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**The British Gas Lurgi and the CEGB**

A series of emails were exchanged on the Claverton website relating to the lack of interest by the CEGB in using the British Gas Lurgi as the core of an IGCC. The BG Lurgi was a modification of the original German fixed bed gasifier making it more like a pressurised blast furnace with tuyeres and a unique form of slag tap.

This modification allowed the gasifier to use ordinary coals, instead of one that were highly reactive. There had been a straight Lurgi site in Scotland, and British Gas converted one the gasifiers to the new design. It is therefore sometimes referred to as the “Slagging Lurgi”.

This unit ran for several years from 1974 onwards and was eventual coupled to an Olympus gas turbine and generator to show how electric power might be produced.

Eventually the gasifier was shipped to a plant in Eastern Germany were it was used to gasify a mixture of waste tar held in a large lake and domestic plastic and paper waste. The lake was the tar that had come from Lurgi gasifiers that had operated on the site. The tar and waste were compressed in clumps that looked like the sole of a shoe. I saw the British Gas Lurgi running when I had a brief visit to the site, which was near Cottbus, in 2007.

On the Claverton website I started the discussion by recounting what Grev Gibson, an Assistant Director at London Research Station had told me about a visit of the CEGB team to the site.

This is followed by an email from Chris Hodrien who gives some of the in-house political background as to why the CEGB lost interest. I have modified Chris’s account to make it more readable.

The loss of interest in all forms of IGCC happened across the world, as they were perceived to be of high capital cost and new and “difficult” technology. In addition, the realisation dawned that natural gas fuelled CCGTs were very cheap and quick to build and were essentially non polluting, in terms of SO2, NOX and ash. CCGTs killed off interest in steam plant, nuclear and IGCCs

I have also added in emails from Tony Day and Steve Browning. Steve used to work for the CEGB and because of the reference to the Olympus gas turbine, added some comments on the use of these machines for peak power production.

**From Fred Starr**

A CEGB team visited the British Gas Lurgi site at Westfield, possibly at a time when the gas was being used to power a Rolls Royce Olympus.

I was told by Grev Gibson, an Assistant Director at British Gas -London Research Station, who was there, that the CEGB were not overwhelmed.

They did not like the complexity of the gas clean up system. This type of gasifier produces a lot of tars and highly contaminated water. Mixed in with these are particles of coal and H2S.

To people working on gas works they are all part of the job, but would represent a whole new set of issues to people coming from the power plant sector.

Other gasifiers are inherently cleaner.

Furthermore, the BGL Lurgi despite these issues is the best of its type for making town or natural gas, since the gas it produces has a relatively high methane content.

 But, in my view, not the best for making electricity or hydrogen.

Fred

Gas-Lurgi (BGL) gasifier -a CEGB View

**From Chris Hodrien**

British Gas (BG) and the CEGB. These were 'old rivals' indeed! Especially in the domestic heating market. It is my understanding that Sir Denis Rooke, the then charman and the BG Board were much against 'helping' electricity generation at the time. In consequence the Dept of Energy had to do quite a lot of 'head-bashing' to **both** sides to get them to collaborate on the 'ACORD' 1980 coal IGCC study. The CEGB then 'spiked' the results so it came out as being anti-IGCC!.

The Yanks had already been interested in the proven, high-efficiency BG Lurgi from back in 1974, at the start of the Westfield programme for both for SNG and IGCC. Subsequently the EU for IGCC circa 1980.

Whatever the CEGB's 'reactionary' views c.1980, I would think that over half (possibly up to 80%) of the US and EU external financial support for Westfield over the years was aimed at IGCC power applications. Both the USDOE and EPRI believed that IGCC (and eventually, 'IGFC' with fuel cells!) was **the best** way forward for clean coal power. The BG Lurgi was proven by their studies as the most efficient gasifier for doing it, but then the US Government eventually cancelled the funding for the planned Duke Energy full-scale IGCC demo plant as natural gas CCGTs started taking off in America.

In EU, it was pretty obvious to the gasifier specialists that one of the two EU IGCC demonstrations should **have** been the BG Lurgi, instead of two near-identical entrained flow gasifiers. That is Shell and Prenflo.

Cyril Timmins was involved in the BG Lurgi proposals to the British Government, but that 'was torpedoed’ politically because the 'coal-bashing' Thatcher gov't refused to support it - 'the right engineers in the wrong country' ( - AKA 'lions led by malicious donkeys').

**In addition to** the BG Lurgi's significant efficiency advantages, EU/US-funded (- the CEGB 'were sulking'!) gasifier tests at Westfield showed that despite its 'old-fashioned' fixed-bed design, the fixed fuel bed was advantageous. It enabled load cycling for IGCC to be done safely, because you could 'bank' it as a heat store for up to 1-2 days just by turning the O2 feed off. It **was inherently** much safer for cycling than entrained gasifiers, because the fuel was always in excess. That made it an all-round technical winner for IGCC, as the Yanks recognised.

Fred, I am sure you're right that the complexity of the gas clean up terrified the CEGB engineers. There was hardly a Chemical Engineer between them! Much later of course in the 1990s, they had PC plant flue gas clean up 'forced on' them, in the form of FGD and even SCR! I believe over £500m has been spent on these at Ratcliffe PS alone.  If the CEGB had been more 'pro-active' back in 1980s, instead of pressurising Thatcher to get them 'waivers' from EU FGD regulations, these could have been British instead of foreign clean up technology. I remember the Norwegian lawsuits against the UK gov't in late 1980s over our SO2 + NOx 'tall-chimney exports', allegedly killing Norwegian forests, but I never did hear if they won that case? Apparently, the deep irony of this is that in UK **lime-rich** agricultural soils, falling acid rain actually beneficially provided 'free' sulphate +nitrate fertiliser + partial alkali neutralisation!

The BG's methane yield was no problem at all in IGCC back in those 'pre-CCS' days. It has only become a potential problem with respects to IGCC with CCS. I contend it is still no problem if based on low-cost bio-waste fuels. As one is using renewable rather than fossil fuel, as the need for carbon capture disappears. Furthermore, if hydrogen is proposed for a future gas grid there, secondary catalytic reforming is available.

Chris

**From Fred Starr**

I would guess the CEGB visit to Westfield would be in the early eighties.......

As an aside, around this time one of the CEGB experts came along to London Research Station came along to give us a "Friday Afternoon Talk" on the awakening of interest by the CEGB in IGCC (Integrated Gasifier Combined Cycle). I cannot remember the name of this man but he was married to a leading Labour Party MP.

I then did a write up for the British Gas House Journal/Newsletter. The article, in a rather sneering way, pointed out that the CEGB's steam plant technology had reached the end of the line, in terms of efficiency improvements and was beset with the acid rain problem from SO2.

Gasification automatically removed the SO2, and combining gasifiers with CCGTs, promised higher efficiencies. Accordingly, and I think I used these words, I wrote "that the CEGB were having to come cap-in-hand" to seek the help of their old rivals.

This amusing, technically competent article was eventually read by the Chairman of British Gas, Sir Dennis Rooke. He had, I understand, something of a fit. He insisted in vetting all subsequent articles......Fortunately I learnt this through the grapevine and there were no obvious repercussions for myself.

Fred

**From Tony Day**



Chris,

Agree with you generally re BG vs CEGB politics back in the 70's and 80's. BUT at that time CEGB was really out for the large PWR programme that eventually led to Sizewell B as a precursor to the planned full scale electrification (300GW nukes + 60GW coal) of UK plc in the 21st C when Natural Gas was supposed to run out. The 1976 ACORD report (accessible via the New Scientist archive) sets all this in detail.

My impression is that CEGB was committed heart and soul to nuclear as the long-term solution to UK energy supplies. Of course, SIzewell B remained the only 'new' nuke after the closure of the AGR programme because the planned massive transfer of energy flows from the gas industry to the electricity industry never happened because cheap North Sea gas ate expensive electricity's 'lunch' @ 1/3rd the price per unit energy plus vast virtually free energy storage.

Best wishes,

Tony Day

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**From: Stephen Browning**

**Thanks Fred,**

**Just wondering when our lot came to visit?**

**The first lot of OCGTs went in from 1963.  Including the two at Croydon, each with 4 Olympus B Engines.**

**I seem to remember we used to burn refined Diesel - Home Heating oil?**

**So, when were they looking to convert to Methane, as I take it that was the reason for looking at SNG as well as NG?**

Thanks Fred, both to yourself here and to yourself and Chris for the posts on the Clav '1992' thread.

Including the CEGB Supercritical fiasco.

Noting that the Chinese are also trying to go Supercritical (the Coal boilers that is, not the population - lol!!)

have seen a proposal from the Chinese to mount the HP cylinder on each such turbine separately, 'up the top' of the Boiler with its own Alternator, to minimise the length of the pipework from the Final Superheater to the HP Inlet and from the HP outlet back to the Reheater!!  But the unit still won’t be too efficient and still emits CO2 the Coal 'rate' per GJ burnt; much higher than Gas burn.

And I remember the Norwegians in the 1980s getting annoyed with the Acid Rain from the SO2 from our Coal plant stacks.

As regards burning Gas for Generation - I put up the details re the EU restriction and the overnight burn up to early 1980 to help stabilise the NTS (1992 thread).

You mentioned the Olympus Engined GT units

We started out from the early 60's with single engine sets (17.5MW) connected to the Works Power Boards of each 500 and 660MW units (2\*17.5 on each Drax Unit, only 3 out of 6 still in service).  And a Diesel Generator to power the Auxiliaries on those GTs to effect Black Start.

And the first Generation Main GTs, 4 Olympus engines on each - 70MW total output.  Installed 1963.

2

units at each of Croydon B and Rye House (London) and Town Hill (Scotland).

Grotty Power Turbine design (Bristol Siddeley);  at right angles to the 4 engines which were side by side in their Brick Cells (8" concrete 'roof').  Gas path from each engine went through 90 degrees into its individual Power Turbine then another 90 degree turn at the outlet up the stack!!

Again, the Stations had Diesel Generators; compressed air starter, hand cranked Single Cylinder diesel fuelled compressor with the pressure vessel.  Again for Black Start.

Next came the Avon powered stations at Norwich and Hastings (2 \* 55MW units each)

And then they got the Olympus based design right.

2 engines on each side of the Alternator, I assume mounted axially to point 'at' the Power Turbine.

Letchworth, Watford, Cowes - 2 \* 70MW each.  Bulls Bridge (Hayes, West London) 4 \* 70MW

Best Regards

Steve