WINFRITH:
the nuclear blot on Dorset’s landscape?
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Construction of the reactor began in 1963. It began operating in 1967, and was notable for it being built under-budget and within the allotted timescale (four years). It was built as a demonstration reactor, with the intention of building a series of commercial reactors based on the design. However, the SGHWR design was never advanced beyond the prototype at Winfrith, and the design was sidelined in favour of AGR reactors. The Winfrith reactor was shut down in 1990.

Winfirth nuclear plant is a strange place to behold in person; it is set in a beautiful area of heathland and wildlife, and yet still to this day contains nuclear waste and elements that are being decommissioned. The end date for decommissioning is set to be around 2021.

The aim of this book is to consider the original concept of Winfrith, its construction, knock-on effects, results, and role change of the station from the 1950s to the present day. Personal reflections on the plant shall also be included.
Winfrith Atomic Energy Establishment or AEE Winfrith was a UK Atomic Energy Authority site near Winfrith Newburgh in Dorset.

It covered an area on Winfrith Heath to the west of the village of Wool between the A352 road and the London Waterloo to Weymouth railway line.

It was home to a demonstration steam generating heavy water reactor (SGHWR) providing power to the National Grid, as well as to a nuclear research facility.
One day in November 1955, Colonel Joseph Weld received a visit at his house in East Lulworth from a Colonel Raby who represented the United Kingdom Atomic Energy Authority (UKAEA). Colonel Raby wished to discuss the matter of purchasing land on Winfrith Heath on which the authority proposed to build a research establishment. Much that was discussed that day was to be subject of bitter controversy over the ensuing years because no notes were taken.

Colonel Weld was sceptical about having such an establishment on his estate: he had no need to sell the land, and as Chairman of the Dorset branches of the Landowners’ Association and the Campaign for the Protection of Rural England, he had a commitment to protect the beauty and integrity of the Dorset countryside. But Colonel Raby assured him that it was necessary as space at Harwell, the original research centre in Oxfordshire, was running out and a further site was needed somewhere in the country with plenty of room to build a number of experimental reactors. When Colonel Weld expressed his concern about how he and his forebears had been treated by the Ministry of Defence in the past, Colonel Raby assured him that he could expect to be treated ‘very generously’ with regard to compensation.

Colonel Weld kept his silence but the government’s plans were no secret and an opposition group calling themselves the Dorset Land Resources Committee had already been set up and was demanding a public enquiry, which opened at County Hall, Dorchester, on 8 January 1957.
The proposed building site...

...WTF

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The case for UKAEA was put by Mr G D Squibb QC, who explained that out of seventy sites examined, that at Winfrith had been chosen because it had a degree of remoteness from large population centres, had reasonably good road and rail links, and offered the potential of a good labour supply from the Poole, Bournemouth and Weymouth areas. It also had a large underground fresh water supply for cooling purposes: at least a million gallons a day, which would be taken from bore holes at West Stafford and the River Frome. This immediately aroused objections from the Weymouth Water Board and the Civil Institute of Engineers, who maintained that it would seriously affect local water supplies. However, Professor Taylor of the Geological Society said that studies had revealed that this was not the case, but it might reduce the flow of the river.

Mr Squibb produced a map which showed the land to be purchased: a total of 994 acres of which 793 belonged to the Weld Estate, 75 to the Masters family, 120 to the Hyde family and 6 to Mr Bowditch. With all these proprietors negotiations would be entered into with regard to financial compensation. The County Council had already debated the matter at its November quarterly meeting and had given its approval by 71 to 16. Other supporters were the Amalgamated Engineers Union, who argued that it would provide an impetus to training in the county, and Weymouth Town Council, who said it would give a boost to the local economy. Other rural and district councils reserved their judgement. The Dorset chambers of commerce were in support of the project.
But those totally against the project were legion. They were headed by Mr J H Arkill of the Campaign for the Protection of Rural England, who said that it would be a blot on Hardy’s Dorset, on the classic Egdon Heath, would result in an influx of ‘industrial people’ into an essentially rural area, and would enable the County Planning Committee to carry out its housing programme.

The National Farmers Union and the National Union of Agricultural and Allied Workers both expressed concern at the effect upon the local labour supply for their industries, which were already facing severe shortages. When Dr James, the water consultant of the Southern Sea Fisheries Committee, said he was satisfied that the effluent would be effectively dispersed into the sea without adverse effects, it raised a further storm of protest as for the first time this statement revealed that a pipeline would be dug across the Weld Estate to discharge into the sea at Arish Mell.

Financial compensation for dispossessed landowners proved to be a matter on which the parties could not come to an early agreement and UKAEA, determined to start construction work without further delay, forced the Winfrith Heath Bill, which gave it the right to acquire the land, through Parliament in July 1957. They followed it up with a Compulsory Purchase Order when it was clear that the differences would not be speedily resolved. Colonel Weld felt particularly aggrieved when UKAEA, even after the Superintending Valuer at Reading had proposed a commercial value for his land of £53,000, refused to pay this on the grounds that their expenditure was scrutinised by the Public Accounts Committee of the Treasury, who would not sanction this sum in the interest of the taxpayer. In view of the astronomical sums to be spent on the whole project, this appeared to be an unreasonably niggardly attitude by the government. Eventually, after many meetings and appeals, Colonel Weld was resigned to accepting the terms of a Completion Statement in March 1959 which awarded the Lulworth Estate £25,000 plus £1,340, 12s. 1d to cover legal costs. He and other landholders felt that they had been the victims of government parsimony.
Construction had begun in September 1957, which turned out to be an exceptionally cold and wet winter on this far from ideal site where the barren heathland was a sodden bog. A vast drainage system had first to be installed to lower the water table so that the massive foundations of concrete and steel for the reactor buildings could be set at a depth of twenty to thirty feet. Also, a huge underground reservoir had to be constructed under Blacknoll Hill, just within the site perimeter, to hold the fresh water supply needed.

One of the first departments to be set up was the Apprentice Training School in September 1958, starting with sixty apprentices to train as mechanical and electrical engineers. By the time the School closed in 1993, over 1000 trainees had passed through its workshops and many had gone on to carry their skills into local firms.

In the summer of 1959 the construction of the five-mile-long effluent pipeline from Winfrith to the coast at Arish Mell was begun. Depending on the terrain, the welded dual steel piping had to be laid at depths of up to eighty feet, and when it reached the coast, twenty lengths of 1200-feet-long pipes were pulled out to sea by ship and welded into continuous lengths two miles long, lowered and firmly anchored to the seabed.

The purpose of the Winfrith establishment was to showcase different types of nuclear reactors and by the 1960s they had a wide range of experimental and research models on line. The most successful of these was the Steam Generating Heavy Water Reactor (SGHWR), which was started in 1963, reached full output in January 1968 and continued to operate for almost 23 years supplying electricity to the National Grid. However, in 1976 the government decided not to develop this system to a fully commercial stage, it was shut down in 1990 and the plant dismantled.
Winfrith’s Reactors

ZENITH [Zero Energy High Temperature Reactor] built in 1959. It was a zero-energy reactor which was used to study the physics of high temperature reactors.

NESTOR [Neutron Source Thermal Reactor] built in 1961. Based on the JASON reactor at the Royal Naval College, Greenwich. A small research reactor which produced a large amount of neutrons making it a useful tool for investigating the design of power-producing reactors and carrying out sub-critical experiments on core assemblies.

DIMPLE [Deuterium Moderated Pile of Low Energy] built in 1962. Originally built at Harwell in 1954, Dimple was Britain’s first heavy water reactor. It was moved to Winfrith in 1962 and extensively modified and rebuilt for studies of the physics of reactor systems moderated by light or heavy water and by an organic moderator.


JUNO, built in 1964. Built from the components of a zero-energy graphite moderated reactor called NERO, and from a sub-critical assembly used for steam generating heavy water reactor investigations, it was used to provide the information needed for the design of small power reactor cores.

DRAGON The Dragon reactor was built in 1964. It was the first power reactor built at Winfrith. It was an experimental reactor built as a European inter-governmental research and development project. It was the first demonstration high-temperature gas-cooled reactor (HTGR) and had a thermal output of 20 MW. It operated until 1976.
Distant view of plant amongst heathland from nearby hill.

Drawing this picture in situ was a surreal experience, as the area is very quiet, even though it is quite open and exposed. One definitely feels like they are being watched by hidden eyes.

Closer views through chain-link fence that marks the perimeter of the site.

The closer views of these buildings were harder to make, as the security was quite high level around these areas, and sometimes the guards would wander up to me and ask questions, even though I was not trespassing.
the role change
“By showing the world there’s an endgame to nuclear power stations we’re keeping open the options for the next generation”

Alan Neal, Winfrith site manager

One of its nine reactors, the steam-generating heavy water reactor, used to produce enough electricity for a town the size of nearby Dorchester. But work on the development of civil nuclear power gave way in the 1990s to research on decommissioning, after the government ended fast reactor research and accepted that the cost of nuclear liabilities was becoming prohibitive. Now the UKAEA plans to spend £30m a year until about 2020, when the entire site will be decommissioned, entirely due to the financial rules under which it operates.

They have come to this decision by a technique called discounting which is used to compare costs and benefits that occur in different time periods, and is used to convert them to “present values”. Alan Neal, the site manager, told BBC News Online: “The discount rate has changed from 6% to 3.5%.

“On a site like this it costs a lot of money to stand still, with all the maintenance and security involved. The change in the rate means I can now increase the ratio of money going into actual work, not infrastructure.”

“It’s really incumbent on the developed world to go for non-fossil fuel technologies, with electricity consumption worldwide forecast to double by 2050. By showing the world there’s an endgame to nuclear power stations we’re keeping open the options for the next generation.”
It remains to be seen whether the heathland and wildlife can ever fully recover from the nuclear imprint left by Winfrith since the 1950s...
Decommissioning involves the removal of bulk radioactive material, dismantling and removal of contaminated parts of the facility dismantling/demolition and clean-up of land to meet an agreed end state for future use.
When a nuclear licensed site, or part of that site, is no longer used for any activity requiring a nuclear site licence the licensee can apply for a variation to their site licence to exclude that part of the site from regulatory control (delicensing). In general such an application will be made following decommissioning of any facilities contained within the area covered by the application.

Decommissioning involves the removal of bulk radioactive material, dismantling and removal of contaminated parts of the facility, dismantling/demolition and clean-up of land to meet an agreed end state for future use.

During July and August of 2012, the ONR agreed two applications from the site licensee at Winfrith in Dorset, Research Sites Restoration Ltd (RSRL), for a large area of decommissioned land within the nuclear site to be ‘delicensed’. This has allowed the land to be re-developed into Dorset Green Technology Park. The decommissioning work involved demolition of several substantial facilities including the zero energy reactor halls and fissile material store. The total area that has been delicensed in response to these recent applications is equivalent to 10 rugby pitches, in excess of 10% of the site.

The last reactor was shut down in 1995, although decommissioning of the site will not finish till 2021. Winfrith housed several experimental reactors during its lifetime. There were also impact test facilities, and a used nuclear fuel examination facility with the associated hot cells.
FROM MEAN TO GREEN?

...but has the damage already been done?

Perhaps...

Can we forget Winfrith’s past?
Almost £2,000,000 is being invested in a strategic Dorset employment site to secure its future. Purbeck District Council and Dorset County Council are to invest £927,000 each in the Dorset Green employment site at Winfrith Newburgh. The district and county councils have been working with the Homes and Communities Agency (HCA), which is the freehold owner of the site, to acquire 6.2 hectares of land on the 40 hectare site.

The councils say the current leasehold owners of the site recently went into receivership so investment is needed in the site to provide reassurance to existing businesses and kick-start future employment development on the site to build further confidence.

This investment is in addition to successful Local Growth Deal funding of £600,000, which Purbeck District Council applied for through the Dorset Local Economic Partnership (LEP). The LEP had identified Dorset Green as a strategic employment site and a high priority for investment through the government funded growth deal.

Councillor Peter Wharf, Economy and Infrastructure Spokesperson for Purbeck District Council, said: “Investment in Dorset Green is absolutely critical. It is one of Dorset’s strategic employment sites so helping to secure its future is crucial to stimulating growth in Purbeck.”

Cllr Wharf continued: “Helping to secure this site is the right thing to do and helps to protect future employment in the area.”

Colin Jamieson, Dorset County Council’s Cabinet member for economy and growth, said: “Economic growth is the number one priority for the Dorset County Council as it underpins the social needs of our communities and consequently reduces the pressure on other functions of the county council. By investing in local centres such as this, it is possible to create the framework needed for new business in the area with high-tech needs in a secure environment.

“Our investment with other partners in this strategically important site will go a long way to ensure the sustainability of this former nuclear research park and this area as a strategic centre for local employment.

“I look forward to seeing new businesses and new high skilled employment being generated here, and a stronger Dorset economy as a result of this joint investment.”

Bruce Voss, Area Manager of the Homes and Communities Agency said: “The HCA is working tirelessly to bring new investment to Dorset Green.”
But was decommissioning WINFRITH actually for the best?

Winfrith may have been designed specifically for research purposes, but it still provided a useful, regular and reliable output to the grid of 50MW. While it was in operation, Winfrith was serviced by many small companies all based in the surrounding area. These companies were in turn serviced by other small companies providing everything from stainless steel to sandwiches.

Today the remains of the once dynamic industrial site between Winfrith and Wool, now renamed Dorset Green, is a mere shadow of its former self. Most of the jobs, along with the carbon free power generation from the Winfrith reactor are long gone.

It is interesting to compare the effectiveness of the 60 year old Winfrith research reactor to recent plans for so called “renewable” energy in Dorset. Last year the Dorset Energy Group were airing a “reasonable scenario” of building 180 2MW turbines in Dorset. This number has evidently now been trimmed down, perhaps so as not to frighten the locals. Hypothetically speaking, 100 turbines could now be their dream target.

It is known that in 2010 the wind turbine capacity factor for the South West was 17.7% (the lowest in the country). By rounding up, these turbines would be over 10% better than their peers elsewhere in the South West. This in turn gives us a capacity factor of about 20%. So the output of these 100 turbines would actually amount to 100 x 0.2 x 2 = 40MW.

These turbines would bring very few jobs and no technologically-based business park. Virtually nothing would be added to the local economy. The only real local gains would be made by the already rich land owners. Many people believe that these 100 turbines would utterly ruin the ancient county of Dorset, and that every village would be blighted; every viewpoint would be polluted; and all for just 40MW. If the number of turbines were reduced the already poor power output would be lower though collectively somewhat less ugly.

By comparison, the Winfrith site provided many good jobs and single-handedly provided the power equivalent to 120 huge wind turbines. The tiny Winfrith reactor also provided consistent on-demand output unlike the intermittent and unpredictable wind turbine output. Most of the people who designed Winfrith have not only retired but many have now died of old age. Yet 60 odd years ago they produced plentiful carbon free electricity that was, at the time, generated by the very leading edge of technology.

If you really wanted to reduce carbon emissions from coal and gas plant then even the old Winfrith research reactor would be a step forward from the wind turbine fiasco. But today far more effective nuclear technology is available. Exciting new developments with MSR or LFTR technology promise massively plentiful yet utterly safe and secure power generation. The next generation nuclear reactors will be developed by dynamic establishments - like Winfrith used to be.

Unfortunately Winfrith will no longer be one of them.
Only time and governments will tell of the future for nuclear-sourced power....