and being forced to live in fear of what the future may behold, the public wants to see things done and to get them done. Bad things happen to good people. They do. And they came to be. We live in a world shaken by a war that was not supposed to occur, a war that has most of the West involved this way or another in opposing the Kremlin villains. When confronted with a direct threat of what such an upheaval – or, for that matter – a geopolitical reshuffling on a larger scale would mean, the foggy possibility of a disaster in a nuclear power plant, a disaster that we have the power to prevent in a nuclear power plant that we control and use for general good, seem fickle.

This shift, the rising understanding that we as civilizations and countries need nuclear to generate energy in a carbon-free, environmentally-friendly manner that will allow us to leave behind the politics coming with our dependency on fossil fuels, is becoming one of the main drivers of action in the political and nuclear world. After all, it is no one else but the general public that makes sure it is the pro-nuclear politicians who are elected to shape energy policies, like in Sweden or South Korea. If we as mankind indeed do possess a tool so potent as to allow us to destroy ourselves, we may just as well use it to save ourselves and countries that most of us hold so dear from both: the climate crisis and from reliance on

external supply of a good so vital as energy is. And from hopelessness, from hopelessness too.

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