Generic Design Assessment of General Nuclear System Limited's UK HPR1000 reactor proposed for Bradwell

On 3rd March 2021, Cllr Knight attended an on-line meeting with representatives from the Office for Nuclear Regulation (ONR) and the Environment Agency (the Nuclear Regulators) who are working together to ensure that any new nuclear power stations built in the UK meet the highest standard of safety, security, environmental protection, and waste management. Together they have established a Generic Design Assessment (GDA) process to consider the acceptability of the new nuclear power plants. One of the stages in the process is consideration of the environmental acceptability of the design. In the GDA process, they are carrying out detailed assessments of the environmental effects of each design, which will lead to a statement about the acceptability of the design.

The statement on acceptability will be non-binding but will give a strong indication of whether a design is likely to be acceptable in principle in the UK with respect to matters that the Environment Agency regulates.

General Nuclear System (GNSL), a subsidiary of EDF and China General Nuclear Power Corporation (CGN) has submitted its UK Hualong One Pressurised Water Reactor (UK HPR1000) nuclear power plant design for evaluation under the GDA arrangements and several of its representatives also attended the meeting. In its submission, GNSL assumed that the UK HPR1000 would be located at a generic site, such that the final selected site would be bounded by the generic site envelope.

GNSL have also proposed limits on discharges of radioactive wastes to atmosphere and as liquids. The proposed limits, which were based on the annual maximum radioactive liquid and atmospheric discharges, were used as the basis for assessing doses to the local population and collective doses.

As part of the GDA process, an independent assessment of the potential impact of liquid and gaseous discharges of radioactive wastes from the UK HPR1000 design has been carried out on behalf of the Environment Agency. This assessment takes account of the discharge information, design and the generic site description, provided by GNSL.

The aim of the independent assessment was to perform an independent estimate of doses and additional assessment of the radiological impact from the estimated discharges from the site.

Stage 1 of the Initial Radiological Assessment (IRA) method calculated doses of 120 µSv y-1 from atmospheric discharges and 28 µSv y-1 from liquid discharges, whilst Stage 2 calculated doses of 22 µSv y-1 for both atmospheric and liquid discharges.

Doses were calculated for the most exposed families to atmospheric discharges (local resident family) and liquid discharges (fishing family). The most exposed individuals from these families were the infant in the local resident family and the adult in the fishing family, who received doses of 21 µSv y-1 and 8.0 µSv y-1 respectively. The candidate for the "representative person" was determined to be the infant in the farming family.

The assessment estimated that this individual received an annual dose of 29 µSv. Whilst this value is above the dose criterion of 20 µSv y-1 below which further assessment is not required, it is well below the dose constraint of 150 µSv y-1 for nuclear new build and 300 µSv y-1 for a single source. Almost all the dose was associated with discharges of C14.

Direct radiation contributed between 0.152 and 0.439 µSv y-1 to the total dose of the independent assessment, assuming 100% occupancy at 300 m from all buildings on site. The cautious habits assumed for the representative person (for example that they get all their food from sources close to the reactor) means that no other individuals could receive higher exposures, including other members of the public or non-nuclear workers. 4 of 102

The independent assessment of doses from short-term releases calculated total doses of 6.9 µSv, 6.0 µSv and 7.8 µSv to the adult, child and infant groups respectively. The total doses are dominated by the inhalation of the plume and ingestion of foods and the dominant radionuclide was C-14.

The independent estimates of the collective radiation dose to the populations of Europe and the world were above the collective dose criterion historically proposed by the International Atomic Energy Agency (IAEA), of 1 man-Sv y-1 of discharge. However, more recently the IAEA has revised its guidance on collective dose and no longer offers a dose criterion.

The collective radiation dose estimate for the UK population was below this value at 0.72 man-Sv. Estimates of exposures to wildlife did not indicate any doses that would be of concern; (well below all screening limits)..

The dose calculations in this study are applicable to the GDA generic site and to a single UK HPR1000 unit. If a site is selected and a permit applied for then a site specific assessment will need to be undertaken, taking account of site-specific factors and the number of UK HPR1000 units that will be operated.

To put this in perspective, the highest estimated total dose to the public was between 10 and 23 micro-sieverts per day whereas you could expect to be exposed to 80 micro-sieverts on a Transatlantic flight.

Atmospheric nuclear weapons tests in isolated areas often resulted in doses of less than 1 man-Sv to any individual. All the thousands of atmospheric tests that occurred in the 20th century together now cause a 30,000 man-Sv collective dose each year from fallout. That annual dose currently reduces each year.

GDA includes a comments process. The reactor design company is encouraged to publish detailed design information on its website and update it as new information becomes available.

Anyone can view that information and comment on it. The design company is required to respond to questions and comments about their design. The Nuclear Regulators are able to see both question and response so that they can consider them in their assessments.

Six GDA issues had been identified and 40 assessment findings had been made so far. All issues are expected to be resolved by the end of the GDA.

Concerns expressed on behalf of residents included the lack of appropriate transport planning, the disposal and transport of nuclear waste and the location of a disposal facility.

We were advised that as the matter was at an early planning stage, Highways data did not factor into the GDA, it was a matter that would be decided at a later date by the Planning Inspectorate based on updated traffic and highways Data.

Whilst transport of hazardous materials and waste was a matter for the ONR this issue did not fall within the scope of the GDA. However, it was pointed out that this was a heavily regulated area.

It was also confirmed that the overall design must be safe and allow for extreme weather events and flooding.

As to disposal of waste, currently there are no plans for an incinerator on site and off-site facilities are already available in the UK where it is intended waste will be sent eventually. Apparently, two other communities have already volunteered to become geological waste sites and one can only assume these are in isolated areas with low employment prospects.

In the meantime, the GDA allows for an interim waste store on site until 2040 for "packaged" waste..

According to the experts, Bradwell is the only site in the UK that could take this Model reactor but it is still not a foregone conclusion that it will be built because GDA is **not** permission to build. Bradwell is currently the lead site and if it does eventually get the go ahead, the operator will need a Licence covering every stage of construction and operation.

The Environment Agency aims to publish its final conclusions in a 'decision document' in early 2022 and will continue to act subsequently as advisor to the appropriate planning authorities to assist in the final decision making process.

The current consultation process is due to close on 4 April 2021.

There does of course still remain political questions that may impact on these proposals including whether China should be allowed to take a lead role in the development of our nuclear industry and also whether large scale reactors are a suitable substitute for cleaner alternatives such as solar, wind and tidal energy.

Cllr Jim Knight

Rettendon Parish Council.