Schedule 3 – Priced Options			
Date of change	**Reason for Change**	**Clauses Changed**	**End Date of Change**
10 May 2005	Replacements 314s	Non applicable	Non applicable

MODIFIED PRICED OPTION
REPLACEMENT OF
CLASS 314
ELECTRIC MULTIPLE UNITS

Executive Summary:

1.1 This report has been prepared pursuant to the letter dated 10th May 2005 from the Strategic Rail Authority (SRA) to First ScotRail (FSR) which tasked FSR to discharge five specific recommendations that were made in the report titled 'Class 314 Options', produced by FSR and presented to SRA, Strathclyde Passenger Transport Executive (SPT) and Scottish Executive (SE) in January 2005 (see Appendix 1).

1.2 The report does not seek to make any specific recommendations, but rather to give an indication as to the practicality and cost implications of delivering a number of options relating to class 314 refurbishment or replacement.

1.3 Having extensively explored various cascade options (including the conversion of the class 458 units to operate from a 25kV AC overhead line power supply), we conclude than none of the options can be delivered with certainty (either from a cost and/or a practicality perspective) and all are therefore rejected.

1.4 Seven potential solutions are suggested for further consideration; four of these are based upon improvements to the class 314 fleet and two involve a new train procurement project that will allow the class 314 units to be returned to the lessor, Angel Trains. A seventh scenario is also outlined which would address the wider issue of Electric Multiple Unit (EMU) requirements for Scotland in view of the proposed Glasgow Airport Rail Link (GARL) and the re-opening of the Airdrie to Bathgate line and the consequent introduction of electric services from the Strathclyde area to Edinburgh. Whilst this proposal goes beyond the remit set by SRA we believe that it is in line with the recent request by SE for FSR to develop a 'National Rolling Stock Strategy' for Scotland.

1.5 FSR would wish to remind the SRA, SPT and SE that the current lease agreement for the class 314 vehicles expires in October 2006 and in order for them to be extended beyond that date at the lease rental that is assumed in the franchise subsidy profile it is necessary for notice of this extension requirement to be given to Angel Trains before 12.00 hours on 16th October 2005. SRA, SPT and SE must therefore give FSR clear instruction as to the way forward well in advance of that date.

1.6 The capital rental for the class 314 vehicles is currently £[redacted] per vehicle per month (pvpm) and will reduce to £[redacted] pvpm from 17th October 2006 if the lease on these vehicles is extended. An additional charge of £[redacted] pvpm is included in the franchise subsidy profile from 17th October 2005 in respect of the modifications that are required to be undertaken as per Schedule 1.6 of the Franchise Agreement if the class 314 lease is extended. Any variation from this 'base case' will require an adjustment to the franchise subsidy.

Introduction:

2.1 The class 314 fleet is the oldest multiple unit fleet currently operated by FSR. In addition to having the worst 'miles per casualty' performance of the FSR fleet - the moving annual average currently is around 3,500 m.p.c. - it is also acknowledged that the vehicles fall short of delivering the customer environment that is now expected.

2.2 During the franchise negotiations it was agreed with the SRA, SPT and SE that the class 314 fleet would be leased for an initial two year period (to 16th October 2006) whilst an assessment of the future options for the class 314 fleet were evaluated. The Lease Agreement with Angel Trains is structured such that, providing extension of the lease to the end of the franchise is confirmed by 12.00 hours on 16th October 2005, the vehicles can continue to be leased by FSR at a pre-agreed rate.

2.3 Schedule 1.6 of the Franchise Agreement includes an obligation for FSR to undertake a total of 11 reliability and/or passenger facing modifications on the class 314 fleet by the end of May 2008 in the event that the lease on these vehicles is extended as per clause 2.2 above. The undertaking of these reliability modifications formed part of FSR's bid assumptions in terms of performance improvement.

2.4 The capital rental for the class 314 vehicles is currently £[redacted] pvpm and will reduce to £[redacted] pvpm from 17th October 2006 if the lease on these vehicles is extended. A further payment of £[redacted] pvpm will also apply from 17th October 2005 in respect of the modifications noted in clause 2.3 above. These rental figures are assumed in the franchise subSidy profile and any variation from this 'base case' will require an adjustment to the franchise subsidy.

2.5 In January 2005 FSR provided a report to the SRA, SPT and SE on the class 314 options. This report, which is included as Appendix 1, made a total of five recommendations as follows:

(1) Angel Trains should be requested to provide proposals for the refurbishment of the class 314 fleet to include options for the undertaking of reliability initiatives and the adoption of a performance regime based on unit reliability;

(2) The Authority should confirm the latest position with regards to the national EMU rolling stock strategy, specifically the potential availability of existing class 317, 321/322 and 458 units;

(3) Porterbrook be approached with a view to obtaining timescales and costs for class 458 conversion;

(4) A review should take place of current passenger loadings to identify the most appropriate use of four car units on the SPT electrified network. This should consider a minimum number of 14 x 4 car diagrams plus identify any further areas where additional capacity is required; and

(5) Dialogue should take place with the potential manufacturers to establish train configuration options, manufacturing capability and timescales.

2.6 After further dialogue with FSR, the SRA wrote to FSR on 10th May 2005 authorising the company to proceed with developing a number of options in respect of the replacement of the class 314 fleet, but also in respect of enhancing and/or refurbishing those vehicles.

2.7 Five specific actions were requested in SRA's letter of 10th May:

(1) First ScotRail should seek from Angel Trains proposals for the refurbishment of the Class 314 fleet to include options for the undertaking of reliability initiatives and the adoption of a performance regime based on unit reliability. Angel Trains should be asked to confirm their best estimate of future lease costs and to accept that these costs are, barring a change to external circumstances, firm and an acceptance from them that the technical risks associated with conversion and certification are theirs;

(2) First ScotRail should continue to investigate the latest position with regards to national EMU rolling stock availability, specifically the potential availability of existing Class 317, 321/322 and 458 units;

(3) First ScotRail should approach Porterbrook with a view to obtaining timescales and costs for a Class 458 conversion of the type discussed in the paper [of January 2005]. Again, Porterbrook should be asked to confirm their best estimate of future lease costs and to accept that these are firm. Additionally, Porterbrook should be asked to accept that the technical risks associated with conversion are theirs;

(4) A review should take place of current passenger loadings to identify the most appropriate use of four car units on the SPT electrified network. This should consider a minimum number of 14 x 4 car diagrams plus identify any further areas where additional capacity is recommended; and

(5) Dialogue should take place between First Scot Rail and the potential manufacturers to establish train configuration options, manufacturing capability and timescales. To allow for straight comparisons with other options, First Scot Rail should provide an estimate of likely lease rental and other operational costs that would arise if new build options were taken up.

Each of these specific actions is reviewed in turn (sections 4 to 8 inclusive).

2.8 This report seeks to answer the SRA's questions in so far as they can be answered at this stage. The very tight timescale, and the range of options considered means that, in some areas, the results are still of a very preliminary nature. FSR looks forward to working with the SRA, SPT and SE to develop more robust proposals in due course.

2.9 FSR would wish to remind the SRA, SPT and SE that the current lease agreement for the class 314 vehicles expires in October 2006 and in order for them to be extended beyond that date at the lease rental which is assumed in the franchise subsidy profile it is necessary for notice of this extension requirement to be given to Angel Trains before 12.00 hours on 16th October 2005. SRA, SPT and SE must therefore give FSR clear instruction as to the way forward well in advance of that date. Failure to give the required notice may create a situation whereby the class 314 units are no longer available for operation in Scotland since Angel Trains are expected to commence re- marketing of the units if there is no certainty of their future in Scotland beyond October 2006. It would also nullify Angel Trains' obligation to

offer the reduced capital rental of £2,950 pvpm that is assumed in the franchise subsidy: any increase would require additional funding.

Class 314 - The Current Position:

3.1 The existing 16 x 3 car class 314 units were build in 1979/1980 at British Rail's York Works. Although they are similar in body style to the class 313, 315, 507 and 508 units operating in England, there are a number of very significant technical differences. In particular, the class 314 units were the first to be built with electronic control of the traction system, the earlier class 313 and 507/508 fleets being fitted with camshaft controlled equipment. In keeping with the British Rail Board's then policy of dual sourcing major components, the fleet of 16 units incorporates traction control systems manufactured by two companies - Brush Traction and GEC (now Alstom). It is also worthy of note that the two systems are obsolete as traction control technology has changed beyond all recognition over the subsequent 25 years.

3.2 Whilst the obsolescence of equipment causes only occasional problems at the moment, it is likely that this will become an increasing problem over the next decade with the lack of spare parts resulting in units having to be stopped awaiting 'repair and return' of traction system components.

3.3 The Association of Train Operating Companies (ATOC), under the guise of the National Fleet Reliability Improvement Programme (NFRIP), publishes rolling stock reliability figures for all UK fleets. The class 314s have consistently been poor performers: part of this is due to their technical features and part is due to the low mileage routes that they operate with frequent station stops and high passenger loadings. Currently, they are performing at a moving annual average of 3,573 miles per casualty – defined as a technical failure causing a 5 minute train delay or train cancellation. This is the equivalent of about one failure every three weeks for each unit in the fleet. By way of comparison, the class 320 units that operate North Electric services also have elements of high loads and frequent stops and are covering 13,229 miles per casualty - about one failure every six weeks.

3.4 There is one key modification that is not currently being implemented on the class 314 units; Railway Group Standard GM/RT2472 'Data Recorders on Trains - Design Requirements' Issue One dated June 2002 requires that 'data recorders that meet the requirements set out in this document shall be fitted to all existing trains by 31 December 2005 if the trains are to remain in operation on Railtrack (sic) controlled infrastructure beyond 31 December 2007'. At the present time. since the class 314 units are not being leased beyond 31st December 2007 no plan exists for the fitting of data recorders to these units, although a one unit has been fitted with a trial installation that has validated the installation design.

3.5 In the event that the leases on the class 314 fleet are extended beyond 31st December 2007 there will be a need to fit data recorders to these units. Since this is unlikely to be achieved by 31st December 2005 it will be necessary to seek a temporary non-compliance against GM/RT2472 for the period of time between 1st January 2006 (or the date when lease extension beyond the end of 2007 is confirmed, if later) and the date by which the last class 314 unit can be modified.

3.6 At this time it is not possible to predict whether such an application might be successful.

This creates a risk to future fleet deployment, unless an option is chosen that replaces the entire fleet before the end of 2007. The SRA, SPT and SE should be mindful of this issue.

Class 314 Reliability And Passenger Amenity Improvements:

4.1 The SRA asked that: *"First ScotRaii should seek from Angel Trains proposals for the refurbishment of the class* 314 *fleet* to *include options for the undertaking of reliability initiatives and the adoption of* a *performance regime based on unit reliability. Angel Trains should be asked to confirm their best estimate of future lease costs and to accept that these costs are, barring* a *change* to *external circumstances, firm and an acceptance from them that the technical risks associated with conversion and certification are theirs. "*

4.2 Schedule 1.6 of the Franchise Agreement obliges FSR to undertake certain reliability modifications in the event that the lease on these vehicles is extended. These modifications, which are included in the franchise subsidised on the basis that an incremental rental of £[redacted] pvpm commences from 17th October 2005, must be completed by May 2008 and are as follows:

Modification	**Purpose**
1. LED bodyside indicator lights	Reliability, reduced maintenance
2. LED tail and marker lights	Reliability, reduced maintenance
3. Londex relay	Reliability
4. Replace door equipment	Reliability
5. Environmental panel modifications	Reliability
6. Enhanced drumswitch overhaul	Reliability
7. Traction motor enhancement	Reliability
8. Traction electronics modification (Brush units only)	Reliability
9. Hardware WSP	Reliability
10. Windscreen wiper modification	Reliability
11. Local passenger door controls	Passenger Benefit

4.3 Following a review of class 314 reliability, a further set of reliability modifications have been evaluated by FSR which Angel Trains would be prepared to rentalise at a rental of £[redacted] per month for each £[redacted] of expenditure. These modifications are as follows:

Modification	**Purpose**	**Cost (£ per unit)**
12. High intensity headlight	Reliability, reduced maintenance	[redacted]
13. Compressor replacement at C4	Reliability	[redacted]
14. Cab enhancement	Reliability, working environment	[redacted]
15. Air system enhancements	Reliability	[redacted]
16. Improved body end sealing	Reliability	[redacted]
17. Replacement of cab bulbs with LEDs	Reliability, reduced maintenance	[redacted]
18. Droplight Overhaul	Reliability	[redacted]

19. Control relay renewal	Reliability	[redacted]
20. Additional WSP enhancement	Reliability	[redacted]
Motor contractor overhaul	Reliability	[redacted]
Transformer system overhaul	Reliability	[redacted]
Fuse holder renewal	Obsolescence	[redacted]
Door system diode replacement	Reliability	[redacted]
Door belt renewal	Reliability	[redacted]
	TOTAL	[redacted]

* rental increases are based on a lease until October 2011

If rentalised, the above modifications would incur an additional rental cost of £[redacted] pvpm over and above the assumed rental costs in the franchise model (i.e. £[redacted] p.a.). The overall performance benefit from the additional modifications is estimated at 3,900 minutes p.a.
The programme of modifications outlined in clauses 4.2 and 4.3 have been developed following a review of class 314 performance data by the technical teams within both FSR and Angel Trains. As such they represent those modifications that are considered to be deliverable within the timescales required by Schedule 1.6 of the Franchise Agreement and that would give a reasonable return in terms of reliability.

4.4 Further customer facing modifications have been proposed by Angel Trains as follows:

Modification	**Purpose**	**Cost (£ per unit)**
26. CCTV (2 cameras per vehicle)	Customer and staff benefit	[redacted]
27. Passenger Information System	Customer benefit	[redacted]
28. Re-covering of seats	Customer benefit	[redacted]
29. Re-spray of interior panels	Customer benefit	[redacted]
30. New linoleum floor covering	Customer benefit, RVAR compliance	[redacted]
31. Powder coated grab rails	Customer benefit, RVAR compliance	[redacted]
32. Glass luggage racks	Customer benefit, safety and security	[redacted]
	TOTAL	[redacted]

* rental increases are based on a lease until October 2011

If rentalised, the above modifications would incur an additional rental cost of £[redacted] pvpm over and above the assumed rental costs in the franchise model (i.e. £[redacted] p.a.). Additional maintenance costs associated With the above enhancements, principally arising from the maintenance and repair of CCTV and PIS equipment, are estimated at a further £[redacted] p.a.

4.5 It should be noted that Angel are not prepared to "accept the technical risks associated With conversion" or to "adopt a performance regime based on unit reliability", both of which were requirements of the 10th May remit. Clearly, more debate on this subject Will be required in due course should it be decided to pursue these proposals, although at this stage it

is expected that the modifications will be covered by the existing Design and Endemic Fault provisions of the existing lease agreement since the modifications would be developed and implemented by Angel Trains.

4.6 Angel Trains would propose that the works are undertaken as a stand alone project out with the ongoing heavy maintenance requirements to permit early introduction so that the timescales listed in Schedule 1.6 of the Franchise Agreement can be met.

4.7 During our discussions With Angel Trains, a 'dry lease' arrangement has been explored. Whilst such an arrangement on other fleets has allowed FSR to avoid the contingency and profit element of non-capital rentals which are levied by the ROSCOs, in the case of Angel the dry lease proposal has actually resulted in an increased capital rental payment of approximately £[redacted] p.a. Angel have been challenged about this higher cost and have replied that this is because of their need to recover overhead costs associated with their staff who would otherwise be fulfilling their MOlA lease obligations in respect of class 314s but who will have no role if dry leases were to be put in place. Angel have also stated that, unlike the fleets which FSR have switched to a dry lease arrangement since franchise commencement, there would be no maintenance reserve transferred to FSR if such a change were made: this is particularly relevant since a number of units are outstanding expensive C3+ overhauls in 2005/6 and 2006/7.

4.8 Due to the apparent overall increase in costs (and risk) that would occur if the dry lease route were pursued we have not explored this any further.

Cascade Of Rolling Stock From Other UK Operators:

5.1 The SRA asked that: *"First* ScotRail *should continue to investigate the latest position with regards to the national EMU rolling stock availability, specifically the potential availability* of *existing class* 317, 321/322 *and* 458 *units. "*

5.2 Angel Trains were unable to help us with this option, believing that all their EMU fleets are on leases which preclude any transfers to Scotland. This includes the class 317 units which were specifically in the SRA's instructions to evaluate.

5.3 Both Porterbrook and HSBC have given us very indicative information that is heavily caveated in respect of their obligations to the SRA contained within the various Direct Agreements. Both ROSCOs are acutely aware that delivering an offer of cascaded rolling stock is not within their gift and depends ultimately on the SRA deciding what rolling stock is, and is not, required within other franchises. That said, a number of potential cascades have been suggested by Porterbrook and HSBC, the details of which are as follows:

5.3.1 Class 321 units:

Owned by HSBC, the 37 x 4 car units that are leased to Silverlink are on lease until October 2006. Thereafter, HSBC are of the view that the SRA's franchise plans for the southern end of the West Cost Main Line are unclear, but believe that some might be available for movement to Scotland.

Since the original remit was issued by the SRA, confirmation has been received from Scottish Executive that the near-identical class 322 units that are currently leased by the 'One'

franchise can be sub-leased by FSR to operate North Berwick services.

We understand the capital lease rental of class 321 units to be around £[redacted] pvpm compared to the class 314 long term capital rental of £[redacted] pvpm. This would increase capital lease costs by £[redacted] p.a. if 16 x class 321 units were taken on lease. Incremental non-capital rental is estimated at a further £[redacted] p.a.

Further additional costs are estimated as follows:
- materials (£[redacted] p.a.)
- variable track access (£[redacted] p.a.)
- electricity consumption [redacted] p.a.)
- staff costs (£[redacted] p.a.)

It is important to stress that the above incremental costs are estimates as a detailed diagramming exercise would need to be undertaken in order to determine the resultant annual mileages of other EMU types as a result of any cascade initiated by the use of class 321 units since these units would not be suitable as direct class 314 replacements.

5.3.2 Class 323 units:

Owned by Porterbrook, these 26 x 3 car trains are currently on lease to Central Trains. As these are 23m vehicles there may well be gauging problems on some parts of the FSR electrified network - the current Network Rail Sectional Appendix for these routes does not readily identify that these routes are cleared for the operation of 23m vehicles.

Release of these vehicles depends upon the SRA's strategy for rolling stock following the dissolution of the Central Trains franchise. Whilst these EMUs were the first form of electric traction to obtain a nationwide 25kV AC safety case, operation of these 23m vehicles will almost certainly require significant investment in physical clearance works.

As one of the last types of vehicle constructed before the RVAR Regulations came into force, these units are able to seat in excess of 280 passengers in a 3 car formation, even with one toilet and a wheelchair area provided. These units would therefore offer a significant increase in capacity if used on the existing class 314 diagrams. Furthermore, since two out of three vehicles are motored, these units are almost certain to be able to maintain current class 314 timings. They would, however, require modifications for Driver Only Operation (000).

We understand the capital lease rental of class 323 units to be around £[redacted] pvpm compared to the class 314 long term capital rental of £[redacted] pvpm. This would increase capital lease costs by £[redacted] p.a. if 16 x class 323 units were taken on lease. Incremental non-capital rental is estimated at a further £[redacted] p.a.

If the class 323 units were used on the existing class 314 diagrams we estimate a further £[redacted] p.a. would be incurred through increased variable track access charges. Since there is no modelled electricity consumption for this type of train on the FSR electrified network it has not been possible to quantify the change in electricity charges: even though class 323 units feature regenerative braking it is possible that there will be a net increase in electricity consumption as newer units draw higher traction and auxiliary loads.

An increase in running maintenance material costs would be expected as a result of the use of

class 323 units since these feature higher cost electrical components compared to class 314 units: a near doubling of material costs (i.e. £[redacted] p.a.) might be expected.

5.3.3 Class 458 units:
The implications of a class 458 conversion for use on the FSR network is outlined in section 6.

5.3.4 Other units:
A further option, not mentioned by any of the ROSCOs, may arise out of the new High Speed Rail Link in Kent. The new Hitachi rolling stock should allow a cascade of some of the existing Bombardier class 375/377 units from domestic services in Kent during 2009.

However, as there is no certainty as to the quantity and type of vehicles that might become surplus we have not pursued this option further at this time.

5.3.5 Brief details of each type of rolling stock are attached as Appendix 2.

5.3.6 Our research has identified that the difference in performance characteristics (i.e. timekeeping) of the various unit types is an important issue that must be considered as part of any proposed changes in fleet composition. Appendix 3 compares the timetable performance of various unit types on the main line from Ayr to Glasgow Central. Since SPT services have been operated with a 3 car version of the comparable 4 cars trains used in the London area (i.e. class 318/320 units instead of class 317/321 units) a higher power to weight ratio has prevailed which has been exploited in the timetable that is now operated.

5.3.7 It can be clearly seen that a class 321 unit would extend the end to end Ayr to Glasgow Central journey time by some 3½ minutes. The acceptability of this to stakeholders clearly needs to be considered prior to any such cascades being developed further.

5.3.8 In the light of the various unknowns, the performance disbenefits and the ROSCO caveats, First ScotRail has formed the view that none of these cascades is viable or deliverable at this stage. We are however, very willing to advise the SRA, SPT and/or SE as to the technical feasibility of putting any, or all, of the vehicle types to work on our network. Safety Case, vehicle gauge, power supply suitability and a host of other issues are important, but have not been evaluated at this time.

Conversion Of Class 458 Units

6.1 The SRA asked that: *"First ScotRai/ should approach porterbrook with* a *view* to *obtaining timescales and costs for* a *class* 458 *conversion* of *the type discussed in the paper. Again, Porterbrook should be asked* to *confirm their best estimate* of *future lease costs and* to *accept that these are firm. Additionally, Porterbrook should be asked* to *accept that the technical risks associated with conversion and certification are theirs .* "

6.2 The 30 x 4 car class 458 units were built for operation on the South West Trains network and are part of the Alstom "Juniper" family of metro trains to which the FSR operated fleet of 40 x 3 car class 334 units also belongs. Whereas the class 334 units operate from a 25kV AC overhead power supply, class 458 units operate from the 750V DC third rail. The class 458 fleet was designed with future conversion to 25kV AC operation in mind.

6.3 In terms of passenger provision, the 4 car train as currently configured offers 102 more seats than a class 334 unit. In addition to the capacity afforded by the additional vehicle, further capacity is provided because of the 3+2 seating layout throughout standard class as compared to a class 334 unit which has two vehicles of 2+2 configuration. All class 458 vehicles are fully air conditioned which would offer a clear benefit to customers.

6.4 Converting the class 458 units to 25kV AC operation is much more complex than was originally thought. Class 334 units have a single transformer that takes a 25kV AC input. This is then transformed and rectified down to a 750v DC output to each of the two traction packages. Class 458 units have three separate traction packages, each of which takes a 750V DC input from the third rail power supply. Virgin Pendolino units have six traction packages on the train, three per half train, much like a class 458 unit. On the face of it, it might therefore appear that conversion of class 458 unit to operate from a 25kV AC overhead power supply is fairly straightforward and would only require installation of a transformer and rectifier to obtain the 750V DC power supply that is required to operate the traction packages.

6.5 However, on Virgin Pendolino units each traction package incorporates a small transformer of its own: the power supply is distributed along the train at 25kV AC. Consequently, no single large transformer exists that could be utilised on a class 458 unit to feed all three traction packages and a very costly and time consuming development programme would be required if one were required. To redevelop the class 458 unit to a Pendolino type architecture (i.e. to have a 25kV busline along the length of the unit) would be expensive and very complex in safety approvals terms.

6.6 Alstom and Porterbrook have therefore offered a simplified scheme; the class 458 units would be reworked to be, at least in traction terms, exactly the same configuration as a class 334 unit using equipment manufactured to the same design: the same transformer feeding the same two traction packages through the same rectifier. This is relatively simple to engineer and is likely to lead to safety approvals in a very short tirneframe. However, rather like as outlined in section 5.3.6, the train would have the same installed horsepower as a class 334 unit with one extra vehicle. There is therefore a journey time penalty of several minutes on an Ayr to Glasgow Central service when compared with a class 318 unit. This would lead to a slowing of the timetable on the route by some 5% minutes. More details are attached in the table referred to earlier, Appendix 3, showing a comparison of the performance of various unit types on the main line from Ayr.

6.7 Even given the passenger benefits that might be expected as a result of introducing a higher capacity train with air conditioning and also allowing the introduction of first class accommodation on this route, stakeholders will have to carefully consider whether such an extension of journey times is acceptable.

6.8 Performance aside, a number of other important modifications are required to the class 458 units to allow operation in Scotland. First, and possibly most importantly, the units are not compliant with the RVAR requirements in all respects. most notably the layout of the toilet, door control push buttons and passenger information screens. It is suggested that the lengthy works sojourn that would be necessary to undertaken the AC conversion would also be the most appropriate time to carry out all necessary RVAR modifications, although at this stage it is unclear whether the costs should rightly fall to Alstom/Porterbrook or whether any future lessee (i.e. ultimately the Scottish Executive) will be required to make the investment.

Since 000 operation will be required in Scotland driver CCTV equipment would need to be fitted along with a number of other minor changes.

6.9 Even with this work completed, it will still not be possible to operate a class 458 and a class 334 together in passenger service since there will continue to be incompatibilities in the Train Management and Passenger Information Systems. The units would, however, be compatible for rescue and empty stock purposes albeit with some loss of functionality.

6.10 As a final point, whilst the class 458s have inter-unit gangways, the design has proved operationally unsuitable and the equipment is largely unused due to the lengthy time for deployment of the gangway - typically some 5 to 8 minutes. Accordingly, it is suggested that the units should be considered to be non-gangwayed were they to be transferred to Scotland, which would be no different to all our other EMU rolling stock (post class 318 C6 refurbishment).

6.11 Alstom have proposed a project plan for the class 458 conversion indicating that the first unit could be delivered 15 months after a firm commitment was given. Therefore, assuming an October 2005 commitment to proceed, the first unit could be in Scotland for testing in February 2007 with the sixteenth unit not following until early 2008 (which would be the earliest point at which class 314 units could be eliminated). The final (30th) unit would be delivered by November 2008. Porterbrook have advised us that release of the units from their current operator to allow a conversion programme to commence should not be problematic as only 16 of the 30 units are currently diagrammed by South West Trains.

6.12 We estimate that the capital cost of the AC conversion is in excess of £[redacted], with a further £[redacted] required for the other modifications outlined above. At the time of writing, Porterbrook have still not confirmed any lease prices (indicative or firm).

6.13 Maintenance costs for a converted class 458 unit are not currently available. Electricity consumption charges would not be able to be quantified until after testing of the modified units had been undertaken. Whilst a four car class 458 unit currently attracts a similar level of variable track access charge as a three car class 334 unit, it is understood that the additional weight that would be generated by the additional electrical equipment would increase the current payment rate. Should the SRA, SPT *andlor* SE wish to explore this project in more detail then further work will be required.

Operation Of 4 (and 8) Car Trains:

7.1 The SRA asked that: "A *review should take place* of *current passenger loadings* to *identify the most appropriate use* of *four car units on the SPT electrified network. This should consider* a *minimum number* of 14 *x* 4 *car diagrams plus identify any further areas where additional capacity is required. To the extent that this review will fall within the passenger counting provisions in the franchise agreement there will be, we are agreed, no cost for these. The costs* of *those parts* of *the review which are beyond the provisions in Schedule* 1.5 of *the agreement are already included within the revised offer contained in Andrew Mellors' paper. SPTE will liaise directly with First ScotRaii* to *establish what will be required here by way* of *passenger counts and will activate the relevant clauses* of *the agreement*."

7.2 In addition to the routine and planned counts that are carried out periodically, FSR have carried out a number of "ad hoc' counts as part of this investigative exercise. The latest counts

have, of course, been viewed along with historical passenger count data to form a view as to the key issues. Copies of the latest results are attached - see appendices 4, 5 ,6 and 7.

7.3 For Glasgow Central (High Level), a count was performed on every train arriving and departing. For the Low Level routes, which pass through the city rather than terminate within it, a different methodology was used. Counts were performed at Bridgeton, Partick and Bellgrove (inbound in the morning and outbound in the evening) representing stations at the outer ring of the city. This required 6 people on each platforrn, counting one coach each as the train performed its station duties, but it does give an indication of the loadings that apply beyond the "10 minute" limit.

7.4 In general, FSR (and Scotrail Railways before it) have been very good at matching the demand for a particular service with the train formation. The counts that have been performed on the Low Level routes tend to support this, with a few exceptions:

Train	Formation	Number standing from:
0739 Motherwell to Anderston	3 car	45 at Bridgeton
0816 Motherwell to Dalmuir	3 car	64 at Bridgeton
0820 Motherwell to Dalmuir	3 car	43 at Bridgeton
0807 Airdrie to Balloch	3 car	44 at Bellgrove
0816 Airdrie to Balloch	3 car	48 at Bellgrove
0828 Drumgelloch to Balloch	3 car	30 at Bellgrove
0822 Milngavie to Springburn	3 car	54 at Partick
1709 Anderston to Motherwell	6 car	40 at Bridgeton
1638 Balloch to Drumgelloch	6 car	79 at Bellgrove
1708 Balloch to Drumgelloch	3 car	36 at Bellgrove
1716 Airdrie to Balloch	3 car	35 at Partick

7.5 The key conclusion obtained from these results is that there is some peak overcrowding on both the southern section of the Argyll Line and the North Electrics which needs to be addressed. The planned timetable change on these routes, which is associated with the introduction of through trains from Milngavie to Larkhall is something that creates a further unknown for the train planners: most train times will change significantly, and the precise loadings for each service is therefore difficult to predict as customers adjust their journey habits.

7.6 On services from Glasgow Central, the survey results demonstrate that a number of trains are running very close to capacity during the peaks and that several daytime services are also well filled; well over 100 people on some Ayr trains, for example.

7.7 This leads us to believe that the routes that could usefully benefit from a change to 4 car trains are those from Glasgow Central to the Ayrshire coast at Ayr, Largs, Ardrossan, Gourock and Wemyss Bay. That group of services currently requires a pool of 27 x 3 car diagrams.

7.8 Whilst there are some diagrams Ayrshire and Inverclyde unit diagrams which are captive to an individual line of route, the majority of unit diagrams interwork on services between Glasgow and the outer terminals of Ayr, Largs, Ardrossan, Gourock *and/or* Wemyss Bay in order to maximise operational efficiencies, particularly with platforming and crew working at Glasgow Central. The approximate disposition of units is as follows:

Route	Off-Peak Unit Requirements	Peak Additional Unit Requirements	TOTAL
Ayr	5	6	11
Largs	3	2	5
Ardrossan	2	0	2
Inverclyde	8	1	9
TOTAL	18	9	27

7.9 We believe that a 4 car operation (with 8 car operation on certain trains in the peaks) will immediately resolve all the current overcrowding problems, whilst providing some future capacity.

7.10 It is suggested that if 14 x 4 car diagrams were introduced it would be most appropriate for these new units to be confined to specific line(s) of route. However, whilst this is desirable for operational purposes, it is not essential as the routes concerned are already operated by units of different types which are not compatible. The passenger loading data in Appendix 4 would suggest that the following morning peak services would justify use of 4 car (or 8 car) units with approximately 240 (or 480) seats:

Service	Current Formation	Proposed Formation	Capacity	Loadings
07.23 LAR-GLC	2 x 334	2 x 4 car	480	589
07.25 AYR-GLC	2 x 334	2 x 4 car	480	400
07.43 AYR-GLC	2 x 318	2 x 4 car	480	785
07.58 AYR-GLC	2 x 334	2 x 4 car	480	
07.13 AYR-GLC	2 x 334	2 x 4 car	480	TBC
07.42 LAR-GLC	2 x 334	2 x 4 car	480	355
06.57 AYR-GLC	318	1 x 4 car	240	274
06.43 AYR-GLC	318	1 x 4 car	240	263

This would leave the shoulder peak 06.13/08.43 and 08.13 services from Ayr to be worked by 1 x class 318 unit. Evening peak services could be as follows:

	Current Formation	Proposed Formation	Capacity	Loadings
17.20 GLC-LAR	2 x 318	2 x 4 car	480	451
18.00 GLC-AYR	2 x 334	2 x 4 car	480	413
17.30 GLC-AYR	2 x 334	2 x 4 car	480	349
16.30 GLC-AYR	2 x 334	2 x 4 car	480	341
16.00 GLC-AYR	2 x 334	2 x 4 car	480	321
17.13 GLC-AYR	2 x 334	2 x 4 car	480	311
17.45 GLC-LAR	1 x 318	1 x 4 car	240	306
17.00 GLC-AYR	2 x 334	1 x 4 car	240	267

7.11 Without more work, which has not been carried out, it is expected that the total number of diagrams might reduce to 26 or possibly even 25 as some more lightly loaded 6 car trains are reduced to 4 cars. A fleet of 30 units (such as the reworked 458s or a new build) is therefore considered sufficient to operate the services in their entirety. A cascade to provide added capacity on the other routes could then take place with train lengths adjusted to suit the revised timetables that will be introduced in December 2005 upon commencement of the Milngavie-Larkhall service.

7.12 In addition, First ScotRail have carried out a survey of the stations to ascertain whether operation by 4 and 8 car trains is feasible. The survey results are attached in Appendix 8 and highlight platforming issues to be resolved at a number of locations.

7.13 Whilst there are a number of through platforms which are not able to accommodate 8 car formations it should be noted that most manufacturers offer Selective Door Operation (SDO) as a standard feature on their new train products. Such technology, which uses GPS technology to identify the position of the unit and therefore the number of doors which can be opened, is already proven on Bombardier Electrostar units and is now approved by HMRI for use on Southern services.

7.14 If a new build procurement were to be undertaken it is therefore possible that it would only be necessary to undertake platform extensions at terminal end platforms where a full 8 car formation would need to be accommodated (e.g. Ayr bay platforms and Largs) or where passenger loadings were such that it would be desirable for loading and unloading of passengers to take place along the full length of the train formation.

7.15 In the event of 4 car units being introduced which were not SDO fitted, a revised train plan might overcome the problems at Greenock West and Drumfochar by scheduling only 4 cars to call at these stations. However, as indicated in paragraph 7.10, operation of 4 car units during the peak to/from Largs is not feasible due to existing passenger loadings and either an infrastructure solution needs to be adopted at this location or else 6 car formations retained on peak services.

7.16 The opening of an extended service to Ayr Hospital, and the building of a suitable terminus there with appropriate platform capacity might be a simple solution to the Ayr bay question.

7.17 Depot and stabling siding capacity will also become an issue which requires a full survey before costings can be made. Issues certainly include capacity and equipment at Shields depot for maintenance of the trains, together with a review of stabling capacity at Corkerhill, Shields, Ayr Town head. Undoubtedly, additional or upgraded CET equipment would be required at a couple of locations across the network to cope with the additional requirements which additional vehicle impose.

Our indicative list of depot enhancements to cope with an influx of a minimum number of 16 x 4 car units is as follows:

- Twin headed wheel lathe at Shields (due to additional tyre turning commitments);
- Extension of certain sidings and/or cleaning platforms at Ayr Townhead depot;
- Extension of the shed roads at Shields depot to accommodate 4 car units; and
- Re-location of existing CET equipment at Shields depot.

This above list is not exhaustive.

7.19 A costing exercise for infrastructure works in Ayrshire would need to be undertaken if this option is to be progressed.

New Build Options:

8.1 The SRA asked that: *"Dialogue should take place between First ScotRail and the potential manufacturers* to *establish train configuration options, manufacturing capability and timescales. To allow for straight comparisons with other options First ScotRail should provide an estimate of likely lease rental and other operational costs that would arise if new build options were taken up. As* we *have discussed previously, it is not appropriate* at *the moment* to *move to* a *full OJEU process, and* so *these costs will be indicative albeit that First ScotRail should seek* to *firm up on the proposals and likely costings where possible. "*

8.2 In accordance with the SRA's instruction, we have simply tested the market: no OJEC has been published. That said, ROSCOs and manufacturers responded positively to our request.

Three rolling stock manufacturers could be considered serious players for a contract to supply new rolling stock to Scotland: Siemens, Bombardier and Hitachi. In order to give some boundaries to our request for information, we asked for details of two train types:
A quantity of 16 x 3 car inner suburban "metro" type unit with high density seating for about 214 people and no toilet provision: and

A quantity of up to 30 x 4 car outer suburban units with an interior layout more akin to a class 334 (giving seating for about 250 people) and a single fully accessible toilet.

8.4 As might be expected, all the ROSCOs produced highly caveated responses, largely dependant upon the detailed specification and pricing of the trains, the likelihood of a "Section 54" (or equivalent) undertaking from the SRA and their own internal approvals processes. All costs can therefore only be considered to be indicative at this stage.

	Bombardier 3 Car	Bombardier 4 Car	Siemens 3 Car	Siemens 4 Car	Hitachi 3 Car	Hitachi 4 Car
HSBC	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Porterbrook	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Angel	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Prices are £ per vehicle per month (pvpm) capital rental on the basis of a lease until November 2014 for 4 car units and for 10 years from delivery for 3 car units (supported by a "Section 54" agreement or similar)

8.5 In each case, delivery assumptions were to be based upon a notice to proceed given in December 2005. Bombardier could deliver up to 30 x 4 car units by December 2007 but Hitachi could not achieve this until December 2008. Siemens require an earlier notice to proceed, 5th September 2005, and could deliver up to 16 x 3 car units by December 2007 and a delivery of 30 x 4 car units by early 2008.

8.6 From the responses which have been provided by ROSCOs and manufacturers it is therefore considered unlikely that 16 x 3 or 4 car new build units could be introduced into service by October 2006. This therefore means that a class 314 lease extension would be required on some or all of this fleet.

As outlined in paragraph 3.4, it would be desirable to have the first sixteen of any new build units in service before the end of 2007 in order to avoid the potential risk of having to fit

further class 314 units with data recorders.

8.7 It is clear from the pricing, in which a 4 car unit is typically cheaper that a 3 car, that the manufacturers have some significant up front work to produce a 3 car AC unit, whilst we also guess that the leasing market has a strong dislike of 3 car EMUs, which is perhaps understandable given the fact that nearly all other TOCs operate 4 car fleets. At first sight, a procurement of 3 car trains appears to represent very poor value for money - albeit that a 4 car procurement requires additional expenditure in terms of route infrastructure. However, these infrastructure costs can be reduced by the adoption of SDO technology as outlined in paragraph 7.13.

8.8 In terms of maintenance costs in relation to a new build, creating a level playing field upon which to compare different offers is always problematic since there are many variables and differing assumptions to be made before truly comparative positions can be achieved. However, the following information is given with the aim of informing the decision making process. Much more work, including a formal tendering process, will be required in due course.

8.9 However, using information collated for us by HSBC as the base (since that ROSCO is offering to supply the widest range of new rolling stock across the three manufacturers), we find prices, in pence per vehicle mile for an annual usage of 100,000 miles, as follows:

	Bombardier	Siemens	Hitachi
3 car	N/A	[redacted]	N/A
4 car	[redacted]	[redacted]	[redacted]
Key assumptions on maintenance prices:	Indicative price includes cleaning and train preparation. Maintenance cost is only 'labour and utilities'. Unclear where any concumables, parts and materials costs are. Excludes mid-life refurbishment. Excludes indexation.	Includes "train preparation". Excludes cleaning and servicing. Excludes mobilisation costs. Excludes line of route cover. Excludes depot costs. Excludes indexation.	Excludes cleaning. Excludes mobilisation costs. Excludes depot running costs. Excludes mid-life refurbishment. Excludes indexation.

All these prices do assume that depot facilities are provided by First ScotRail, but as can be seen the scope and assumptions vary considerably between the manufacturers.

8.10 A summary of the three manufacturer's products is included as Appendix 12. Detailed submissions from each manufacturer are included as Appendices 9, 10 and 11.

EMU Rolling Stock Strategy:

9.1 A number of essential parameters need to be fully considered before an EMU rolling stock cascade plan can be finalised. These include:

- A forecast of ridership on First ScotRail EMU network;
- Ridership forecasts for the Airdrie-Bathgate (indeed Helensburgh-Edinburgh) route; and
- Details of any further planned expansion of the electrified network.

However, assuming a broadly status quo position, seven viable solutions might be as outlined below, with the consequential indicative effect on franchise subsidy requirements as outlined in Appendix 12:

9.1.1 Option 1:
The "do minimum" option - essentially to allow the franchise to run its course as envisaged when the current Franchise Agreement was signed in August 2004. This would entail the implementation of some class 314 reliability works between 2005 and 2008, as already allowed for in the franchise profile. The subsidy payable by the SRA, SPT and SE would remain unchanged. Clearly this option would not provide any overall additional capacity, either in terms of total number of seats provided or in terms of additional units to operate extensions of the electrified network. Given the future plans for creation of the Glasgow Airport Rail Link (GARL), the re-opening of the Airdrie to Bathgate line and the subsequent introduction of through electric services from Helensburgh/Balioch to Edinburgh it is considered that additional EMUs will be required (either cascaded or new build) from *2007/8* onwards either for these new routes or else to allow a cascade of existing stock from current routes.

9.1.2 Option 2:
As option 1, plus any, or all, of the additional reliability modifications listed in section 4.3. This would increase the capital lease Charges (based on a 2011 franchise termination date) by up to £[redacted] per vehicle per month (i.e. £[redacted] per annum for the fleet), leading to a further saving of around 3,900 delay minutes per year.

9.1.3 Option 3:
As option 1, with the addition of passenger environment improvements for an additional lease charge of £[redacted] per vehicle per month (i.e. £[redacted] p.a. for the fleet) and maintenance costs of £[redacted] p.a. No reliability benefit accrues from this work.

9.1.4 Option 4:
This option combines both the passenger environmental benefits and the reliability improvements. Overall costs would therefore increase by £[redacted] p.a.

9.1.5 Option 5:
This is the first of the proposals which would see the class 314s withdrawn from traffic. Given the difficulties associated with rolling stock cascade noted above, this proposal is to do a straight replacement of the class 314s with new trains. With suitable gearing, it is felt that a newly constructed 3 car train would be able to meet the class 314 performance requirements on the Cathcart, Newton, Neilston routes. The new trains would therefore simply replace the class 314s on a '1 for l' basis.

Some costs for this option are now much clearer, although there are still a number of unknowns:

• Lease charges for a new fleet of 16 x 3 car trains, based upon a Siemens 3 car funded through HSBC (which represents the cheapest option currently on offer, although a genuine call for tenders from ROSCOs and manufacturers might well lead to more advantageous offers being made): £[redacted] p.a., counterbalanced by reduced class 314 lease charges of £[redacted] giving a net Change of £[redacted] p.a.;
• Maintenance costs for said fleet are likely to be around [redacted]p per vehicle mile (around £[redacted]k p.a.);
• EC4T (electricity charges for traction purposes) are assumed to be unchanged: although new trains are more power hungry, but do offer the benefit of regenerative braking - this is considered a reasonable assumption given that the modelled consumption rate for a class 314 unit (without regenerative braking) is comparable to a class 334 (with regenerative braking); and
• Variable track access charges have been assumed to be at a similar level to a class 334 unit - which is almost double the class 314 pence per mile - which would increase costs by £[redacted] p.a.

As per Appendix 12, the on-going incremental annual costs are estimated to be in the region of £[redacted] p.a.

The effect on depot facilities would need to be confirmed but, at this stage, it is assumed that none of the depot enhancements outlined in section 7.18 would be required. However, further costs might be expected in relation to the provision of additional depot test equipment. This option would also incur costs in relation to staff training and other 'new train introduction' related tasks. There would also be some one-off additional cost associated with the change-over period between new trains coming on lease and the class 314 units being returned to Angel Trains.

9.1.6 Option 6:
Given the high lease charges of newly constructed 3 car trains, when compared to 4 cars, an alternative solution is to acquire 16 x 4 car trains, giving a partial substitution of 4 cars on Ayrshire routes as outlined in section 7.

Given that class 334 units are not suitable for prolonged operation on the Cathcart circle all day - the thermal capacity of the traction equipment is insufficient to cope with the harsh duty cycle of both traction and braking – an internal cascade of class 320s from North Electric services to the class 314 core routes of Cathcart circle and Neilston is proposed, with the class 334s displaced from Ayrshire replacing class 320s on the north side of the city.

Unfortunately, this leads to a situation wlhere the class 320 fleet operates about 11 diagrams south of the Clyde and 9 to the north. Nevertheless, such a complex operating pattern is considered tolerable.

Modification to the class 320s to allow this to happen include the provision of a CCTV system to facilitate 000 (estimated as £[redacted] per unit, £[redacted] total). It is also considered that the change in deployment of the class 320 units might prompt Network Rail to insist that class 320 units were fitted with sanding equipment as per the equipment already fitted to disc braked class 158, 170, 318 and 334 units (estimated as £[redacted] per unit, £[redacted] total).

Being a more complex scheme involving an internal rolling stock cascade within Strathclyde, this option brings with it further unknown costs. However, for the purpose of this analysis it

is assumed that the current annual vehicle mileage in the financial model (25.670 million vehicle miles p.a., which is the equivalent of 8.557 million unit miles p.a.) is constant and that 16/40th of the current modelled class 334 mileage (I.e. 1.357 million unit miles p.a.) is worked by four car units (I.e. the new fleet operates 5.428 million vehicle miles p.a.). Existing modelled class 318, 320 and 334 unit (and vehicle) mileages are then factored down in equal proportions to reflect the headline unit mileage operated.

A summary is as follows:

• Lease charges based upon a (16 x 4 cars, Bombardier built, leased from Porterbrook) of £[redacted] per year, giving a net change of £[redacted] p.a. when offset by the class 314 reduction;

• Adding a sum for materials to the Bombardier prices quoted (assumed to be an additional 30 pence per vehicle mile as per the current class 334 fixed material costs), maintenance costs for said fleet are likely to be around £[redacted] p.a.;

• EC4T (electricity charges for traction purposes) are assumed to be unchanged on a 'per vehicle' basis: although new trains are more power hungry, but do offer the benefit of regenerative braking - this is considered a reasonable assumption given that the modelled consumption rate for a class 314 unit (without regenerative braking) is comparable to a class 334 (with regenerative braking); and

• Variable track access charges have been assumed to be at a similar level to a class 334 unit - which is almost double the class 314 pence per mile.

• Station, depot and other infrastructure investment will be required to accommodate 4 car units, as mentioned above .

As per Appendix 12, the on-going incremental annual costs are estimated to be in the region of £[redacted] p.a.

The cost of the infrastructure enhancements as outlined in section 7 are excluded from the above incremental cost, as are other 'new train introduction' related tasks such as staff training. There would also be some one-off additional cost associated with the change-over period between new trains coming on lease and the class 314 units being returned to Angel Trains.

9.1.7 Option 7:
None of the above proposals take into account the requirements for additional EMUs for known expansion schemes (such as Airdrie-Bathgate and the Glasgow Airport Rail Link). Nor do they make any attempt to address overcrowding in a structured way, other than by simply providing an additional 1,100 (approx) or so seats for Ayrshire services if the 4 car option is exercised.

Combining replacement of the class 314s with other rolling stock proposals might produce a larger order size, with other economies of scale.

A further deployment of 4 car trains, over and above a straight '1 for l' replacement of the class 314 fleet has also been considered. Such an enhanced fleet size might be up to 39 or 40 units and be deployed as follows:

Route	Unit type	Diagrams	Fleet Size
Ayrshire, Inverclyde & Glasgow Airport	New 4 car	35 or 36	39 or 40
Milngavie/Dalmuir to Bellgrove /Springburn	320	9	22
Neilston and Cathcart	320	11	
Argyle Line, North Electrics, Including Airdrie - Bathgate	318 334	19 37	21 40
North Berwick	322	4	5
Total EMU Fleet	3 car (318, 320 and 334) 4 car (322 and new)	76 40 or 41	83 44 or 45

Such a solution requires a little further work to ensure that the capacity and frequency requirements of the new Airdrie - Bathgate service can be adequately provided along with the commitments on North Electrics. In order to deliver this solution, the class 320s would require fitting with CCTV to permit 000 and sanders (as per option 6). It is also assumed that the Glasgow Airport service runs with 4 car trains of identical configuration to the rest of the Ayrshire fleet. However, the creation of a dedicated a sub fleet with a differing interior configuration on the same vehicle platform is perfectly possible.

Other advantages of this proposal are as follows:

• Increased capacity on Ayrshire & Inverclyde, with the elimination of the class 314s which are not really suited to such longer distance operations;
• Homogenous unit type working the route between Paisley Gilmour Street and Glasgow Central, giving the benefits of consistent performance, customer service delivery and rescue in the event of failure;
• Class 320s delivering enhanced capacity and quality on Cathcart circle. Newton and Neilston routes;
• Class 320s (the only remaining unit without a toilet) confined to short workings on both north and south sides of the Clyde (some of these reliable high capacity units might otherwise be redundant post Airdrie - Bathgate re-opening as they are unsuited to long distance journeys); and
• Class 318 and 334, with good standards of passenger accommodation and toilet provision, on the longer Argyle Line and Edinburgh -Helensburgh services.

It may be necessary to retain some DMU working on peak time Bathgate to Edinburgh workings in order to deliver capacity at the eastern end of the route.

First ScotRail would be willing to work up a detailed deployment plan and castings for this option upon request.

Financial Analysis:

10.1 The financial model for the franchise indicates that total costs associated with leasing, maintaining and operating the EMU fleet are as follows (2005/6 price levels):

Class	Capital Lease (£k)	Non-Capital Lease (£k)	Variable Track Access (£k)	Materials (£k)	EC4T (£k)	TOTAL
314						
318						
320						
334						
TOTAL						

10.2 Options two to seven as outlined in section 9 would represent a variation to the financial model. The effect of options two to six has been estimated as per Appendix 12 and is summarised as follows:

Option	**Description**	**Incremental Annual Costs (£k)**	**Additional Costs (£)**
1	Base		
2	Class 314 reliability		
3	Class 314 cosmetic		
4	Class 314 reliability and cosmetic		
5	16 x 3 car new build (HSBC/Siemens)		
6	16 x 4 car new build (Porterbrook/Bombardier)		

10.3 The above incremental costs are indicative only and are included in this report to facilitate an informed decision to be made on the affordability of the potential options.

Conclusions:

11.1 A variety of additional reliability modifications and/or customer facing modifications could be undertaken on the class 314 fleet which could be either capital funded or else rentalised by Angel Trains. These modifications would give a slight improvement to the attractiveness of the class 314 fleet to stakeholders but would not deliver any additional capacity either for the existing network or for any future expansion thereof.

11.2 It has not been possible to identify a cascade of existing rolling stock into Scotland which has an acceptable level of certainty of delivery. In any case, most of the rolling stock which may (or may not) be available at some stage in the future is likely to be unsuitable due to the reduced power to weight ratio compared to existing EMUs operated by FSR and the consequent increase in end to end journey times.

11.3 There are a number of options which exist with regards to new trains. Procurement of a small fleet of high density inner-suburban EMUs would allow the class 314 fleet to be removed from service. However, like the options associated with class 314 enhancement, this option would not deliver any additional capacity either for the existing network or for any future expansion thereof.

11.4 The procurement of new 4 car units would allow additional capacity to be provided on the existing network. A cascade of the existing EMU fleet would then follow, the most suitable of which would result in high density reliable class 320 units being used on short distance South Electric services including the demanding Cathcart circle route. Since new build EMUs come with SDO as standard, the cost of infrastructure enhancements could be limited to depot developments plus the lengthening of terminal end platforms at Ayr (bay platforms) and Largs.

11.5 Additional 4 car units would allow a conversion of most or all Ayrshire and Inverclyde diagrams to 4 car operation which would result in enough suitable 3 car units being made available to resource through services to Edinburgh via the re-opened the Airdrie to Bathgate line. A new build order would also provide the opportunity for additional unit$ - possibly with a bespoke interior layout - to be provided for GARL services. The production timescales are such that the additional units would be delivered during 2008 which is consistent with the dates when these two new routes are expected to be opened.

11.7 A larger build of new EMUs would offer more economies of scale both in terms of initial procurement but also in terms of on-going operational costs.

11.8 Confirmation of the option which is to be pursued is required prior to 16th October 2005 which is the date by which FSR must notify Angel Trains of the intentions with regards to the leasing of class 314 units beyond October 2006.