Submission No 12

ELECTRIC BUSES IN REGIONAL AND METROPOLITAN PUBLIC TRANSPORT NETWORKS IN NSW

Organisation: Scania Australia Pty Ltd

Date Received: 19 December 2019

INQUIRY –
ELECTRIC BUSES IN NSW PUBLIC TRANSPORT NETWORKS

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19th December 2019

Parliament of New South Wales
Legislative Assembly Committee on Transport and Infrastructure

Chair: Ms. Robyn Preston, MP

Inquiry – Electric buses in NSW public transport networks

Dear Ms. Preston,

Scania is pleased to have the opportunity to offer our submission to the subject Inquiry and offers the following information against the Inquiry's Terms of Reference headline points:

1. *Benefits of electric buses and factors that limit their wider uptake.*
2. *Minimum energy and infrastructure requirements to power electric bus fleets.*
3. *Other renewable, emissions neutral energy sources.*
4. *Ways to support manufacture and assembly of electric buses in NSW.*
5. *Experience with introducing electric bus fleets in other jurisdictions.*
6. *Opportunities and challenges of transitioning the entire metropolitan bus fleet to electric.*
7. *Any other related matters*.

By way of providing some background of our Company, Scania is a global organization owned by the VW Group, specialising in the manufacture of Heavy Transport equipment, trucks, buses and engines (industrial & marine). It employs over 52,000 people internationally and over 500 people in Australia. Scania's global production of buses and coaches for 2018 was 8,482 units. Global truck production was 87,995 units for 2018, with Industrial Engine production of 12,809 units. Scania has global truck, bus & coach production facilities in Netherlands (Zwolle), France (Angers), Brazil (Sao Paulo) and Sweden (Sodertalje).

Scania Australia Pty Ltd is a wholly owned subsidiary of Scania CV AB based in Sodertalje, Sweden. Scania Australia first commenced operations in Australia in 1971, establishing a production facility in Campbellfield Victoria and is extremely proud of its long term relationship in the Australian Bus industry, realising a consistent market share of circa 30% over the past 10 years.

Whilst this has been in the market of diesel powered buses, in 2019, Scania has commenced delivery of our Hybrid powered bus (diesel / electric) into the Australian market and is well positioned for the supply of Battery Electric buses (opportunity charge and in-depot charge) in the coming years. A nationwide network that includes both Company owned and independently owned Aftersales facilities supports Scania's products in service in Australia.

SUSTAINABLE TRANSPORT SOLUTIONS

Scania's aim is to be the world leader in ***Sustainable Transport***. Whilst Euro 6 emission technology is offering the cleanest diesel exhaust emission levels the world has ever seen, the pursuit towards zero emission public transport vehicles is a very realistic goal. Additionally, Scania's Global Leadership in the field of extremely low emission "Alternative Fuels" such as Bio-Diesel, Ethanol and Bio-Ethanol, means that we manufacture a large suite of vehicles designed to suit a wide range of vehicle operation applications.

Scania's commitment to the reduction of CO2 emissions is the number one priority for the company. During a recent visit to Australia, Scania's President & CEO Henrik Henriksson outlined his vision and passion for increasing the investment in "Sustainability" across the heavy transport industry, and the role Scania is playing in achieving CO2 emission reductions with the products it is manufacturing for the future.

"I truly believe myself that as a leader of big international company, if you do not do this transformation and turn your company into a sustainable one, you will simply not survive, because soon no one will buy our products or services, no one will invest money in your company and no one will like to work for you.

So this is a matter of survival of the company as well. But we need to do this in partnership. Partnership with our customers and our customers' customers and we need to make sure that we build alliances, sometimes unexpected alliances, to create this change."

"And I think here there is a lot of opportunity as well in Australia. If you look at the potential of utilising natural resources, agricultural resources, waste, we can already today utilise renewables to create biofuels in a much bigger scale than is currently being used.

Electrification will come of course eventually, but in a big country the nature of Australia, it will take a little bit longer. We cannot just sit and say, okay let's wait for electrification to come to us as a sort of silver bullet for sustainability. No, that's when we need to drive them, which we believe very much in sustainably produced biofuels. Coming out of waste water, creating biogas, coming out of maybe sugar cane production to create bioethanol. Or through other sort of growth and agriculture products you create biodiesel. Then we can reduce CO2 with up to 90, 95%."

NEW INDUSTRIAL TECHNOLOGIES & EMPLOYMENT OPPORTUNITIES

Driving customer profitability through sustainable solutions and pursuing responsible business are complementary long-term perspectives for continuing to be a profitable company. While the core of our contribution to society is delivering sustainable transport solutions by improving customer profitability, it does not mean that our responsibility ends there.

The introduction of Scania Bio-Diesel prepared Euro 6 Diesel Buses means that the NSW Government could achieve an 85% CO2 reduction **here and now** while waiting for the transition and introduction of electric buses. Alternatively, the use of Bio-Gas from Sydney's waste water treatment facilities could also be a long term solution to utilise the Methane gas that is currently being "burnt off" and only adding to the CO2 greenhouse gas issue.

The opportunities to create a new wave of industrial technology and employment opportunities within NSW by utilising *Alternative Fuel* sources via recycling of waste product only further highlights the benefits to both the Sydney CBD and the Rural Cities, as presented in our submission below.

Once again, we thank you for the opportunity to showcase Scania's product portfolio and offer our Company's extensive Bus experience to this Inquiry.

1. ***Benefits of electric buses and factors that limit their wider uptake.***

a. Benefits

Where Bus services are offered and the electricity required to both manufacture and then provide power for electric buses whilst in service can be assured as being clean, domestically produced and reliable, the headline benefits are clearly evident as follows:

- Improved air quality:
  - Zero tailpipe emission from electric powered buses have an immediate impact on reducing the amount of greenhouse gases and related pollutants emitted into the bus operating environment

- Reduced noise emission levels:
  - As well as the lower noise level produced by an electric driveline compared to diesel powered buses, electric buses are completely silent when the bus is stationary

- Reduced vibrations:
  - An electric powered bus has reduced driveline vibrations compared to diesel powered buses and therefore improved passenger comfort and reduced damage to surrounding infrastructure.

- Improved community health:
  - In the area of the bus services being provided, the short and long term benefits to overall community health and well-being due to both the noise and harmful emission reductions is well documented.

- Energy security:
  - Where the power for electric buses is being made available via domestic production sources via “locally” available means, the economic stability as a consequence is assured.

b. Limitations of a wider uptake

With the benefits of electric buses clearly evident, there are several competing factors that could prove restrictive for their wider uptake, as summarised below:

- Uncertain power reliability:
  - For an electric bus to deliver its service, Bus operator access to electricity to power its fleet must be assured. The consequence of failure to provide electricity is simply no bus service.

- "Unclean" source of power generation:
    - Whilst the operating area of the Bus Service utilising BEV's is the direct beneficiary of the resultant reduced vehicle emissions, the green houses gas (GHG) emissions performance of a vehicle energy source must be analysed over all three stages:
        - Well-to-Tank (WTT)
        - Tank-to-Wheel (TTW)
        - Well-to-Wheel (WTW).

      WTT considers all GHG emissions resulting from any extraction, transportation, production, refinement, distribution, and storage of the energy source. TTW considers all GHG emissions from the energy source when the bus is in operation. WTW combines the WTT and TTW effects

- High initial capital cost:
    - As at today, the initial capital investment needed to acquire a BEV is approximately 50% vs a diesel powered bus. As mentioned elsewhere in our submission, the volume of buses being replaced on a 1 for 1 basis alone would add some $143 million to the national spend on low entry DDA compliant city buses. Funds have to be made available.

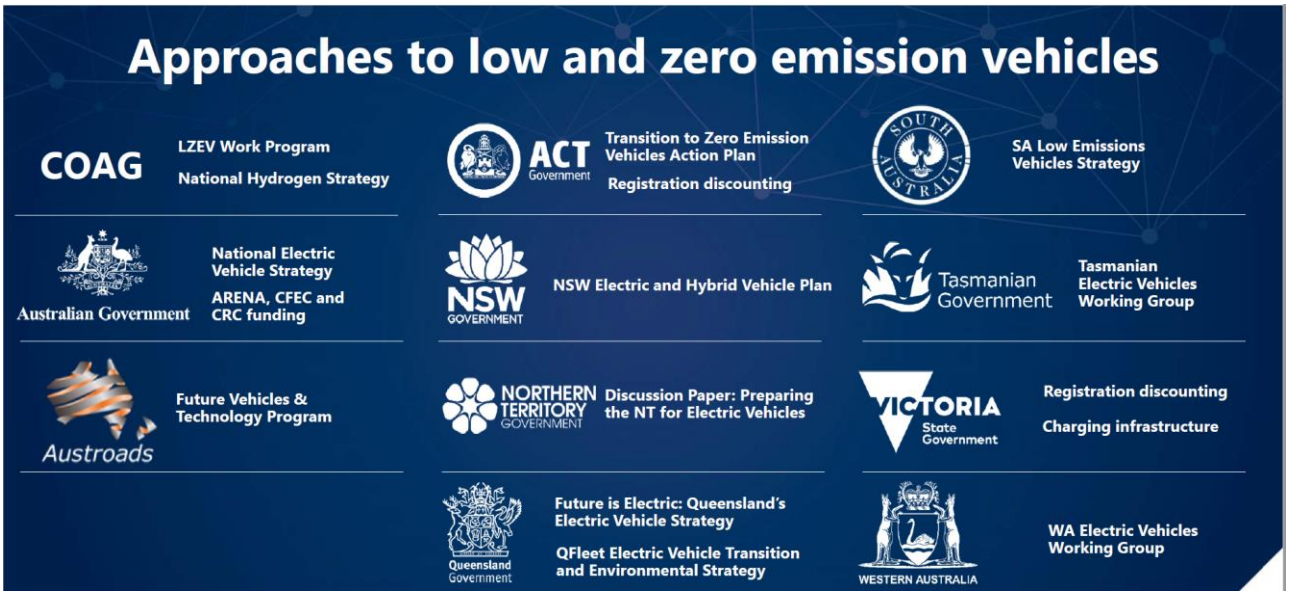
- High infrastructure investment and lack of harmonised stakeholder goals and objectives:
    - Regardless of whether BEV's are a Back to Depot charge or Opportunity charge whilst en-route, the introduction of BEV's where diesel powered buses currently operate, will require significant investment in charging points and the co-operation of the various stakeholders such as:
        - Bus owner
        - Bus Manufacturer and Supplier
        - Bus Operator
        - Finance providers
        - Energy provider
        - Road owner
        - All levels of Government.

      Funds and a platform for engagement have to be made available

- Competing development of alternative, more efficient power technologies:
    - This Inquiry is focusing on Electric Buses. With ongoing development of alternative zero emission vehicles such as Hydrogen fuel cell buses indicating a more efficient bus service delivery (albeit yet to be proven beyond small scale bus operations) there could be a reluctance to leap to BEV technology due to the factors mentioned above and throughout this submission
    - Similarly, the rapid advancement of BEV technology could conceivably render a BEV acquired in 2020 to be obsolete within 2-3 years.

- Competing infrastructure and investment resource priorities:
  - Whilst the initiative to move to a zero emission Bus delivery service is a logical progression, the capital required will compete with other equally as, or even more important Government investment demands across NSW and Australia such as:
    - Water storage and security
    - Health care
    - Aged care
    - NDIS
    - Security

- Lack of a single National vision for low and zero emission vehicles:
  - At the November 2019 Bus Industry Confederation (BIC) conference in Canberra, a presentation was given related to low and zero emission vehicles. The slide below highlights the extensive and varied studies that have so far been undertaken by National and State based entities. With different jurisdictions potentially developing different approaches, the impact on cost and resource demand is an unknown.



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3. *Other renewable, emissions neutral energy sources.*

In line with the latest media release on 13th November 2019 by the National Government's Minister for Energy and Emissions Reduction, there is an objective to create a New Bioenergy Roadmap to grow an emerging energy source and enhance Australia's bioenergy sector. This will also help to identify the role that bioenergy can play in Australia's future energy mix.

Scania views this as a positive initiative to take emissions reduction seriously.

Relevant to Transport, the roadmap will consider:

- The potential for biofuels to decarbonize the industrial and transport sectors;
- The role biofuels can play in contributing to Australia's liquid fuel security;
- Opportunities to use biogas in the gas network;
- Quantifying the economic opportunities for Australia, including a focus on regional Australia.

The Bioenergy Roadmap is part of the Government's commitment to reduce Australia's emissions by 26 to 28 per cent below 2005 levels by 2030.

The continued development of Australia's bioenergy sector has the potential to stimulate regional development, enhance energy security and help meet emissions reduction targets.

Scania has pioneered the use of alternative fuels for 30 years, resulting in the broadest range of alternative fuel vehicles available today.

In the transport sector, sustainable biofuels can make an almost instant contribution to decarbonization.

Scania has a broad alternative fuels engine portfolio:

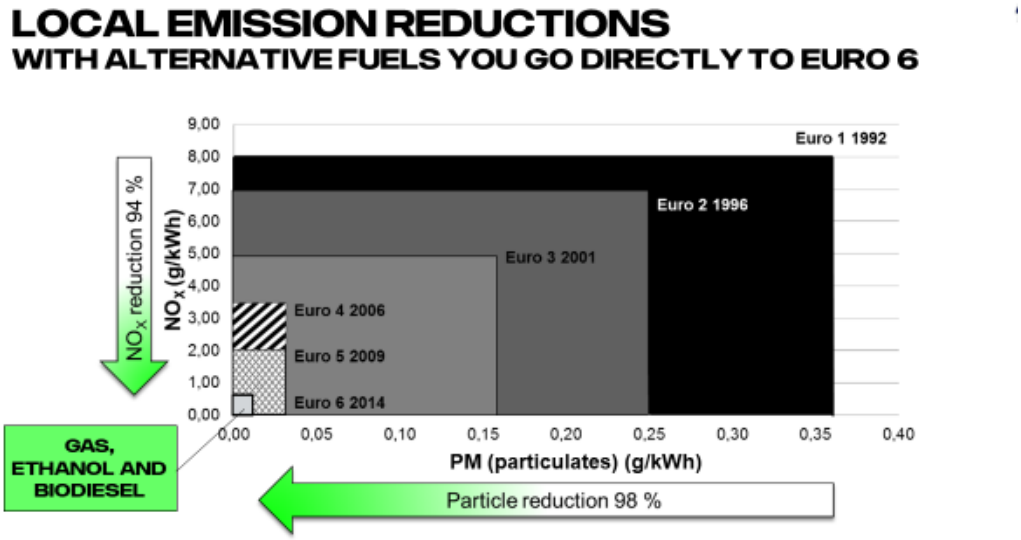
The Transport sector contributes a quarter of total energy-related CO2 emissions. Operators do not have to wait to adapt their businesses to a sustainable transport system – the solutions are already here.

Scania's Euro 6 emission buses all operate on biofuels where waste sources are key i.e. Biogas from wastewater, Biodiesel from abattoir waste and used cooking oil and Bioethanol from sugarcane and food waste.

Scania can provide a broad range of platforms and services to support our customers today and in the future.

Interesting to note that Scania joined the **Global Industry Partnership on Soot-Free Clean Bus Fleets** with a commitment to, by 2018, provide modern soot-free buses to 20 major cities in Africa, Asia, Latin America and Australia where the city of **Sydney together with C40 Cities is part of the partnership.**

‘Today’ in NSW where air quality has deteriorated, biofuels can make a difference, here and now.

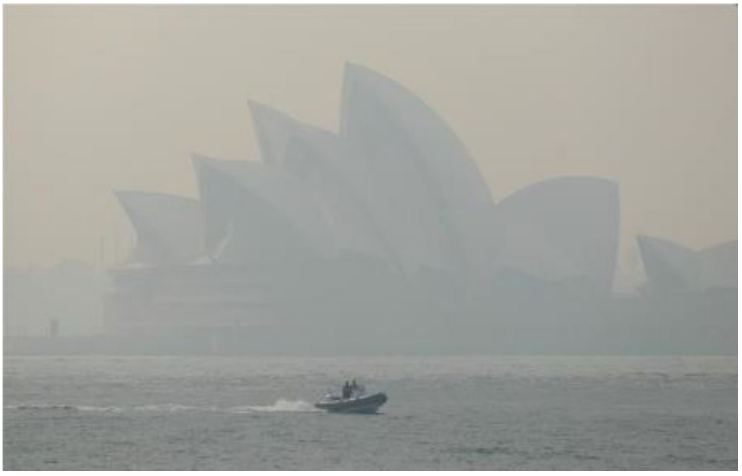


And…

According the WHO, poor air quality is the world’s number 1 cause of death.

- Congestion and air quality problems threaten health and cities’ economical growth
- Particle and soot emissions cause lung cancer and 1 out 8 deaths related to poor air quality (WHO)
- Black carbon/soot also is the 2nd worst climate change emission
- HD diesel → over 80% of particle emissions

Sydney Air Quality Index (**AQI**) during the December 2019 bush fires was rated **over 200** which is rated as ‘hazardous’.



As part of committing to reducing emissions, Scania was recently awarded the Bioenergy Australia Corporate Leadership Award for Driving the Shift towards sustainable transport solutions and for building Biofuel Partnerships.

For Scania technology is not the problem!

We can operate sustainable and commercially viable transport systems here and now. Since we need to cut our CO2 emissions by half every decade, we need to start implementing our here and now solutions – on a large scale – while at the same time push for even more advanced solutions for the future.

Scania's alternative fuel solutions are our contribution to the reduction of CO2 greenhouse gases – **HERE & NOW.**

4. Ways to support manufacture and assembly of electric buses in NSW.

It is beneficial to first review some data regarding the buses sold in Australia each year to set the scene for these discussions:

a) Currently approximately 1,300 new heavy (>14t) buses are registered nationally per annum, with the NSW market typically accounting for 30-35% of these.
b) These are typically on “1 for 1 replacement” basis when the current bus reaches the end of its service life, this means the vehicle can be 25 years and 364 days old in some jurisdictions. There are currently limited numbers of “growth” buses for new and expanded services.
c) Industry is currently replacing 25-year-old buses (that can be Euro 1 or 2) with the current mandated minimum legislation of Euro-5. We see a good number of these replacement buses providing the yet to be introduced Euro-6 standard to most government and forward thinking private operators. At the November 20019 BIC conference in Canbera, Mark Darrough, Acting General Manager, Land Transport Policy Branch - Fed Dept Infrastructure, Transport, Cities and Regional Development announced that Euro 6 will be introduced in 2027
d) Looking into the breakdown of the approximately 1,300 units per annum, we see approx. 650 low entry DDA compliant city buses and of these, the vast majority (approx. 88%) have the body manufactured in Australia.
e) Most of these are built on chassis imported from Europe and these chassis are the basis of the buses that are manufactured in specialist body building plants across the nation.
f) These manufacturers employ approximately 800 to 900 FTEs.

One of the “challenges” for local bus manufacturing is the ability to cope with substantial swings in demand, both increases and decreases so it has evolved over the past years to be able to maintain a steady rate of supply based on the scheduled aged based replacement volumes as outlined above.

Scania supports and proposes that the introduction of BEVs (Battery Electric Vehicles) to the Australian market begins with the transition of scheduled aged based replacements being BEVs rather than a Euro 5 or Euro 6 diesel powered vehicle in the initial stages.

This will allow the local body building industry time to evolve and develop the new skills required to build BEVs. This includes the training in the new chassis componentry and dealing with high voltage wiring in the initial build and during the commissioning process.

Scania is committed to carry out the necessary training and technology transfer in a strategic partnership arrangement with the selected and qualified bodybuilders.

The traditional diesel bus chassis the local bodybuilders work with today will become more modular with the additional componentry of a BEV chassis and that will require additional engineering and planning to ensure mutually beneficial integration to the bodywork.

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5. Experience with introducing electric bus fleets in other jurisdictions.

Scania's experience with a full electric bus trial began in 2015 when the Municipality of Östersund in northern Sweden called for a proposal from its major OEM partner Scania, who had supplied almost 100% of the existing bus fleet in the municipality. The pre-requisite of the trial was that the system was to be operational by 2018.

In 2017, Scania released the fully electric opportunity charge Citywide Low floor city bus at Busworld in Kortrijk, Belgium (see below).

The rationale behind "Opportunity Charge (OC)" technology versus "Back to Base (B2B)" technology was due to,

- Uptime – OC buses can stay out longer (better uptime) than B2B as they aren't relying on a major "hit" overnight to have them ready for service the next day – if there was the demand and the availability of drivers then Op Charge buses could run 24/7……

- OC – Agreements to be made with utility companies who can supply the infrastructure and structure the cost recovery as a "pay as you go" scenario, so the initial capital outlay is amortised over a longer period of time which will ultimately improve the cost/benefit ratio of the project.

- OC - Power consumption is in short bursts (not a prolonged charge overnight) – spread over a geographically larger area (ie: not concentrated in the Depot) therefore making the charging process less taxing on the grid. This is particularly relevant when it comes to the volume of electric buses that will require charging as the number of buses in the depots increase year on year.

- B2B promotes an increase in the number of “micro-grids” – operators looking to provide their own power with solar etc. as the cost of “poles and wires” excessive and also as the capacity of the grid to concentrate so much power in one position (Depot) is not always guaranteed.

- Micro-grids severely limit the Utilities Companies revenue flows and therefore without their “buy-in” to these significant projects the chance of success is limited.

OSTERSUND TRIAL RESULTS

Working with ABB, Scania and the local bus operator Nettbus, the municipality gave the greenlight to begin trials using 3 electric buses in 2018, with a further 3 units commencing operation at the start of 2019.

“Line 6 in Östersund is a completely new 14 kilometer long frame, from Torvalla south of the city through the city centre to the newly built district of Brittsbo in the north. Here the operator runs Nettbus Electric buses from Scania. Since line 6 started in March 2018, the first three electric buses have rolled 120 000 km, and more than 300 000 travelers have been silently and emissions-free to get to and from their jobs.”

In terms of the results from the bus trial, Scania can advise the following (note: Buses are not air-conditioned):

The mean consumption is, and has been around 1.15 kWh/km. Note: These results are based on temperatures that have varied between -30 degrees during winter and +30 degrees during summer

The buses have had a very high up time with few stops for the operator. Despite this project being a field test, we have had an up time of approx. 90%.

A full description of the trial is located on the following YouTube link:

https://www.youtube.com/watch?v=xMMngoyexGI

NEW TECHNOLOGY RELEASE – COMPLETE TURN-KEY SOLUTION

Scania launched the updated Battery Electric Vehicle at Bus World in Belgium in October this year, and interestingly this “Pantograph Rapid Charge” technology is in line with the technology that will be adopted by Brisbane City Council for the 24m Bi-Artic, high capacity “METRO” project.

The Scania Citywide BEV showcased at Busworld is built for opportunity fast charging through the inverted pantograph. With fewer batteries, the bus is equal in weight to traditional diesel and gas bus with a similar passenger capacity. In addition to 300 kW DC roof-mounted pantograph charging, the bus is equipped both for alternating and direct current depot charging.

The 12-metre Scania Citywide BEV comes equipped with a powerful 300 kW electric motor. With Scania’s oil spray cooling system for the motor, there are no torque limitations in hilly and warm environments.

The batteries have been divided with four on the roof and four in in the rear overhang to give a lower centre of gravity, enabling better bus drivability and handling. This distribution of weight enables the bus to carry up to 95 passengers.

All the main components, such as batteries and powertrain, have been designed and engineered by Scania, thereby enabling a complete vehicle optimisation. Scania can therefore take complete vehicle responsibility with services and expertise in its global network, which ensures maximum availability.

"With a range of 80–150 kilometers, the Scania Citywide is well-suited for the vast majority of inner city routes. Naturally, each transport system must be optimised based on its own set of conditions, however our analysis clearly show that charging throughout the day in most cases provides the best total operating economy," says Anna Carmo e Silva, Head of Scania Bus & Coach.

6. Opportunities and challenges of transitioning the entire metropolitan bus fleet to electric.

The current contractual arrangements and average bus life is currently geared around a 25 year vehicle life. As outlined in the response to section 4, we see bus approx. 650 buses replaced per annum nationally and this will mean it will take 25 years to replace the entire fleet.

Scania recommends a gradual initial introduction that would see BEVs replacing the older vehicles as they fall due under the existing contract arrangements. This can then be accelerated as the local bodybuilders and the associated support infrastructure suppliers adapt and ramp up to meet the new demands, subject to suitable Government funding for both the vehicle and charging infrastructure.

Additional benefits to an accelerated replacement program will be the introduction of additional onboard electronic safety features that have evolved over recent years as well as a public perception of seeing new, clean and quite vehicles on the roads and streets of the state.

Additional capital cost of a BEV over the standard diesel bus will be offset over time with the reduced running and maintenance costs however the 'upfront' funding impact must be considered in the operator contract arrangements.

The availably of "clean" electricity is essential to the operation of a BEV as electricity produced by coal can see up to a 30% INCREASE in total emissions.

Scania is able to bring existing global relationships to the project working with the local arms of business such as energy transmission and vehicle charging infrastructure expert ABB with facilities in Moorebank, to deliver a turn-key solution for TfNSW.

With air-conditioning as standard on all new city buses, the demands and energy consumption are a major consideration on the available range of any BEV. Scania has selected to offer a product with both in service opportunity charging and overnight depot charging capabilities. Opportunity charging at points along the route allows for a reduction in battery capacity and mass to provide a lighter bus that reduces energy demands and can allow increased passenger capacities.

7. Any other related matters

ENERGY RELIABLITY IS THE KEY TO SUCCESS

The NSW Transmission Line infrastructure Upgrade initiated in 2018 to provide an additional 20,000 megawatts in the planning system is essential for the increased supply of Battery Electric Vehicles (BEV's) into the NSW public transport system.

A typical city bus will consume on average circa 160,000kWh per annum of operation – which is the equivalent of 6.25 buses per megawatt. Bus Depot infrastructure upgrades will be a necessary and expensive process to allow for the transition across to full BEV's.

Whether it be Back to Base (B2B) or Opportunity Charge (OC) technology that is employed, the increased volume of power consumption and the installation of charging stations will be one of the major challenges for the roll out of the Battery Electric Buses.

DIESEL VS ELECTRICITY – BASE COST COMPARISONS & TAX IMPLICATIONS

A Cost study based on Diesel vs Electricity will also need to be undertaken to understand the base operating costs of both vehicles, as diesel currently heavily taxed, while electricity is not. This leads to the question of the level of tax generated for both State and Federal Governments from the existing diesel bus fleet, and the impact of moving to a full BEV fleet.

Current arrangement allows for the federal excise on diesel to be claimed as a rebate from the Government, currently A$0.416 per litre on diesel fuel (ultra-low sulphur/conventional).

TECHNOLOGY CHALLENGES FOR REGIONAL OPERATORS

Regional NSW Operators may find supporting full BEV's a challenge due to technical expertise and infrastructure availability.

Hybrid Buses (Diesel/Electric) have the capacity to reduce CO2 emissions by up to 25% due to the reduced fuel consumption associated with the battery power operation these vehicles at speeds less than 40km/h.

The NSW Government may also wish to look at buses powered by renewable fuels such as ethanol, biodiesel and biogas (from sewage treatment plants). These vehicles have the capacity to reduce CO2 emissions by up to 90% as well as provide for an opportunity for jobs in a new area of fuel supply.

These vehicles are available from Scania **here and now** and represent the quickest way to reduce our CO2 impact in our regional centres.

We hope the information proves of interest to the New South Wales Government and we look forward to our participation in further stages of this Inquiry.

Yours Sincerely

Julian Gurney

Sales Director – Buses & Engines

Scania Australia Pty Ltd