Investment Decision Pack
NGET A7.04 Site Separation
December 2019

As a part of the NGET Business Plan Submission

nationalgrid

Justification Paper Load Related – Site Separation			
Primary Investment Driver	Power station closure and resultant site separation		
Reference	NGET_A7.04 Site Separation		
Location in Submission Narrative	Chapter 7 – *Enable the ongoing transition to the energy system of the future* Section 5.1 iii) *Invest to facilitate closure of conventional generation and secure easements*		
Cost	£41.4m		
Delivery Year(s)	2021 – 2026		
Reporting Table	B series tables and totex cost-matrix tables		
Outputs in RIIO-T2	Site separation for 10 sites		
Spend Apportionment	**T1**	**T2**	**T3**
	£75.7m	£41.4m	N/A

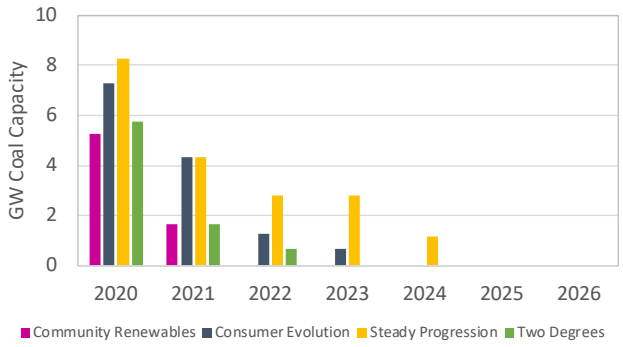
All costs are in 18/19 prices, unless otherwise stated.

Contents

1. Need

The recent Climate Change Committee recommendations that have been adopted into legislation by Government mean that the ongoing transition to the energy system of the future is leading the country towards a world of net zero carbon emissions by 2050. Whilst the exact pathway of this transition is uncertain, the imminent closure of ageing conventional power stations because of pre-existing European environmental legislation (i.e. the Industrial Emissions Directive) is not in question. Figure 1, below, shows the total capacity of coal fired generation expected across all four of the ESO Future Energy Scenarios (FES 2019). Before the end of the T2 period, all the existing ~10GW of coal fired generation is expected to close.

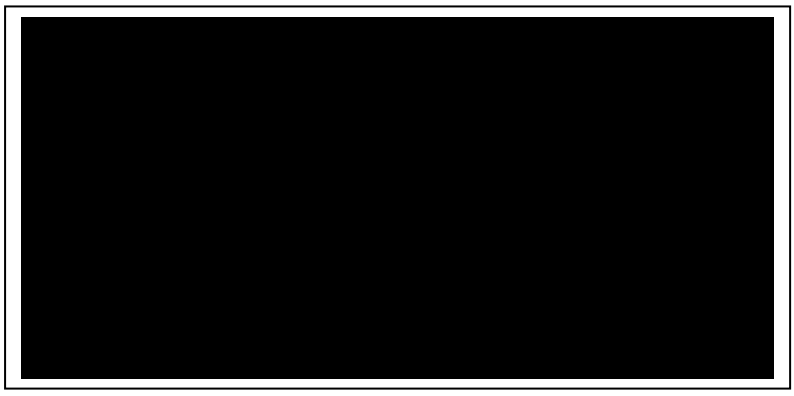
Figure 1 – Coal generation capacity expected across the FES19 scenarios



SOURCE: NGET analysis of ESO FES publication http://fes.nationalgrid.com/fes-document/

In parallel, a considerable proportion of Britain's fleet of nuclear power stations are coming to the end of their lives. Many of these are already half-way through their previously granted life extensions, as shown in the Figure 2.

Figure 2 – Closure dates for existing EdF nuclear power stations



The power stations in England & Wales are connected to our transmission network and some work is therefore required to affect closure in a safe and efficient manner.

When these sites were initially built pre-privatisation, the Central Electricity Generating Board owned both the power stations and the transmission network. As a result, most of the transmission substations from this time are on shared sites with the power station and, to a greater or lesser extent, share essential site services. A small number of sites also have third party private networks connected.

Upon deciding to close a power station, customers need only provide us with 12 months' notice (as per the interface agreement 1990) before shared services provided by the station are removed. Depending on how integrated the power station and transmission sites are, and whether the transmission substation is required

in future, we must undertake a range of works to ensure we can continue to operate our site safely and efficiently.

2. Scope and cost

The scope of work needed to facilitate the closure of conventional generation built in the period pre-privatisation can be split into two broad categories:

i) Decommissioning only - substation no longer required

Where the sole purpose of a transmission substation is to connect a power station, it becomes obsolete when the power station disconnects. Few substations fit this criterion as most also connect multiple circuits and act as a marshalling point for the main transmission network.

Examples normally occur where a power station is on the end of circuit, i.e. a spur. Oldbury on Severn and Sizewell A substations are examples of this. On closure of these nuclear power stations, the transmission substations no longer served a purpose. The terms of the land lease with Magnox requires that we remove all assets and hazardous waste (incl. asbestos, PCBs) from the substation before relinquishing our lease.

ii) Full or partial separation - power station and transmission substation on the same site with shared services

Where a power station and transmission substation are on the same site, they generally share many services. Following privatisation of the electricity industry, the ownership of the power stations was passed to Powergen, National Power and Nuclear Electric and the substations to National Grid. In March 1990, an interface agreement was put in place for each shared site that stipulated how the shared services should be treated. Each agreement was similar in content; whilst the power station was in existence it would provide the substation with Low Voltage AC electricity supplies, water supplies, site lighting, sewage disposal, drainage disposal, etc. The power station owner has an obligation to provide us with services up until they themselves cease to use them, at which point the 12-month notice period should be served. The transmission substation may also benefit from the power stations site security, not covered in the agreement.

Land lease agreements were also put in place with a clause that stipulated that the power station would provide a laydown area to the substation on request, predominately to facilitate essential site maintenance Subsequently, power station land owners have sought to remove this clause from the lease, as it inhibits the sale of their land.

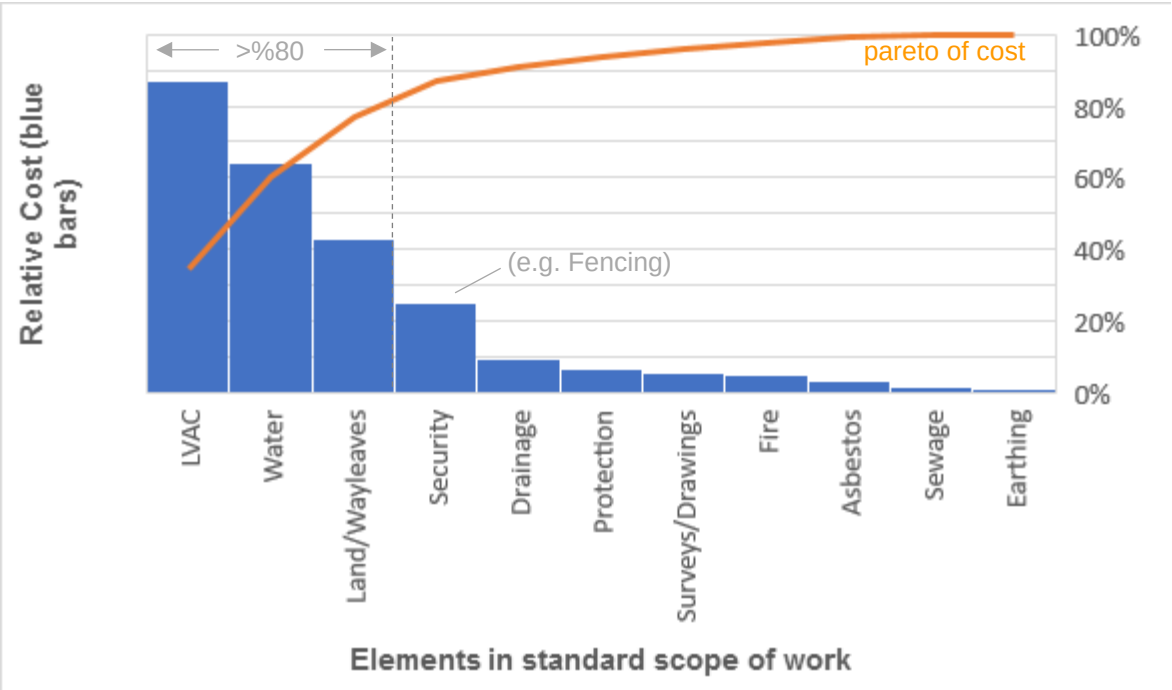
The focus of this paper is on sites with shared services where there is a continuing need for the substation. From our ongoing programme of work to separate site services, experience shows that costs vary for each individual site, depending on the extent of integration and variability of individual cost drivers within the standard scope of work. Each service that is secured in the standard scope for a site separation is described in Table 1, below.

Table 1 - Standard scope of work to enable separation of services

Service	Description
Low Voltage AC (LVAC) supplies	A Low Voltage AC (LVAC), 415V electricity supply is required at each site for auxiliary supplies, protection systems, backup DC battery supply, air compressors, welfare facilities and lighting. The supply is crucial to enabling the substation to function. The LVAC supply can either be sourced from the transformer tertiary winding (i.e. feeding a 33kv/415V transformer to supply the site) or the local Distribution Network Operator (DNO). The benefit of supply from the DNO is that it has sufficient redundancy such that it is independent of specific assets that require maintenance outages or could be subject to equipment faults. Therefore, this option is normally pursued. The installation cost of DNO supply is dependent upon the site and DNO. For example, at [redacted] the cost was £[redacted] to provide a connection, whilst at [redacted] the cost was £[redacted]. Wayleaves are also required from the landowner (across the old power station land) for the new DNO supply and the substation LVAC board is retained unless it is not sufficient for DNO security of supply requirements.
Water	Each substation requires a water supply for welfare and wash down areas. An independent supply is sought from the local water company and necessary wayleaves across the power station land for the new supplies are agreed.
Land / Wayleaves	In addition to the wayleaves negotiated for LVAC, water, drainage, etc. (as noted in the individual services listed within this table), the purchase of land or a wayleave for a laydown area is often required.
Security	Typically, power station land is sold for light industrial or domestic housing. To maintain security of the substation site, where required and if possible: a) land is purchased to enable security fencing to be erected b) the laydown area that was previously provided by the power station on their land is purchased and brought inside the fence line c) where tunnels connect the power station to the substation, the tunnels are blocked to prevent access.
Drainage	Where possible, the terms of the land lease are amended to reflect the requirement that the landlord will provide drainage facilities. Otherwise, sufficient site drainage is installed and wayleaves agreed
Protection	Historically, some protection assets owned by National Grid (e.g. relays, control panels, etc.) were on power station land. National Grid have a liability to remove these assets within 6 months of the power station terminating their Bilateral Contract Agreement with the Electricity System Operator.
Surveys and Drawings	When reconfiguring a site and introducing new services, surveys are required and drawings need to be updated.
Fire	Negotiations with the local fire service determine requirements. These vary depending on the regional fire and rescue service. Works are carried out to ensure the provision of water in case of fire is aligned with the local service that would be called out. Where a hydrant is required, the appropriate water supply is sought from the local water company. A wayleave is required from the power station landowner to enable the water pipes to be laid across the power station land.
Asbestos (and other hazardous waste)	Where relevant, the terms of our lease will require that we remove all assets and hazardous waste from the site. This is predominately the removal of asbestos, but can also include other waste, such as PCBs.
Sewage	Options for dealing with site sewage include: (i) mains sewer, (ii) anaerobic digestion, and (iii) septic tank. Whilst preferable, the mains sewer is generally a distance from the power station. An anaerobic digester requires constant use to function effectively and this is not appropriate at all sites. The waste from the digester can be disposed of with site run off water. Where an anaerobic digester is not appropriate, a septic tank is installed. Additional land with access and egress may be required to site the tank.
Earthing	The earthing mat for the power station and substation is uncoupled. Tests are carried out to ensure that the resultant earthing mat is sufficient for the substation. Where required, new earthing rods are installed with the necessary wayleave acquired from the power station landowner.

Figure 3, below, shows the relative costs for each of the elements in a standard scope of work for an average site.

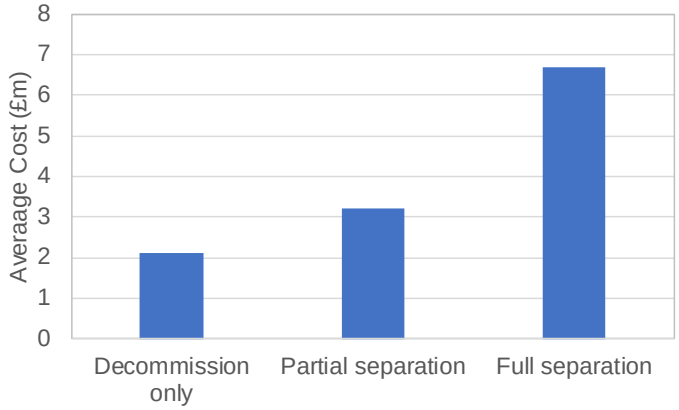
Figure 3 – Relative cost for each element in a standard scope of work for an average site



The figure shows that there are 3 main cost drivers within a site separation scheme: LVAC supplies, water services and land purchase / wayleaves. As described in Table 1, these costs are also some of the most variable. Fencing is also a significant cost driver, but is not required at every site.

From the many conventional power stations and older nuclear power stations that have already closed in the T1 period, our experience shows that scheme costs have tended to coalesce around three averages, as shown in Figure 4.

Figure 4 – Historic, average costs for varying extents of site separation



Our T2 plans include mostly full separation scope schemes.

3. T1 experience and lessons learned

There was no explicit funding in RIIO-T1 to deliver site separation outputs.

The total cost of sites expected to complete separation in the T1 period is shown in Table 2, below. Of the total cost, £1.4m was incurred prior to T1.

Table 2 –Sites expected to complete separation in the T1 period

Type	Site	Total Project Cost (£m)	Notes
Decommissioning only	[redacted]		
Decommissioning only			
Partial separation			
Partial separation			
Partial separation			
Partial separation			
Full separation			
Full separation			
Full separation			[redacted]
Full separation			
Full separation			
Full separation			
Full separation			
Full separation			
Full separation			[redacted]
Total:		77.1	
Average (all sites):		5.1	
Avg. (full sep. only)		6.7	

For site separations undertaken to date, the 12-month notice period has not proved sufficient to enable agreement of wayleaves, installation of independent permanent LVAC supplies and water supplies. To avoid unnecessary expenditure, our driver for initiating investment has been the generator terminating their Bilateral Contract Agreement with the Electricity System Operator. However, we found that, at this point, a station owner is likely to be negotiating the sale of their land with prospective landowners and not willing to agree wayleaves with us. Resolving terms for new wayleaves has been protracted as station owners are mindful not to detrimentally impact the sale of their land.

Distribution Network Owners have also generally been unable to provide the required capacity without upgrading their network, meaning that we have struggled to put in place permanent independent supplies within the 12-month notification period. Consequently, substations have been reliant on expensive temporary supplies. This is reflected in some of the high project costs for full separations shown in Table 2.

To reduce the risk of this happening in future, a strategy for dealing with site separation investments in a proactive manner has been implemented. We now have a forecast of closures, derived from our own market intelligence. All power stations with closure expected in the short to medium term have now been planned. Those expected to be at greatest risk of closure in the T1 period have been prioritised and site separation work has been initiated.

To avoid the risk of having to negotiate wayleaves under time pressure and of exposing consumers to the increased costs of temporary supplies over that period, we are taking a proactive approach to separating services for conventional power stations expected to close in T2 and beyond.

4. T2 proposals

Based on our learning from the T1 period, our T2 plans are to proactively separate all remaining integrated sites to minimise the overall cost to the consumer of doing so. The accompanying NGET_ A7.04 Site Separation CBA01, uses conservative assumptions for the cost (£[redacted]/annum) and duration ([redacted]yrs) of temporary LV supplies compared to our experience in T1 and shows that the savings of a proactive approach that avoids this cost is likely to be £1.56m per site.

In addition to the forward looking CBA, the reduced costs of taking a proactive approach are directly reflected in the costs of our baseline T2 plans, shown in Table 3. The average project cost for full separation schemes undertaken to date is £6.7m (see Table 2), whilst the forecast average project cost for complete full separation schemes in T2 (i.e. all except [redacted]) is £5.3m.

Table 3 –Site separation proposals for the T2 period

Site	Type	Projected Closure	T1 cost (£m)	T2 cost (£m)	Total cost (£m)	Scope
[redacted]	Nuclear	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	Nuclear					
	Nuclear					
	Oil		[redacted]			
	Coal		[redacted]			
	Coal					
	Coal (waste)		[redacted]			
	Oil					
	OCGT		[redacted]			
	Total		2.298	**41.433**	43.731	
	Average project (all sites)				4.859	
	Average (full sep. only)				5.279	

The breakdown of scope for each project is shown in Figure 5, below.

Figure 5 – Site separation scope for T2 projects

[redacted]

The annual profile of expenditure for these proposals is shown in Table 4, below.

Table 4 –Annual spend profile for site separation in the T2 period

	2021/22	2022/23	2023/24	2024/25	2025/26	Total
T2 annual costs (£m)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	**41.4**

5. Risks

Given the difficulties we have had in negotiating wayleaves whilst attempting to secure LVAC supplies, there is a risk that our proactive approach is insufficient to fully mitigate these challenges in all cases. Based on our experience to date, the impact of this risk would likely be an increased cost attributed to putting in place temporary supplies for these key services.

The programme for site separations that we've developed since the start of the T1 period assumes that we are able to complete all integrated sites not included in the T2 plan. Due to the challenges we have experienced in negotiating wayleaves, there is a risk that these sites slip into the T2 period.