



Document from the working group coordinated by *Pour l'Ukraine, pour leur liberté et la nôtre!*¹
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How, in the face of the Russian threat, to ensure and strengthen Ukraine's energy security, at the heart of the country's social life

Having failed to win the swift military victory it had hoped for, Russia has been targeting civilian populations for over 2 years, in a bid to break their spirit of resistance - so far in vain. **One of the main components of [this deliberate strategy of terror targets energy infrastructures](#). As a result, the winter of 2022-2023 has been very difficult for Ukrainians**, much more so than the following relatively mild one.

However, since the spring of 2024, Russia has stepped up its bombardment of civilians, [particularly electrical installations](#), taking advantage of a growing shortage of Ukrainian air defenses. Power cuts have even reached the capital Kyiv, which this summer experienced blackouts lasting 12 to 15 hours a day. But every city in the country is affected to varying degrees. On August 26 alone, Russia launched 109 Iranian Shahed drones and 127 missiles. 35 of these missiles hit their targets, including the distribution substations of the three nuclear power plants still under Ukrainian control. At the time, they were responsible for around three-quarters of the country's remaining production, [resulting in even more massive power cuts across the country](#). Russia has clearly announced its objective for the coming weeks: to prevent these crucial plants from operating. It is thus jeopardizing their cooling, increasing tenfold [the nuclear threat posed to the whole of Europe](#) for 2 years now by the occupation of the shutdown Zaporizhia power plant.

[Russia seems to be waiting for the first bitter cold](#) so as to strike massively at energy infrastructures at the worst possible moment, rendering Ukraine uninhabitable (buildings without water, heating, light or elevators, industries at a standstill), causing the evacuation of major cities and the departure abroad of millions of refugees. The preservation of fresh and frozen food, as well as vaccines, has already been compromised. In early September, [the UN High Commissioner for Human Rights denounced this strategy](#). Repeated attacks on hydroelectric dams, the other essential source of electricity still available (see map p.3), could not only further reduce production but also lead to ecological and human disasters in the very short term.

As we stated in [a recent article in Le Monde](#), we can and must save Ukraine from this programmed nightmare, and the whole of Europe from a potential nuclear catastrophe.

¹ These proposals are the result of a collective effort in which the contributions of François Grünewald (Groupe URD) and Jacques Duplessy (NGO SAFE) were decisive.

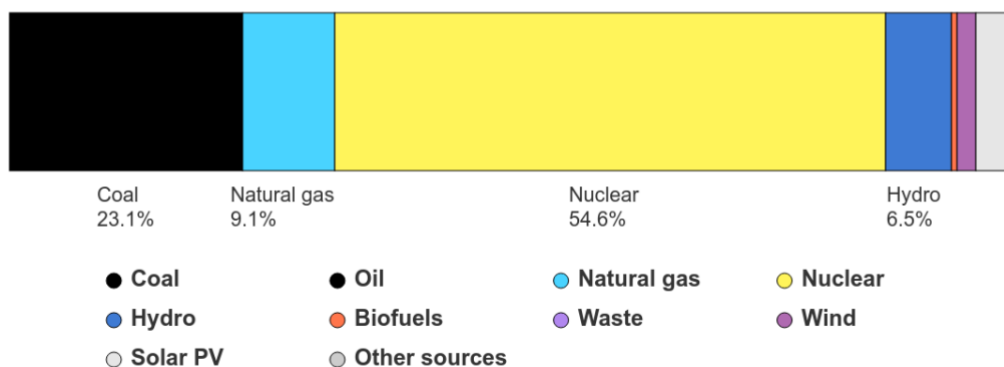
The ten measures we are proposing are relatively inexpensive, if we compare them to the budget needed to rebuild the facilities targeted by the Russians, or even to the ruin that would result from radioactive contamination of the European continent, with all its consequences for the population.

Preamble: power generation in Ukraine

Before the full-scale invasion on February 24, 2022, [Ukraine's energy sector](#) had already been hit hard by the loss of mining resources in the Donbass (mainly coal and gas) and Crimea (offshore hydrocarbons). According to [the International Energy Agency](#) (IEA), between 2013 and 2021, coal's share of electricity production will have fallen by more than half - which, by accelerating [the necessary phase-out of fossil fuels](#) (see proposition 9 below), obviously has not only negative aspects.

In 2021, again according to the IEA, total power generation in Ukraine will be 54.6% nuclear (the highest percentage in Europe after France), 32.2% thermal, 6.5% hydroelectric and 4.2% solar (see chart below).

Electricity generation sources, Ukraine, 2021



Source: International Energy Agency. Licence: CC BY 4.0

The 4 power plants in operation at the time had a total generating capacity of 13.8 GW. The largest, Zaporizhia (6 GW), has been shut down since it came under Russian control in spring 2022. The remaining reactors, Rivne, South-Ukraine and Khmelnytskyi ([see map p.3 below](#)), therefore represent only around 56% of pre-invasion nuclear generation capacity in 2022. [4 new 1 GW nuclear reactors](#) are under construction at the Khmelnytskyi plant, but will not come on stream for at least 3 years.

After the last strikes in August 2024, Ukraine would only have 10-20% of its thermal power plant output and 55% of its hydroelectric power. According to [an estimate by the specialist think-tank Dixigroup](#), even before August 26, Ukraine was short of around 4.5 GW of capacity to meet peak winter demand, estimated at 18 GW. The current shortfall is likely to be even greater.

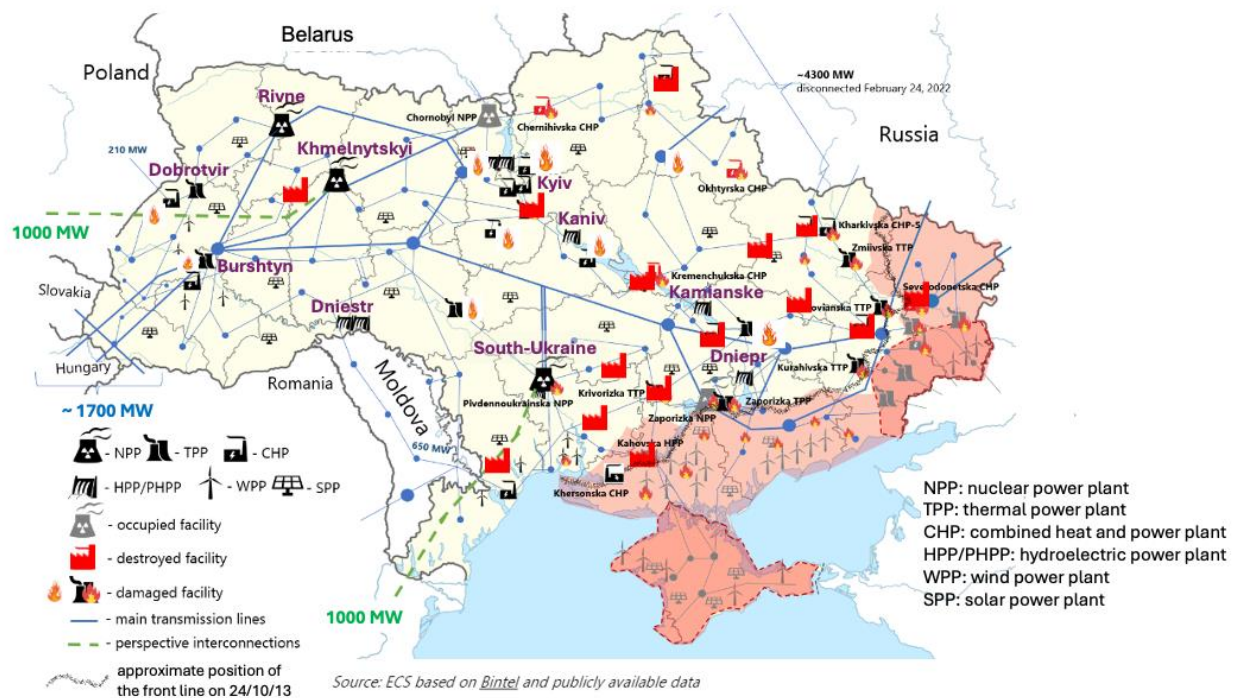
Negotiations are underway [to increase electricity imports](#) from Hungary (which accounts for over 30% of electricity imports), Slovakia, Poland, Romania and Moldavia. However, the proposed increase from 1.7 GW to 2.4 GW would be a long way from satisfying all needs.

Another essential element for winter survival is heat production, managed by municipalities. In urban areas, around 60% of heating and hot water needs are met by above-ground steam networks (not underground, as in France). Targeted by the Russian bombing raids, these networks are less vulnerable due to their dense network. Some of these plants also use cogeneration (heat + electricity), which significantly improves energy efficiency and enables decentralized power generation.

The following ten proposals focus on **three strategic axes**:

- **Military defense** of energy facilities (proposals 1 and 2)
- **Emergency assistance** with energy supplies and plant repairs (proposals 3 to 5)
- **Support for Ukraine's energy conversion** (proposals 6 to 9)

The means of financing the measures we present are described in the tenth and final proposal.



Status of Ukraine's main energy infrastructures.

The map shows the extent of the destruction caused by Russian bombing, according to open sources. Taking into account the negotiated increase in electricity imports from the five countries to the west of Ukraine, the country will need a minimum of 15.6 GW to cope with the 18 GW winter consumption peak. Ten sites, shown in purple, are capable of generating 15.9 GW. Strengthening Ukrainian air defences at these ten sites could significantly reduce the risk of blackouts this winter (Axis 1 below). The increasing decentralization of power generation (mini-plants, generators, wind turbines, solar power, etc.) will also contribute to this (Proposals 4, 6 and 7 below).



Axis 1: military defense of energy facilities (proposals 1 and 2)

Proposal 1: increase our supply of anti-aircraft weapons to Ukraine.

President Zelensky recently estimated that his country needs 25 Patriot batteries or their Franco-Italian SAMP/T Mamba equivalents to fully defend its airspace, compared with the six or seven currently available. Of course, it's up to the Ukrainian authorities to decide which sites to protect first.

However, it can be argued that at least ten sites would need to be secured (see map p.3 above) to ensure peak winter consumption of 18 GW, combining thermal and hydroelectric power plants still in operation (or under repair) and the three nuclear power plants.

We propose that France and Italy send two additional SAMP/T Mamba systems very quickly (including the Italian battery scheduled for September). It would be difficult to go beyond this, as Ukraine is likely to face a relative shortage, in the medium term, of the Aster 30 missiles fired by these batteries.

Such a Franco-Italian decision would serve as an incentive or accelerator for other countries, such as the Netherlands, to send Patriot batteries.

These long-range systems (from 80 to 160 km depending on the type of missile) should be complemented by medium-range batteries (14 to 40 km), such as the German IRIS/T, the American NASAMS or the French Crotale-NG (even if this equipment is a little old), and short-range systems, to form a second and third defensive circle.

France could also supply more long-range surveillance radars, to provide better coverage of the 10 energy sites to be protected.

With 1 GM-200 radar delivered + 1 sold, it falls well short of deliveries from the USA (21), Germany (13 + 1 to be delivered) and Sweden (one ground-based radar already delivered and the promise of two AWACS-type aircraft, which are very valuable).

These measures could be financed by the proceeds of frozen Russian public assets, which the EU has decided to allocate mainly to financing military aid to Ukraine.

Proposal 2: Protection of Ukrainian skies by neighboring countries

This long-standing Ukrainian request, formulated as early as spring 2022 and which we relayed, implies the mobilization of ground-air and air-air defenses available in neighboring countries, notably Romania (where French troops are present) and Poland, which is very active on the subject.

More and more Russian drones and missiles are coming dangerously close to neighboring territories, or even crashing into them (whole or as debris). These countries are entitled to destroy them preventively, including by intervening in Ukrainian airspace, as President Zelensky has invited them to do. This is a measure of self-defence - which justifies a change of doctrine within the Alliance - not only against the material and human damage that these missiles could cause if they landed beyond Ukraine's borders, but also against the potentially catastrophic consequences, for the whole of Europe, of a major malfunction of the three nuclear power plants at Rivne, Khmelnytskyi and South-Ukraine targeted by Russia.



We propose to rapidly close the Ukrainian sky, as an emergency measure, to ensure the safety of neighboring countries themselves as well as Ukrainian energy installations. This includes the three nuclear power plants and their substations, the cross-border electricity export lines (see proposal 3 below) as well as the hydroelectric dams, whose destruction has catastrophic ecological repercussions beyond the simple energy problem, as we saw at Kakhovka in June 2023.

It should also be remembered that Ukraine has been waiting for months for authorization to strike Russian territory with the weapons supplied to it by its allies, notably France. Such strikes on warehouses and launch sites for missiles and drones, as well as on airports from which Russian bombers take off, are crucial: better to eliminate the archers themselves than their arrows once launched.

Axis 2: emergency assistance for energy supply and installation repairs (proposals 3 to 5)

Proposal 3: increased electricity imports from the EU

Ukraine can currently import up to 1.7 GW from 5 neighboring countries: Hungary (which accounts for 30-50% of imports), Slovakia, Poland, Romania and Moldavia. Negotiations are underway to raise this ceiling to 2.4 GW.

We propose that [France, which is beating its export records this year](#) (with an average annual capacity of 8.8 GW), should examine the possibility of participating in exports to Ukraine (by supplying Germany, which could then supply more to Poland, etc.), as well as in the work needed at the Ukrainian border to enable this increase in exports.

Proposal 4: Emergency supply of medium and high-power generators

At the end of August 2024, the Ukrainian Ministry of Energy's estimated requirements correspond to a total of 1.33 GW, of which around 80% have already been delivered or ordered. We estimate the cost of the remaining 20% (2551 generators for a total of 256 MW) at around €50 million. This is an estimate, as precise costing is made difficult by the diversity of models required (from a few KW to over 10 MW) and the quantities requested.

We propose to speed up the supply of generators (accompanied by sufficient spare parts, manuals and maintenance facilities, as well as funds to buy the necessary fuel). We must also ensure that **all these systems are backed up by electricity storage devices** (batteries, ecoflows), so as to prepare reserves while the main grid or generators are running.

Proposal 5: reinforcement, maintenance and repair of sensitive sites

The Ukrainian government has begun to implement simple measures to protect small power plants, using sandbags, gabions (protective baskets) and even concrete roofs, but this does not completely prevent material damage. Emergency response and repair capabilities remain essential, especially when large urban power plants are targeted.



We propose that the supply of repair equipment be launched as a matter of urgency: adapted vehicles, cables, connectors and spare parts reserves. Some countries, such as Germany and Japan, contribute significantly to this part of the aid, but there is a strong demand for French know-how.

Axis 3: support for Ukraine's energy conversion (proposals 6 to 9)

Proposal 6: heat production

The production of heat (home heating and hot water production) is a separate major challenge. Oil-, gas- and coal-fired power plants produce a significant proportion of the calories needed to combat the cold, which are then distributed by thousands of kilometers of piping, often in the open air. But all these systems are regularly targeted by Russian strikes.

Faced with this situation, the Ukrainians are making considerable efforts to develop alternative modalities, including cogeneration, by building small and medium-sized power plants in dispersed (and therefore less vulnerable) locations in eastern cities. However, much remains to be done before this technology becomes widespread in Ukraine. Work is also underway on the use of wood to improve existing practices in rural areas.

We propose that France's expertise in district heating, geothermal energy (e.g. [CPCU](#)) and the production of heat from biomass and domestic waste be mobilized, and that **priority be given to the supply of cogeneration plants.**

Proposal 7: Support Ukraine in its quest for energy resilience

In Ukraine, a developed country that is very cold in winter and increasingly affected by summer heat waves, economic activity, well-being and access to basic services are entirely dependent on energy. Faced with Russian bombardment of its facilities (whose location and vulnerabilities are well known to Moscow), Ukraine has opted for a strategy of energy resilience.

We propose to support this strategy, which is based on a combination of approaches and solutions:

- decentralization and dispersion of production resources, making them more difficult to target;
- the combined use of hybrid systems comprising conventional generation, alternative generation based on renewable energies (solar panels, wind turbines, biomass, etc.) and energy storage;
- redundancy, with switchover between grid and batteries as required (see proposal 4 above), which also helps to increase system resilience.



Proposition 8: The quest for greater energy efficiency

Stemming from the Soviet years and post-independence difficulties, Ukrainian energy production, distribution and utilization facilities show many systemic weaknesses.

Huge savings are possible in water pumping and treatment systems, in hospitals as well as in housing and industry. In the short term, energy efficiency could be increased not only by developing cogeneration (heat + electricity), but also by thermal insulation work, and by replacing machines, pumps, networks, etc., all of which would lead to significant reductions in consumption, and therefore "less" demand on energy production systems, which are under extreme pressure.

We propose to offer strategic support to better diagnose leak locations, identify technical options and supply more energy-efficient equipment, as well as substantial resources to insulate essential public buildings (hospitals, schools, etc.) and rebuild homes with better thermal insulation.

Proposition 9: Promote the energy transition

In the medium and, above all, long term, the current situation could enable Ukraine to get rid of obsolete, polluting and inefficient technologies. Replacing damaged or destroyed thermal power plants with renewable energies (solar and wind in particular) would enable Ukraine to move ahead more quickly with the evolution of its energy mix, in line with the [6-year National Energy and Climate Plan](#), essential for EU accession, adopted by the Ukrainian government in June 2024, at an estimated cost of around €37 billion.

We propose to respond to requests from the Ukrainian authorities for expertise in implementing these measures and thus preparing for their European integration.

Financing

Proposal 10: use of Ukraine support funds

A bilateral agreement with Ukraine signed on June 7 by France set [up a €200 million Ukraine Fund](#) to support critical infrastructure and priority sectors of the Ukrainian economy. For its part, the European Union has also allocated substantial resources to the energy sector. [The Ukraine Energy Support Fund](#), set up by the European Commission and the Ukrainian Ministry of Energy, had received a total of €585 million by 16/09/24 (more than a third of which was provided by Germany), out of a promised total of €629 million. It finances transformers, special repair equipment, physical protection of installations and decentralized production equipment (gas turbines, cogeneration units, etc.).

We propose that the resources of the French fund be allocated as a priority to financing proposals 4, 5 and 6, and that the funds be committed as quickly as possible. France's contribution to the European fund needs to be increased if it is to play a significant role in driving and guiding the fund.



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