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Analysis of today
Assessment of tomorrow

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When jellyfish shut down 5.4 GW - climate shocks and Europe's energy vulnerability

On the night of 10 to 11 August, the French nuclear power plant Gravelines, the largest nuclear facility in Western Europe, lost virtually all of its production.

The reason for this was not a reactor failure, human error or sabotage, but an invasion of jellyfish that clogged the cooling system.

In just a few hours, four of the six reactors were automatically shut down, while the remaining two were taken out of operation for a planned overhaul. 5.4 gigawatts disappeared from the grid—enough to destabilise the supply not only in France but also in neighbouring countries connected to the single European grid.

This event, bizarre as it may seem at first glance, shows how sensitive the key elements of the energy system are to changes caused by nature.

The mass movement of jellyfish in the warm summer months is not a new phenomenon, but climate change and the warming of surface waters in the Atlantic are increasing the frequency and intensity of such waves.

When such a mass reaches the intake pipes of a nuclear power plant, filters designed for normal amounts of marine debris cannot withstand the pressure.

The result was a sudden shutdown of the system, and a return to work was announced within 3-4 days.

A symptom of a wider weakness

For France, which obtains more than two-thirds of its electricity from nuclear sources, such an interruption means a possible increase in imports and the use of reserves, depending on demand, and thermal reserve capacity.

This is more expensive, dirtier, and politically sensitive, especially at a time when the government has committed to accelerating decarbonisation.

For the rest of Europe, which relies on French electricity exports, the Gravelines incident has led to short-term price volatility on the exchanges and grid balancing issues in some regions.

What makes this case particularly significant is the fact that it is not an isolated incident but a symptom of a wider weakness.

> The prevailing approach to energy system planning has been based on the assumption that biological disturbances are marginal and short-lived

Biological risks, such as jellyfish or algae invasions, are increasingly disrupting the operation of water-based energy plants—whether they are nuclear power plants, hydropower plants, or desalination facilities.

This vulnerability has been underestimated because the prevailing approach to energy system planning has been based on the assumption that biological disturbances are marginal and short-lived. Climate trends are challenging this assumption.

The need for common standards

Technically, there are solutions. Modernising the cooling system, improving filters, adding additional barriers, and using sensors to monitor biological stress in real time could decrease the likelihood of a complete shutdown.

These are the investments that EDF (Électricité de France) and other companies are now prioritising following the incident.

The economic aspects of the problem are clear. Every modernisation costs money, but the consequences of an interruption, even a short one, are many times more expensive.

The loss of 5.4 GW during a summer heatwave means a simultaneous increase in demand and decrease in supply — the perfect formula for a price increase.

> The Gravelines incident is a reminder that the resilience of the energy system is not just a technical issue but also a strategic one

Industry, especially energy-intensive production, suffers direct financial losses, while households feel indirect and delayed effects.

Switching to replacement sources like gas and thermal power plants costs not only money but also leads to increased emissions that undermine climate targets.

Politically, the Gravelines incident is a reminder that the resilience of the energy system is not just a technical issue but also a strategic one.

The French government must now answer the question of how it intends to protect the nuclear fleet from such disruptions in the future. The European Commission must develop common standards and protocols for the management of biological risks in the energy sector, given the reality of an interdependent network.

A lack of coordination would mean that any similar incident could trigger a domino effect across the continent.

Europe doesn't need more declarations — it needs a concrete plan

Forecasts for the coming years are not optimistic. Scientific models show that seasonal jellyfish migrations will lengthen and intensify as the ocean warms. This means that incidents like this will not be the exception but an increasingly common nuisance.

When considering the increased power consumption due to the electrification of transportation and digital infrastructure, as well as cooling during heatwaves, it is clear that the system does not have the luxury of ignoring such threats.

The most reasonable scenario is for France and other European countries with nuclear power plants to implement mandatory biological risk assessments during the construction and maintenance of these facilities.

The energy transition and climate policy cannot be viewed in isolation from infrastructure resilience to new forms of natural disasters - The Gravelines Nuclear Power Station

This includes constant monitoring of the water temperature and salinity, automatic closing and cleaning of the inlet filters, and the installation of physical barriers at the main access points to the inlet systems.

In addition to technical solutions, a rethink is also required. Biological risks must be part of the resilience strategy, not just a detail in safety documents.

The Gravelines incident also reveals a broader, essential lesson: the energy transition and climate policy cannot be viewed in isolation from infrastructure resilience to new forms of natural disasters.

Investments in renewable energy and decarbonisation do not make sense if the resilience of the systems that support them is not simultaneously strengthened.

The question remains whether the authorities and industry will react quickly and decisively, or whether there will be the same story with even bigger numbers and consequences next time.

In any case, Gravelines has already become a case study in how one wave of nature can sink an entire notion of technological infallibility.

Europe doesn't need more declarations on climate protection — it needs a concrete plan to protect energy sources from new risks.

Otherwise, the next blackout could last not just a day or two, but weeks. This scenario would have consequences that are neither bizarre nor cute, but rather deeply destabilising.