SUBJECT 7
THERMAL DISCHARGES INTO THE CHANNEL

The Flamanville 3 condenser[12], like those of the two other Flamanville site units, is cooled with water drawn from the Channel. All of the cooling water is discharged into the Channel.

The degree to which the seawater is heated depends on the unit's power and the cooling water's flow rate, which varies according to the tide and the number of pumps in use.

Under normal operating conditions, the rise in temperature between the water inlet point and the tunnel discharge outlet does not exceed 14°C for the EPR unit and 15°C for units 1 and 2.

Impact of thermal discharges into the Channel

Current thermal discharges by the Flamanville CNPE site are very quickly diluted in the sea water. The thermal plume[13] is limited in scope (residual heating of 1°C only affects a few square kilometres) and the maximum heating levels are reached at the surface thanks to the hot water jet's vertical stratification due to the difference in temperature between the ambient environment and the discharge outlet. Only a small surface area is therefore subject to residual heating which varies between 1°C and a maximum of 7°C as the rest of the water head is less affected by heating.

As the seawater temperature has never exceeded 19°C in Flamanville, the discharge temperature 50 metres away from the offshore outlet point has therefore not exceeded 26°C, temperature, which is below the threshold harmful for marine fauna.

Hydro-biological monitoring by IFREMER since the plant's construction in the area close to the discharge outlets has not revealed that the thermal discharges have any particular impact on the marine fauna and flora.

Adding an EPR unit to the Flamanville site does not significantly modify the sea's residual heating. The EPR reactor's plume acts exactly like that of units 1 and 2 (vertical stratification, good dilution) and does not add to them. Only the surface area subject to heating increases slightly with the additional thermal load contributed by the EPR unit. The continuation of the monitoring studies while the EPR unit is operating will let us make sure that the receiving environment in the three units' thermal discharge area is not being disturbed.

Measures foreseen to eliminate, reduce and if possible compensate the effects of Flamanville 3

The decision to discharge the EPR unit's thermal discharges offshore through an underwater tunnel of 700 metre long equipped with an outlet diffuser means the impact on the shore is minimized. Furthermore, the discharge point is positioned in such a way as to avoid that the various production units' thermal effects accumulate.

To check the area's dilution conditions, two measurement campaigns using aerial infrared thermography, complemented with measurements in the body of water (ongoing measurements taken at several fixed points and ongoing measurements through a radar dragged by a boat) were performed in 1988 and 1989. These measurements confirmed that the thermal discharges diluted very well in the body of water and that the plume has a vertical structure. They also served to calibrate the digital model developed by EDF to predict the thermal plume of units 1 and 2. This digital model shows that at a distance of over 50 metres from the waste outlet points, heating is reduced by half. It also makes it possible to verify that the discharges from the EPR unit act in the same way as those of units 1 and 2.

Thermal discharge surveillance is currently performed under IFREMER's hydro-ecological monitoring programme.

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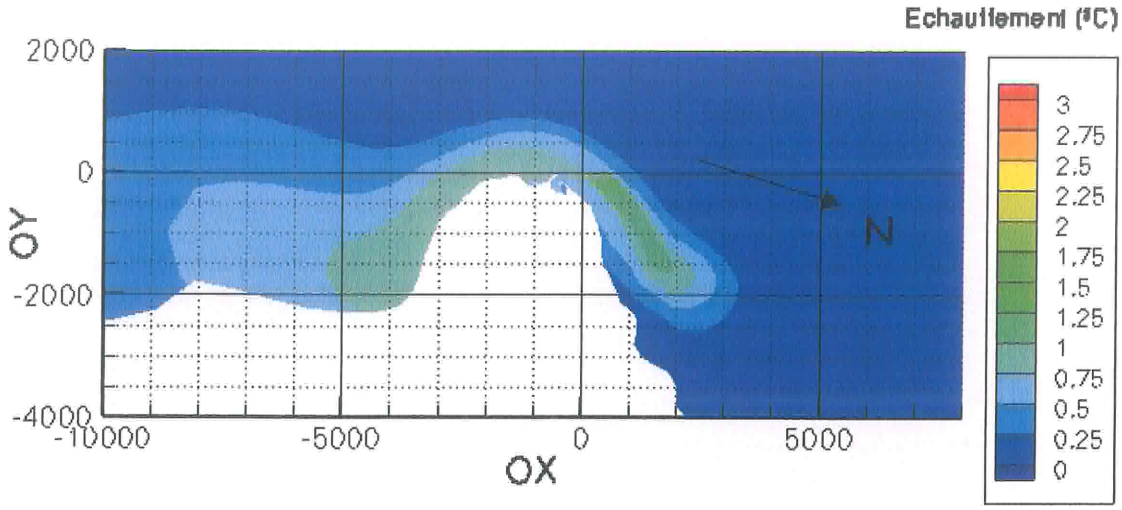
[12] The condenser is part of the cooling system, third system of the plant presented o page 7.

[13] Marine area heated by the thermal discharges of the plant

The diagram below, coming from the digital model, gives an image of the thermal plume in the area of Flamanville. The discharge outlets are located near the point (0, 0), the site of Flamanville being located on the white tip.



Modelling of the three units' maximal thermal plume off the cove shore of Sciotot by low tide

☞ **TO FIND OUT MORE**, please see:

- ***Documents 6 Piece B - Chapters IV.1, IV.4****: Thermal discharges*
- ***Documents 6 Piece C - Chapter I.3****: Thermal reference state*
- ***Documents 6 Piece E - Chapter III.1.2****: Impact of thermal discharges*
- ***Documents 6 Piece E – Chapter VI.1.2.1****: Measures foreseen regarding marine ecosystem*