

Power to the people

Supercritical technology is set to transform efficiencies and emissions from E.ON's new Kingsnorth power station, when the approvals go through. Brian Tingham reports

We've got a problem with energy generation. We need more capacity and higher efficiencies to cater for unrelenting increases in demand, but we also need to reduce CO₂ and other emissions. This at a time when many of our fossil fuel power stations face closure, as the costs and engineering issues around fitting flue gas desulphurisation (FGD) and selective catalytic reduction (SCR) equipment – to reduce SO_x and NO_x respectively – prove insurmountable.

And there's not a lot of time. A substantial part of the UK's coal-fired plant is due to close, as a result of the Large Combustion Plants Directive (2001/80/EC). Under LCPD, plants with a thermal input of 50MW or more must fit FGD and SCR plant or, if they were built pre-1987, can opt out – but then they have only 20,000 running hours left from 1 January this year and must close by 2015.

For the UK, that means a loss of some 9,000MW. But that's not all: much of the UK's ageing fleet of nuclear power plant is also past its sell-by date, leading to best estimates of a 16–20,000MW capacity shortfall by 2020.

Crash and burn

Which is why it's excellent news that E.ON's new Kingsnorth clean-burn project is almost certain to get the green light and come on stream in 2012. It's a far better option than retrofitting FGD and SCR to the existing coal-fired plant. As project manager Adrian Smith says: "We could have done that, but it was built in the '60s, so we would have improved NO_x and SO_x, but on an old, 36% efficient plant.

"We're better off closing that and building from scratch, taking advantage of newer supercritical technology, with all the sulphur and NO_x removal designed-in – not least because it gives us a full 10% efficiency improvement, which equates to 20% less CO₂. And it means we can make it CCS [carbon capture and storage] ready."

The new plant will be built on the existing site, using twin supercritical 800MW boiler units. "The processes are the same and we'll be burning the same coals, but the steam temperature will be 620°C, as opposed to 560°C on the existing plant, with pressure of 280bar, rather than 160bar," says Smith. "So you're looking at much more robust and exotic materials for the boilers and turbines, taking advantage of improvements in engineering tolerances, and new plant and equipment since the 1960s, as well as better coal-grinding machinery."



He also refers to improvements in plant reliability. For example, the existing power station was built with dual redundant forced- and induced-draft plant for each boiler. "But air heater and fan technology has moved on, so we're only specifying a single air stream. We don't need to spend money on duplicate plant any more," he states.

E.ON is currently at the tendering stage, looking at suppliers such as Dusan Babcock and Alstom for the boilers, and Alstom, Toshiba, Siemens and ABB for the turbines. "The performance from any of these will be significantly better than we can achieve right now, in terms of ramp rates. Supercritical technology is much more responsive," says Smith.

It also means significant reductions in unburned carbon, in large part due to improvements in the control systems, which today enable closer continuous multi-parameter optimisation. "The new Kingsnorth will have a screen-based computer control system and a lot more automation – quite unlike the control panels," confirms Smith.

What about carbon capture and reuse? "We're looking at technologies such as amine scrubbing that clean the flue gases, and we're keen to be considered for the government's generator-scale CSS demonstrator," he says. "We're leaving space for post-combustion plant and we do have an advantage. A lot of 2,000MW stations have one chimney, but four flues with a common windshield, so there are too many ducts in a small space. Here, we will have one stack and ductwork, so we can easily tap in for the clean-up technology." **PE**

Pointers

- Under the Large Combustion Plants Directive, plants with a thermal input of 50MW must fit FGD and SCR plant or, if they were built pre-1987, can opt out – but then close by 2015
- We're better off closing old coal-fired plants and building from scratch, taking advantage of newer supercritical technology
- Sulphur and NO_x removal plant can be designed-in from scratch
- That provides a full 10% efficiency improvement, equating to 20% less CO₂.
- New plant can be made CCS [carbon capture and storage] ready