RAB Financing of Sizewell C Nuclear Power Plant

Financing of Hinkley Point C

The financing of Hinkley Point C (HPC) Evolutionary Pressurised-Water Reactor (EPR) nuclear power plant was subject to a European Commission Decision of 8 October 2014 on an Aid Measure SA.34947, the first measure of which is a Contract for Difference (CfD) providing revenue support during the operational phase.

The beneficiary is NNB Generation Company Limited (NNBG), which at the time of the decision was fully controlled by Electricité de France (EdF), but now is jointly owned by EdF and CNG, a Chinese state company

The Contract for Difference ('CfD') provides revenue support during the operational phase of HPC. The CfD is a private law agreement between NNBG and the CfD Counterparty.

Under the CfD, NNBG will receive an amount of revenues which is determined by the sum of the wholesale market price at which it sells electricity and a difference payment corresponding to the difference between the pre-determined Strike Price ('SP') and the Reference Price ('RP') observed in the previous reference period.

When the RP is lower than the SP, the CfD Counterparty will pay the difference between the SP and the RP, ensuring that NNBG will ultimately receive relatively stable revenues, subject to its selling strategy and the amount of output it produces.

Conversely, when the RP is higher than the SP, NNBG will be obliged to pay the difference to the CfD Counterparty.

The RP is a weighted average of wholesale prices which the UK sets. In the case of NNBG, the relevant RP is the Baseload Market RP, which applies to all baseload generation operators.

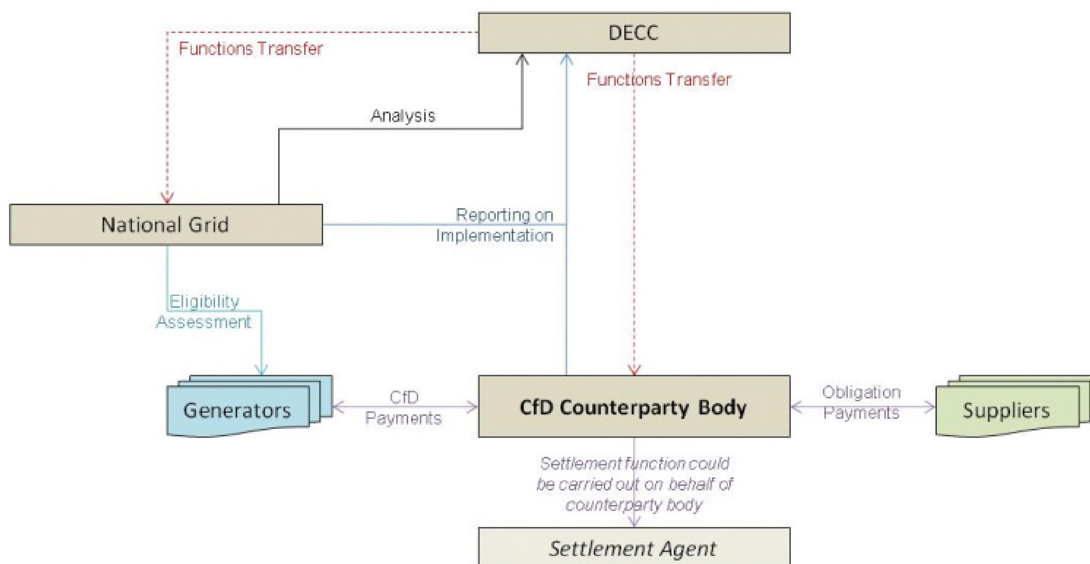
The “strike” price (SP) will be set at GBP 92.50 per MWh in 2012 nominal prices.

If an investment decision to build the Sizewell C new nuclear power station is taken, using the same design and allowing for the opportunity to share some costs for the HPC reactors, the SP will be changed to GBP 89.50 per MWh, again in 2012 nominal terms.

The SP will be fully indexed to the Consumer Price Index ('CPI') and the CPI adjustment will be annual with a base date of November 2011.

The CfD will have as ultimate starting date the Target Commissioning Window for each reactor.

Figure 1 – Roles and responsibilities in the operation of the CfD



In Figure 1 DECC is now BEIS. The Settlement Agent demands contributions from the Suppliers, depending on their electricity market share, which are passed to the Counterparty, which in turn passes sufficient funds taken from the Suppliers to meet the difference between the "strike" price and the settlement price.

The government has formed the Low Carbon Contracts Company Limited and its sister the Electricity Settlements Company Limited with powers to levy the Suppliers for money for the Counterparty to have sufficient funds to make CfD generator payments. Each supplier would be liable for these and LCCC/ESC's costs, depending on its market share defined by metered electricity use.

By 2026 when HPC may be commissioned, the "strike" price being subject to inflation will be around £105/MWh. But its magnitude was based on the HPC construction cost of then £16 billion. The cost is now estimated at £26 billion on completion, so to provide a return on capital the strike price should be raised by 26/16 to around £170/MWh.

With the withdrawal of coal-fired generation and with an increased recourse to natural gas the regulated wholesale electricity price will be forced to increase. As the situation in 2026 is liable to increase in severity, the Suppliers will be unable to pass funds to the Counterparty and the government will have to provide the difference.

It is therefore unsurprising that a different financial system for Sizewell C is sought. Heathrow and Tideway are regulated by the CAA and by OfWat respectively and are cited by BEIS as models for a Regulatory Asset Base advanced payment system for the financing of Sizewell C. Electricity supply is regulated by OfGem.

Infrastructure Debt Financing

Infrastructure in the UK is mainly owned overseas, with minimal equity and with capital spending financed by debt. The interest on the debt is set against the operating profits with little or no corporation tax paid. Bonds are issued overseas in tax havens avoiding withholding tax on the interest payments. The sector is in need of reform possibly by restricting the offsetting of profits by the interest payments on borrowings and other financial costs to say 20% to 40%.

Heathrow (FGP Topco Limited)

FGP Topco Limited - is Heathrow's owner.

British Airports Authority was privatised in 1987 as BAA plc. In 2006 it succumbed to a hostile takeover bid and was acquired by a consortium led by Spanish Ferrovial (62%) as FGP Topco Limited, the current owner of Heathrow. The sale price of £10.1 billion was raised by FGP Topco's borrowings of £2,865m before and £8710m after the acquistion of BAA plc..

By the end of December 2006 FGP Topco had debts of £11,712m, while at the end of December 2007 this had risen to £13,634m, both including the £10.6 billion borrowed for the acquisition of BAA plc, thus getting it for free. It then owned seven major UK airports, until when by 2014 those other than Heathrow were sold, raising over £4 billion. Ferrovial's stake is now reduced to 25% as one of the 90% foreign shareholders.

FGP Topco's financial statements were signed off by Ferrovial's Jorge Gil Villen, but he has been replaced as CEO by Luke Erik Bugeja.

FGP Topco's borrowings had risen to £16,863m by the end of 2019, but with Covid had risen to £20,135m by the end of 2020. See Figure 2.

FGP Topco

		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Totals
Revenue	£m	1090	2247	2590	2263	2312	2524	2362	2652	2691	2767	2809	2884	2970	3070	1175	36406
Operating costs	£m	823	1670	1570	1821	1530	1712	1697	1618	1902	1608	1798	1818	1879	1925	1998	-25369
Dividends	£m	140						240	555	1075	300	325	525	500	500	100	-4260
Borrowings	£m	11712	13634	12973	12652	12675	12794	12818	12577	11574	11891	14342	14214	14569	16863	20135	
Interest	£m		811	813	501	457	444	487	589	597	631	608	563	533	742	562	-8338
Financial costs	£m		24	-241	-81	-41	-31	71	-69	-78	138	-479	203	-570	-39	-353	-1546

As the "top company" in which the accounts of it and the other 12 major subsidiaries are consolidated, FGP Topco owns Heathrow Airport Limited (number 12 in the chain) which is licensed to operate and be regulated by CAA. BAA plc was delisted as BAA Limited and renamed Heathrow Airport Holdings Limited (number 4 in the chain).

FGP Topco has 4 finance companies. ADI Finance 1 and 2, (2 and 3 in the chain), Heathrow Finance plc (8 in the chain) and Heathrow Funding in Jersey (joint 10 with Heathrow (AH) Limited). FGP Topco's borrowings are raised by issuing bonds, 20% in the UK by Heathrow Finance plc and 80% offshore by Heathrow Funding Limited. In the prospectuses it states that withholding tax on interest payments will not be payable and if it is the bondholder will be compensated.

Over 2007 –2020 it has set its financial costs against its operating profits, paying no net corporation tax,. It has paid its bondholders around £8+ billion in interest, saving them perhaps £1.6 billion in withholding tax (20%?). It paid its shareholders (90% foreign owned) £4,260m in dividends, some taken from its £4+ billion in non-Heathrow airport sales, but mostly adding to FGP Topco's borrowings.

FGP Topco's shareholders paid up shares total only £13.1 million for which investment they have acquired £4.26 billion in dividends.

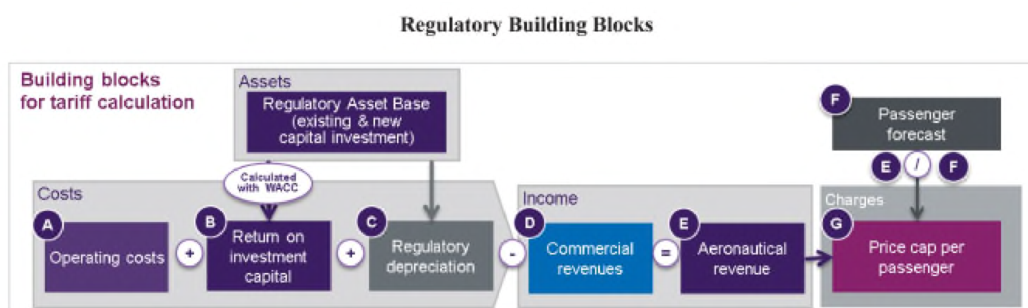
Covid restricted flights using Heathrow and its revenue fell. No dividends were paid in 2021 and FGP Topco has had to borrow more to pay its financial costs, so as the shareholders have paid up no more shares, Heathrow has become a Ponzi.

CAA's regulation

The CAA regulator sets its allowable airport charges at a "price cap" in accordance with 7 Regulatory Asset Base (RAB) "building blocks" including capital invested.

Figure 3

Regulatory Building Blocks



The Aeronautical revenue is divided by the passenger forecast numbers to establish the price cap for airport charges. The operating costs include the financial costs arising from the debt, the weighted average cost of capital (WACC) and the size of the RAB are determinents in the allowed total revenues, from which the commercial revenues are subtracted to calculate the allowed aeronautical revenues. The continuing rise of airport charges have allowed the interest charges on the borrowing to be covered and obviated the need for real investment. As the top company runs at a loss the dividends are borrowed, add to the debt and the size of the RAB. The airlines are critical of the regulator as from 2007 to 2020 the airport charges have risen from £8 to £22, bringing them up to 65% more than those of competitive hubs in Europe.

The CAA refused to allow additional airport charges to fund the airport expansion DCO, but added $300 million to the Regulatory Asset Base (RAB) to offset the losses caused by the reduction of traffic by Covid. Heathrow asked for a 90% increase in airport charges to cover the debt cover reduced by the loss of 75% of its revenue, but this is currently refused, but subject to consultation over the next regulation period. An interim settlement is for a 37% increase to now around £30.

With the net losses, net corporation tax is paid, so that the dividends are paid from borrowings. The tax avoidance, both of corporation tax and bond interest witholding tax, means that the Treasury receives only the VAT from the commercial revenues - as by international agreement air industries are tax free.

Relieving the UK's huge Covid debt burden will mean that the tax avoidance, resulting from the current practice of financing by debt, with the financial costs therefrom set against operating profits, performed by the majority of the UK infrastructure companies cannot be allowed to continue.

Kemble Water Holdings Limited and Bazalgette Equity Limited

Kemble Water Holdings Limited is the parent company of the Group owning Thames Water Utilities Limited (TWUL).

Bazalgette Equity Limited is the parent company of the Group owning Bazalgette Tunnel Limited (BTL), trading as Tideway

Thames Water Utilities Limited and Bazalgette Tunnel Limited are regulated by OfWat

Kemble Water Holdings Limited is owned by 16 international shareholders including some United Kingdom members. It has paid up shares of £1991.6m and at 31 March 2021 had borrowings of £13,536.5m with a loss that year of £500.9m.

Bazalgette Equity Limited is owned by 5 shareholders, with around half UK pension funds. It had paid up shares of £507.4m at 31 March 2021 and borrowings of £2,782m. There were £720.4m loans from the shareholders paying a 8% fixed rate as income in lieu of dividends.

Bazalgette Ventures Limited is the vehicle to organise shareholder loans financing.

TWUL has appointed Bazalgette Tunnel Limited (BTL or Tideway) for the construction of the tunnels, shafts and associated works under the Thames.

Tideway has appointed 10 construction companies, organised into five sections, a programme manager, West, Central and East Contract joint ventures consisting of 3, 2 and 3 member constructors respectively and a systems integrator.

BTL has appointed its own board directors remunerated as in the following table extracted from its successive annual reports up to 31 March 2021. See Figure 4.

Tideway directors remuneration	**£1000s**						
	2016	**2017**	**2018**	**2019**	**2020**	**2021**	Totals
Andy Mitchell	484	729	720	729	1633	863	5158
Mark Corben	303	484	470	1964			3221
Mark Sneesby	285	459	470	478	1094	549	3335
Mathew Duncan				124	384	546	1054
Sir Neville Simms	166	275	275	275	279	285	1555
Richard Morse	56	90	90	90	97	100	523
Mike Putnam					64	70	134
John Holland-Kaye			39	54	61	64	218
Ann Baldock	33	54	54	54	18		213
Mark Fairbairn	33	54	54				141
Michael Queen	33	54	54	54	61	64	320
Baroness Ruby McGregor-Smith					48	64	112
Annual totals	1393	2199	2226	3822	3739	2605	
		3592	5818	9640	13379	**15984**	

The salaries are augmented by bonuses and amounted to around £16 million by 31 March 2021. Of interest is the remuneration of Mark Corben CFO of £3.221 million with just four years in service, including a deferred bonus of £1.5 million in 2019. He afterwards joined BEIS to advise it of the RAB financing of Sizewell C.

OfWat's regulation

TWUL's waste treatment consumers are charged an advanced payment for Tideway which up until 31 March 2021 amounted to £218.425m revenue paid to Tideway. TWUL's liability will be to pay a proportion of the revenue collected from its wastewater customers to BTL on a monthly basis. The charges will be included in TWUL's customers' bills and there will be no separate bills for the Tideway's portion.

The allowed annual revenue payments from TWUL to BTL are regulated by OfWat and are based on annual Regulatory Accounting Statements published in Tideway's annual reports.

The Regulatory Asset Base (RAB) is the basis of CAA's Heathrow airport charges price cap. The OfWat equivalent of it is the regulated capital value (RCV), one of the building blocks from which Tideway's annual charge on TWUL is calculated and agreed by OfWat.

There are Regulatory Accounting Guidelines (RAG) published by OfWat in document RAG-3.12. This lists the data tables to be completed (and statements to made) from which the RCV is calculated. This and other building blocks sets the allowed level of annual revenue payments TWUL makes to BTL. The definitions of the terms used in the tables are laid down in another document RAG-4.09

Tideway has published the completed tables (from which the allowed revenue in 2021-2022 will by calculated in pages 160-170 of its 2020-2021 annual report. Tideway has certified the accuracy of the data in the tables and published the required statements in pages 171 –180. Tideway then submits an allowed revenue statement to OfWat for approval.

Figure 5

Updated Revised Revenue Statement - 2021/22 Allowed Revenue

Submitted to Ofwat on 18 December 2020

£, nominal	Year preceding Prior Charging Year 2018/19	Prior Charging Year 2019/20	Current Charging Year 2020/21	Forthcoming Charging Year 2021/22
Allowed Revenue	49,235,940	63,431,062	76,465,429	87,029,095
Amounts received from TWUL	38,387,688	57,610,001		

The annual revenue, TWUL –BTL, covers the operational costs, interest on borrowings and on the 8% interest on shareholder loans, eventually paid as income to Bazalgette Equity Limited. However, it does not reduce the project borrowing which continues to add to Tideway's debt.

The revenue statement shows that it will increase to cover increasing costs and interest payments under the first regulatory framework until this ends in 2030. The second regulatory framework will commence from 2030.

See the delivery model extracted from Tideway 2020-2021 annual report.
In Figure 6

THE DELIVERY MODEL

The Thames Tideway Tunnel has an innovative delivery model, which was established to attract private sector capital to finance infrastructure and deliver value for money to customers.

It includes a bespoke regulatory framework, with a contingent Government Support Package, which recognises the unique nature of Tideway's business. This framework provides a revenue stream during both the construction and operational periods. Revenues are billed and collected on our behalf by Thames Water from its wastewater customers and passed to Tideway.

For the period until 2030, our revenues are calculated according to the framework set out in our Licence, which is primarily based on a percentage return (2.497 per cent) on the regulatory value of our company (Regulatory Capital Value or RCV). From 2030, we expect to be regulated in line with the rest of the water industry.

Tideway in its 2020-2021 annual report Page 18 gives a Timeline, which is a schedule for the delivery of the project. See an extract as Figure 7

- **Construction**
  This includes excavating deep shafts at the three drive sites and each CSO interception site, followed by tunnelling, tunnel secondary lining, installing mechanical and electronic equipment, and architectural and landscaping works.
- **Commissioning**
  All the worksites and tunnels will be connected to the London Tideway Tunnels (LTT) system and tested. Once this is complete, the MWCs hand over the Thames Tideway Tunnel (TTT) Works to Tideway. At this stage, the MWCs' activities will be complete, and the contractors will be demobilised.
- **System Acceptance period**
  This will be an 18 to 36 month proving period. The LTT will be operated across a variety of storm conditions, to demonstrate that it fulfils the project requirements. Once this is complete, Thames Water will become responsible for maintaining the near-ground structures and assets. Tideway will retain responsibility for the shafts and tunnel structures and ensure the TTT is available to allow flow to pass to the Lee Tunnel. This involves inspecting the deep tunnels and shafts, which we expect to do on a ten-yearly cycle, performing any maintenance as required.

In the Tideway Investor Report published in August 2021 is a list of issued bonds. See an extract as Figure 8

Debt Portfolio – March 2021

Drawn Debt Portfolio - March 2021

Facility	Drawn amount	Type	Drawdown date	Maturity (CY)
£75m CPI + 0.828%	75	Green Bond	Aug-17	2047
£300m 2.86%	300	USPP Loan Note	Sep-17	2032
£250m 2.375%	250	Green Bond	Nov-17	2027
£200m CPI + 0.74%	200	Green Bond	Nov-17	2042
£100m RPI + 0.688%	100	Green Bond	Jun-18	2050
£80m Tranche 1	80	EIB	Jul-18	2051
£100m RPI + 0.249%	100	Green Bond	Dec-18	2040
£80m Tranche 2	80	EIB	Jan-19	2051
£100m RPI + 0.755%	100	Green Bond	Jun-19	2051
£80m Tranche 3	80	EIB	Jul-19	2051
£125m RPI + 0.192%	133	Green Bond	Jul-19	2049
£100m RPI + 0.01%	100	Loan	Sep-19	2049
£80m Tranche 4	80	EIB	Jan-20	2051
£25m RPI + 1.035%	25	Green Bond	Jun-20	2048
£50m RPI + 0.787%	50	Green Bond	Jun-20	2052
£25m RPI + 0.951%	25	Green Bond	Jun-20	2054
£80m Tranche 5	80	EIB	Jul-20	2051
£80m Tranche 6	80	EIB	Jan-21	2051
£80m Tranche 7	80	EIB	Mar-21	2051
Subtotal	**2,018**			

Committed and Undrawn Debt Portfolio - March 2021

Facility	Nominal amount	Type	Drawdown date	Maturity (CY)
RCF	160	Revolver	N/A	2025
EIB	140	Loan	Various 2021-2022	2051
£25m RPI + 1.042%	25	Bond	Jun-21	2048
£25m RPI + 0.954%	25	Bond	Jun-21	2054
£75m RPI + 0.01%*	75	Green Bond	Aug-21	2036
£75m 2.418%	75	Green USPP Loan Note	Sep-21	2041
£150m RPI + 0.01%**	150	Green Bond	Apr-22	2032
£75m CPI + 0.949%	75	Green Bond	May-22	2052
£50m RPI + 0.074%	50	Green Bond	May-22	2049
£50m RPI + 0.174%	50	Green Bond	May-23	2049
Subtotal	**825**			

(*) re-offer price of 112.157% reflecting negative yield of -0.754%

(**) re-offer price of 100.24% reflecting negative yield of -0.014%

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Bazalgette Finance plc's debt portfolio shows that it has a Green Bond maturing in 2052.

Bazalgette Equity Limited

Bazalgette Equity Limited is to exist as water company from 2030, perhaps for the anticipated 120 years' life of the tunnel. Bazalgette Equity Limited will have retained its debt, so the interest on which and other financial costs will continue to be paid by TWUL's waste treatment consumers. It will be able to set these against its operating profit for corporation tax avoidance.

Its subsidiary, Bazalgette Finance plc in its prospectus has stated that it will not deduct withholding tax from its payments to bondholders, unless ordered by tax authorities. Its longest maturity bond will demand payment of interest until 2052, unless it is "callable" and can be paid off early.

As the final costs of the works are likely to rise to around £5 billion (from the current estimate of £4.6 billion), it will exceed the original project cost of (£3.144bn in 2014/2015 prices) by the stipulated 130%. The government support fund will be liable to an equity payment, 60% to TWUL's waste treatment customers and 40% to Bazalgette Equity Limited. This could be used to reduce Tideway's debt on completion, but might simply be paid to shareholders as a dividend, leaving the debt as a device to avoid tax.

The fixed rate of return until 2030 will be 2,497%.

TWUL's investment in the connecting works and sewage plant upgrades will cost an amount of ca. £1 billion and will be added to its regulatory RCV and processed by OfWat in its 5 year determination of wastewater collection charges.

Bazalgette Tunnel Limited (Tideway) will continue to maintain the tunnels and shafts, with inspections on a ten-year cycle.

Tideway's handover to TWUL

The handover is described in Bazalgette Finance plc's 2019 prospectus on Page 11.

Once completed, the above-ground assets, structures and equipment of the Thames Tideway Tunnel (TTT) will be transferred to Thames Water Utilities Limited (TWUL), leaving the main tunnel, connection tunnels and shafts under the Bazalgette Tunnel Limited (BTL)'s ownership. Thames Water will operate the TTT, while Tideway will maintain and make available the deep tunnels and shafts.

BTL will operate and maintain the civil structures of the Tideway project, being the tunnels and shafts) in such manner as to keep them free from sediment and allow flows to pass along the tunnel up to the connection with the Lee Tunnel whilst maintaining the total storage volume in the tunnel and shafts. The principal maintenance activity undertaken by BTL will be the inspection of the Tideway project (anticipated to be on a 10-year cycle).

If in extreme circumstances, sewage continues to flow into the Thames, it will be difficult to attribute responsibility to which (or to both) of the companies involved. However, fines levied by OfWat will fall only on TWUL and if tunnel flows are blocked or attenuated there will be disputation.

Normally, the issuing of a handover certificate by a Vendor to a Supplier is the trigger for the contractual means of payment, but it appears that TWUL will in effect be leasing the handed over of the below ground listed works from Tideway, rather than paying for them. Presumably the advance payments by TWUL's waste treatment consumers would end, to be replaced with annual payments by TWUL, the prices of which being determined by OfWat.

The best way to settle this unique, business arrangement would be for Kemble Water Holdings Limited (KWHL) to takeover Bazalgette Equity Limited and its subsidiaries into its group. The assets and debt of BTL would then be consolidated into the top company's accounts.

There could then be a reorganisation of the KWHL multiple subsidiaries into a simpler structure, more open to audit and for regulation as one entity by OfWat. The multiple boards of directors could be merged and reduced in numbers.

Sizewell C

EdF and CGN signed the Sizewell C Project equity documents on 29 September 2016 alongside the HPC contracts, for the development, building and operation of two EPR reactors (3.2 GW) at Sizewell in Suffolk.

During development phase prior to final investment decision, EDF Energy's share of the project is 80% and CGN's is 20%. EdF has planned to pre-finance the development up to its share of an initial budget of £458 million. Final investment decision is likely to be made by mid 2022.

This project is based on the assumption that third party investors will invest and become majority shareholders of the Project. EdF plans, at the date of the final investment decision, to become a minority shareholder with corresponding limited rights and to deconsolidate the project from the Group's financial statements (At this stage, it is not certain that the Group will achieve this objective.)

This financing model has never been implemented for projects of that scale before and therefore would be one of the largest ever equity issuance and project financing on the European scene. Securing the appropriate risk-sharing mechanism and ultimately the corresponding financing structure ahead of the Final Investment Decision is therefore key for the project, the UK Government and the current shareholders.

EdF's ability to make a final investment decision on Sizewell C and to participate in the financing of this project beyond the development phase could depend on the operational control of the Hinkley Point C project, on the existence of an appropriate regulatory and financing framework, and on the availability of sufficient investors and financiers. From EdF Energy Holdings Limited annual report 2020.

RAB financing for SZC (as the Cambridge EPRG Working Party Model)

If applied to Sizewell C (SZC), the shareholders of a newly formed development company would issue shares of 30% of the estimated construction cost, i.e. £6 billion of the current cost of £20 billion, which would be paid up in annual instalments of £600 million over the 10 years of construction. If the date of commissioning was extended and the costs were increasing, further shares valued at 30% of the increased costs would be issued and paid up annually. Debt would be raised annually to cover the 70% of the increasing construction costs and would cover 70% of the additional costs accruing after the 10 years construction period.

During the construction period and up until SZC became operational, the 27 million householder consumers would pay the Weighted Average Cost of Capital (the WACC) on the 70% of the costs, which would be added to the electricity consumers' bills.

Once SZC is in operation, the "strike" price paid by the suppliers to the then owners of SZC would be a combination of the WACC for the 70% of the capital costs plus the running costs. Presumably in the negotiations with the formation of the development company a level of profit on the £6 billion equity, (plus the equity paid for the 30% of any increased construction costs) would also be included in the "strike" price.

The electricity suppliers would add these to their electricity payments to the development company, via a Counterparty. It is assumed that the "strike" price will be met by a contract for difference (CfD) and as for Hinkley Point C the Counterparty will need government subsidy.

The model envisages that OfGem's regulatory period would continue over the 60 years of operation.

Comments

In citing the Heathrow and Tideway's RAB as models for financing Sizewell C, BEIS has failed to take into account their current low equity, high debt financing enabling tax avoidance together with the passing of dividends paid out of borrowings to foreign shareholders.

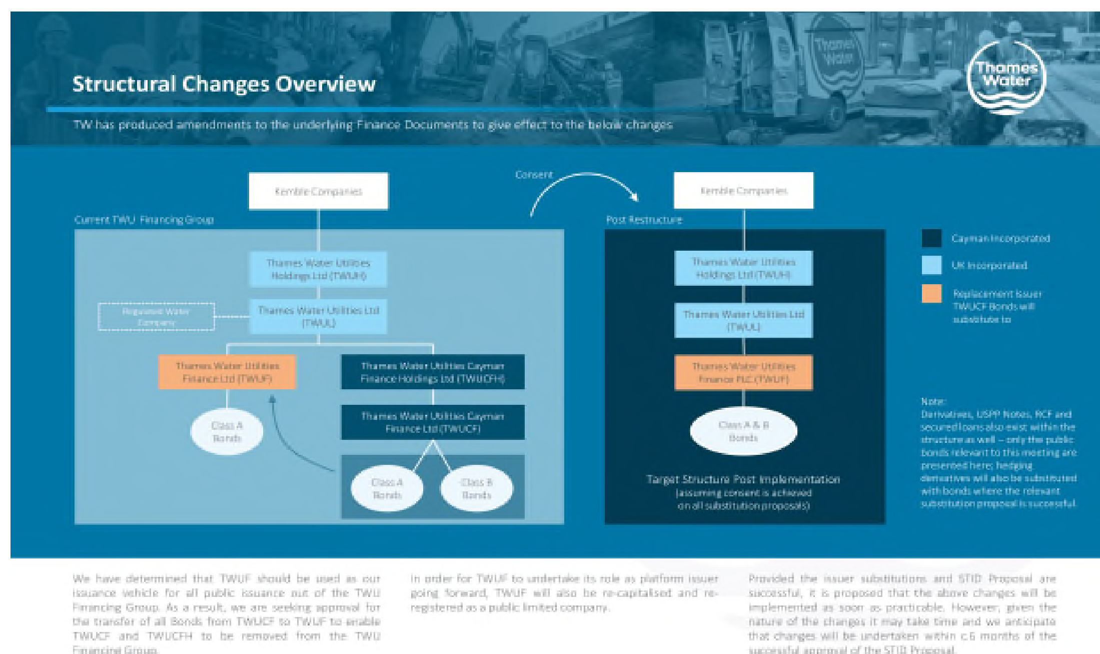
Heathrow is not the worst example of this scenario, but its initial paid up share capital of £13.1 million for a return totalling £8+ billion has evaded scrutiny by CAA and the Transport Select Committee. FRC and FCA have refused to adjudicate.

The Transport Committee hearing on 5 February 2017 failed to question the CEO of Heathrow's owner FGP Topco Limited's CEO Jorge Gil Villen on its financial practises, while its *modus operandi* was fully ventilated at a session of the APPG Heathrow in Portcullis House on 24 January 2018, but which had no impact on the later decisions on the third runway.

As an interim measure CAA has allowed Heathrow's airport charges to be increased by 37%, but it will still be unable to service its huge debt following Covid's traffic attenuation. Kroll's subsidiary Lucid Trustee Services Limited has a charge on FGP Topco Limited's first subsidiary ADI Finance 1 Limited. If this rescue attempt fails to raise an equity input, FGP Topco Limited could be put in administration by its creditors. Its subsidiaries Heathrow Airport Limited and Heathrow Express Operating Company Limited might then be taken over by the official receiver and continue to run the airport and its supporting auxiliaries.

Tideway had borrowed £2,757m by 31 March 2021, while revenue payments made by TWUL's waste management customers and passed to Tideway by then totalled just £218.4m. On handover of the above ground works to TWUL, those below will remain in Tideway's bailiwick, but the interest on the continued borrowings will continue to be paid.

In 2019 Kemble Water Holdings Limited engaged in a reform of its tax haven bond issuers, see an extract from Thames Water Utilities Limited 2018 as Figure 8.



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Cayman Islands companies

There were two Kemble companies registered in the Cayman Islands, viz, Thames Water Utilities Cayman Finance Holding Limited (TWUCFH) owning Thames Water Utilities Cayman Finance Limited (TWUCF).

In 2019 the issued bonds from Thames Water Utilities Cayman Finance Limited were transferred to Thames Water Utilities Finance Limited (TWUF) re-capitalised as a plc.

TWUCF and TWUCFH were then removed from the TWU financing group. The annual reports of TWUCF were published which included a list of issued bonds, but TWUCFH is an exempted company with no need to publish accounts, so its function and holdings are unknown.

Although bonds from TWUCF have been moved to TWUF, both companies may still be in existence.

Sizewell C

SZC's massive, reinforced concrete, civil construction is due to safety considerations following incidents at Three Mile Island Unit 2 in the USA and Fukushima Units 1-4 in Japan. To make the EPR safer, the containment's reinforced concrete walls have been doubled to hold an hydrogen explosion pressure. So, with this and the increase in the reactor vessel size and ancillary equipment, the doubling of its standby generators and the addition of spent fuel casking and storage on site it has resulted in its vastly increased costs.

Its current cost estimate of £20 billion is likely to rise, as has HPC's £16 billion to £23 billion and SZC may end at £25 billion.

SZC's financing

The Heathrow RAB and Tideway RCV/RAG are cited respectively as models for the financing of Sizewell C by advance payments to the development company during construction and by CfDs when in operation, added to the bills of its 27 million consumers, but not shown separately.

The proposed RAB advanced payments by consumers will cover the interest on the borrowing for progress payments, but payments will continue for the interest on the remaining debt, on depreciation and operational costs until SZC's operation ends and the spent fuel leaves its pond and it is in dry casks. There is, anyway, a levy on the MWh generation for waste management.

The BEIS's Low Carbon Contracts Company and Electricity Settlements Company levy the Suppliers for funds for its Counterparty. This currently pays Contracts for Difference (CfDs) to 73 projects including wind, biomass, solar PV and Energy from Waste. It plans to administer the payment of CfDs to its projects for operational periods of 15 years, but Hinkley Point will have an operational period of 35 years.

The estimated CfD costs of its current projects over their 15 year operational periods will be £37 billion, while Hinkley Point C's CfDs over its 35 years' period will total £52 billion. The burden on the suppliers for the 73 LCCC projects (excluding HPC) will be ca. £7.5 billon a year, while HPC will add another £1.5 billion a year. If this cannot be recovered from the Suppliers, in part or in full, a subsidy will have to be added to the LCCC Counterparty's funds by the government.

Sizewell C

Sizewell C at 3.2 GW is too big for grid stability, as all the nuclear power plants will be on base load and there will be no equivalent standby if it drops out while HPC is under going a fuel change.

Its supplies of its fuel are subject to extraction cost rises as uranium ores reduce in concentration. World uranium production peaked in 2016, while production has since reduced by a quarter and is now lower than the anticipated consumption.

Nuclear power is unaffordable in the short term, but with the proposed advanced payments to cover loan interest costs during the construction period and if the excess capital costs reflected in its "strike" price were to be subsidised by the taxpayer **and if** SZC lasts its 60 years' anticipated life it may be affordable in the long term. But then it is faced with 20 years of cost for its closure procedures without revenue. Its fuel supplies' costs will rise (and may run out), its components are subject to corrosion, its controls will need to be regularly updated and it may be subject to a cyber attack.

A pressure water reactor will not survive a continuing station blackout, so it needs a secure supply of diesel for its standby generators to be available in an SBO and at the end of this century to maintain the cooling of the spent fuel ponds. It will also need a source of energy to manufacture dry casks of concrete and metal, to produce inert gas, for cranage to handle the spent fuel into the casks and for the ultimate building of a repository. It may be that the station battery storage could be increased, but some form of motive power will be needed post generation.

Moreover, it will leave a waste management legacy for the next century that will elicit a curse laid by our descendents on our generation.

SZC Development Company

EdF SA took over Areva the EPR nuclear power designer and constructor, while its partner CGN has overseen the building and commissioning of two EPRs in China. Although the first two EPRs in Finland and in France are yet to be commissioned, the knowledge and expertise of the consortium currently engaged in building the HPC EPRs is incomparable.

EdF SA has borrowings of around £67 billion, so that if it had taken a majority share in SZC's building of 80% it would have added £16 billion to its borrowings, or 24% extra. As this is at risk as equity and the average interest on its issued bonds is around 5%, it must have been deemed too much for a majority government-owned enterprise to find political support for another countries infrastructure.

With two EPRs, one with a supply contract signed in 2003 and one in 2007, still to be commissioned, there cannot be a certainty in ending with a successful, profitable project. If the Flamanville EPR is to be shortly generating, there may be excess electricity in France to sell to the UK through the inter-connector.

If investors can be attracted by the Cambridge University model of RAB financing, they will have to be ready to down pay the £6 billion equity in 10 yearly instalments of £600 million, perhaps extended over further annual payments with inflationary construction costs, with no return. The UK government may have to sign up to a subsidy by augmenting the Supplier payments to a Counterparty to make up to a "strike" price. It may be that the "strike" price will be raised to provide a profit on the £6 billion equity paid up by the development company (under the Cambridge Working Party study).

Although the advance payments by consumers may alleviate the rising costs, even the small additional costs of them will be resisted. TWUL's wastewater consumers will not welcome the inclusion of the advance payments in their bills - without the advising of the additional part of the bills. Anti-nuclear electricity consumers will object to paying extra on their current bills, perhaps over the 10 years or so of he build years of SZC.

Basically, the EPR capital costs are too much to produce affordable electricity, while with the world uranium production reducing, nuclear fuel costs are rising. Finding a developer to risk a £6+ billion equity down payment with, or without, government guarantees may prove to be an elusive pursuit and the government may have to provide the equity as the French and Chinese governments have done for HPC.

Regulatory financing

The CAA regulates Heathrow Airport Limited, a twelfth subsidiary of FGP Topco Limited, of which the shareholders have so far paid no equity into it, just taken out dividends from it, thus allowing it to burgeon its debt to more than £20 billion. It has allowed the cap of airport charges to progressively rise in spite of the hostility of the airlines to it. As interest charges are one of the building blocks of the RAB, increasing its borrowing for capital spending has allowed the RAB to increase in size and with it the cap on airport charges.

Around 80% of FGP Topco's borrowing is offshore in Jersey, but even the other 20% of bonds issued in the UK are also free of withholding tax, while its financial costs are set against its operating profits to reduce corporation tax.

OfWat is content to regulate Tideway as a separate construction and operating company in a duality with TWUL, a subsidiary of its partly foreign owner, currently loaded with £14+ billion debt, which will continue indefinitely. Capital charges will be eased by advanced payments by the wastewater treatment consumers, while interest charges on debt and running costs will continue after commissioning.

The duality of facilities ownership will mean the continuing costs of two administrations and scope for disputation over responsibility for illegal discharges. So, the merging of Kemble Water Holdings and Bazalgette Equity Limited is recommended.

BEIS has commended Heathrow's RAB and OfWat's RCV financing as models for SZC's financing, but their application to SZC's financing is questionable.

Office of Nuclear Regulation

ONRs regulation is technical and operational and it may not be willing to license a subsidiary of a development company as the prime investor. The development company could be wholly or partially owned overseas and deny the operator of adequate funding for solving future problems.

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Figure 1
Extracted from European Commission decision on HPC State Aid 8 October 2014

Figure 2
Table of figures compiled from successive FGP Topco Lmited annual reports.

Figure 3
Regulatory building blocks diagram extracted from Heathrow Finance plc prospectus.

Figure 4
Table of directors' salaries formed from successive Tideway annual reports

Figure 5
Table of revenue passed from TWUL to BTL extracted from Tideway annual report 2020-2021

Figure 6
Tideway's delivery model extracted from Tideway annual report 2020-2021

Figure 7
Timeline, Commissioning and System Acceptance period from Page 18 Tideway 2020-2021 annual report

Figure 8
Kemble Water Holdings Limited debt restructuring

Sizewell C
Statement of EdF/CNG's withdrawal from full control of Sizewell C extracted from Page 22 of EdF Energy Holdings Limited annual report 2021

RAB financing model
Cambridge EPRG Working Paper 1926
Financing Low-Carbon Generation in the UK: The hybrid RAB Model
David Newbery, Michael Pollitt, David Reiner and Simon Taylor

LCCC Annual report to March 2021