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BIG CARL
gets to work at Hinkley Point

Heralded as the world's most powerful land-based crane, the Sarens SGC-250 is now at work on its first job – lifting prefabricated modules at the Hinkley Point C nuclear power station project in Somerset. **David Taylor** reports

Photo: ©Sarens

Somerset has a few decent tourist attractions. There's Cheddar (where the cheese comes from) with its famous gorge; there's the Wookey Hole show caves (also very cheesy); and of course every year there's the Glastonbury Festival for middle-aged music fans. But now there's another landmark on the tourist trail: *Big Carl*, the world's biggest land-based crane.

THE SARENS SGC-250 IN NUMBERS

- *Big Carl* is believed to be the most powerful land-based crane in the world
- Capable of lifting 5,000 tonnes at a radius of 40m
- 250m tall in its tallest configuration
- Supported by 52 counterweight containers, each weighing 100 tonnes
- Powered by 12 engines
- Runs on 96 individual wheels as it travels between different lift locations at Hinkley Point
- Will lift over 700 prefabricated components including the heaviest components for the reactor buildings

Photo: ©paimages

The 'common raft' for the first reactor unit was completed on schedule in June

Big Carl (or the Sarens SGC-250 to give it its official title) is now on its first job – lifting huge prefabricated components into the two new nuclear reactors at Hinkley Point C power station on the Somerset coast.

The crane, which we featured in the magazine this time last year (November 2018, page 53) when it was undergoing final tests at Sarens' yard in Belgium, is nominally capable of lifting a maximum load of 5,000 tonnes, making it the most powerful crane of its type.

Named after the company's director of technical solutions, Carl Sarens, *Big Carl* is working for Bylor, the Bouygues/Laing O'Rourke joint venture that has the £2.8bn main contract for the two reactor buildings and main civil engineering works.

Super-heavy cranes are a familiar sight on major infrastructure projects such as nuclear power stations, but *Big Carl*'s extreme lifting capacity is considered a key element in ensuring that Hinkley Point C sticks to schedule, a most sensitive consideration and the biggest fear of client EDF Energy of France, which is developing Hinkley Point C in joint venture with China General Nuclear Power Group (CGN).

Hinkley Point C will comprise two new European Pressurised Water Reactors (EPRs) that will operate alongside an existing nuclear power station. The choice of EPRs is highly controversial, not least because previous projects involving their construction have proved costly and have been subject to severe delay.

EDF has already embarked upon construction of four similarly-designed power stations – two in China, one at Flamanville in Normandy and another at the Olkiluoto nuclear power project in Finland. The two Chinese reactors are both now generating power although they took twice the estimated time to build.

But neither Olkiluoto nor Flamanville is yet operational more than a decade after work began on them. Flamanville is notoriously over-budget by billions of Euros. Last month, EDF warned that weld repairs at Flamanville, ordered by the French nuclear watchdog ASN, would add another €1.5bn to the cost.

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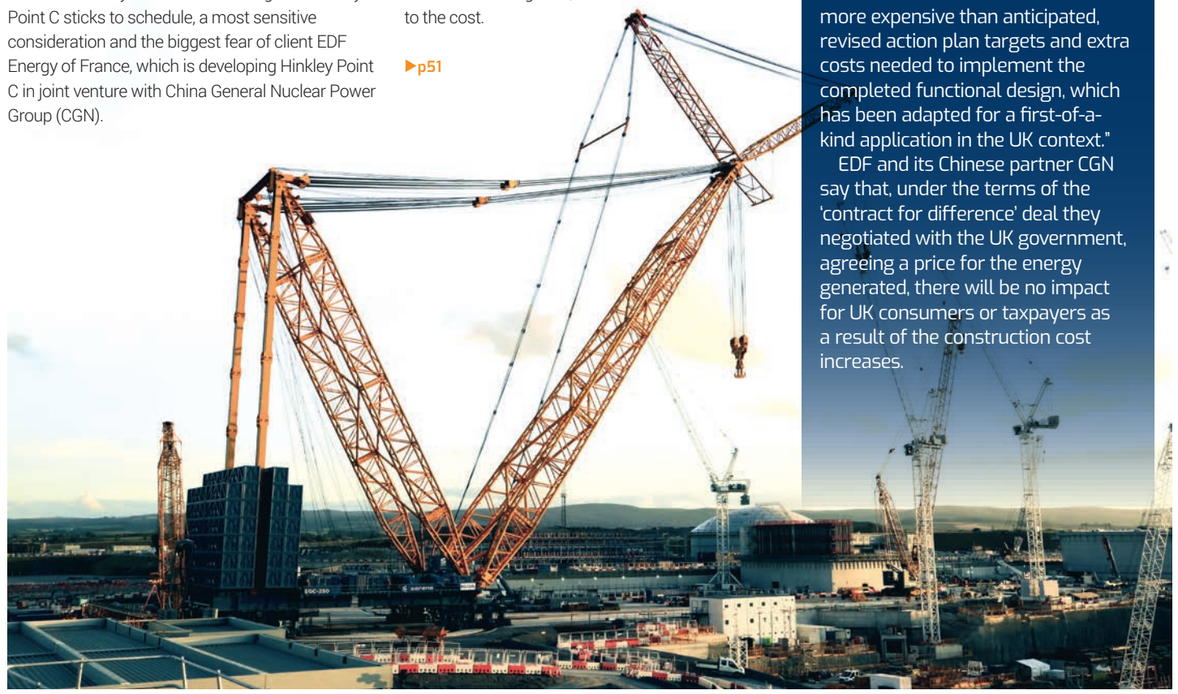

Photo: ©Sarens

STILL ON SCHEDULE, BUT COSTS ARE CREEPING UP

Difficult ground conditions have been blamed for contributing to an unexpected 10% cost escalation of the Hinkley Point C construction project.

In September, the estimated cost of building the new nuclear power station was revised up from a range of between £19.6bn and £20.3bn to between £21.5bn and £22.5bn (at 2015 prices). That is an increase of £1.9bn to £2.9bn compared to the previous estimate.

A review of the project's costs, schedule and organisation was conducted after the milestone completion in June of the nuclear island 'common raft' for the first unit, in line with the schedule announced in September 2016.

The review has concluded that the project remains on course to hit its next big target – completing the common raft for Unit 2 in June 2020.

However the cost projections have increased and the range depends on the effectiveness of action plans to be delivered in partnership with contractors, says EDF Energy.

In a statement it said: "Cost increases reflect challenging ground conditions which made earthworks more expensive than anticipated, revised action plan targets and extra costs needed to implement the completed functional design, which has been adapted for a first-of-a-kind application in the UK context."

EDF and its Chinese partner CGN say that, under the terms of the 'contract for difference' deal they negotiated with the UK government, agreeing a price for the energy generated, there will be no impact for UK consumers or taxpayers as a result of the construction cost increases.

The team at Hinkley Point is therefore under considerable pressure to avoid a similar debacle, not least because the success or otherwise of Hinkley Point C will affect EDF's plans for another EPR nuclear power station at Sizewell C in Suffolk. A lot of time and effort has therefore been spent learning from the mistakes at Flamanville and Olkiluoto.

The problems at previous EPR plants have centred on issues of quality in both materials and construction. Reinforced concrete is the primary material for all the main structures and variability in site-batched concrete poured in-situ is potentially problematic.

Hence Bylor has chosen to make optimum use of factory prefabrication of many components, including many of the large complex elements that are critical – including the 60m-diameter reinforced concrete domes that sit on top of the reactor buildings.

And to lift prefabricated components on this scale, you need a crane of exceptional capacity. "The crane's huge size and capacity allows large components to be built in covered factory conditions on site, improving quality and saving time," says Rob Jordan, EDF Energy's construction director.

"The success of prefabrication has already been proved during construction of the two operational EPRs built by EDF and CGN at Taishan in China. Its use at Hinkley Point C is another example of the innovation made possible by experience gained and applied from other nuclear construction projects."

The SGC-250 was delivered to Hinkley Point C in 280 loads from its base in Belgium via Bristol Port's Avonmouth Docks. Erecting and rigging the giant machine was a lengthy and time-consuming business, says the company's project engineer Matthias Sarens.

"There's not much space to work at Hinkley Point. Normally it takes around 10 weeks to assemble the crane; here it took three months," he says. The machine had already been assembled and thoroughly tested in Belgium, so there was no need to carry out any further tests once the crane was assembled on site, he adds.

Unlike a traditional crane in which the superstructure slews on a bearing fixed to a heavy undercarriage, the SGC-250 is designed to sit on a special circular track laid on the ground. This allows it to slew through 360° but it remains static and cannot pick and carry a load like a crawler crane.

"For sure, it's not a mobile crane," says Matthias Sarens. "But at Hinkley Point there will be three lifting positions and we are using straight rails to allow the crane to move from one ring to another."

The SGC-250 will lift around 700 items during its time on site, the heaviest of them weighing in at 1,600 tonnes. At 50m radius, *Big Carl* can lift the equivalent of 32 single-storey houses or 1,600 cars. "Although there won't be many loads above 1,000 tonnes, but there will be up to 20 really heavy lifts," says Matthias Sarens.

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THE *OTHER* 'WORLD'S BIGGEST CRANE' AT HINKLEY POINT...

Although Sarens' SGC-250 is by far the most visible piece of kit at Hinkley Point C, it is far from the only remarkable crane working on the site. In fact it's not even the only crane that can claim to be the biggest or most powerful of its type.

The world's biggest luffing tower crane is also on site, having been shipped all the way from Australia to work on Balfour Beatty's marine tunnelling works at Hinkley Point.

Balfour Beatty has a £200m contract to construct 9.5km of tunnels for the new Hinkley Point C nuclear power station. The 7m-diameter tunnels – some extending out into the Bristol Channel, 30m below the seabed – are an essential part of the power station's cooling system.

Balfour Beatty has erected a Favelle Favco M2480D tower crane to support this contract. The crane has been supplied by Marr Contractors in Australia, which worked with Favco on its design and development 10 years ago.

While there are larger tower cranes in the world (the Krøll K-10000, an enormous saddle-jib crane designed and built for the Soviet nuclear programme, remains the world's largest) the M2480D can lay claim to the title of the world's largest luffing tower crane. And it doesn't just have a luffing jib; it has a luffing fly jib too. It can lift a maximum of 330 tonnes at 14.5m radius and 55 tonnes out to 63.4m.

Balfour Beatty is installing approximately 38,000 prefabricated nuclear-grade concrete segments to support the three underground marine tunnels, which will have the capacity to transfer 120,000 litres of water per second.

The M2480D crane is being used to lift materials and tunnel-boring machine (TBM) components into the launch pits. The first TBM, named *Mary* in honour of Dorset palaeontologist and fossil-collector Mary Anning, can achieve a maximum tunnelling speed of 120mm per minute, excavating 11 tonnes of rock in that time.

Balfour Beatty's project director, Alistair Geddes, said: "This is a significant milestone, critical to the successful delivery of the first new nuclear power station in the UK for over 20 years. Having installed the first permanent segment ahead of schedule, this milestone is testament to Balfour Beatty's expertise and to the collaborative approach required to deliver a project of this scale and complexity."

The Favelle Favco M2480D (with black tower) is helping Balfour Beatty on its £200m contract to construct the reactors' cooling tunnels

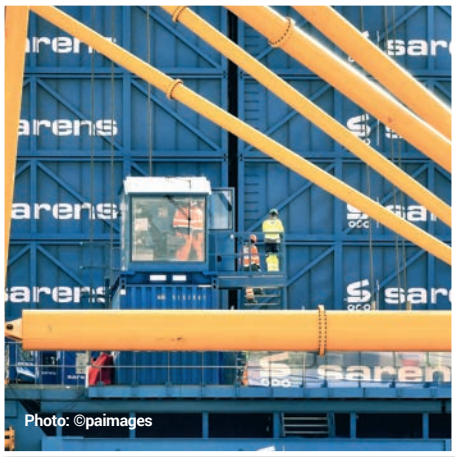
Sarens has a team of at least four people on site continuously. Some are operators, some are riggers and some can do both jobs. And *Big Carl* is not the only crane Sarens has at Hinkley Point; also assisting the SGC-250 is a Demag CC3800 crawler (with a mere 650-tonne lifting capacity) and several smaller cranes.

So far *Big Carl* has had it easy, lifting relatively light loads such as rebar cages into position. It won't be flexing its muscles properly until December.

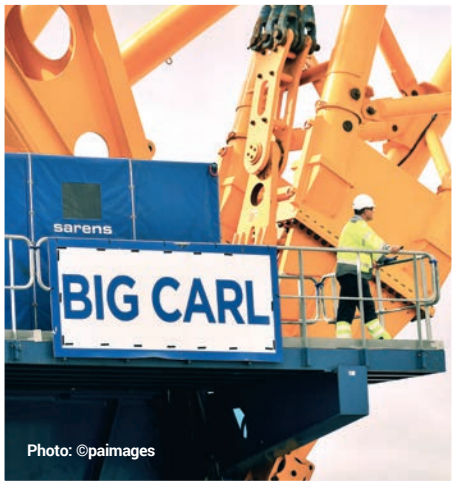
"The crane is an impressive piece of kit and a world beater," says Jordan. "It allows us to innovate in the way we build the power station, lifting complete pieces out of our factory bunkers and into place across the site. Prefabrication helps us boost quality, gives better conditions for skilled workers and saves time – that's good news for the project and an example of learning lessons from success at other projects."

Sarens has a four-year contract with Bylor and, with the SGC-250 highly visible on the flat landscape of the Somerset Levels for miles around, it's bound to attract the attention of visitors to the area. Already it has featured not only in the local press but also national media, including most of the major television channels. "I guess it's a new landmark for the area," says Matthias Sarens. ■

TABLET USERS
Sarens launches the SGC-250



The massive crane carries a counterweight comprising 52 containers each weighing 100 tonnes



***Big Carl* is named after the company's director of technical solutions, Carl Sarens**

VIEW FROM THE CAB

Operator Martin Redmond told local news service SomersetLive that operating the SGC-250 is "all just part of the job, really…It's our task to assist the building of the two reactors and we need something as big as this to move the heavy parts into place".

Redmond joined Sarens in 2012 and within two years was operating what was then the company's flagship – the 3,200-tonne-capacity SGC120 – on the Cilacap RFCC refinery upgrade in Indonesia.

"The project in Cilacap…was my first experience with the SGC-120 and it was quite unique," he said after completing the project. "Operating the biggest crane in our fleet brings also the responsibility to coordinate a team of people handling the assembly and disassembly of the crane, which takes up to six weeks each."

The SGC-250 slews 360° on circular rails. Straight rails also allow the crane to travel between the three strategically-located lifting locations on site

Photo: ©paimages