Analysis of road and rail costs between coal mines and power stations

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MDS Transmodal

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1. EXECUTIVE SUMMARY

This report describes the impacts on costs and mode choice of significantly increasing rail track access charges (TAC) for coal travelling from road-only Scottish mines to power stations (Longannet, Fife and Drax, North Yorkshire). To use rail from a road-only mine requires a road haul to get to a local coal rail terminal.

For transport from Scottish road-only mines to ***Longannet***, currently direct-by-road and road-then-rail costs are typically similar – depending on the location of the mine. MDS Transmodal's Coal Power Station Transport Model and stage 2 report for the ORR[1] suggests that increasing TAC by £10 per thousand net tonne kms would increase traffic from Scottish road-only mines direct-by-road to Longannet by 34%. With this 34% increase in traffic, coal from Scottish road-only mines direct-by-road to power stations would make up 1% of the coal transported in Britain to power stations.

For transport from Scottish road-only mines to ***Drax***, road-then-rail costs are currently much (around £13 per tonne) cheaper than direct-by-road. Increasing TAC by £15 per thousand net tonne kms still leaves road-then-rail £7 per tonne cheaper than direct-by-road.

Even then, with a very optimistic road scenario with a 10% reduction in fuel prices, 10% reduction in drivers' wages, and an additional 10% reduction in the road price due to finding a suitable backload, road-then-rail is still £3 per tonne cheaper than direct-by-road. We therefore believe traffic from Scottish road-only mines to Drax would ***not*** switch from using rail to going direct by road, even with the largest TAC increase considered.

For rail-connected mines to power stations, no local road haul is required to use rail. Therefore the choice to use rail, even over short distances is more clear-cut . None of the TAC increases considered would cause a mode shift from rail to road from rail-connected mines.

If coal traffic were reduced by 40% overall, the efficiencies associated with economies of scale for coal rail terminals may be slightly reduced. This would not have a significant impact on overall transport costs.

[1] Impact of changes in track access charges on freight traffic, July 2012: http://www.rail-reg.gov.uk/pr13/PDF/mdst-freight-tac-changes-jul2012.pdf

2. INTRODUCTION

MDS Transmodal were commissioned by the ORR to consider the impact of changes in track access charges on freight traffic. This involved the development of the Coal Power Station Transport Model (CPSTM). The CPSTM:

- Suppresses the demand for coal as a function of a delivered price that includes inland transport costs
- Redistributes the origins and destinations of power station coal within Great Britain
- Adjusts the mode share of coal traffics upon changing the transport costs
- Allows cost absorption responses to be input for each pit and port to indicate how they may adjust their gate prices upon changes in demand.
- Calibrates to existing flows so that pit-specific production costs and port-specific relative costs such as deep water (lower shipping costs) at Hunterston can be represented
- Uses a multinomial logit algorithm to assign traffic

The CPSTM includes competition between road and rail – with a switch to serving power stations direct by road if rail costs are increased.

MDS Transmodal's stage 2 report for the ORR (Impact of changes in track access charges on freight traffic, July 2012: http://www.rail-reg.gov.uk/pr13/PDF/mdst-freight-tac-changes-jul2012.pdf) summarised results from the CPSTM for a £5, £10 and £15 per thousand net tonne kms increase in rail track access charges.

In this report, we present some supplementary analysis to the stage 2 report. ORR commissioned this report in response to points made by the Freight Transport Association (FTA), who argued that a £10 per thousand net tonne km charge would prompt some rail traffic from Scottish mines to Drax power station to shift to road.

We have estimated and analysed road and rail costs between the specific Scottish road-only mines and power stations considered by the FTA. This report describes the work and the findings, along with some discussion around modal choice if track access charges (TAC) were significantly increased.

Two road-only mines (existing or potential) were considered:

- Dalfad surface mine, Skew Bridge, Cronberry, near Cumnock, East Ayrshire. Lat/Lon: 55.468297,-4.159441 with access onto the A70.
- Broken Cross open cast mine. Lat/Lon: 55.619356, -3.820307 near junction 11 of the M74.

Two power stations were considered:

- Longannet, Fife (rail-connected)

- Drax, North Yorkshire (rail-connected)

The analysis involved:

- Applying our generic power station coal transport cost models to the potential flows to arrive at road and rail costs for each. The rail costs for potential increased TAC of +£zero, +£5, +£10 and +£15 per thousand net tonne kms are shown for the rail routes that are currently used, or would be likely to be used.
- Analysing current train operations into Drax and Longannet (using Network Rail movement data that describes timings and identifies wagons and locos).
- Comparing the actual wagon and locomotive utilisation and train formations (wagons per train etc) for Drax and Longannet, to our generic assumptions, and inputting the actual assumptions into our cost model.
- Running other sensitivity tests on the cost models: Inputting specific changes into our cost models to show the scale of the impact if assumptions more favourable for road were made. These sensitivity tests indicate the extent to which our results and conclusions could be changed under different conditions. These alternative assumptions were:
    - Lower fuel costs (both road and rail)
    - Lower drivers' wages (both road and rail)
    - If an example backload could be found for road

The CPSTM and stage 2 report included generic modelling for these traffics: with typical local road haulage costs between local authority areas and coal rail terminals included. However individual road-only mines were not considered.

The practicalities of using road, including the potential to carry a backload are discussed in section 7.2. The economics of using road versus rail between rail-connected mines and power stations, including the efficiencies of the merry-go-round rail operation are discussed in section 8. The impact on mode choice if coal traffic were reduced by 40% is discussed in section 9.

3. GENERIC ROAD AND RAIL COST MODELS

MDS Transmodal have built up generic road and rail cost models from the cost components involved in running a typical HGV and railway train operation carrying coal for power stations. The cost models are built up by summing the various costs experienced by a freight haulier. These include:

- Capital costs (HGV / locomotive / wagons)
- Average speeds
- Fuel costs
- Maintenance
- Drivers' wages
- VED
- Tonnes per HGV: 28 tonnes of coal
- Tonnes per rail wagon: 74 tonnes of coal
- Wagons per train: 21
- Utilisation
- Rail track access charges (TAC)
- Turnaround times
- Terminal charges

These costs come from a wide variety of sources – both public domain (ORR, RHA, DVLA, HMR&C, Motor Transport cost tables etc), our industry experience and industry data held by MDS Transmodal.

The cost models are regularly used and validated by both public and private sector clients (including operators), and have been used to inform a number of high profile projects for the DfT (e.g. longer semi-trailers) and the recent rail freight forecasts for Network Rail (Nov, 2012). They are inputs into MDS Transmodal's GB Freight Model (GBFM). GBFM has been independently validated by the DfT and forms part of the National Transport Model.

The resultant cost models are (per tonne):

- Rail: £0.90 + £0.0135 x one-way-distance (km)
- Road: £1.40 + £0.0729 x one-way-distance (km)
- Additional £1.00 terminal charge for a road-to-rail transfer

These represent the round trip costs (including returning empty) for each mode. These generic cost models were used in the Coal Power Station Transport Model as reported in MDS Transmodal's stage 2 report for the ORR (Impact of changes in track access charges on freight traffic, July 2012: http://www.rail-reg.gov.uk/pr13/PDF/mdst-freight-tac-changes-jul2012.pdf)

4. TRAIN OPERATIONS

The generic cost models reflect average assumptions for the coal transport market as a whole. However operations for any specific flow may not exactly adhere to these assumptions. In this section we consider how the train services in question actually operate or are likely to operate.

We understand that coal from Dalfad would be taken by road to the local Killoch coal rail terminal. For Broken Cross, Ravenstruther rail terminal is the likely choice.

Analysis of rail movements for one recent week in November 2012 shows how trains operate between these near-mine rail heads (Killoch and Ravenstruther) and the power stations (Drax and Longannet).

Killoch to Drax

In this week, there were 9 trains from Killoch to Drax. All had 19 HHA wagons carrying 70 tonnes each, so each train was carrying 1,330 tonnes of coal.

These trains take several different routes: All via Prestwick, Kilmarnock and Dumfries, with some via the Settle-Carlisle line, and some via Hexham to the East Coast Main Line (ECML). The average distance was 444 kms and the average journey time was 11 hours 25 minutes.

The average time between arriving at Drax and departing again was 1.5 hours. The true turnaround time could be quicker if required because some slack is built into the timetable. A quick turn-around time is possible due to the merry-go-round (MGR) operation.

The empty return journey can often be quicker because an empty train has better acceleration capability than a loaded train. For Drax to Killoch, the return timetabled time is around 8 hours. The empty journeys from power stations are not always necessarily straight back to the same coal mine / terminal, but in the case of Killoch to Drax, the journey times are appropriate to achieve a return journey in 24 hours, so that the same train set can use the same timetabled paths 24 hours later. Demand is also sufficient to support at least a daily train.

Ravenstruther to Drax

Ravenstruther is on the west coast main line 121 kms by rail north of Carlisle. In comparison Killoch is 192 km by rail from Carlisle (via Kilmarnock).

Therefore journey distances and times from Ravenstruther to Drax would typically be less than from Killoch. Based on southbound journeys from Ravenstruther to other English power stations via

Carlisle, the journeys would be 71 kms and 110 minutes less than from Killoch: i.e. 373 kms distance and a journey time of 9 hours and 35 minutes. The trains are similar to trains from Killoch: 19 wagons carrying 70 tonnes = 1,330 tonnes of coal per train.

Ravenstruther to Longannet

There were 16 trains in the week analysed. The rail distance is 90kms. The time taken varies depending on the time of day – ranging from 1 hour 49 minutes to 6 hours 24 minutes (including a 4+ hour wait in Mossend). There is also some variety in wagon type and tonnes per train, ranging from 1,014 to 1,534 tonnes per train. A typical train's pattern in a 24 hour period is to achieve 2 return journeys.

Killoch to Longannet

There were no trains from Killoch to Longannet in this week. However there are many trains from nearby Hunterston to Longannet (typically 23-wagon trains), with a rail distance of 138 kms.

These Hunterston to Longannet trains often make 2 return journeys in 20 hours. As Killoch to Longannet is only 24 kms further than Hunterston to Longannet (i.e. 162 kms), 2 round trips could be completed between Killoch and Longannet in 24 hours.

5. ROAD OPERATIONS

The road distances (one-way) from the mines to the power stations are as follows (source: Google maps):

- Dalfad to Drax via the dedicated HGV route (M62 J36): 367 km
- Broken Cross to Drax via the dedicated HGV route (M62 J36): 344 km
- Dalfad to Longannet: 106 km
- Broken Cross to Longannet: 77 km

The road distances (one-way) from the mines to the rail heads are:

- Broken Cross to Ravenstruther: 20 km
- Dalfad to Killoch: 19 km

It is assumed that road operations could be conducted as a shuttle operation, with 1.5 hours per round trip for tipping and loading.

6. APPLYING COST MODELS TO THESE JOURNEYS

6.1 Generic cost models

Applying our ***generic*** cost models to these journeys, using the distances described above, we arrive at the following results:

Table 1: Road and Rail costs using our generic cost models

	Mine	Dalfad	Dalfad	Broken Cross	Broken Cross
	Power Station	Drax	Longannet	Drax	Longannet
Direct by road	Road distance (one-way kms)	367	106	344	77
	Road cost (£/tonne round trip)	28.14	9.13	26.46	7.01
Via local rail terminal	Rail terminal	Killoch	Killoch	Ravenstruther	Ravenstruther
	Road distance to rail terminal (one-way kms)	19	19	20	20
	Road cost (£/tonne round trip)	2.79	2.79	2.86	2.86
	Railhead cost £ / tonne	1.00	1.00	1.00	1.00
	Rail distance (one-way kms)	444	162	373	90
Rail costs (£/tonne round trip)	Current TAC	6.89	3.09	5.93	2.12
	Extra £5 TAC	9.11	3.90	7.80	2.57
	Extra £10 TAC	11.33	4.71	9.66	3.02
	Extra £15 TAC	13.55	5.52	11.53	3.47
Road+rail costs (£/tonne)	Current TAC	10.68	6.88	9.79	5.98
	Extra £5 TAC	12.90	7.69	11.66	6.43
	Extra £10 TAC	15.12	8.50	13.52	6.88
	Extra £15 TAC	17.34	9.31	15.39	7.33
Direct-by-road cost minus road-plus-rail cost (£/tonne)	Current TAC	17.46	2.25	16.67	1.04
	Extra £5 TAC	15.24	1.44	14.81	0.59
	Extra £10 TAC	13.02	0.63	12.94	0.14
	Extra £15 TAC	10.80	-0.18	11.08	-0.31

Note: The increased TAC are measured in: Per thousand net tonne kms

Using our generic cost models, using rail with current TAC is the cheaper option for each of the 4 traffics. However if TAC was increased by £15 per thousand net tonne kms, it would be cheaper to go directly by road to Longannet.

With current TAC, it is £17 per tonne cheaper to use rail to get to Drax. If TAC was increased by £15 per thousand net tonne kms, it would still be £11 per tonne cheaper to use rail.

6.2 Assumptions specific to these rail journeys

However instead of our generic assumptions, we should input assumptions specific to these rail journeys:

- 19 instead of 21 wagons for Killoch/Ravenstruther to Drax
- 70 tonnes instead of 74 tonnes per wagon
- Daily round trips for Killoch/Ravenstruther to Drax
- Twice daily round trips for Killoch/Ravenstruther to Longannet

Our generic assumptions for road are for an average speed of 60 kph. This is because most coal by road traffics are relatively short distance, with a high proportion of the journey on the local lower-speed road network. However for long distance traffics on the motorway and trunk road network, the average speeds are quicker. For all of the routes in question, a large proportion of the journey is on motorway or dual carriageway, so a higher average speed of 70 kph can be assumed.

These altered assumptions reduce the cost for road and increase the cost for rail, resulting in the following equivalent road/rail cost comparison tables.

Table 2: Road and Rail costs using cost models adapted to these specific flows

	Mine	Dalfad	Dalfad	Broken Cross	Broken Cross
	Power Station	Drax	Longannet	Drax	Longannet
Direct by road	Road distance (one-way kms)	367	106	344	77
	Road cost (£/tonne round trip)	25.55	8.38	24.04	6.48
Via local rail terminal	Rail terminal	Killoch	Killoch	Ravenstruther	Ravenstruther
	Road distance to rail terminal (one-way kms)	19	19	20	20
	Road cost (£/tonne round trip)	2.66	2.66	2.73	2.73
	Railhead cost £ / tonne	1.00	1.00	1.00	1.00
	Rail distance (one-way kms)	444	162	373	90
Rail costs (£/tonne round trip)	Current TAC	8.16	3.50	7.61	2.98
	Extra £5 TAC	10.38	4.31	9.48	3.43
	Extra £10 TAC	12.60	5.12	11.34	3.88
	Extra £15 TAC	14.82	5.93	13.21	4.33
Road+rail costs (£/tonne)	Current TAC	11.82	7.16	11.34	6.70
	Extra £5 TAC	14.04	7.97	13.21	7.15
	Extra £10 TAC	16.26	8.78	15.07	7.60
	Extra £15 TAC	18.48	9.59	16.94	8.05
Direct-by-road cost minus road-plus-rail cost (£/tonne)	Current TAC	13.72	1.22	12.69	-0.23
	Extra £5 TAC	11.50	0.41	10.83	-0.68
	Extra £10 TAC	9.28	-0.40	8.96	-1.13
	Extra £15 TAC	7.06	-1.21	7.10	-1.58

Note: The increased TAC are measured in: Per thousand net tonne kms

Once route-specific assumptions are input into the cost model instead of our generic assumptions, going direct by road to Longannet is more viable. For both Broken Cross and Dalfad, the road and rail costs are similar, so it is not a clear-cut choice as to whether to use rail or go direct by road. If TAC was increased by £15 per thousand net tonne kms, it would be cheaper to go directly by road to Longannet – particularly from Broken Cross.

With current TAC, it is £13 per tonne cheaper to use rail to get to Drax from Broken Cross (£14 from Dalfad). If TAC was increased by £15 per thousand net tonne kms, it would still be £7 per tonne cheaper to use rail than direct-by-road from both mines.

7. POTENTIAL ALTERNATIVE SCENARIOS FAVOURING ROAD

There are potential alternative scenarios that would be more favourable to road. Tables 3 to 5 show the costs arrived at under various alternative assumptions (with the specific-journey cost models as the starting point)

7.1 Fuel costs and drivers' wages reduced by 10% for both road and rail

Both fuel costs and drivers' wages are significant components of the road cost. A train consumes around a third of the fuel that an HGV consumes per tonne over the same distance. Therefore the savings achieved by a reduction in fuel costs are 3 times greater for road journeys compared to rail journeys.

An HGV (with one driver) can carry around 28 tonnes of coal. A train (with one driver) can carry over 1000 tonnes of coal. Therefore a reduction in drivers' wages has a much larger impact on road costs per tonne than on rail costs.

Table 3: Road and Rail costs with fuel costs and drivers' wages reduced by 10% for both road and rail

	Mine	Dalfad	Dalfad	Broken Cross	Broken Cross
	Power Station	Drax	Longannet	Drax	Longannet
Direct by road	Road distance (one-way kms)	367	106	344	77
	Road cost (£/tonne round trip)	23.69	7.80	22.29	6.03
Via local rail terminal	Rail terminal	Killoch	Killoch	Ravenstruther	Ravenstruther
	Road distance to rail terminal (one-way kms)	19	19	20	20
	Road cost (£/tonne round trip)	2.50	2.50	2.56	2.56
	Railhead cost £ / tonne	1.00	1.00	1.00	1.00
	Rail distance (one-way kms)	444	162	373	90
Rail costs (£/tonne round trip)	Current TAC	7.84	3.38	7.32	2.88
	Extra £5 TAC	10.06	4.19	9.19	3.33
	Extra £10 TAC	12.28	5.00	11.05	3.78
	Extra £15 TAC	14.50	5.81	12.92	4.23
Road+rail costs (£/tonne)	Current TAC	11.34	6.88	10.88	6.44
	Extra £5 TAC	13.56	7.69	12.75	6.89
	Extra £10 TAC	15.78	8.50	14.61	7.34
	Extra £15 TAC	18.00	9.31	16.48	7.79
Direct-by-road cost minus road-plus-rail cost (£/tonne)	Current TAC	12.35	0.92	11.40	-0.41
	Extra £5 TAC	10.13	0.11	9.54	-0.86
	Extra £10 TAC	7.91	-0.70	7.67	-1.31
	Extra £15 TAC	5.69	-1.51	5.81	-1.76

Note: The increased TAC are measured in: Per thousand net tonne kms

These results show that if fuel prices and drivers' wages reduce by 10%, and TAC was increased by £15 per thousand net tonne kms, the economics stack up more favourably for road and it would be significantly cheaper to go directly by road to Longannet – particularly from Broken Cross.

With current TAC, it is £11 per tonne cheaper to use rail to get to Drax from Broken Cross (£12 from Dalfad). If TAC was increased by £15 per thousand net tonne kms, it would still be £6 per tonne cheaper to use rail than direct-by-road from both mines.

7.2 The potential for a backload cargo to be found for HGVs returning from Drax

Some hauliers carrying cargos over long distances are able to find a backload so that the HGV does not have to return empty. This means the round trip cost can be shared, thus reducing the cost for each leg. However there are several difficulties that have to be overcome:

- There needs to be a demand for a high-volume of cargo to be transported from nearby Drax to nearby the mine (Dalfad or Broken Cross).
- This potential cargo needs to be something that can travel in a coal bulk tipper, for which contamination from coal dust is not a problem. For example grain would suffer contamination.
- Local journeys are normally required at both ends – i.e. to get from Drax to the origin location of the backload and from the destination location of the backload back to the mine (Dalfad or Broken Cross). These local journeys have transport costs as well as potentially waiting time costs too
- If it is a traffic that is currently not making this journey, there may be relatively low demand for the movement – and it would only happen if the transport costs were very low. It is therefore possible that coal transporter would have to bear the majority of the overall round trip cost

It is possible that a suitable backload could be found from the Drax vicinity. Potential backloads may include:

- Flue ash from Drax to a construction plant in Scotland: This would have the benefit of not requiring a local road haul at Drax. However it is unlikely that this flue ash would normally travel such a distance by road, so there would be little demand for this movement from Drax to Scotland, and therefore no willingness to bear a large proportion of the overall round trip costs.
- Other construction materials or Municipal Solid Waste (MSW) to an Energy-from-Waste plant: As for the flue ash, it is unlikely that other construction materials or MSW would normally travel such a distance by road, so there would be little demand for this movement from the Drax vicinity to Scotland, and therefore no willingness to bear a large proportion of the overall round trip costs.

Without the identification of a specific backload traffic, it is not possible to determine the reduction in the price for the coal traffic. We have represented finding a suitable backload, as a 10% reduction in the price paid for the coal movement to Drax.

The return journey from Longannet is much shorter (lower cost) than from Drax. Therefore it is unlikely that a backload could be found that would be worth the associated difficulties and costs.

Table 4: Road and Rail costs with road costs to Drax reduced by 10% to represent finding a suitable backload

	Mine	Dalfad	Dalfad	Broken Cross	Broken Cross
	Power Station	Drax	Longannet	Drax	Longannet
Direct by road	Road distance (one-way kms)	367	106	344	77
	Road cost (£/tonne round trip)	22.99	8.38	21.63	6.48
Via local rail terminal	Rail terminal	Killoch	Killoch	Ravenstruther	Ravenstruther
	Road distance to rail terminal (one-way kms)	19	19	20	20
	Road cost (£/tonne round trip)	2.66	2.66	2.73	2.73
	Railhead cost £ / tonne	1.00	1.00	1.00	1.00
	Rail distance (one-way kms)	444	162	373	90
Rail costs (£/tonne round trip)	Current TAC	8.16	3.50	7.61	2.98
	Extra £5 TAC	10.38	4.31	9.48	3.43
	Extra £10 TAC	12.60	5.12	11.34	3.88
	Extra £15 TAC	14.82	5.93	13.21	4.33
Road+rail costs (£/tonne)	Current TAC	11.82	7.16	11.34	6.70
	Extra £5 TAC	14.04	7.97	13.21	7.15
	Extra £10 TAC	16.26	8.78	15.07	7.60
	Extra £15 TAC	18.48	9.59	16.94	8.05
Direct-by-road cost minus road-plus-rail cost (£/tonne)	Current TAC	11.17	1.22	10.29	-0.23
	Extra £5 TAC	8.95	0.41	8.43	-0.68
	Extra £10 TAC	6.73	-0.40	6.56	-1.13
	Extra £15 TAC	4.51	-1.21	4.70	-1.58

As the costs are unchanged for Longannet, the results are the same as those for the route-specific cost models (section 6.2). However for Drax, the road costs come closer to the rail costs: If TAC was increased by £15 per thousand net tonne kms, it would still be £5 per tonne cheaper to use rail than direct-by-road from both mines.

7.3 Fuel costs and drivers' wages reduced by 10% for both road and rail AND a backload found for Drax

If fuel costs and drivers' wages were reduced by 10% ***and*** a backload was found for returning HGVs from Drax, this would reduce road costs further.

Table 5: Road and Rail costs with fuel costs and drivers' wages reduced by 10% for both road and rail AND road costs to Drax further reduced by 10% to represent finding a suitable backload

	Mine	Dalfad	Dalfad	Broken Cross	Broken Cross
	Power Station	Drax	Longannet	Drax	Longannet
Direct by road	Road distance (one-way kms)	367	106	344	77
	Road cost (£/tonne round trip)	21.32	7.80	20.06	6.03
Via local rail terminal	Rail terminal	Killoch	Killoch	Ravenstruther	Ravenstruther
	Road distance to rail terminal (one-way kms)	19	19	20	20
	Road cost (£/tonne round trip)	2.50	2.50	2.56	2.56
	Railhead cost £ / tonne	1.00	1.00	1.00	1.00
	Rail distance (one-way kms)	444	162	373	90
Rail costs (£/tonne round trip)	Current TAC	7.84	3.38	7.32	2.88
	Extra £5 TAC	10.06	4.19	9.19	3.33
	Extra £10 TAC	12.28	5.00	11.05	3.78
	Extra £15 TAC	14.50	5.81	12.92	4.23
Road+rail costs (£/tonne)	Current TAC	11.34	6.88	10.88	6.44
	Extra £5 TAC	13.56	7.69	12.75	6.89
	Extra £10 TAC	15.78	8.50	14.61	7.34
	Extra £15 TAC	18.00	9.31	16.48	7.79
Direct-by-road cost minus road-plus-rail cost (£/tonne)	Current TAC	9.98	0.92	9.17	-0.41
	Extra £5 TAC	7.76	0.11	7.31	-0.86
	Extra £10 TAC	5.54	-0.70	5.44	-1.31
	Extra £15 TAC	3.32	-1.51	3.58	-1.76

Note: The increased TAC are measured in: Per thousand net tonne kms

For Longannet, the results are the same as those for the reduced fuel and drivers' wages scenarios (section 7.1). However for Drax, the road costs come even closer to the rail costs: However if TAC was increased by £15 per thousand net tonne kms, it would still be £3 per tonne cheaper to use rail than direct-by-road from Dalfad (£4 from Broken Cross).

8. MODE CHOICE FOR RAIL-CONNECTED MINE TO POWER STATION

The analysis above suggests that short distance flows from road-only mines to power stations (e.g. Broken Cross to Longannet) may be encouraged to switch from road-plus-rail to direct-by-road if TAC is significantly increased. However for rail-connected mines, there is no need for the road haul to get to the local rail terminal.

Consider the example in section 7.3 above from Ravenstruther to Longannet. If the coal was being mined at Ravenstruther, then in the most favourable-to-road scenario considered (road and rail drivers' wages and fuel costs reduced by 10%), the road cost would be £5 per tonne and the rail cost with current TAC would be £2.90 per tonne. Even with TAC increasing by £15 per thousand net tonne kms, the rail cost is still only £4.20 per tonne. If the rail distance was shorter, more than 2 return journeys per day could be achieved.

This demonstrates that rail costs would have to increase by more than £15 per thousand net tonne kms for road to be considered viable for coal traffic between a rail-connected mine and a power station.

Coal is delivered by rail to power stations using a merry-go-round (MGR) operation: wagons are emptied as the train drives through a discharge area on a track loop, such that the train (now empty) can continue its journey without reversing or shunting. This is a very efficient means of discharging coal.

9. IMPACT ON MODE CHOICE IF COAL TONNES WERE REDUCED BY 40%

In general for small volume flows, it is normally preferable to have a frequent small-tonnage delivery, rather than an infrequent large-tonnage delivery. Smaller deliveries tend to mean less space is required for storage and inventory costs are lower.

HGVs are much more suited to frequent small-tonnage deliveries (28 tonnes of cargo per HGV) compared to trains typically carrying over 1000 tonnes of coal.

If traffic volumes by rail decrease below a level where an efficient shuttle operation can be maintained, this can increase costs, because the trainset may either not be well utilised, or it will have to relocate to be used for other traffics.

Longannet receives 3 million tonnes of coal by rail per year equating to around 8 train arrivals per day. Drax receives 10 million tonnes (around 25 train arrivals per day). If Longannet received 40% less traffic, this would still be around 5 train arrivals per day. As most trains achieve 2 round trips in a day supplying Longannet from Scottish mines and ports, 5 arrivals could be served by either 2 or 3 trainsets working at a similar intensity to that achieved now. If the traffic level from any one terminal fell below that to sustain 2 train departures per day, the trains could alternate between rail terminals. E.g. Killoch – Longannet – Ravenstruther – Longannet – Killoch.

The economies of scale associated with a large operation may mean that rail terminals may become slightly less efficient with a slightly higher cost per tonne if their traffic reduced by 40%. However as the terminal cost is only a small proportion of the overall transport cost, this is unlikely to have a significant effect.

If overall demand for coal-generated electricity were to reduce by 40%, it is unlikely that all existing coal power stations would simply reduce production by the same 40%. It is likely that some power stations would reduce generation and some would close. Others may fully convert to burning biomass (as is planned for Eggborough), others may partly convert to biomass (as is planned for Drax) and others may continue at generation rates similar to today.

10. CONCLUSION

To get from Scottish road-only mines to Longannet with current transport costs, direct-by-road and road-then-rail costs are typically similar – depending on the location of the mine.

Increasing rail costs by increasing track access charges (TAC) pushes the balance in favour of road. The Coal Power Station Transport Model included the switch from rail to road for coal from Scottish road-only mines to Longannet: Table 5 of the stage 2 report (http://www.rail-reg.gov.uk/pr13/PDF/mdst-freight-tac-changes-jul2012.pdf) suggests that increasing TAC by £10 per thousand net tonne kms would increase traffic from Scottish road-only mines direct-by-road to Longannet by 34%. However there may be other restrictions relating to voluntary agreements with the local authority, requirements to contribute to the maintenance of local roads, or planning restrictions, that would hinder a significant modal switch to road.

To get from Scottish road-only mines to Drax with current transport costs, it is around £13 per tonne cheaper by rail (assuming no backload). Even if rail costs increased significantly (TAC increased by £15 per thousand net tonne kms) and road costs decreased significantly (fuel costs and drivers' wages reduced by 10%, and a backload is found that reduces the price of using road by a further 10%), rail is still cheaper, but the difference is reduced to £3 per tonne.

Even with the optimistic, reduced-road-cost scenarios described above, with the highest TAC increase considered, it would therefore still not be possible for a road haulier to sustainably offer a price to haul traffic from Scottish road-only mines to Drax that could compete with rail. We therefore believe traffic from Scottish road-only mines to Drax would ***not*** switch from rail to going direct by road.