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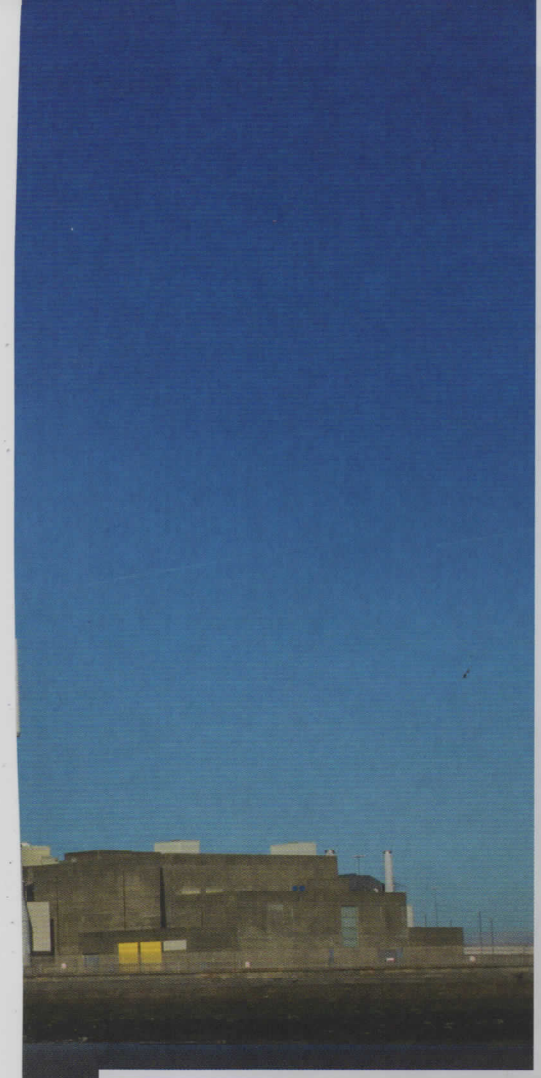
The Nuclear Power Stations at Heysham

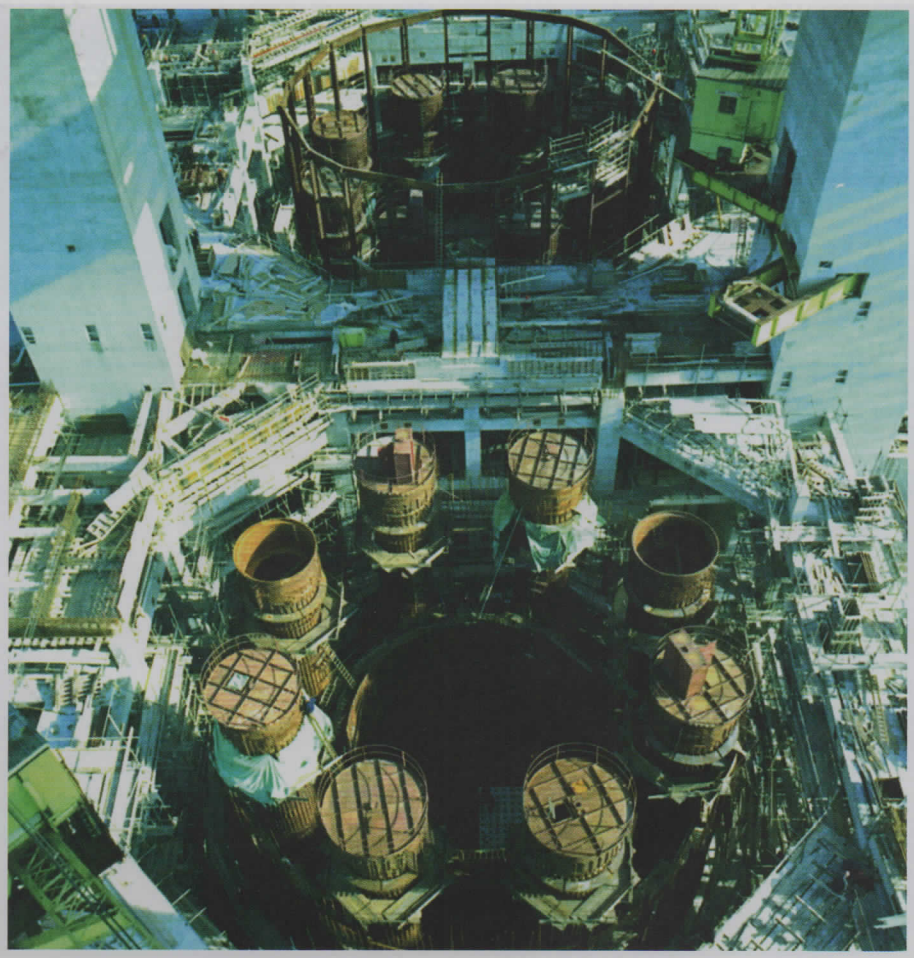
By Andrew Harris

Unless you sail to the Isle of Man from Heysham you probably haven't been up close and personal with the Heysham 1 and Heysham 2 nuclear power stations. They are massive structures visible from miles away yet well off the beaten track for most people. Despite this they play a central role in all our lives by providing the electricity upon which we all depend. They are also crucial to the local economy.

The two power stations at Heysham provide electricity for more than 4 million homes. The 2 reactors of Heysham 1 became operational in 1983 and 1984 after 13 years of construction. Heysham 2 took 9 years to build with a modified design, became operational with 2 reactors in 1988 and generates 1250 Megawatts Electric – MWe - of power compared to the 1150 MWe capacity of Heysham 1. Both have the British-designed Advanced Gas-cooled Reactors or AGRs and were owned by British Energy until 2009 when the UK nuclear generator was taken over by EDF Energy – the wholly owned UK subsidiary of the French state-owned Electricite de France. EDF Energy acquired a fleet of 7 AGR power stations in the UK which, when your columnist visited the Heysham stations, were producing 22% of the UK's electricity.

EDF Energy has been good news





MAIN: The Heysham 1 (left) and Heysham 2 Nuclear Power Stations viewed from the beach. TOP: The Heysham 1 reactor under construction. ABOVE: Inside the Heysham 1 Power Station.

ABOVE: The Turbine Hall of Heysham 1 Power Station. BELOW: The Heysham 2 Control Room when the world record was achieved. RIGHT: John Munro the Heysham 2 Station Director.

for all the AGR power stations. CEO Simone Rossi explains "Since the acquisition of the UK nuclear fleet in 2009 we have increased output by 50%, safety performance by 51% and lifespan by 25%. From 2008 to 2015 we increased output by 20 TeraWatt Hours which equals 6% of the UK's annual need for electricity. We have achieved that while dramatically improving the safety of the plants – last year we had our best ever performance."

The efficiency of Heysham 2 was dramatically demonstrated on the 1st August 2016 when its Unit 8 broke the world record for the longest continuous operation without a shutdown. It beat the previous run of 894 days set by the Pickering 7 Unit of Canada's Ontario Power Generation – and went on to a record 940 days. AGRs have the advantage of being able to re-fuel without having to close the reactor down. Heysham 2 Station Director John Munro comments "This was a fantastic achievement and is testament to the professionalism of the team we have here at Heysham 2."

The safety of both Heysham Stations is vigorously overseen by the Office for Nuclear Regulation and good performance has enabled the life of the stations to be extended. The lives of Heysham 1 and 2 have been extended by 5 and 7 years to 2024 and 2030 respectively. The potential for a Heysham 3 nuclear power station is confused. In November 2015 Prime Minister David Cameron and local MP David Morris declared "Heysham 3 will

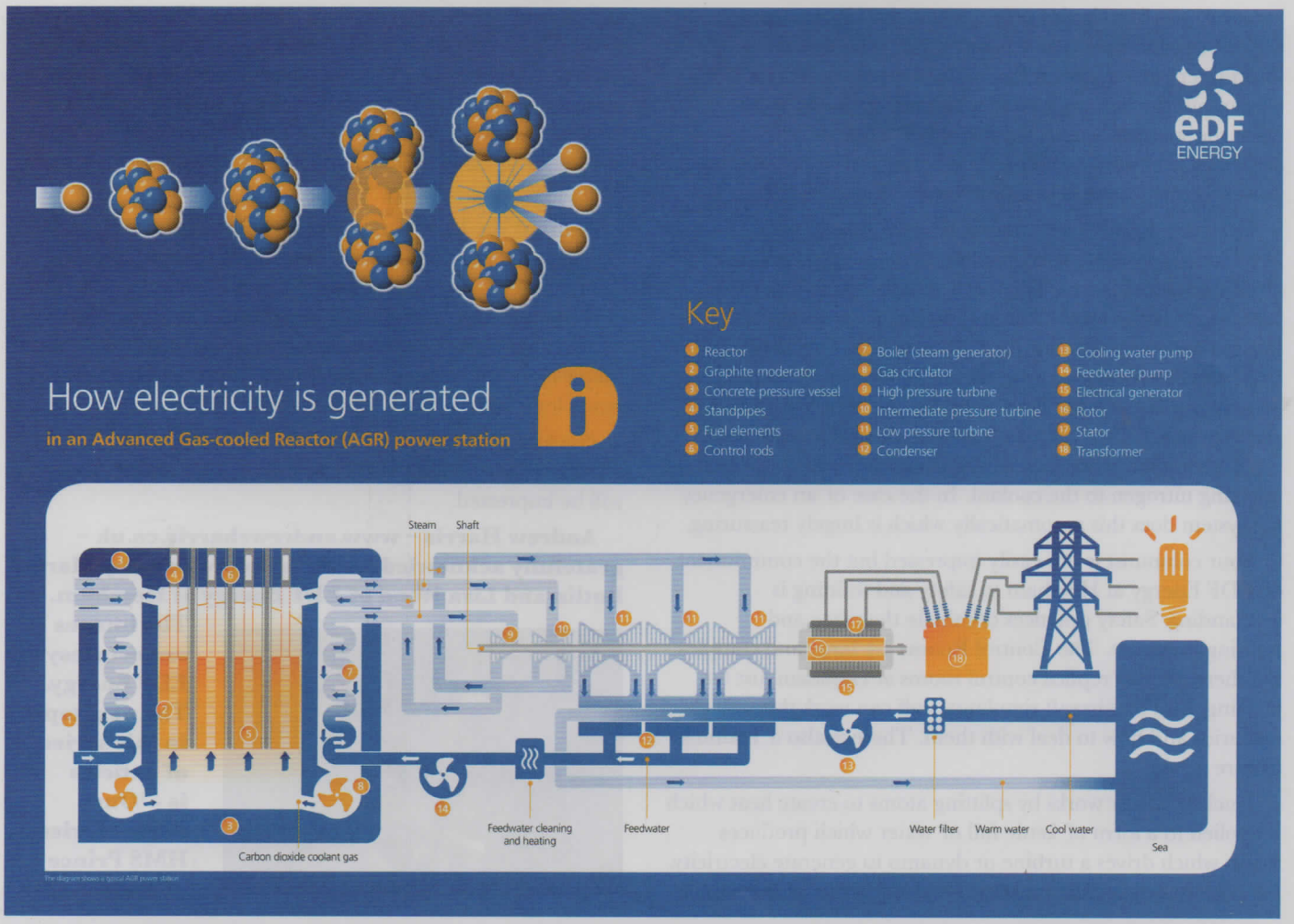
happen" but other sources think this unlikely as insufficient space is available at the site.

Heysham 1 and 2 fulfil a huge role in the community. They directly and indirectly – via contractors – employ 1,500 people many in highly skilled and highly paid jobs – more than 95% of them living within 10-miles of the site. The 'trickle down' benefits of such employment are well known as local shops and services are sustained by the resulting spending power. Fifty apprentices are in the EDF Energy's 4-year local training programme at any time and most are drawn from local schools. The stations work with about 40 local businesses which provide key services.

Despite all this the future of nuclear energy is not assured. Fission-based nuclear power has been a reliable baseload generator for electricity production - accounting for 21% of generation is 2016. However, it is becoming increasingly uncompetitive once all costs – particularly environmental and safety ones – are reflected in the price of the electricity produced. Expectations for adding a lot of new nuclear capacity by 2030 therefore look optimistic.

The commissioning of the UK's newest nuclear plant at Hinckley Point in Somerset has resulted in developers being offered a guaranteed electricity price more than double recent average wholesale rates. In essence, power from large-scale nuclear fission plants cannot compete with gas without a major subsidy. A Financial Times study concludes 'A financially viable nuclear power station looks increasingly like a mirage.' Switzerland and Germany have already decided to phase out nuclear power. The alternative of nuclear fusion is expected to be at least 50 years away but would solve the problem of nuclear waste.

Most people would like renewables to replace nuclear power and by the



LEFT: EDF Energy Chief Executive Simone Rossi presenting Georgina Hines of Heysham 1 with the company's 2017 Apprentice of the Year Award.
BELOW: The Visitor Centre at Heysham is a fascinating place for children too.

end of 2016 REN21 – a global umbrella group for renewables – estimated that there was enough installed capacity to meet 24.5% of the world's need for electricity. Two-thirds of this, however, was from hydro power where the UK lags and the rest depend upon the sun and wind. The usefulness of intermittent generation is limited by the sad fact that in 2018 we can put the human race in space and fly at more than twice the speed of sound but the only large scale way to store electricity is to pump water uphill! So we will still need nuclear power for the foreseeable future despite the economics.

Heysham 1 and 2 are impressive. EDF Energy have invested large sums to achieve and maintain the highest standards of efficiency and safety. The fuel is enriched uranium oxide pellets in stainless steel tubes and produced at Springfields near Preston as reported in our June 2017 edition. Carbon dioxide circulates through the core reaching 650C then passing steam generator tubes outside but still within the concrete and steel pressure vessel. Control rods penetrate the moderator and the system has a secondary shutdown system which involves injecting nitrogen to the coolant. In the case of an emergency the system does this automatically which is hugely reassuring.

Your columnist is not easily impressed but the commitment of EDF Energy at Heysham to safety and training is outstanding. Safety practices dominate the place and training is intense. The Control Rooms are large and complex but there are two replica control rooms at Heysham just for training. Like an aircraft simulator, staff can work through all scenarios and how to deal with them. There is also a Training Centre on site.

Nuclear power works by splitting atoms to create heat which is applied to a form of kettle full of water which produces steam which drives a turbine or dynamo to generate electricity. For a more detailed explanation see the graphic or, better still, go to the Visitor Centre at Heysham which suits all ages. It is an outstanding free facility which serves both power stations and is open to the public between 0900 and 1600 hrs Monday to Friday all year except on Bank Holidays. Visitors are invited to drop in during these times. Saturday visits are possible but only by appointment. Parking can be difficult so car sharing is a good idea. You will probably see the front of the Visitor Centre after you have passed it. It can be contacted on 01524 868451 or by email to heyshamvisitorcentre@edf-energy.com. School visits are popular.

Tours of the Heysham 2 power station can be arranged but for safety and security reasons there are a number of rules. Tours must be arranged at least 3 weeks in advance, tour visitors must have acceptable photographic identification, must be wearing suitable clothes and footwear and must leave even minor electronic devices at reception. Tours are up to two hours long and involve a lot of walking and some steep stairs.

Nuclear power worries some and fascinates many. To address both feelings a visit or tour is recommended. You will be impressed.

Andrew Harris – www.andreweharris.co.uk – gratefully acknowledges the help provided by Martyn Butlin and Lisa Wood of EDF Energy at Heysham.

The images are courtesy of EDF Energy. The next topic in this series of articles is - 'Our' Supercarrier HMS Prince of Wales.