

A DAY IN THE LIFE...

What Go-Ahead London Chief Engineer Chris McKeown enjoys most about his job is the fast pace and varied challenges. He shared part of his day with **Andy Izatt** recently to give him an insight into what it's all about

Chris McKeown is Chief Engineer of Go-Ahead London with a fleet of around 2,300 vehicles. Working in a competitive, tendered market where maximising vehicle availability is critical, he is taking a multifaceted approach to delivering that. Not only is he looking for better coordination between different disciplines within his department, he's harnessing the latest technology to deliver accurate up to date information that can help minimise the time and cost of vehicles off the road.

"If a bus is going to be VOR (Vehicle Off the Road) we want it to be for the shortest period of time possible, and at a time of our choosing," Chris explained. "The more we can control that, the more we can minimise lost mileage and the number of spare vehicles we have. It's all the more important with electrification because of the significant infrastructure costs that go with a contract that might be for only five years.

"It's actually a really exciting time to be an engineer because there's so much going on. When I was young I'd always been interested in cars, but didn't necessarily know what I wanted to do although I was convinced it should be in and around engineering. I studied mechanical engineering at Oxford Brookes University and was particularly interested in the Go-Ahead Group graduate recruitment scheme because it involved vehicles. I

thoroughly enjoyed my training because I could get involved. I could be as hands on as much as I wanted. "I was Engineering Manager at Brighton & Hove Buses'

Whitehawk garage before doing the same for Metrobus at Croydon. Then I was Engineering Manager for Go-Ahead London covering New Cross and Bexleyheath as well as Belvedere when East Thames Buses was taken over. I returned to Metrobus as Operations Engineer for a short time, but eight years ago Richard Harrington was promoted to Go-Ahead London Engineering Director and I applied for and got his old job as Chief Engineer.

"Over the time I've been involved, Go-Ahead London has grown from 1,500 to 2,300 vehicles and it has 17 operating locations. There are just over 400 employed in the engineering department. Directly reporting to me is my head office administration team, technical team, an area engineering manager and nine depot-based engineering managers.

"Richard (Harrington) is responsible for strategy and planning. He helps win the work and buys the vehicles. He's good at developing relationships with suppliers and manufacturers.

The day to day of making sure we

have a full PVR (Peak Vehicle Requirement), monitoring lost mileage, MOT pass results and overall depot budget performance is down to me. Richard and I have a very open working relationship.

"I represent engineering at our monthly performance review meetings with TfL (Transport for London) and to do that properly I need to know what's happening at all our depots. That everything is going in the right direction, and if there are any issues, what they are and what are we doing about them. I try and visit every depot once a month to undertake a performance review. That's when we run through all the KPI (Key Performance Indicators) and talk about any staffing, building or maintenance issues, and formulate a plan of action if necessary.

"Engineering managers run depots like it's their own business unit. We don't micro manage anyone. It gives people a sense of responsibility and pride. After all, we're the largest operator in London so there's quite a lot to be proud of.

"This is a people business so what's important is everyone shares our vision of where the company is going. That's particularly important when there's a lot of change going on like there is at the moment. Go-Ahead London is a friendly company. I see myself as a facilitator and my style is to talk to people. What I like is engineers managing engineers."



Go-Ahead London will be allocating 49 BYD ADL Enviro400EVs to Northumberland Park. The manufacturers showed this demonstrator at Coach & Bus UK last year. **ANDY IZATT**

Complying with PSVAR

I'd joined Chris at Go-Ahead London's 18 Merton High Street head office at the end of November just as he was about to go into a meeting with Richard Harrington and Commercial Manager Colin Farrant. Go-Ahead London organises and provides rail replacement vehicles for the Govia Thameslink Railway franchises across the southeast of England and they were discussing the company's response to meeting the PSVAR (Passenger Service Vehicle Accessibility Regulations) requirement which at that time were expected to be fully implemented from 1 January.

"My job is to provide a service to our operating colleagues with fit, reliable, compliant buses," observed Chris. "One of the challenges we have is the location of our commercial operations and how we can support them, but to cover as much of the DDA-compliant rail work as we can, we need to have those vehicles in places where we've not operated before."

New outstations were being established at King's Lynn, Pulborough and Newhaven with additional vehicles sourced from Brighton & Hove Buses, ADL (Alexander Dennis Ltd) and Go North East for those and existing locations across the southeast. What was being finalised were maintenance arrangements and company procedures. It was agreed that a commercial unit mobile engineer would be recruited who would be responsible for overseeing maintenance at the varied locations.

App that makes a difference

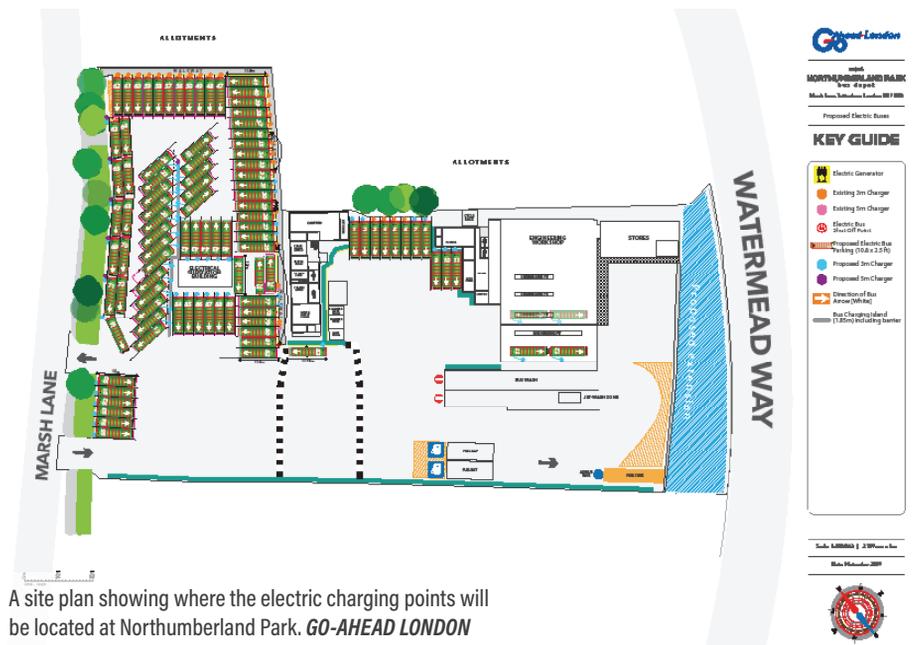
The next meeting Chris had was with members of his engineering technical team to discuss the ongoing implementation of the company's drivers inspection app and the introduction of vehicle fluids analysis on key components to assist preventative maintenance. Tasked with overseeing both is Quality Auditor Lewis Margrave who is currently on a learning development programme with his employer.

"We're taking a slightly different approach with our drivers' app," said Chris. "It's not just about creating a record. It's about challenging behaviour and trying to engineer compliance. Lewis is managing the roll-out of that. We piloted it at Waterloo and Camberwell depots first and now he is progressively introducing it across the rest of the company."

"Previously we had a VCR (Vehicle Condition Report) card on every bus. All the drivers who use that vehicle would log their name and duty number and tick yes or no in a box for each check that they had to undertake. If there was a defect, they would write what it was and tell either the depot engineers or their controller. Another section on the card is where



Chris McKeown (left) with Northumberland Park Engineering Manager Lee Connelly. *ANDY IZATT*



A site plan showing where the electric charging points will be located at Northumberland Park. *GO-AHEAD LONDON*



There are already 34 BYD-supplied chargers at Northumberland Park depot. *ANDY IZATT*

the engineers would record what they'd done about it. There could be quite a time span when all concerned were communicating over a defect, auditing it all was very time consuming and things could be missed.

"Drivers have a smartcard that holds all their details and they use it to sign-on and for access around their depot. To use the app, developed for us by Tranzaura, they will take out the smart phone assigned to that vehicle, which is mounted in a cradle in the cab, and touch in their card. Every 24 hours the system prompts a first use inspection and it can also be used to communicate defects throughout the day. We've been quite careful how we selected the cradle, the skin, the device and how we specified the app, vehicle ID tag and driver's card to make sure they all work together and are future-proofed."

Said Lewis: "The app will guide the driver round the vehicle, prompting yes or no answers to questions. If they say no, it will ask them to explain what the defect is in a box and, because it's a smart phone, they have the ability to take a picture of it as well – a key benefit to engineers who need to make a

decision on what's going on. It's a huge aid."

Said Chris: "It's challenging drivers to behave because it measures what they do by counting the numbers of steps they take and how long it takes them to do the check. Engineers should get the information straight away and will

“It's actually a really exciting time to be an engineer because there's so much going on

communicate back to the driver what they need to do. Verbal communication is still happening at this stage and I don't want to stop that. I want the engagement to continue.

"If there's a drop between the WiFi and 4G and a delay in the information being

transmitted, we insist on them communicating and taking advice from controllers and engineers. If the device itself has failed, then that's the defect that needs to be reported and we have spares at the garage that can be touched into the vehicle's tag.

"Engineering managers can see what has been reported as they come into work. The information is live per vehicle on the website. Every morning I also get a report from each depot as well. If it's green against a vehicle I don't look too hard. If it's white we don't expect the inspection to be done because it's off the road for maintenance or some other reason. If it's red we know no inspection has been carried out and anything that is amber or a red should have an audit comment against it. It gives us a level of visibility that a paper system just can't deliver.

"Over time, this will be linked to our new electronic maintenance system called Equinox, which is being introduced across Go-Ahead. Brighton & Hove Buses is piloting it at the moment and once everyone is satisfied it's all working properly, we'll move on to it next year.

"It has taken time to convince everyone of the

app's merits, but the DVSA is happy with what we've been doing and so are TfL's auditors.

At Waterloo it was all the same type of bus so implementation was easier. Camberwell is a 24-hour garage with a mixed fleet so it was harder. However, if it worked there, it would work anywhere and the engineers loved it. The engagement was there.

"We've now got the capital authority to roll it out across the fleet – an investment of around £0.75m or touching £1m with all the training. It's a lot of money to spend with no immediate evidence of payback other than improved performance on compliance. However, it's a one-off cost because when new buses come in, we can capitalise the cost into each vehicle.

"Inevitably, with an operation like ours, there are occasional non-compliances. Now I will know about all of them and can do something about them. I can also demonstrate I have less than I used to have. I'm very pleased and proud of this system."

Chris introduced Quality Manager Tim Painting. "Part of my responsibilities is carrying out run-out reviews to see how the drivers get on with their walk round checks," said Tim. "I've got a scoring mechanism that I use so we get a handle on how each garage is doing. With the introduction of the app, there was a significant improvement. It served the purpose of revitalising the pre-use check as well as recording it. I did another check after three months and then another three months later and although there was a slight drop and it levelled off, it was still up. It has sustained."

Detailed analysis

We're joined by Technical Support Manager Darren Connolly and Lewis' boss, Technical Services Manager Ian Hogg.

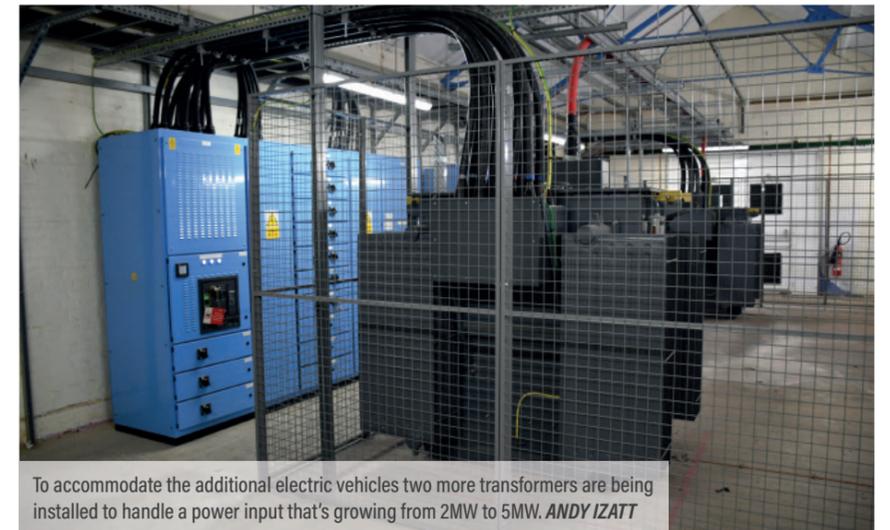
"The other half of Lewis' project is fluids analysis on key components, which we've been doing since the summer in conjunction with Finnings," Chris continued. "We're learning as we do the analysis, exactly what it means when we get a particular result. Lewis is overseeing that in the garages to make sure it's done as it should be, that we're getting the sampling regime about right and then seeing through the process of interpreting and understanding the results.

"For us it's really about the control of major unit costs by early intervention. Find the problem and fix it while it's relatively small before it becomes a bigger issue and it means we have a better performing product out on the road. We also want to manage our fluids changing more effectively. Maybe some are being changed too frequently while others not frequently enough.

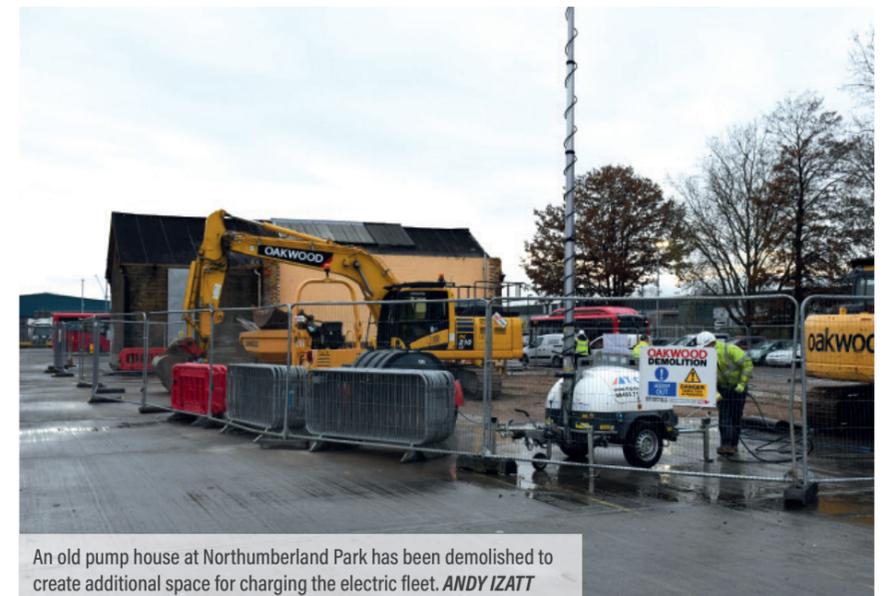
"I've changed how our technical team works



Northumberland Park maintains some of the vehicles the Go-Ahead London commercial department has based at Luton including this Mini Pointer Dart. **ANDY IZATT**



To accommodate the additional electric vehicles two more transformers are being installed to handle a power input that's growing from 2MW to 5MW. **ANDY IZATT**



An old pump house at Northumberland Park has been demolished to create additional space for charging the electric fleet. **ANDY IZATT**



The workshop at Northumberland Park currently maintains 184 buses including 34 BYD ADL Enviro200EVs. **ANDY IZATT**

over the past year or so, so we have a more coherent approach to planned preventative maintenance. Units wear out and fail, but the fluids analysis will enable us to identify trends and have a more proactive approach and we're responding to that."

"We have a number of engines where we seem to be coming to a point where we can predict when we need to intervene," said Ian.

"Gearboxes, differentials and axles as well. An in-chassis rebuild costs around £1,800-2,000 compared to £9,000 if we leave the engine to fail. We can schedule the repair and we don't have the recovery costs or any of the other related issues."

Said Chris: "We're in a scenario where not all the manufacturers and suppliers want to share information, but the spreadsheets we're now getting from the fluids analysis gives us the ability to look at all the data. It's an important maintenance tool."

"We've attempted warranty claims now before a unit has failed and manufacturers should be grateful because it lowers the cost of repair for them. However, not everyone is quite on the same path we're on so it's about gaining their confidence. When we understand the issues better ourselves, we're in a much stronger position for going back and talking."

"Oil sampling enables us to create service programmes that are unique to a depot and we can drill down even further and make them specific to a vehicle," said Ian. "If we create a condition-based oil change, we're only changing at the point where it's required rather than when it's timed. If a bus happens to operate in an arduous area or on a difficult route, we expect to increase our maintenance regime to reflect that or, of the opposite is true, we can adjust accordingly."

"Probably within the next month every vehicle in the fleet will have been sampled engine-wise at least. We're coming away from experiencing total unit failure. It's a new world of engineering."

Said Chris: "Off the back of all of this, Darren is setting up an engine shop at Camberwell garage where he's already established a facility repairing ramps. Based on the oil samples and what we can ascertain the engine needs, he will be able to build-up a rebuild kit and send that out to the garage for installation. That way we take all the measurement and fine control

element away from the depot environment and no specialist tooling is required. Again, it's controlling VOR onwards costs. If we do have an engine that we need to rebuild, we'll do that in-house at Camberwell."

Said Ian: "Go back 30 years and it was all about planned overhauls that were labour intensive, expensive and inefficient. That's why we moved away from central works. Creating

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What I enjoy about the job is the fast pace. It's exciting because I'm directly involved in something that is quite meaningful

the engine shop is about trying to bring some of that centralised control back in-house, but doing it specific to the requirement of the bus, not because it was due its five-yearly overhaul."

At the end of the meeting Chris explained: "Every week we have conversations like this. It's about sharing knowledge and feeding it back to the guys in

the garages. It is a challenge at the moment because we're putting so much information to the depot managers to act on so we need to be leading and educating."

Going electric

I then joined Chris on a visit to Northumberland Park depot in north London where 62 BYD ADL electrics, 13 of them Enviro200EVs, the remainder 49 Enviro400EVs, are being introduced on to five TfL contracted routes in the first half of this year.

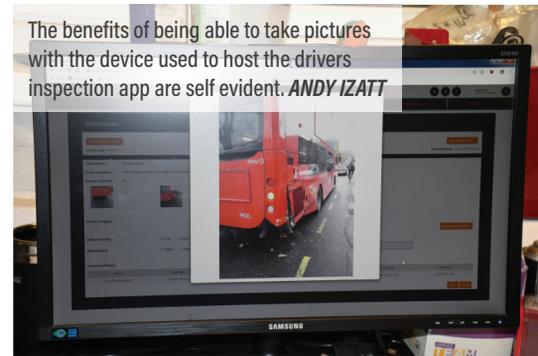
Single-deck route 212 (Chingford-



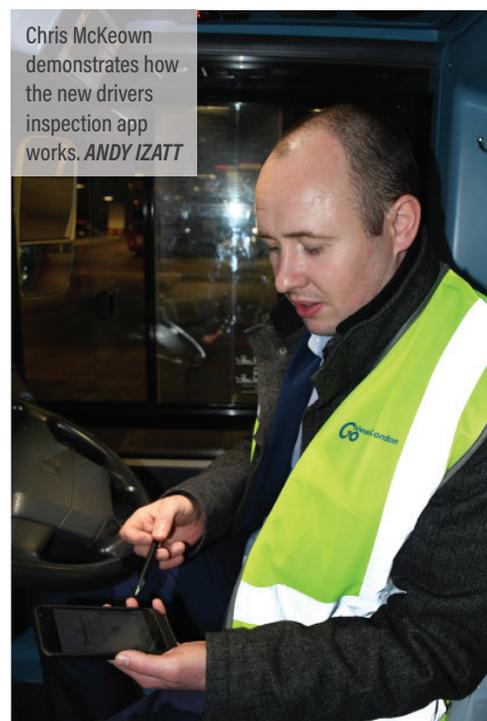
Every morning Chris McKeown gets a report from depots where the new drivers inspection app has been introduced. **ANDY IZATT**



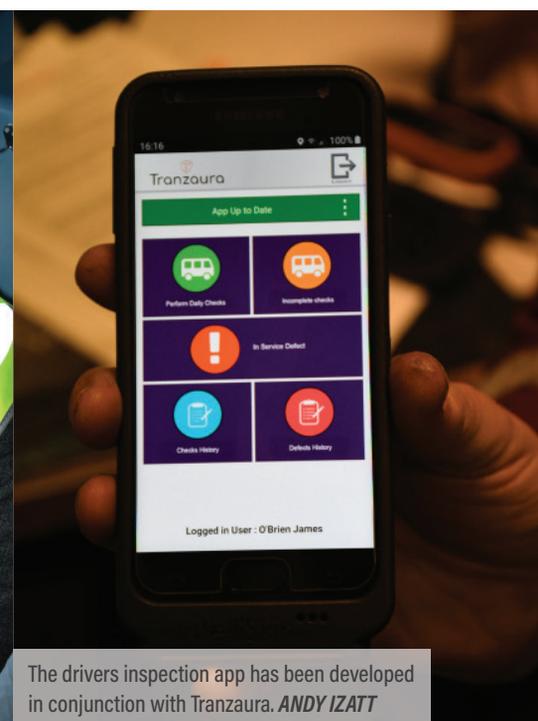
Chris McKeown is based at Go-Ahead London's 18 Merton High Street head office. **ANDY IZATT**



The benefits of being able to take pictures with the device used to host the drivers inspection app are self evident. **ANDY IZATT**



Chris McKeown demonstrates how the new drivers inspection app works. **ANDY IZATT**



The drivers inspection app has been developed in conjunction with Tranzaura. **ANDY IZATT**

FACE TO FACE / CHRIS MCKEOWN

Walthamstow) with 13 10.8m buses and double-deck service 444 (Chingford-Turnpike Lane), previous operated by Tower Transit, are expected to convert on 7 March. Also double-deck are the 106 (Finsbury Park-Whitechapel) to be taken over on 25 April and 230 (Upper Walthamstow-Wood Green) on 30 June from Arriva, while 357 (Chingford Hatch-Whipps Cross) has been retained on re-tendering.

Alongside diesel-bus operated routes, Northumberland Park already operates 13 10.8m Enviro200EVs on the 153 (Finsbury Park-Moorgate) and 21 10.2m buses on the 214 (Highgate-Moorgate). Chris wanted to finalise the position of the additional charging points that will be required with the depot's Engineering Manager Lee Connelly.

A substation built inside the end building of a now demolished old pump house on the depot site takes power from the national grid. Two transformers step that down from 11,000v to the 415v used by the buses and currently there are 34 BYD-supplied chargers located around the perimeter of the parking area. To accommodate the additional electric vehicles two more transformers are being installed to handle a power input that's growing from 2MW to 5MW and the number of chargers is being increased to 98. Four of those will be in the workshop area where there are still two double-length pits – a legacy of when artics were based at the depot.

"We will have surplus energy during the day," observed Chris. "I'm a transport provider so maybe that can help provide some other means of transportation such as electric taxis. We had a loose plan for where the chargers were going to be located that was sufficient for getting the building works underway, but we now need



Camberwell garage is where the ramp and engine shop that Technical Support Manager Darren Connolly has set up is located. **ANDY IZATT**

to pin down their exact location. We have to consider the length of the leads – three or five metres – when it comes to the exact position of all the buses. It will be best if some of the parking is staggered and where possible we'll put stops in place so vehicles can't be reversed too far. Parking will be concentrated on the plot of land that we bought from a church and where the pump house used to stand.

Lee Connelly explained that currently 184 buses are maintained at Northumberland Park including what the commercial unit operates at Luton primarily for services to the airport. There will still be around 50 diesel buses allocated after all the electrics are in service so one of the challenges will be how best to organise the depot's fuel lines during the evening run in. "We should have 23 engineering staff, but we're running at about 17 at the moment," said Lee. "Getting enough engineers is a challenge as this site can be

difficult for some to get to."

Said Chris: "When the first batch of electrics came in, we had BYD, which is prime contractor, on site going through all the basic maintenance with us. The buses are covered by a five-year driveline warranty so we don't get involved in the high voltage side. There's support from ADL and Graysons as well. If the TfL contract runs for just five years, we probably won't change the batteries, but if it's seven years or the vehicles have a second life, we will.

"The batteries in the latest buses are slightly different to the ones we have at Waterloo, which were air-cooled. These are liquid-cooled so the thermal management is greater, as is the energy density. We're anticipating less degradation and better battery life as a result.

"The electric buses on the 214 were the first with electric heaters. Electric heating increases the throughput of energy and that's affects the lives of the batteries. The bandwidth we

want to remain within is between 80% to 25%. Do that and we maximise the opportunity to extend the life, but on some duties we're pushing that range. We're monitoring the amount of degradation, but won't be able to properly evaluate it for several years.

"The exercise we're working through at the moment is understanding the differences between the vehicles and the controls we need to put in place to reduce energy consumption. There are opportunities to do that, whether it's the driver not using the heater when the bus isn't going anywhere, switching the screen demister off when it's not needed or training drivers to shut the blowers down when the exit doors are open. We're using quite a varying amount of energy across the electric fleet. At the end of each week we're getting a graph of total energy consumption that is broken down by the output per km/mile per bus. That should enable us to identify any trends and investigate what's happening.

"It's important that any issues we encounter don't become a problem for TfL. It's our customer at the end of the day. I want to get to a situation where we're doing all the maintenance work, even if it's warrantable, ourselves. We're already a service partner for ZF, for instance, and I'd like to be in the same situation with Volvo, Cummins and BYD because, again, that helps us control our VOR time. It should suit both sides. When Wright's went into administration, we took the opportunity to recruit a number of its Customcare people as Lead Engineers. Very skilled people who know what they're doing."

Inside Camberwell

Out next port of call was Camberwell garage in

south London, home to around 225 buses and where BYD ADL Enviro200EVs for route 360 (Royal Albert Hall-Elephant & Castle) are based and where the first 9.7m examples for route 100 (London Wall-Shadwell) were imminent. It's also home to five of Waterloo's allocation of electrics so there are 35 charging points.

"We thought we could put all the charging points in one area, but there was no way we could reliably get the first two buses out on service if we'd done that," said Chris. "We had to run additional cabling to charging points by the exit. The substation is on a strip of land between the garage wall and fence. It was really convenient because the space was available and the cabling was relatively straightforward.

"It's different solutions at every location. Maybe 20% of our fleet has very long operational days – night routes, or long duties. Then there might be weight and height restrictions that might need to be taken into consideration. Any of these factors may require us using either a very fast charge or opportunity charging. The charging infrastructure will be different.

"You know, we could share space with supermarkets, using their car parks to recharge overnight when they're not otherwise being utilised. Another option worth exploring is building residential property above a garage to alleviate the housing shortage. It would mean tunnel parking for us, but we could share the power supply. What we've found is important is engaging with everyone involved.

"There just isn't one answer. We have to tailor it to what we want and of course, we want to do it in the most cost effective manner. That's true for AC versus DC charging. What's the point in spending more on having DC charging when it's doing something I don't need it to do?"

Chris showed me around Camberwell's extensive workshop facilities where the vehicle lift options include hydraulic rams. It's also where the ramp and engine shop that Technical Support Manager Darren Connolly is setting up has been established. "We're already started rebuilding our own ramps, but it's work in progress as far as engines is concerned," said Chris. "It's in what used to be our old brake shoe shop.

"We talked earlier about the benefits of doing fluids analysis. It's worth mentioning that with the Euro VI up-fit systems that have been installed in Euro IV and V vehicles, if the injectors are starting to fail, or if the engine is worn and starting to smoke a little bit, I don't get any warning sign of that in the cab. The first indication of a problem is when I've got warning lights relating to the after treatment

system. Not only have I got the cost of repair to the engine, I also end up getting the cost of a repair to the downstream system which is damaged as well. Doing that fluids analysis enables us to see issues that have been masked by up-fits and respond accordingly.

"I'm not planning on rebuilding loads of engines at Camberwell. As I said, my objective is to use this facility to package up kits that are sent out to the garages for them to install because we've identified the problem early enough to be able to do something about it. It's about working together and sharing best practice. We're doing a lot at the moment and it's a challenge to attribute improvements to any one element, but that's why I like working for Go-Ahead London. We can just be pragmatic about what we do.

"What I enjoy about the job is the fast pace. It's exciting because I'm directly involved in something that is quite meaningful. We've played quite a big part in the air quality improvements that are going on in London. We've helped design the retrofit emission abatement systems that have been introduced because we have a big enough voice that means we're listened to by manufacturers and suppliers. They come to us to help form their views and opinions and I like to think our knowledge is respected enough that they'll partner with us for trialling and development whenever they can. That's satisfying and rewarding and then there is seeing it all come together and delivered in the garages.

"There's never a dull moment in this job. There is always something new and interesting to get involved in." //



BYD ADL Enviro200EVs for route 360 are based at Camberwell garage and at the time of CBW's visit, the first 9.7m examples for route 100 were imminent. **ANDY IZATT**



Vehicle lift options at Camberwell garage include hydraulic rams. **ANDY IZATT**